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Paul Robert George Stokes

**The Roman Fort at South Shields (Arbeia)
A Study in the Spatial Patterning of the Faunal
Remains**

**Thesis submitted for the Degree
of
Master of Arts
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Vol 1



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The Roman Fort at South Shields (Arbeia) A Study in the Spatial Patterning of the Faunal Remains

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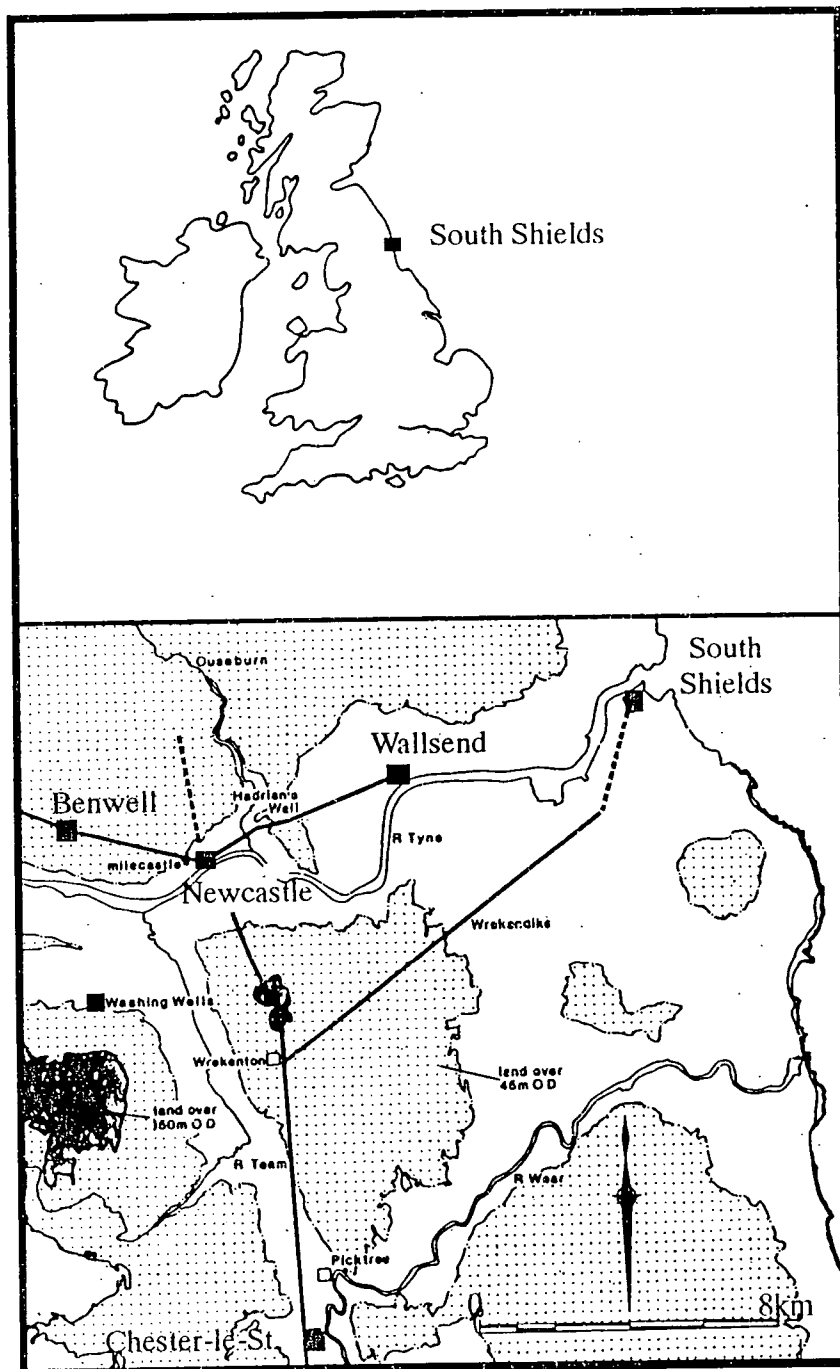
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1 INTRODUCTION

The Fort

The Roman Fort at South Shields is situated on the south side of the river Tyne near to its estuary (NGR: NZ 365 679).



(after Bidwell and Speak, 1994)

The history of the fort and its occupation has been fully described by Hodgson (in Bidwell & Speak 1994, 11-47) and this text forms the basis for the following summary. The Roman occupation has been divided into nine periods.

Chronology of structural periods and occupation at South Shields as proposed by Bidwell and Speak (1994, 7)

Period	Date	
1	Flavian - Trajanic	Fort possibly of Flavian origin away from known fort.
2	Trajanic (?) to Hadrianic	Extra-mural occupation outside fort away from known site.
3	Late Hadrianic to early Antonine (?)	As above, but new plan perhaps reflecting alterations to fort
4	Mid-Antonine to c205-7	Known stone fort built c163 with <i>principia</i> showing two stages of construction, stone barracks. Reduced occupation in late 2nd century.
5	Severan, c205-7 to 222-35	First period of supply base, <i>principia</i> rebuilt to face south-east, dividing wall separates supply base. Fifth Cohort of Gauls in garrison
6	Severan, 222-35 to late 3rd or early 4th century	Dividing wall demolished, supply base enlarged, new <i>principia</i> on different site, new barrack accommodation
7	Late 3rd or early 4th century to mid-4th	Fort destroyed by fire. New <i>principia</i> some granaries converted into barracks, courtyard house built, all probably for Tigris bargemen
8	Mid to late 4th century	Widespread minor alterations. End of supply-base function? Church in <i>principia</i> forecourt?
9	Early post-Roman onwards	Southwest gate isolated after c400 then restored to use. 5th century activities in fort

It is possible that there was a fort in the area during the Flavian - Trajanic Period, suggested by finds of pre-Hadrianic pottery consisting of decorated samian

and fragments of *terra nigra* besides bronze coinage as early as Nero (Casey 1979, 76). Bidwell (in Bidwell & Speak 1994, 14), however, states that "it is doubtful whether the presence of early issues can be used as evidence for early occupation; some, if not all, might have arrived at the site in the normal pattern of circulation many years after they were struck". This phase of activity corresponds with Period 1 of the structural periods and occupation at South Shields as proposed by Bidwell and Speak (*op. cit.*).

The fort was probably built between 124 and 128AD (Period 2) to guard the flank of Hadrians Wall from its termination at Wallsend on the northern bank of the river Tyne. The known stone fort was built c 163 with barracks constructed in stone. During the late second century (Period 3) the fort had a reduced garrison due to the occupation of the Antonine Wall. It is thought that *ala I Asturum* might have occupied the fort at this time. The *alae* were front line cavalrymen whose higher social status is reflected in the earlier finds of two tombstones (RIB 1064-1065), in particular the one dedicated to Victor, a freedman of a trooper in the *ala I Asturum*.

In the mid-Antonine period c205-7 (Period 4) the fort was enlarged but it would have been too small to have been garrisoned by a full strength *ala*, a unit of 500 men, as opposed to the maximum strength of a *cohors equitata*, which was a unit of 240 men. The fort at this time resembles that of Wallsend, which Daniels (1989, 79) concluded was garrisoned by a *cohors quingenaria equitata*, but unfortunately to date neither fort has produced any epigraphic evidence to confirm the size or identity of the unit garrisoned during period 4.

During the Severan campaigns in Scotland c 205-7? to 222-35 (Period 5) the fort was again enlarged, from 4.1 acres to 5.2 acres, to accommodate the conversion of the fort to a supply base. The original area of the fort was largely taken up by the construction of granaries. The new extension was added to the south-east of the preceding fort boundary. It is this area of the fort that has been examined in detail for this study so it should be emphasised that the south-east

barracks and *principia* of period 5 (plan 1), were built in an area formerly external to the fort of periods 2-4 and that therefore any underlying stratigraphy is not of internal military occupation. The new work was built with a pink micaceous sandstone and some of the older stones were used in the new granaries and dividing wall. The new defences were built by *Legio VI Victrix*. Any faunal debris associated with the construction of the period 5 extension to the fort may therefore be associated with this legionary detachment.

It is thought that *cohors V Gallorum*, apparently a *quingenaria equitata* unit, was garrisoned at the fort in both period 5, c 205-7? to 222-35 and period 6, 222-35 to late third or early fourth century. Part of the same unit also appears to have been garrisoned at Cramond during the Severan campaigns. The fort continued in use after the Severan campaigns serving the northern frontier. The alterations to the fort in period 6 (plan 2) may be associated with the re-integration of the whole cohort.

Period 6 will be described in some detail, since deposits of this period were selected for detailed analysis in this study. Although the fort retained its function as a supply base in this period, there was substantial remodelling of the internal layout. For example the *principia* of period 5 was mostly demolished and the remainder of the building converted to a granary. The new *principia* was built to the south-east of its demolished predecessor, where it blocked the street from the south-east gate. A barrack block survived from period 5 on the north-east side of the *via praetoria* but its usage in period 6 is unclear. A further five barracks were constructed, of which four were arranged in pairs with a street dividing each pair, while the fifth barrack faced onto the *intervallum* street. It should be noted that these barracks have a different alignment to those of period 5. These barracks were built in stone with interior partitions of wattle and daub. The number of granaries within the fort was increased. The new internal layout of the fort in period 6 meant that there were only four points of access to the granaries and would therefore have simplified protection of the contents from unauthorised access. The entire

garrison of *cohors V Gallorum* would therefore have been confined to the area of the extension built in period 5. Opportunities for fly tipping of refuse in the original area of the fort, occupied solely by granaries in period 6, would have been practically nil. The garrison was therefore occupying a very constrained area with limited areas for waste disposal within the fort. The faunal deposits from period 6 were therefore seen to have excellent potential for analysing spatial distribution patterns. The end of period 6 was dramatic with the barrack blocks being destroyed by fire. This may have been a deliberate act of demolition which got out of control. Which left most of the area covered by a layer of burnt daub up to 0.30m in depth.

Subsequent to this fire, the interior of the fort was again replanned. The re-planning of the fort appears to have been designed to accommodate a new garrison, suggesting that *cohors V Gallorum* had been redeployed elsewhere. The occupation in period 7, late third or early fourth century to mid-fourth, saw high quality building construction in stone. Some of the granaries were converted into accommodation for the non-commissioned officers administering the port at the mouth of the river Tyne. A large courtyard house was built for the commanding officer on the site of the period 6 barracks described above. It is thought that the garrison at this time was manned by the *numerus barcariorum Tigrisiensium*. The linguistic evidence suggests that this unit was ethnically Arabic.

Periods 5-7 saw major phases of remodelling of the fort layout. In contrast, period 8, mid to late fourth century, denotes a series of modifications to the standing buildings of period 7. There is also thought to be continuity in the garrison. Sometime around AD369 the fort may have ceased to function as a supply base, although military occupation continued. A putative Christian church in the *principia* forecourt may indicate continuity of religious observance by the Tigris bargemen.

The faunal remains from periods 7-8 therefore offer the opportunity to contrast the faunal exploitation with that of periods 5-6 using chronological,

cultural and spatial parameters and observing whether the contrast in the ethnic background of the units is subsumed by standard military issue of rations and discipline with regard to waste disposal.

There was some early post-Roman (Period 9) activity in the fort with the Southwest gate being restored to use.

The Faunal Reports

There have been only four published reports which have included information on the faunal remains since 1875, when the first excavation took place. The first report by Roberts (1878, 146) states that there was a great quantity of bones from the 1875-6 excavation, especially lower jaws, teeth and fragments of horn (presumably antler since keratinous horn very rarely survives), many with knife and saw marks. How reliable Roberts' identifications were is questionable. As there were a number of cattle skulls with no jaws and a number of red deer jaws but no skulls, it begs the question whether the jaws were correctly identified. Cattle jaws in the Roman period were of a similar size to red deer and without a reference collection a person with limited experience may have confused the two.

The second report by Lyall (1878) was a small report on the shells from the 1875-6 excavation.

The third bone report on the finds from the 1967 excavations (Hodgson 1971) was published as a summary only, with no actual numbers of bone fragments. The relative abundance of species was based on minimum number of animals of each species present. In the absence of raw data, this report can not be used for any comparisons.

The fourth report published was on a small assemblage of small mammal bones from the forecourt granary and the south-west ditch (Younger 1994). This gave some indication regarding the environment of the fort in three of the nine periods. Two contexts were from the forecourt granary. The first context, 12236, was a deposit of up to 50mm in depth which had accumulated between the sleeper

walls of the period 6 occupation and demolition. This deposit contained a large number of rodent bones and carbonised grain. An estimated MNI of 340 animals for the whole granary was given by Younger. The species present included yellow-necked mouse and garden dormouse, the latter was thought to have been imported, possibly with the bread wheat (van de Veen 1988). Younger argues that this number of pests could have been a problem of economic importance but he takes no account of population densities or the length of time the granary was in use. Bidwell and Speak (1994, 93) suggested that this granary remained in use and unchanged for the whole of period 6.

The average population density per hectare for each species represented in the granary was obtained from the data given in Corbet and Harris (1991). These figures were then multiplied by two since the fort occupied 2.1 hectares in period 6. In turn, the figures so obtained were then divided by 24, this being the number of granaries. An approximate figure was therefore produced of the number of each of the small mammal species that might be expected to have been living in the environs of each granary at any one time:

Species	Density per hectare x 2	Approximate No per granary	
Black rat	104	4	
Water vole	4	2	
Field vole	40	2	
Bank vole	120	5	
Common shrew	14	0.5	
Pigmy shrew	12	0.5	
House mouse	40	2	
Yellow-necked mouse	40	2	
Garden dormouse	5	0.25	
Totals	415	18.25	18.25

The mortality rate for each species varies but, given an average of fifty percent per annum, a total of nine bodies could have accumulated per year per

granary. Therefore the estimated MNI of 340 small mammals obtained for the forecourt granary would have taken approximately forty years to have accumulated. If all these animals were to have died in one catastrophic event, when the granary burnt down, the population densities would have had to be twenty times higher than average, something approaching plague proportions. This concept does not match with the small mammal remains from the barrack blocks in this study, where very few small mammal bones were found. Although the contexts in the barrack blocks were not sieved, if population densities were as high as plague proportions there ought to have been larger numbers of bones noticed.

Younger (1994) questions which species of dormouse were considered edible. There are two species that are known to have been eaten. The common dormouse (*Muscardinus avellanarius*), which is smaller (15-40 grms) than the European garden dormouse (*Eliomys quercinus*) (45-120 grms), was eaten in Britain: Cameron (1917, 19) states "it is never difficult to secure half a dozen for a pie.....dormice may be roasted and served on toast; and a stuffing of chestnuts or other puree of nuts improves them". The other dormouse is *Glis glis*, which is otherwise known as the edible dormouse (70-180 grms). Nowak (1991, 875) states that "The meat of Glis is still a gourmet dish in some parts of Europe".

The only other positive identification of European garden dormouse is from York, where ten fragments were recovered from the early third century AD deposits at General Accident Site, Tanners Row (O'Connor 1988). All the bones originate from the same area of the site, in or near a drain. At South Shields the dormouse bones were found under a grain store where it would have been dry and sheltered. Both of these finds of garden dormouse may represent escaped animals hibernating for the winter, as they nest in groups. The presence of *Eliomys* at both sites is more likely to indicate an intentional import, as Younger (1994, 267) suggests in his second explanation for its presence in South Shields. Since dormice hibernate from October onward in burrows, it is difficult to see how they could have been unintentionally imported within shipments of grain. Imported grain

would have almost certainly have been shipped before the time of hibernation. *Eliomys* is not a grain eating rodent, its habitat is extensive forests in Europe. Therefore the best explanation for its presence on two Roman sites of, more or less, similar date is that it was a food item. The question now is whether dormice were being imported to South Shields for onward supply elsewhere, for example the Imperial household campaigning in Scotland, or whether they were being consumed on the site. There is no evidence yet to suggest that dormouse was eaten at South Shields itself.

The second context sampled from the forecourt granary was 12176, assigned to Period 8. This context contained fewer rats and house mice and lesser numbers of the other grain eating rodents than context 12236. This change in the composition of the small mammal fauna coincides with the fort no longer being a supply depot. There is also an increase in frog bones, which may suggest that the building was damp and possibly no longer in use.

The third deposit sampled for examination of the small mammals was context 14609, Period 9. The finds were from the south-west fort ditch and consisted of water vole, field vole, field mouse and frogs. This suite of species may indicate that the ditch was overgrown and wet.

Unpublished work on the faunal remains includes an assessment of the animal bones from five seasons of excavation between 1977 and 1981 by Rackham (unpubl. a). This contained no details other than numbers of boxes of bones. There are also three undergraduate dissertations on groups of animal bones from the south east corner of the fort. Stokes (1992) examined the bones from the Commandant's house of periods 7 and 8, while Phillips (1995) studied the faunal remains from the *principia* and the fort ditch of period 5. Both of these studies used recording and analytical methods compatible with those used for this study. The third study (Winship 1996) is an analysis of the cattle metapodials from the

nine chronological periods within the fort and from excavations since 1983 extra mural to the fort boundary.

The Aims of the Project

This project was designed to examine spatial patterning within the faunal assemblages from the Period 6 (222 - 35 to late 3rd or early 4th century) levels of the south-east corner of South Shields Roman Fort. The assemblages from period 6 consisted of contexts derived from the occupation and demolition phases and also included contexts from period 7a construction. These latter were included as the archaeologist considered them to be residual deposits from period 6.

The key parameters for this study were species representation by area and detailed breakdown of anatomical elements by species and area. Such analyses can be extremely rewarding for interpretations of social status and economics within contemporary deposits but are generally beyond the constraints imposed on project funded faunal specialists working to external deadlines.

The earlier work on Period 5 (Phillips 1995) and Periods 7 and 8 (Stokes 1992) had already shown that this area of the fort at South Shields had the potential for this type of analysis. Since the data from periods 5, 7 and 8 are in a format compatible with the recording and analyses of period 6, undertaken specifically for this project, there is a chronological sequence of faunal evidence which can be associated with changing use of the fort and changes in the known garrison.

In this study certain other points were deemed to be of particular interest:

(i) To interpret any patterning found in the spatial distribution of the deposition of faunal debris. The results were compared with those of Halstead *et al.* (1978) and Halstead and Hodder (1982), who suggested that the spatial patterning of bone waste could be linked to discard after specific activities such as

slaughter and butchery, the preparation of food and the consumption of food. If bone refuse can be shown to derive from only these three sources, they argue that it may be possible to locate the areas in which these specific activities took place:

(ii) To ascertain if any changes could be detected in the representation of the three main domestic species (cattle, sheep/goat and pig) through time from c AD 205 to AD 369. Such changes could be related to dietary preferences of different garrisons.

(iii) To look at the evidence for animal husbandry practices and, in particular, any chronological variation. For example any changes in the size or conformation of the sheep and cattle might be indicative of "improvements" in the indigenous livestock types by the introduction of imported livestock. This could have happened at South Shields when the fort was used as a supply base. In historical times live animals were transported as a source of fresh meat and any not consumed at the end of the voyage entered the breeding pool. (Epstein and Bichard 1984,151)

(iv) To examine the evidence for butchery practices, predominantly the dismemberment of cattle, to see whether or not there are any chronological and/or cultural changes.

2 METHODS

Recovery and Preservation

All the bones in this study were hand recovered.

The preservation of the animal bones is, by and large, excellent. A large number of bones from birds and small mammals such as vole and hare have survived, as well as bones from very juvenile pig and sheep/goat. The proportion

of loose teeth is very low, only four to five percent of the identified fragments for all three main domesticate species. These are both indications that there has been negligible loss of bone through preservational factors.

Identification and Recording

Once the bone assemblage for this study was selected, the fragments were identified. This was achieved by comparison with the reference collection of the Biological Laboratory in the Department of Archaeology, University of Durham and with the personal collection of Miss Louisa Gidney. The initial identification of the fish bones was sought from Wheeler, A. and Jones, A.K.G (1989) and confirmed at the EAU laboratory, York.

To maximise the useful information obtained from this assemblage, only those fragments of cattle, sheep/goat and pig with 'zones' were catalogued. The zones used are those defined by Rackham (unpubl. b) and are listed in appendix 1. In brief, a zone is a diagnostic feature on an element and is only recorded if at least half of the feature is present. This procedure reduces the over-recording of heavily fragmented bones and gives a truer indication of the relative abundance of the species exploited for food. A direct comparison of element distribution between species is possible and a minimum number of joints of meat, rather than individual animals, can be estimated.

Besides zones, partial and whole mandibles and maxillae were recorded if teeth were present. The teeth are used for estimating the age structure of the slaughter population. This procedure exaggerates the presence of these elements in the raw fragment counts but consideration of the zones present gives the true indication of frequency. Loose teeth were also recorded. Along with tooth wear information, the recording of loose teeth may give some indication or guide to preservation, since teeth are far more resilient and less likely to dissolve than bone.

All cattle- or sheep-sized vertebrae, that remained recognisable after comprehensive dismemberment, were recorded as large or small ungulate. Those attributed to the large ungulate category are almost certainly from cattle because few red deer or horse bones were found, nor did these bones exhibit a horse or deer like appearance. Furthermore thirty three percent of the large ungulate fragments were clearly butchered, unlike those of horse or deer. The small ungulate remains almost certainly derive from sheep/goat since pig vertebrae are distinctive and while roe deer was present, only two fragments of lower leg bone were recorded. Some thirty four percent of the small ungulate vertebrae were also clearly butchered. Pig metapodials 3 and 4 are treated as equivalent to the fused metapodial in cattle and sheep/goat.

Ribs were also recorded if the capitulum was present and again these were recorded as either large or small ungulates.

The 'zone' method is only used with the three common domesticates. All the identifiable fragments of all the other species present were recorded.

Phasing

Once the identification of the period 6 and 7a assemblages had been completed, it was necessary to consider how the material might be analysed by phase. Data from all of the deposits from the period 6 occupation and demolition phases were added together. It was considered that the bone waste retrieved from the occupation deposits derived from the very last occupation of the buildings and therefore would have been virtually contemporary with the subsequent demolition material. Although the period 7a construction material was also thought to be residual from period 6, it was kept separate for spatial reasons because the material could have been from either the courtyard house (plan 3) or the location Bk, which was built over Barrack block II, (plan 2). The material from period 7a could have derived from the demolition of the previous period 6 buildings or have been

imported from elsewhere in the fort environs as make-up levels for the new building works. Once the analysis was complete and each area mapped period 7a was added, where possible, to period 6. This was achieved by placing the plan for the courtyard building over the plans for the period 6 barrack blocks and where there was a clear overlap, that is to say when rooms or areas of the courtyard building fell wholly into or over rooms, buildings, streets and alleyways of the period 6 plan, the period 7a locations could then be added to period 6. A few period 7a locations could not be allocated a period 6 label. In all cases the bone debris from period 7a looked similar to that of period 6, the most notable was that of barrack block V, room 5 and the courtyard building room 4 and 5, therefore it was considered safe to combine periods 6 and 7a.

Quantification

The major quantification method used for this piece of work was the number of bone fragments, often referred to as number of identified specimens (NISP). This approach was chosen so that the results could be readily compared with those from other sites. Whole or partial skeletons in the assemblage would therefore have created a serious bias and, as a result, such finds have been counted as one fragment for the purposes of quantification (this has been highlighted in table 1).

Other methods of quantification were considered, such as minimum numbers of individual animals (MNI). However this technique was not considered to be worth attempting for the following reasons:

Firstly, the majority of the bones were so fragmentary that it would have made calculation of MNIs extremely difficult. O'Connor (1989, 194) states that MNIs would be more appropriate than raw fragment counts but then argues "that it is highly debatable whether the concepts of individuals and killed population have any relevance when considering the bone debris from urban settlements." He

suggests that "the killed population is many stages removed from the recovered assemblage: much more so than is the case with bone assemblages from hunter-gatherer or subsistence agriculture sites." His argument that a 13th century pit in York containing sheep bones originated from more than one flock is very valid and can also apply to the bone assemblage from a Roman fort such as that at South Shields, where more than one type of sheep has been found. He also points out that most of the meat was likely to have been distributed as joints or part carcasses. He therefore rejects MNIs, citing this example: "Recovering an estimate of three cattle and fifteen pigs from one particular pit could indicate that the deposited assemblage originally comprised three whole cattle carcasses and fifteen entire pigs, or it might show that a particular household bought in three smoked shoulders of beef and fifteen pigs' heads for brawn. Each reconstruction would prompt a quite different interpretation". From the butchery evidence at South Shields, it would appear that much of the meat was being moved around the fort as blocks of meat not whole carcasses, similar to the situation in a small town.

Secondly, MNI is a somewhat unreliable method, especially when it is not known by what method the bones were recovered. It is possible that this method could exaggerate the importance of the rarer or lesser used animals. Rackham (1983) also questions the use of MNIs as a method "In practice the MNI index is the smallest number of different individuals that the analyst has been able to identify in the sample and not the actual number of different individuals represented in the sample. This makes it an extremely doubtful measure for inter- or intra-site comparisons particularly since factors such as increased fragmentation and modern breakage makes the exercise more difficult and tends to reduce the number of recognised individuals".

A further technique, weight of bone, was also considered but not used because there were no comparable data except Wendens Ambo discussed in chapter 3. Again, because the bone was very fragmentary, it would be difficult to work out exactly the weights of complete bones, especially those of cattle which

were the most incomplete. This method might have proved useful if the relationships between skeletal weights and meat weight for all the animals could be worked out, though such information can be misleading if the time of year and the condition of the animal at death is not known. For example an old cull cow and a three year old steer could have similar bone weights but the latter is almost certain to have been nearly twice the weight on the hoof. The buried skeleton is also subject to changes though time related to decay. Minerals, such as calcium, may be leached out or the bone may attract other minerals from the surrounding soil, such as vivianite. Weights could vary if the bones have been subjected to heat over 100 degrees centigrade, for example by being boiled. This level of heat would destroy both the soluble and the mineralised collagen (Lees 1989).

Although many of the bones were fragmentary, the total assemblage was large enough for an attempt to be made to distinguish between sheep and goats. Only those bones positively identified as either sheep or goat are so labelled, all other fragments are labelled sheep/goat. No attempt was made to distinguish wild pig from domesticated animals as there were insufficient intact jaws to allow this to be done.

Measurements

All bones that were sufficiently well preserved were measured. The measurements used are detailed in Appendix 2 whilst Table 2 presents the metrical data. All measurements up to 150mm were taken using Sylvac electronic callipers, long bones were measured using a standard bone box, a standard tape measure was only used on the outer curvature of the horn cores.

Locations

The locations used were those given by the archaeologist for those contexts which contained faunal debris. The site was divided into streets,

alleyways, barrack blocks and other buildings. This information was added to the Paradox database containing the bone data to allow for the spatial analysis. It was not possible to define the exact locations until all the cataloguing was complete as some were not very clear, such as context 2469 labelled CY1abortfire was CY1 (room 1 in the court yard building) which in turn overlay rooms 1 and 2 of barrack block V. Other locations such as StV-VI (the street between barracks V and VI) could not be further divided unlike most of the barrack blocks which were labelled rooms 1 to 6. Only one barrack block (block V) produced sufficient bone to use the subdivision into rooms. This was particularly fortunate because of the special nature of room 5 within block V, which produced evidence for bone working.

As stated above, the Period 7a construction was added to the locations for Period 6 where possible although not all of the court yard building locations could be attributed to barrack blocks, for example CY7 straddled both barrack block VI and the Street V-VI. This location produced 351 identifiable fragments which unfortunately were not usable for the spatial analyses.

Two other street locations, StII-III and StIV-VI, were considered but since together these locations only produced 25 fragments of bone, these were omitted from any analyses.

The ten locations thus obtained are, from the north-west to the south-east of the area studied (Plan 2), as follows:-

1) C14-C15

Street between granaries C14 and C15

2) BkIII

Barrack block III and Barrack block labelled Bk from Period 7a construction

3) III-V

The alleyway between barrack blocks III and V

4) Bk V

Barrack block V and rooms CY1 to 6 and CY10 from Period 7a construction

5) V-VI

Street between barracks V and VI and CYNV (courtyard building's north veranda)
from Period 7a construction

6) Bk VI

Barrack block VI and CYCY (the courtyard of the courtyard building), CYEV
(courtyard building's east veranda) and rooms CY8 and 9 from Period 7a
construction

7) VI-VII

The alleyway between barrack blocks VI and VII

8) Bk VII

Barrack block VII and rooms CY11 to 14 from Period 7a construction

9) Bk IV

Barrack block IV

10) Rampart

The building structure L (Miket 1983, 35), tucked into the rampart backing at the
angle where the fort wall meets the west wall of the western guard chambers
of the south-east gate.

3 ANIMAL HUSBANDRY, MANAGEMENT & UTILISATION

This chapter presents the skeletal element data for the major domestic species. This information will allow investigation of spatial distributions and address aim (iii), investigating any differences in animal husbandry practices. Furthermore, if the skeletal elements are not known it is impossible to examine what spatial distribution of body parts there is on the site. Therefore it is imperative that a faunal report accompanies any work on spatial patterning. It is also essential to know the age structure of the slaughter population arriving at the site, so that one can take into account how well the juvenile bones are likely to survive to check for bias.

Skeletal Distribution by Fragment Count and Zones

Counts of all the identified elements from the common domestic species, cattle, sheep/goat and pig are listed in appendices 3 to 5. Figures 1 to 3 present the relative frequencies of the skeletal elements present for cattle, sheep/goat and pig. Appendices 6 to 8 list the counts of zones by element for cattle, sheep/goat and pig while figures 4 to 9 illustrate the relative frequencies of the skeletal element zones. The zones are ordered from head down the front leg through to the back leg. The same element zones are given for all three animals, and represent the whole carcass. The numbers of phalanges have been divided by four to compensate for the greater number present in the body, likewise the axis and atlas were multiplied by two because they are not paired bones. The other vertebrae have been divided by the following numbers to equate them with the paired elements: cervical, 4; thoracic, 7 and lumbar, 3.

Species

Fragment counts for all the species present are listed in table 1. It can be seen that bones of the three main domestic species predominate.

Cattle

Since cattle bones represent 51% of the assemblage, it would appear that cattle were the major suppliers of meat to the fort. See figure 10.

The element found most frequently (figures 4 & 5) was the scapula: zones 2, 3 and 5 (Appendix 2): the glenoid cavity, origin of distal spine and posterior of neck with foramen respectively. Zones 1 and 4, the supraglenoid tubercle and tuber of spine, are lower in frequency because a large number of scapulae had been butchered in the following fashion: the glenoid cavity was trimmed like a pencil and the spine trimmed. The low frequency of zones 6 & 7, the cranial and caudal angle, is acceptable because these parts of the bone are not robust and therefore do not survive well.

The next three most frequent elements were astragalus; head of femur (zone 1) and pubis (zone 4 of the pelvis). These frequencies are high in comparison to the adjacent zones and therefore appear to have been deliberately selected. This idea is further supported in that over fifty percent of the astragali come from only four locations.

Compared to the jaws, the skull is under represented. It would appear that the only other parts of skulls coming on to the site were possibly associated with horn working. The jaw zones 3 and 4 have a frequency of over 60% while zones 6, 7 and 8 have frequencies under 20%. One way to explain this pattern is that the tongues were coming on to site attached to the jaw and the butcher had disarticulated the jaw from the skull by chopping through the hinge, removing zones 6, 7 and 8 in the process. This is the quickest and simplest way of removing the jaw, and also makes a container in which to carry the tongue. Zones 4 and 5 of the jaw, by and large, are present but not attached to it and are most likely to have come on to site still attached to the skull.

The frequencies of proximal humerus and tibia are very low, possibly due to poor preservation, butchery techniques and canid gnawing. The low frequency of vertebrae is entirely due to the butchery technique employed (block butchery), with most of the vertebrae chopped beyond recognition, discussed in chapter 4.

Age

Both the epiphysial fusion and teeth wear were studied as a guide to extrapolating what the kill pattern may have been. The ages of fusion and eruption used are taken from Silver (1969, 285-6 & 296-9) and are presented as sequential guidelines only. Correlating age at slaughter from epiphysial fusion evidence and teeth can be an uncertain process, particularly if much of the epiphysial evidence for juveniles has been obscured by canid gnawing. The teeth may be more reliable indicators for the younger age groups since teeth survive better than the porous, juvenile bone.

Fusion

The epiphyses were divided into four groupings for table 3, each containing bones that fuse at approximately the same age. The youngest group comprises bones that fuse by about one year of age (distal scapula etc.). This group contained a very small number of unfused epiphyses, which could indicate that there were some breeding females in the vicinity. Also, from such a small percentage of very juvenile bones (3%), it would appear that calves were deliberately killed for veal. The alternative interpretation is that of sacrifice; depending on the occasion the size of the animal varied if the sacrifice required an animal to be sucking (*lactentes*) or grown (*maiores*). For example a sacrifice to the Earth on 15 April required two pregnant cows (Ogilvie, 1969, 43). The only way of identifying foetal and neonatal bones to species is to compare them with the bones in a reference collection of foetal and neonatal skeletons (Prummel, 1987, 23). This could not be

done as the Durham reference collection has only a very small number of neonatal cattle bones. No pathology was seen in any of the unfused bones in the first group. For sacrifice, all animals would have had to be perfect as any deformity would be an insult to the god (Ogilvie, 1969, 44) and this lack of pathology lends further evidence towards the sacrifice idea.

The second fusion group, which includes distal metapodia and distal tibia comprises bones which fuse between the first and second year of life. This group revealed a significant increase in unfused epiphyses, 16%. This indicates sufficient juveniles to suggest a deliberate cull but not enough to suggest a primary choice on economic grounds. Again some of these animals may have been the result of sacrifice. The surviving iconography depicts male animals possibly of this age, a very good example is that on a stone relief in the Louvre where the *Haruspex* is examining entrails after sacrifice (Scullard 1981, plate 7). Here the horns on the beast are clearly depicted and from their size and the size of the beast, it would appear that the beast was around the 2 -3 year old mark. 50% of all the unfused bones from this second age group derive from one area, between barrack blocks III and V. A further 30 % of this category came from within the barrack block III, including the period 7a construction material for the court yard building in this same area. While the sample is statistically too small to work with, it is noteworthy that these immature bones were concentrated in these locations. This line of evidence might further suggest that the faunal material from period 7a is contemporary with that from the last phase of period 6.

Two suggestions can be proposed to account for the cluster of juvenile bones: the occupants of barrack block III were of a differing status to that of the other blocks, which seems unlikely, or the material derived from sacrificial animals. It is unclear where the meat from these sacrificial animals would have been consumed. St. Paul, in his first epistle to the Corinthians verse 8, writes about meat that has been used in idolatrous worship being eaten in the temple. Public killing of a domestic animal followed by the eating of its meat according to rules, within the

framework of popular Orthodox worship is still practised today in Greece (Georgoudi 1989, 184). The barrack block was clearly not a temple as we understand it. There is also some degree of selectivity with the other elements, which will be discussed below.

The third fusion group of bones (proximal humerus etc.) include those which fuse at about two and a half to three and a half years old; it contained 65% fused bones relative to 35% unfused or fusing. This trend is suggestive of more cattle being utilised for meat at a time when the animal was in its prime state, at least by our standards. It would have been economic to cull the non breeding females and the males that were not suitable to work as such animals were not going to grow any more and would be a drain on valuable food resources.

The fourth group of bones to fuse comprises the vertebrae, fusing at about five years or older. This final age group is where the bulk of the meat appears to have come from. The animals represented would have been a cheap supply of old stock that would have passed their prime and no longer have been productive, such as the old non breeding females and old draught animals no longer capable of work. This type of animal today finishes up in institutional establishments and meat pies.

Teeth

The teeth wear stages for mandibles with *in situ* teeth were recorded after Grant (1982) and used to calculate Mandibular Wear Stages (MWS), which are shown in figure 11. It is apparent that the MWS fall into distinct groupings. The first group may be subdivided into new born calves, wear stage 0, and calves of approximately six months of age, wear stages 7 to 9. The new born were, almost certain to have come from naturally occurring deaths, whereas this is less likely

with the older calves. The one to three year old beasts do not appear in figure 11 because of the way in which the wear stages were recorded, the unerupted teeth were not recorded. The next group, wear stages 30 to 36, represent the prime three year old beef. The last and the largest group, stages 40 to 56, bears out the epiphysial fusion data in indicating that the bulk of the meat was derived from mature to elderly animals. The individual wear stages for all mandibular teeth, loose and *in situ*, are presented in Appendix 9.

Table 3 the cattle fusion data and figure 11 the cattle MWS data both show the four main groups the new born, MWS 0, the six month old veal calves MWS 7 and 9 both groups would be in the unfused bones under 18 months. The next group are the prime 3 year old beef animals represented in the MWS stages 30 to 36 and in the unfused bones in the fusion group by 3.5 to 4 years old. The last and the largest group MWS stages 40 to 55 with fused bones over 5 years old.

Measurements and Stature

All bones that were sufficiently well preserved were measured. The measurements used are detailed in appendix 3 whilst table 2 presents the metrical data.

Only eleven bones from period 6 were complete enough to calculate withers heights, these were six metacarpals, four metatarsals and one radius. The withers height calculated from one radius is also available from period 5 (Phillips 1995).

The multiplication factors used for the cattle metapodials are those of Zalkin (1960, 126) for bones of unknown sex because, on modern reference material, these are known to work reliably. The multiplication factor for the radius was calculated from a Dexter cow from the reference collection belonging to Miss Louisa Gidney. Woodmagic Meadow Pipit was chosen because the radius greatest length was identical in size to the radius from context 4158.

All the cattle bones were also identified using this skeleton because of the similarity in size with most of the cattle bones from the site. The principal exception for period 6 was one first phalange, which had a greatest length of 62mm. This bone was both larger and more robust than the other examples seen, which may indicate that it derives from a male animal. However this bone is smaller than an example from period 7, which had a greatest length of 67.5mm, though both bones fall within the range of those from Corbridge established by Hodgson (1967).

A comparison was made with the metacarpals and metatarsals from Corbridge (Meek & Gray 1911, Hodgson 1967); Exeter (Maltby 1979); Carlisle (Stallibrass 1991); Chesters Bridge (Stokes 1993) and South Shields (Phillips 1995, Winship 1996). Corbridge, Carlisle and Chesters Bridge were selected to examine any possible dichotomies within the livestock of the region while Exeter was chosen to examine whether there are any gross differences in size between northern and southern livestock types.

Stokes: Spatial patterning of faunal remains from South Shields fort

Withers Heights		S. Shields	Chesters	Corbridge	Carlisle	Exeter
Site			Bdge			
Metatarsal						
smallest		0.94m		1.05m	0.95m	1.01m
largest		1.26m	1.19m	1.25m	1.15m	1.19m
mean		1.10m		1.15m	1.05m	1.11m
n		47	1	71	21	15
Metacarpal						
smallest		1.01m		0.96m	0.97m	0.97m
largest		1.29m	1.13m	1.24m	1.23m	1.18m
mean		1.15m		1.10m	1.05m	1.06m
n		53	1	66	17	18
Radius						
smallest		0.96m				
largest		1.11m				

From the above table it is clear that the cattle are similar in stature wherever they originate. The smallest and largest appear at the same sites, this difference of 29cm is mirrored in Miss Gidney's herd of Dexters where the smallest cow, Zanfara Laurretta, has a withers height of 0.92m and the largest steer, Zanfara Bantu, is 1.30m at the withers; both animals have the same mother.

Meat Yields

Assuming that the cattle were nearly all of a similar size to modern Dexters, as suggested by the metrical data for this period, the meat yields from such beasts would be considerably lower than the figures suggested by other workers using modern breed yields.

The meat weights used in this study are based on figures given by Gerrard (1945, 87) for point five of a Hereford steer about thirty months old, this gives a comparable live weight to the figures in appendix 10.

Stokes: Spatial patterning of faunal remains from South Shields fort

Live weight 570 lbs = 258.5 kgs

	Kgs	% of live Weight
Carcase	157.37	60.9
Edible Offal	28.29	10.9
Inedible Offal	35.49	13.7
Carcase loss (hot to cold)	3.17	1.2
Intestinal contents	33.67	13.1
Loss	0.51	0.2
	258.50	100.0
Bone weight	41.60	
Total meat available	115.77	
Plus edible offal	28.29	

The meat and bone (dressed carcass) weight falls a little over half way in between the figures supplied by Miss Gidney for two of her cattle:

Woodmagic Meadow Pipit, a 12 year old cow, had a dressed weight of 126.98 kgs, whilst a 17 month old steer gave a dressed weight of 172.34 kgs, a difference of 45 kilograms or 200 portions of meat working on 4 to 5 portions per kilogram of salt meat (The War Office 1940, 60).

The comparison of meat weights from Wendens Ambo

The late Iron age and Roman settlement at Wendens Ambo (Halstead 1982) in Essex is the only study on refuse patterns using bone that has been applied to a complex Romano-British site to date (Halstead, Hodder & Jones 1978). An analysis was carried out on the variation in the carcass distribution in the different types of features on the site. The skeleton was divided into what was termed "units observed by the prehistoric inhabitants of the site in butchering their

animals" (*ibid*, 120) The skeleton was divided purely on an anatomical basis into (i) trunk: consisting of the ribs, vertebrae, pelves and scapulae, (ii) skull: including horn cores and teeth, and (iii) the limb bones. The amounts of each category of bone was weighed from each feature. Each feature type was looked at to see what type of debris it contained and then assigned to a category using both the types of pottery and the skeletal elements. The spatial patterning and comparisons are discussed below but it is felt useful first to compare meat and bone weights, as the Wendens Ambo study was based on bone weights.

The dressed weights for cattle used for Wendens Ambo were those used by Cram (1973), who in turn took his formulae from a foreign journal dated 1956. This publication proved unobtainable and thus could not be checked to see how the figures were arrived at. It would appear that they were obtained using modern improved breeds before the introduction of the continental breeds in the 1960s and 70s. For example, an Aberdeen Angus (Gerrard 1945, 89) displayed at the Smithfield Club Show in 1936 had a live weight of 356kg and dressed weight of 223kg which is only 2kgs under the figure used for the Wendens Ambo report. The bones of this type of cattle are no larger than those from South Shields and other Romano-British sites, although there would have almost certainly have been a great deal of difference in the amount of meat carried by the beasts of Roman Britain and those exhibited at the 1936 Smithfield Club Show. Modern animals, since the time of Bakewell, the Colling brothers, Coke and Townsend, have been fed on a radically different diet and have been subjected to very selective breeding programmes, to obtain larger animals in terms of meat to bone weight ratios. In the eighteenth century a much fatter carcass was also bred to feed the masses of the Industrial Revolution. These breeds predominated until the 1970's when the Continental breeds were introduced with their fast growing, high performance meat yields with yet higher intensity feeding. Therefore if comparisons are to be

made with archaeological bones and those of known breeds, data relating to an unimproved breed, such as the Dexter, are best.

The total weight of bone from a freshly defleshed beast of equivalent size to a Romano-British beast from South Shields is in the region of 40kgs (this figure was obtained from experimental butchery). After being processed, that is with all the soluble cartilage and the periosteum and marrow removed, the skeleton weighed 15.95kg. This represents a total loss of 60% from the raw weight.

The average percentage of bone for a thirty month old steer carcase is 12.1% which rises to 13.5% for a twenty four month old beast and 22% for a thirteen month old calf (Gerrard 1977). Therefore the figure of 7% for the bone in a carcase, as suggested by Cram, seems a little low. Moderately large modern continental cattle with a live weight of 454kgs, in fair condition, average 8.4% bone weight. West (1995, 34) also gives a figure of 7% bone weight, which was taken from 'A Handbook on Meat and Text for Butchers' (Hammett & Nevel 1929). If the data given in that edition were the same as those quoted in the 1946 edition (Hammett & Nevel 1946, 245), then the percentage given is not the total bone weight of the carcase but the unsaleable bone, that is the bone which cannot be sold in the joint of meat.

Returning to the Wendens Ambo data, the percentage dressed weight is also rather low. The average for adult cattle is 60% (Gerrard 1977).

Recalculating the figures for the cattle from Wendens Ambo using this information gives the following results:

All phases	min no. Cattle	meat wt. Wendens Ambo (Halstead 1982, 49)	meat wt. Wendens Ambo recalculated
	19	4295	2983
total expected wt.			
bone		601.3	360.9
wt. of bone processed (all fat cartilage etc. removed)		not calculated	144.4
wt. of bone recovered		69.71	69.71
wt. of bone recovered as % of expected wt. of bone		11.6%	48.3%

The percentage bone recovered from Wendens Ambo is very low if no account of the differences in bone weights between raw weights straight from the animal and those recovered from an archaeological site, that is bones which have lost all their fat, soluble cartilage, periosteum and marrow and possibly some of the calcium as well. If such differences between fresh and buried bones had been taken into account in the original figures for Wendens Ambo, the percentage of expected weight of bone would have been 28.9% and not 11.6%. By over calculating the amount of meat obtained from a carcass, under estimating the percentage bone weight and not calculating the loss of weight from the bones in the raw carcass to

the bone recovered on an archaeological site, the present study argues that Halstead (1982) has seriously underestimated the percentage amount of bone recovered by 36.7%.

Skeletal Abnormalities

Twenty one bones displayed abnormalities: seven congenital defects and thirteen due to old age, of which four also displayed congenital defects. Two first phalanges, two second and one centroquartal exhibited congenital creases, these are hereditary rather than pathological and all were of type 1 (Baker & Brothwell 1980, 109 - 111). One first phalange was splayed with extra bony growths around the distal articular surface together with eburnation and pitting. It can clearly be diagnosed as osteoarthritis as it has all four of the changes listed by Baker and Brothwell (1980, 115). Osteoarthritis is frequently the result of constant trauma. It was common in draught horses in the last century and the early part of this, being caused by the pedal thump action of the hooves on the hard, unyielding surfaces of metalled roads. The phalange from context 3270 is so distorted that the animal would have had great difficulty in walking, let alone pulling a weight. From the angle of the articular surfaces it would appear that the animal had a condition known as 'sickle hock' (Anderson & Kiser 1963, 683 - 4), whereby the knee joints are turned in and the toes turned out. This is a serious defect in conformation. Two metatarsals also gave the appearance of coming from cows with 'sickle hock', though because the medial condyles were splayed they are difficult to sex with accuracy. One alternative way of gaining an idea of the sex is to measure the distance between the verticilli. One example fell into the normal female range of under 26mm, whilst the other is doubtful. The same condition was noticed in three metatarsals from Chesters Bridge (Stokes, 1993, 8).

However this does not explain the example of osteoarthritis; the metatarsal with a fused centroquartal (spavin); the splaying of a metacarpal and a pitted and eburnated centroquartal, another similarity to Chesters Bridge.

With the use of Miss Gidney's unique collection of old cow skeletons, a possible answer became apparent: that these animals were stalled for the winter on hard standing. All of her skeletons with metapodials were examined and are tabulated below

Name	Born	Died	Stalled	Pathology
Vycanny Glenteitney	25/4/73	3/1/90	Yes	Yes
Woodmagic Pipit	13/10/74	8/2/88	No	No
Templeton Chevette	9/8/75	28/10/93	No	Slight
Crowsnest Clover	11/9/76	11/3/91	No	Slight
Vycanny Glenfinlet	6/4/79	23/2/92	Yes	Yes
Vycanny Kirstie	17/4/79	14/3/95	Yes	Yes
Godstone Abby	2/3/80	22/2/89	No	No
Butterbox	3/7/80	27/10/91	No	No
Glenalmond				
Zanfara Dusty	26/1/90	17/1/93	No	No

All three of the Vycanny cows were in wintered for up to seven months of the year, chained in stalls with brick flooring, with no bedding. They were milked in the stall and could only stand or lie down and therefore had no exercise. All the other cattle were loose housed on deep litter.

All the Vycanny cattle which were stalled, had centroquartals fused to the proximal metatarsal (spavin). Vycanny Kirstie also has splayed metacarpals All the Vycanny animals were very distantly related.

Crowsnest Clover had an enlarged non-infected proximal medial anterior metatarsal probably not pathological but congenital. This condition was also

present in the Vycanny cows. Temple Chevette had a little extra bony growth on the proximal and distal metatarsal. Her condyles were not splayed so this condition is almost certainly due to her age.

It is clear from the table above that stalling cattle does affect the bones. A study of spavin in Swedish dairy cattle carried out by Holmberg and Reiland (1984) demonstrated that a large percentage of the tied cows did indeed suffer from spavin. They also noted that there were significant differences between breeds in the incidence of spavin and that the smaller cows had a higher incidence of injuries to the legs. Holmberg and Reiland also state "hind legs of tied cows are said to be more exposed to stress and strain than the fore legs and therefore more prone to develop foot and leg problems".

Metatarsals from further up the Tyne valley at Chesters Bridge (Stokes 1993, 8) were splayed at the distal end and exhibited more severe pathological changes than the examples from South Shields, which may suggest that they were stalled or in wintered longer. The Chesters Bridge metatarsals did not exhibit any spavin but only one complete metatarsal with pathology was recorded.

Defects in the lower limbs of dairy cattle can be hereditary (Mead, Gregory & Regan 1949, 151 - 155), and thus, from time to time, can manifest themselves in small, isolated, related populations, which tend to have limited blood lines. The result of the Swedish study indicated that genetics could play a role in the frequency and severity of spavin in cattle (Holmberg and Reiland 1984, 125).

It is a possibility that the cattle in the Tyne valley were related and that the two forts, South Shields and Chesters, were being supplied from the same source; clearly more work is needed in this area.

However, it would not have been economic to have kept a draught animal in such lame conditions and neither could a stud bull work with the degrees of lameness resulting from the pathologies seen at both sites. Next to low fertility, diseases of the udder and unsatisfactory milk yield, foot and leg problems are the most common cause of culling in modern dairy herds. (*op. cit.* 1984, 114). A

productive dairy cow may, however, have been worth keeping on. Mrs Wray (pers. comm.) had a lactating cow, producing two and a half gallons of milk per day, although the animal had a severe swelling on the knee joint, causing her some considerable discomfort if not bedded on soft bedding. Nonetheless this cow was being kept until such time that she was no longer economic. The economics of keeping livestock are complicated not only in terms of money, but also the acreage, availability of food, weather, and markets.

The South Shields bone exhibiting the most gross pathological changes was an acetabulum from context 4131. It clearly had been disarticulated, as the socket was very pitted with an infection (possibly osteoperiostitis Baker & Brothwell 1980, 68) and had no signs of wear in the acetabulum socket. There was, however, some eburnation on the shaft of the ilium giving the appearance that the neck of the femur had rested in the greater ischiatic notch close to the ischiatic spine. This animal must have suffered severe discomfort for some time for the infection to modify the bone to such an advanced state. The only reason for keeping such an animal alive would have been on economic grounds, either it was in calf or it was still lactating. The bone has clearly been butchered, indicating that this pathological condition was not perceived to affect the edibility of the carcass.

Four jaws had a congenital absence of premolar 2, out of the 36 that had the area in which p2 is located, this represents 11%. This absence was also noted at Carlisle, Annetwell Street (Stallibrass 1991, 42) where 16% were affected. Twelve per cent of the jaws from the 1907 -10 excavations at Corbridge (Meek & Gray 1911, 242) also displayed the abnormality. This congenital absence is commonly seen in Romano - British cattle jaws (Andrews & Noddle 1975, 138) and is thought to be hereditary, thus further supporting the suggestion that the cattle in the Tyne valley share the same genetic pool. This condition is common in smaller cattle (Powell pers. comm.). Other dental abnormalities recorded were one jaw which had an *ante mortem* loss of molar 1 and one tooth, an upper molar 1, showed signs of abnormal wear.

Sex Ratios

Higham (1969) looked at sexual dimorphism in modern Aberdeen Angus cattle bones so that he could use the data gathered to interpret archaeological samples displaying bi- or trimodalism. He demonstrated that the distal width of the metacarpal displayed a high degree of sexual dimorphism. Therefore this measurement was chosen for this study to ascertain whether or not there was any sexual dimorphism in the South Shields cattle bones.

The metacarpal distal breadths were plotted as a histogram, figure 12, as were the distance between the verticilli (figure 13). This measurement was taken because some metacarpals and metatarsals are splayed. These splayed metapodials distort the overall picture and a way of overcoming this was sought by the author whilst working on the Chesters Bridge material. A number of metacarpals and metatarsals (figures 14 & 15) not exhibiting any splaying were measured using the distal width measurement Bd (von den Driesch 1976, 92) and these were plotted against the distance between the verticilli on the ridges. This measurement was named V2 because more than one way of measuring this distance was tried. A high correlation between the two measurements was observed when the V2 measurement was put through a linear regression and correlation test.

The distal breadths in the South Shields metapodials gave no clear picture but the verticilli measurements suggested two groupings. To test this suggestion both measurements were plotted onto probability paper. The result obtained gave the appearance of a single population in that there is one straight line, not a stepped line as might have been expected if both sexes were represented. Therefore all the cattle in this assemblage from South Shields appear to be one sex. Was the Roman Army buying in old cull cows? Klein and Cruz-Urbe (1984, 85) suggest that there should be a bias in the sex ratios against females as the best parts for sexing are more durable in the males this appears not to be the case at South Shields. Seventeen measurable bones are insufficient to establish whether or

not the population was single sex. Further work to resolve this question is currently being carried out on the South Shields metapodials (Winship 1996).

Horn cores

Although few horn cores were present, from extrapolation of the length of the posterior-dorsal curve, (table 4), they fall into three types:- short, medium and long (Armitage & Clutton-Brock 1976, 331). The ora-aboral and the dorso-basal diameters were plotted (figures 16 and 17). Although it was a very small sample they, too, appear to be three groups. Large variations within horn types from individual sites are not uncommon within the Romano-British cattle population (Luff 1982, Plate 3, 48).

Sheep/Goat

It is accepted that sheep and goat remains are superficially alike in appearance but can, with care, be differentiated using some elements, such as metapodials and the skull. Only eleven fragments were clearly identified as sheep, of which six were complete or partial horn cores. Three fragments were positively identified as goat: a frontal, a radius and metatarsal, these were checked against the goat in the reference collection and the metatarsal was tested using Boessneck's formula (in Brothwell & Higgs 1969).

Like the cattle, very few sheep or goat skull fragments appear to have come onto this part of the site. It appears that the pattern of representation of jaw fragments is similar to that previously observed for cattle (figures 6 & 7). The fragmentation and representation of scapula is, however, unlike that observed for cattle since zones 1 to 5 average approximately fifty percent while zones 7 and 8 are almost non-existent. This suggests that the scapulae of sheep/goat were not being modified in the same way as those of cattle. Proximal humerus, again, is poorly represented. This may be due to factors prior to deposition, for example

canid gnawing. Frequencies of proximal radius and, in particular, mid shaft radius are high while those of the distal end are low, which suggests some modification such as differential survival of unfused distal ends. Table 5 would bear out such a suggestion as the radius is the element with the third highest degree of canid gnawing. An explanation for the high frequency of the atlas is not immediately apparent. The low frequencies of the pelvis and femur are probably due to butchery and other taphonomic processes. Survival of proximal tibia, however, is low, due in part to canid gnawing, while distal tibia is well preserved. Representation of the metapodials is varied, again due to canid gnawing. Numbers of phalanges are low, possibly due to differential recovery by hand excavation.

Age

Both the teeth wear and epiphysial fusion were studied as a guide to kill pattern. The tooth wear on the sheep jaws was assessed using the method of Grant (1982, 93) where possible, figure 18. The individual teeth were also recorded and the wear stages are given in appendix 11. The ages of fusion used are taken from Silver (1969) and are presented as sequential guidelines only (table 6). Correlating age at slaughter from epiphysial fusion evidence and teeth can be an uncertain process, particularly if much of the epiphysial evidence for juveniles has been obscured by canid gnawing. The teeth may be more reliable indicators for the younger age groups since teeth survive better than the porous, juvenile bone.

The epiphyses were divided into four groupings for table 6, each containing bones that fuse at approximately the same age. The youngest group which comprises bones that fuse by about one year of age (distal scapula etc.) contained a large number of unfused epiphyses. Approximately 19% of the bones in group one had unfused epiphyses, suggesting that there was either a high number of natural deaths or that there was a deliberate cull of milk fed lamb. If the latter was the case, it would have enabled the mothers to be milked for three to four months.

Other suggestions for this high number could be that they were being killed for astrakhan or they were killed sacrificially. Lamb was, and still is, a common sacrifice in the Middle East.

The epiphyses indicate that two thirds of the sheep had been culled by the time they were two and a half to three and a half years old, suggesting that meat and milk products were favoured. Figure 18 for MWS, shows that 44% of the jaws were at stages 18-22 correlating with the eruption and wear of M2, further suggesting slaughter of sheep aged over one year. Wool therefore does not appear to have been an important by-product of the sheep supplied to South Shields. However, this cull pattern could indicate a quite sophisticated policy of overwintering wether hogs to obtain the first and best quality wool clip in the spring and also getting prime mutton in the summer and autumn, comparable with modern practice for primitive sheep. This pattern of exploitation is contrary to King (1991, 17), who suggests that by the early fourth century both urban and rural sites have generally adult caprovine ages at death. Also, King suggests that wool played an important role in the agricultural economy because woollen products from Britain were being referred to in late Roman documents, such as Diocletian's "Price Edict". This is probably due to South Shields being a consumer site with a preference for lamb and not mutton. The tooth wear bears out this suggestion as there is a peak in the numbers of jaws at MWS stages 18-22 where M2 is in wear but M3 is not erupted (figure 18).

Size

Though it has frequently been suggested that the Romans introduced new breeds of live stock into Britain, as well as improved methods of husbandry, a critical examination of the evidence fails to produce overwhelming support for the view (Ryder 1983). King (1991, 17) states that "size changes are most marked in the south-east (the most highly Romanised area) and the north (the most

militarised area)." If this is the case, then one could assume that the Roman sheep were larger in size than the Iron Age sheep, perhaps being something like the modern Shetland. To test this hypothesis, the withers heights were calculated using the factors given for sheep by Teichert (in von den Driesch and Boessneck 1974, 339). A comparison was made with the metacarpals and metatarsals from Corbridge (Meek & Gray 1911), Exeter (Maltby 1979), Carlisle (Stallibrass 1992) and Chesters Bridge (Stokes 1993). Corbridge, Carlisle and Chesters Bridge were selected to examine any possible dichotomies within the livestock of the region while Exeter was chosen to examine whether there are any gross differences in size between northern and southern livestock types.

Withers Height

Site	S.Shields	Chesters Bdge	Corbridge	Carlisle	Exeter
Metatarsal					
smallest	53.0cm		53.3cm	54.9cm	54.4cm
largest	56.9cm		57.2cm	65.6cm	64.9cm
mean	55.2cm		55.3cm	60.3cm	57.2cm
n	3		8	5	9
Metacarpal					
smallest	49.7cm	59.8cm	52.3cm	55.7cm	54.7cm
largest	61.1cm		62.5cm	62.6cm	62.1cm
mean	56.3cm		57.9cm	59.1cm	58.2cm
n	7	1	7	6	3

From the above table it is clear that the sheep are similar in stature wherever they originate. The size differences are almost certainly due to sexual dimorphism and, possibly, breed of sheep. Two metacarpals, one metatarsal and a radius from South Shields and three metatarsals, one metacarpal and three radii from Corbridge were from very small sheep. These animals appear to have been

smaller than the minimum size known for a modern Soay (Clutton-Brock *et. al.* 1990). These small bones could, however, derive from a smaller type of sheep comparable with the modern North Ronaldsay, such sheep are known to have existed in the locality from finds of comparable wool type at Vindolanda (Ryder 1983, 180). A scapula from context 7143 and a metatarsal from context 3526 were compared with the limited collection of North Ronaldsay bones in the reference collection at the University of Durham, both matched in size and conformation. The other measured bones do, however, fit into the known Soay range (Clutton-Brock *et. al.* 1990), and the largest of the bones from Corbridge, Carlisle and Exeter fit within the castrate range. The measurements suggest that the sheep being utilised at South Shields were of a small, primitive type and similar to those at Chesters Bridge (Stokes 1993, 10) and Corbridge (Hodgson 1967). They were not of an improved breed as suggested by King (1991, 17). The primitive type of sheep remained in Scotland until quite late. Ryder (1968, 140) states "The findings from the textiles support evidence from wool remaining in parchment that the Soay sheep persisted in Scotland until the mid-seventeenth century".

Horns

While there were only six complete or partial horn cores present, three very distinct phenotypes were represented: one polled, five two horned and one four horned. It is not sure whether or not these examples represent three breeds, as the three morphs could have all originated from one genotype, as seen in the modern primitive Manx Loghtan and Hebridean sheep. These are possibly similar to the description of the sheep in the Tweed valley by Bishop John Leslie in 1578 as "small, short-tailed, horned in both sexes, and often having several horns" (Ryder *ibid*). One horn core exhibited thumb print like impressions, these are normally associated with malnutrition in the reproductive cycle (Luff 1982, 65).

Meat Yields

A good North Ronaldsay carcass at maturity (three or four years) is unlikely to weigh much above 14 kg (Britt & Baker 1990, 7). The epiphysial and tooth wear evidence for age of cull, discussed above, suggests that very few sheep at South Shields reached a comparable stage of maturity. The peak in the tooth wear at MWS stages 18-22 seen in figure 18 would suggest a large number had been culled at over one year of age but less than two years. At six months of age the Soay is at its maximum weight for the year, this is then not exceeded until the same time the following year (Doney et. al. 1974). The mean weights for ewes at eighteen months is 15.42 kgs and rams 19.5 kgs. With a dressed weight of approximately 55% of mean weight, this would give an average weight of 8.48 kgs for ewes and 10.73 kgs for rams. Observations on the North Ronaldsays (Britt & Baker 1990, 13) state that the sheep were "generally worse in the spring than other times of the year", thus a good economical time to cull would have been at fifteen to eighteen months old. Compared to our modern breeds with an average weight of 30 - 35 kgs, the Roman sheep were very small, and, like the cattle, were approximately fifty percent smaller than current breeds. It would appear that there was no improvement in sheep breeds made by the Romano-British in this area, even though they potentially had access to some of the contemporary European and Middle Eastern breeds which were larger, with more fat. This may be due to the Romans deliberately not letting the local farmers have access to what may have been considered special or sacrificial sheep which may have formed part of a Roman cult. There may also have been a reluctance on the part of the natives to acquire "improved" sheep. Bakewell encountered a similar reaction to his improved Leicester sheep some 1300 years later (Hall & Clutton-Brock 1989, 151). Because there is no evidence for these larger types of sheep, it suggests that this leaner, smaller breed was preferred by either or both the consumer and producer or that they were the only type made available to the common masses.

Apicius gives a number of recipes for wild sheep, he also suggests that mutton should be neglected altogether unless wild.

Pigs

Most of the pig bones were from immature animals, thus no estimate of stature could be made from the bones. The skull fragments suggest a small, primitive, long snouted type. One jaw in particular, from the street St IV-V, was very short and exhibited tooth crowding, suggesting that this pig was from domestic stock.

The pig zones appear to be distributed in a similar manner to that seen for sheep (figures 8 & 9), with a few notable exceptions: atlas, which is much lower in frequency; ulna zones 2 and 3 and pelvis zone 5, the acetabulum, are proportionally higher. Proximal tibia, humerus and femur are also low. This pattern could possibly be due to the age structure and preservational factors as the ulna and pelvis of pig are more robust than those of sheep. Again, like the cattle and sheep, the pigs were divided into four epiphysial groupings, table 7, each of the four groups contains the bone elements that fuse at approximately the same age. The youngest group which comprises bones that fuse by about one year of age (distal scapula etc.), this group consisted approximately 11% of unfused epiphyses. The MWS, figure 19, clearly shows two peaks in the comparable age group. The first group comprises sucking pigs at MWS Stage 0, normally no more than three weeks old (Beeton 1987, 397) or not more than one month old (Simon 1952, 491). The second, and larger peak within this group are the prime pork pigs in which M1 is in wear, MWS 9 and 10; these were pigs approximately six months of age at the time of slaughter. The second group within table 7 consists of 43% of the total unfused pig bone assemblage; corresponding to MWS 17-20 in figure 19, and indicating that M2 was in wear. This group of pigs may be compared with modern animals that are slaughtered for bacon, normally at one year to eighteen

months old. The third group in the epiphysial fusion table consists of 31% of the unfused bone, this shows that a total of 85% of the pigs were slaughtered before the ages of two and a half to three and half years of age. This suggests that some of the breeding females were not kept after this age, by which time they could have had one or two litters of pigs. This group is possibly represented by MWS 27 to 29 in figure 19. There were only two fused bones from pigs which were five years and older which clearly demonstrates that very few pigs were kept beyond this age. A Tamworth boar aged 5 in the reference collection at Durham has an MWS of 34 this animal had been kept outside so the tooth wear would have been comparable. The individual teeth were also recorded and the wear stages are given in appendix 12. It is clear from the individual teeth that there was a large cull before M2 and M3 erupted as there is a large tail off in the numbers of loose M2 and M3 teeth of which 1 in 3 come from adult animals of over five years of if compared to the Tamworth boar in the reference collection.. There was only 1 dp4 and there was a high ratio of P4 to dp4. The majority of the pigs, 54% were slaughtered under two years of age and 84% were slaughtered before they were three and a half years of age

There was not a sufficient number of measurable or ageable bones to do very many meaningful comparisons. The small number of measurements that were obtained were compared with those from Exeter (Maltby, 1979), Corbridge (Hodgson 1967) and a two year old farmed wild boar. The wild boar (Peter pig is now part of the resource centre at South Shields) was selected for comparison as being the nearest modern equivalent in size and build to the small, primitive, long snouted type of pig known from the archaeological remains on Roman sites. Corbridge was selected to examine any possible dichotomies within the livestock of the region while Exeter was chosen to examine whether there were any gross differences in size between northern and southern livestock types.

Stokes: Spatial patterning of faunal remains from South Shields fort

Humerus

Measurement	Exeter	Wild Boar	Corbridge	South Shields
Humerus	range	actual	range	range
max dist width	34.4 - 41.3mm		33-35mm	30.9 - 36.3mm
mean	37.4mm n = 29	41.3mm n=1	34mm n = 3	34.4 n = 4
max height trochlea	24.2 - 29.9mm	28.4mm		23.6 - 27.9mm
mean	26.3mm n = 25	n = 1		25.1mm n = 11
max width trochlea	28- 34.2mm	32.9mm		27.4 - 33.5mm
mean	31.7mm n = 32	n = 1		30.0mm n = 9

Radius

max prox width	22.9 - 30.1mm	28.5mm		24.6 - 29.1mm
mean	27.1mm n = 25			27.2mm n = 4

Size and Meat Yields

The pigs at South Shields and Corbridge appear to be slightly smaller than the southern counterparts from Roman Exeter. The wild boar falls well within the range of measurements from Roman Exeter. In comparison there were more measurable pig bones from Exeter than from the two northern site so therefore it may not be a true comparison. The climate and weather may have played a part in the difference in size. The local terrain is similar at both Exeter and the northern forts - surrounded by moorland, which would almost certainly have had more woodland cover then than now. Exeter benefits in that spring comes earlier, thus the vegetation growth is earlier which may benefit the early growth in the pigs making them a few millimetres larger in bone size than the northern pigs.

An average dressing out percentage for pigs of approximately 75% based on a 45kgs live weight will yield a carcass of 33.75kgs (Hammett & Nevell 1946, 203). In the case of pigs the loss between the live weight and dressed carcass

weight is much less than for our other food animals, as the carcass of the pig includes the head, feet, skin and tail.

Red Deer

Of the ten red deer fragments identified, six were antler and all were too small to determine whether or not they were shed or unshed. Four fragments of antler exhibited signs of working.

The four remaining fragments consisted of two proximal metatarsals, a first and third phalanx.

Roe Deer

Only two fragments of roe deer were positively identified, one proximal tibia and an almost complete metacarpal.

Horse

There was a total of two loose teeth and four bones identified as horse from the entire assemblage. One of the bones, a first phalanx, exhibited chop marks on the proximal end. The three other bones consisted of a part maxilla, a complete calcaneum and a lateral metapodial.

Hare

Hare bones were only present in period 7A construction within the courtyard building. These hare bones are larger than those of modern reference specimens. One scapula had cut marks on the glenoid and was chopped through the neck.

Dog

Dog is represented by eleven bones, deriving from small bandy legged, lap sized dogs, slightly bigger than the reference Cairn Terrier and similar in size to Sappho (Stallibrass 1988). Two shoulder heights were obtained using the factors given by Harcourt (1974, 154)

Element	Location	Factor x tl	Height
tibia	CYwCy-13	$(2.92 \times 112.4) + 9.41$	33.8cm
radius	VI2	$(3.18 \times 134) + 19.51$	44.6cm

This type of dog could have been a pet and fed on bones and scraps, as well as possibly scavenging, giving rise to the other evidence for the presence of dog on site in the shape of chewed bones (see below). Hodgson (1971, 137) reported on a single dog tibia being found in the 1967 excavation (period not known). This bone had apparently mended after being fractured, thus reinforcing the idea of dogs being kept for pets.

The other evidence for dogs on site is that of gnawed bones. The percentage of gnawed bone is exceptionally low, thus indicating the low number of dogs in or around the fort that had access to the rubbish. Table 5 clearly shows that sheep/goat were the favoured bone possibly due to the size of dog. Only one location, the rampart building, had a significant number of gnawed bone which numbered 44 fragments or 10.4% of the total rampart bone assemblage

Cat

Only two positive identifications were made for cat, both bones were vertebrae. It is impossible to tell if the cat bones derive from wild or domestic animals, both are possible. If the former, the bones are most likely to have come from an animal that had been hunted for its skin. The possibility that it was domestic cat is less likely, for at that period cats were not commonly kept as pets

in Britain. The Romans are credited with introducing the domestic cat to Britain in A.D. 400 (Robinson 1984, 223). In both cases it is unlikely, but not impossible or unknown, for cat to be eaten. Labouchere, (Simon 1952) who ate cats during the siege of Paris in 1870, wrote that the cat was 'something between a rabbit and a squirrel with a flavour of its own. It is delicious. Don't drown your kittens, eat 'em'.

Birds

A total of 140 bird bones were identified to species, or family.

A fragment count of the bird species is given in Table 1, from which it is clear that domestic fowl predominated (75%) among the twelve species recorded.

Exploitation of Domestic Fowl and Other Birds

Domestic Fowl

The domesticated fowl dominated the avian assemblage, contributing 75% of the total bird bones identified.

The keeping of poultry was recommended by Vegetius, especially in the likelihood of a siege. He also states that they were inexpensive to feed, more so in a place like South Shields which could have fed them on waste grain from the granaries. Vegetius also claims that chickens were beneficial for the sick.

Nine tarso-metatarsals were recorded of which there were a ratio of 2 to 7 spurred to unspurred.

Size and Meat Yields

The bird bone remains in period 6 account for only 3.5% of the total bone assemblage, so this only represents a small proportion of the meat supplied to the

fort. To gain relevant information on meat yields for comparable domestic fowls, an adult female Jungle Fowl, past the laying stage was obtained in feather from Miss Gidney's small holding.

Jungle Fowl

This is possibly the nearest in breed and size that one can get to those used by the Romano-British.

	grams
Live weight	645
Dressed weight	407
Waste	238
Approx. weight of bone *	65
Meat yield	342 = 53% of the live weight

* This figure is based on Gerrard (1945), 16% was the percentage weight of the bones obtained from a series of experiments carried out on a number of different breeds of chickens.

Goose

Goose was the next most favoured bird. Whether or not they were domestic birds is difficult to tell, but with South Shields being situated on an estuary one could assume not and that they were hunted birds.

Other Birds

The most unusual find was that of a part skeleton of a puffin, the first to be found on a Romano-British site. The presence of sea birds is generally rare on Roman sites (Parker 1988, 213) but not surprising at South Shields with its close

proximity to the sea. Other sea birds include greater black backed gulls, found on only one other site prior to Parker's (ibid) survey of the birds of Roman Britain. Other gull species and cormorant. The commensal species present were pigeon, starling, crow/rook and small passerines. These birds were almost certainly coming into the fort to feed on spilled grain and other refuse laying about. The small passerines and the pigeons may have been taken by the soldiers in some cases as food. The black cock and sea eagle were two hunted birds, the former for food and feathers and the latter just for its feathers. Indeed, most of the bones of the sea eagle from the site to date have been wing bones.

Fish

Unlike periods 7 and 8, period 6 was almost devoid of shell fish. There were only four shells of periwinkle and two mussel shells present. Two fish bones were identified to species only, they were both *gadus sp.* Fish does not appear to have played any significant role in the diet of the ordinary soldier.

Summary

There are no detectable changes in animal husbandry at South Shields either spatially or chronologically. The cattle appear to have the same stature as in the north-west and south-west of Britain. From the pathology and congenital creases on certain bones and the large number of jaws with the absence of p2 it is possible that the cattle were sourced locally from the Tyne Valley and they were in-wintered. There is no evidence for any improvement to the livestock during period 6. The bulk of the beef obtained was from old animals, possible cull cows which were suited to being salted and boiled.

The sheep all appear to have been of a primitive sort, with no detectable improvements nor any sign of imported larger breeds of animal. 19% were culled

as milk fed lambs and two-thirds of the sheep were culled before the ages of two and a half and three. The pigs appear to have been a semi-domestic/wild population and were slightly smaller than the west country animals. No data were available for the north-west.

4 BUTCHERY PRACTICES

The analysis of the butchery evidence gives some indication regarding the method of utilising a carcass, which can add to the understanding of the general social conditions and activities of the place and time.

Perren (1978) demonstrates that in Britain as late as the nineteenth century there were tremendous regional differences in the utilisation of the beef carcass. In communities with a tradition of broth and boiled meat, there was no strong consumer preference for particular joints in comparison with, particularly urban, consumers who required roasting meat. The long distance meat trade that built up around the growing demand for dead meat in London led to some mistakes being made. Perren (*ibid*) writes "some Scottish dealers ignorant of the market requirements sent whole salted carcasses to London - salted to prevent the meat spoiling in hot weather". It is possible that meat could have arrived or been sent from South Shields in a similar fashion. This would not require any special containers. McNeill (1981, 190) states that meat in 1703 from the Western Islands of Scotland was being shipped to the mainland salted in a cow's hide, which keeps it close from air.

These regional patterns of demand were reflected in butchering practice. Butchers paid little attention to how they divided up a carcass if there was little price incentive to separate the best from the inferior parts, (figures 20 & 21).

It is possible to envisage a similar lack of motivation on the part of a military butcher dealing primarily with cull cows whose meat would be more suitable for boiling or slow braising methods of cooking rather than roasting, if the facilities for roasting meat were even available to the ordinary soldier. Communal

bread ovens only appear to have been found for period 4 nor is there any evidence of spits being found at South Shields. Davies (1971, 127) states that two of the standard-issue cooking utensils in the Roman army were a spit and a boiling pan. Lowenberg *et al* (1979, 39) suggests that the Roman army have "gridirons and cooking vessels of various shapes and sizes". Thus it would appear that the meat was either boiled, fried or braised. Very few recipes are given by Apicius (Flower & Rosenbaum 1958) in his book for beef, in fact there are only four in the chapter named The Quadruped (section V beef and veal); of these recipes three are for boiled meat and one for fried meat. The recipes are meant for joints or slices of veal or beef and do not refer to the whole carcass. Other meat recipes are in the chapter named The Gourmet (section IV *ofellae* pieces of meat). The meat in these recipes is not always specified but in recipe number two of this section, "meat pieces a la Apicius", the meat is boned and rolled, browned in an oven and then put into a sauce to cook. In other words braised. From the last instruction the meat would appear to be pork as it states that if the meat is too fat then the skin should be removed with some of the fat. Recipes four, five and six are all fried, the latter being soaked in water first which would make the meat lighter in colour and suggests that it could be either veal or pork. Most of the recipes are for pork. Section V in the gourmet section is roasts, again the meat is not specified; number one simply stating how to roast a piece of meat. Number five is roast neck which is boiled before roasting, again meat not specified. Section VI in the gourmet chapter is for sauces for boiled meat of which there are fourteen in total.

It would appear from the lack of recipes that beef was not popular among the high status Romans from the time of the Republic to the age of Heliogabalus. Although the avoidance of cow's flesh seems not to have occurred in that part of the Mediterranean (Simoons 1994, 129) cattle were being used in sacrificial ceremonies where the flesh was consumed after offering the deities their share. The reasons may be similar to those that prevailed in Italy in the early 1950's at which time Elizabeth David (1977, 203) states that there was some confusion over the

terms *vitello* and *vitellone*. In the explanation it transpires that *vitello* is milk fed veal and *vitellone* is generally beef from a one to three year old animal which has never worked. Oxen were used at this time for working in the fields and the meat from these animals, when it came on to the market, was tough. Daubeny (1857, 176) in his lectures on Roman Husbandry states that oxen "were mainly intended for one single purpose, namely, the labours of the farm". He also states (*ibid*, 174) that "whilst beef does not seem to have been a favourite dish amongst the wealthy Romans, indeed is scarcely noticed in the long catalogue of luxuries dwelt upon with so much unction by Athenaeus.....the warmth of the climate in Greece and Italy renders animal food in general, and especially the more stimulating kinds, less wholesome, and less sought after, than it is in more northern latitudes".

This difference between Apicius and Romano-British settlement evidence for large numbers of cattle bones may almost certainly be that there were very few Roman citizens among the Roman troops stationed here after the initial invasion.

South Shields by period 6 was garrisoned by auxiliary troops that clearly were not Roman in origin. The butchery techniques employed nonetheless appear to conform to standard Romano-British practice.

Table 8 clearly depicts what one would have expected, with the larger animals exhibiting more butchery evidence: 27% for the cattle and 13% for the pigs but only 10% for sheep/goat, of which one third are butchered vertebrae. The proportion of chopped pig bones was high because of one element, the humerus. This was solely the distal end which is robust and would survive.

The butchery marks or deliberate damage to the bones can be divided into four:

- a) Those inflicted at the time of slaughter.
- b) During the initial dismembering of the carcass into manageable size pieces for onward processing.
- c) The reduction into pieces suitable for cooking, both boned and unboned.
- d) That incurred during specialised working after boning.

Type a)

The first damage or signs of butchery are those inflicted at the time of slaughter and dressing, that is the killing, skinning or flaying and eviscerating of the animal. Only one bone, a cattle frontal from location VI-VII, exhibited any sign of slaughtering. It appeared that the animal had been poleaxed and is therefore the only detectable slaughter technique at South Shields. Sheep and pigs are normally killed by having their throats cut. If done in a robust manner this could leave knife marks on the hyoid bone. Such evidence was not observed because the hyoid is not a designated zone in the recording system used. Cattle may also be killed by blood letting without poleaxing, particularly in the Mithraic rite. A good example is depicted in King (1982, 157). It is also possible to kill cattle by strangulation (Clutton-Brock 1981, 137). Such methods of slaughter would leave no evidence on the skeleton.

Certain marks on various skeletal elements are commonly interpreted as evidence for skinning. Such marks include knife marks round the premaxilla and lower jaw, particularly on bones of small fur bearing animals such as cats and mustelids. Such marks are unlikely to be found on cattle bones because of the broad nose and muzzle of cattle. In addition modern butchers use the nose as a handle to manipulate the head during the primary slaughter and butchery process (personal observation courtesy of Mr Brownless, formerly proprietor of Thompson & Foster butcher's shop in Barnard Castle). It seems probable that Roman butchers would have used the same technique. Sheep's heads, particularly those with horns, are not normally skinned. One traditional manner of preparing sheep's head was to singe it on the blacksmith's hearth before boiling (McNeill 1981, 184). Evidence for skinning will not therefore be observed on the premaxilla or jaw of sheep. The modern method observed at Simpson's abattoir, Cockfield, is to use the fingers to remove most of the skin on sheep, this can only be done whilst the carcass is still at body temperature.

It should be noted at this point that skinning marks will not be observed on pig bones. The pig is scalded and scraped after slaughter but not skinned. The skin forms the rind on bacon and ham and aids the preservation of these cured meats.

Fine knife marks have been observed on horse bones at Windsor (Bourdillon 1993, 79). The marks were on the skull above the eyes and at the base of the spine from the removal of the tail and were interpreted as evidence for the skinning of an otherwise worthless carcass. Again, such marks are unlikely to be observed on cattle bones since the tail is left on the carcass and the skin is ripped off. The ripping lines on the head are on the thicker, meatier part of the skull (figure 22). In addition the cattle skull is slightly dished between the eyes compared with domed on horses, thus it would be easier to mark the skull above the eyes on the horse skull.

The most commonly observed marks are fine knife marks, generally on the proximal anterior face of the metapodials and seen on both meat bearing and fur bearing species. Such marks are generally referred to as skinning marks, for example the articulated sheep skeletons from Barton Court Farm (Wilson 1984, Fiche 8). However this description is generally applied by colleagues with no practical experience of skinning an animal. Serjeantson (1989) is more realistic "the absence of skinning cuts does not mean that the animal was not skinned, since it is possible to skin an animal and leave no traces on the bones". This would depend on the condition of the animal at the time of slaughter. Hammett & Nevell (1946, 119) state that "A well-fed, sleek beast, in good health, will always flay easier than a poor, ill-conditioned animal. Animals which have been badly driven, deprived of water, and are heated at the time of slaughter will usually give trouble in flaying". Therefore it would have been in the best interests of the Roman slaughterers to have rested any beast before slaughter as the hides would have been of great value to them since leather was a crucial raw material.

There are two options with regard to the feet. They can be left on the carcass and used both as handles for moving the carcass and as a means of

identifying the meat. This is particularly appropriate with sheep/goat sized animals where the hoof can also give an indication of the age of the animal and therefore the best manner of cooking the meat. The final removal of the metapodials may therefore be far removed in both time and space from the skinning process. Cattle feet are rather larger and have been left in the hide in many recent butchery traditions. However, when dismembering a cattle carcass on the ground, it has proved invaluable to detach the metapodials and use these as chocks to support the carcass during the subsequent stages of dismemberment (personal observation courtesy of Mr Brownless). In a young animal it is relatively easy to disarticulate the metacarpals at the first attempt. In older animals with more robust ligaments it can take several attempts to find the gap to insert the knife and during this process knife marks can be left on the proximal anterior face of the metacarpal.

Metapodials with attendant phalanges and carpals or tarsals have been found in several locations at South Shields. Therefore it appears that the feet were not left in the hide but were discarded as complete units.

It has been demonstrated that it is almost impossible to detect evidence of skinning on the bones of the domestic food animals. Despite careful observation on many occasions, damage caused to bones during skinning in the slaughter house, or by others who practise the removal of hides, both trained and untrained has not been observed. The author has recently removed a complete hide from a cow of a comparable size to Romano-British cattle without leaving any marks on the bones.

The surface of all raw bones is protected by the periosteum. Therefore it seems more probable that some of the marks normally interpreted as skinning could have been made during the processing of products such as 'Cow Heel', which incorporates the metapodial and phalanges. Alternatively such marks could have been made during the removal of the meat once cooked, at a time when the bone is softer, for example on 'Pigs Trotters', which again incorporate the metapodials and

phalanges. Therefore, in this particular study, no knife marks on the bones of the domestic ungulates have been interpreted as skinning marks.

Type b)

The marks made, or the damage inflicted, in the dismembering of a carcass would vary depending on the skill and knowledge that butcher had in the anatomy of that particular animal. It would also vary in the use of tools chosen to do the job. The first observation to be made on the material from South Shields is that it is clear that the current day practice of using a saw was not employed. It is extremely difficult to cut the hind leg of a cattle carcass into smaller pieces, with the femur and proximal tibia in place, without the aid of a saw. It is far easier to remove the femur and tibia whole, then the thick round of meat can be cut into natural joints. The process of removing bones also enables salting to be more effective. The removal of these bones also enables others to use the bones such as for marrow/fat extraction and for the manufacture of bone artefacts. Although one distal tibia did appear to have been sawn, this was not butchery. The bone came from the rampart building, interpreted as a bone workshop (see below).

There were only two dorso-ventrally cloven vertebrae of cattle, too little evidence to suggest that the carcasses were being split sagittally, as practised today. It is fairly certain that the cattle carcasses were not split into sides or quarters as today from the way in which a number of vertebrae had been chopped though the centrum at an angle. From the other butchery evidence it might be possible to determine how the carcasses were dismembered.

It would appear that the processes of killing, skinning, eviscerating and dismembering were done in one place, possibly within the fort. Most of the elements from the whole carcass were present within the fort, in contemporary deposits. Once the animal had been slaughtered, it would have been difficult to move the carcass around because the beast, although not as large as our current day animals, would have still weighed somewhere in the region of six to eight

hundred pounds dead weight (Stokes 1992, 114). The dismemberment was probably done on the floor. The only pictorial evidence for hanging up a carcass to butcher comes from the continent. It takes at least three very fit men to lift such a carcass without a block and tackle (personal experience). Secondly the roof or support needed would have to be very substantial. It is not possible to cut the carcass up in the same fashion as described below.

With the carcass on the ground, on its back with its legs uppermost, it is possible, from personal experience, for one person to eviscerate, skin and dismember the body. It is possible that the skin was completely detached from the flesh but left under the carcass until the majority had been dismembered. As already stated, if the metapodials were removed during or prior to skinning they can be used as wedges to stabilise the carcass.

It is probable that the shoulders were removed first. This is the easiest section to remove because there is no articulated joint to cut through. While there can be no archaeological evidence, practical experience has shown that removing the front legs also stabilises the head end of the carcass, that is it stops the torso flopping from one side to the other. The carcass is even more stable if the beast has horns and it has been chocked up with the metapodials under the skin. The hind legs are the next section of the carcass to be removed.

At South Shields, it would appear that the femur was detached from the pelvis with a diagonal blow, as if the operatives stood at the side of the carcass holding the leg towards themselves. Fifty-three fragments of proximal femora survived in identifiable form, of which 33 exhibited butchery marks with 30 marks concentrated on the head of the femur (femoral capita). Comparable butchery has been recorded on many other sites, such as Portchester (Grant 1975) and Caerleon (O'Connor 1986), where the head of the femur was completely removed in one blow, corroborated by the corresponding marks found on the border of the acetabulum.

It looks as though the animal was then opened up by means of cutting the ribs away from the vertebrae in a series of discontinuous blows which glanced off the vertebral centra, causing varying amounts of damage to the vertebrae. As a result of this practice, some of the vertebrae would appear to have been split (dorso-ventrally cloven), some suffered irregular slices, whilst others have only their transverse processes removed. It appears that this process was principally carried out on one side of the vertebral column. This would then enable the butcher to open up the carcass so that the ribs were flat on the ground. As at Portchester, the ribs were generally cut from the inside, most averaging some 100 centimetres in length, very few were in excess of 150 - 200 cms.

It would appear that the ribs were taken off in strips and then made into smaller joints. They would result in joints similar to some American type cuts today such as cross rib, short rib, short plate and brisket which are all joints suitable for pickling and boiling.

Once the ribs were removed it looks as if the rest of the trunk was cut into sections and this has the appearance of having been done by standing on one side of the carcass and cutting at an angle through the vertebrae. In most cases this appears to have been carried out by somebody who had no, or very little, real knowledge of the anatomy of the animal, or little incentive to make a neat job, very much like the eighteenth and nineteenth century northern and Scottish butchers, because some of the vertebrae were cut through the centrum only a centimetre or so from the joints and some exhibited evidence of more than one attempt to do this. This technique of cutting up cattle carcasses could be best described as "Block Butchery". However the joints cut in this way would be suitable for salting.

From the way the cattle long bones were further processed, it would appear possible that all the long bones were removed whole. As already stated it is difficult to cut the hind leg of a cattle carcass into smaller pieces, with the femur and proximal tibia in place, without the aid of a saw. It is far easier to remove the femur whole, to enable the thick round of meat to be cut into joints, the tibia is not

so well fleshed but it is far easier to remove the shin meat from the distal end and bone out the proximal with the femur intact. The removal of these bones also enables others to use the bones such as for marrow/fat extraction and for the manufacture of bone artefacts. All the long bones from South Shields, with the exception of some metapodials, were split/fragmented into small pieces. The epiphysial ends were commonly split into thin longitudinal pieces, possibly to remove the marrow as described below. All the long bone shafts had been subsequently so well fragmented/chopped as to make positive identification impossible in many cases. For this precise reason the system of recording only those fragments with diagnostic zones was developed.

Interpretation of meat consumption patterns on the basis of the recovery of discarded long bones, that is "better" and "poorer" cuts of meat is invalid if the meat had been removed from the bone and the end user/depositor was only concerned with marrow fat extraction.

Rixson (1989) states that removal of the bone marrow fat from the medullary cavity can be readily facilitated by splitting the long bones with a chopper. To chop a bovine long bone across the shaft is very difficult, and sometimes impossible, using only a light chopper, but by chopping the bone from the end it can be split sufficiently for the removal of the marrow.

Using a 4 lb chopper, the author has split femora from adult cattle with five or six blows (Stokes in press). The method is to place the bone on a firm surface (a butcher's block, tree trunk - or something equally solid) with one end towards the butcher and chop through the epiphysis in the longitudinal plane of the bone. There is only a thin layer of compact bone covering the epiphysis and therefore the chopper will shear through this and the cancellous bone tissue causing the thick compact bone of the shaft to split more or less longitudinally.

This may have had some effect on the percentages of cattle fragments compared to those of sheep and pigs, but as this was, or appears to have been, a

very common practice on Roman sites it should not affect the percentages between sites.

It would appear that almost all the dismemberment and cutting and splitting was done with a chopper but there is less evidence for the use of a chopper in the boning out of the meat. There are 23 scapulae with evidence of their spinous processes having been removed with a cleaver and the glenoid cavity was trimmed like a pencil. This was almost certainly done to allow the shoulder joint to be brined, and, in almost all cases, a hole was made in the middle of the blade, possibly to hang the shoulder for smoking.

The other elements include a radius and tibia that had their distal epiphysis trimmed pencil fashion and seven phalanges, two of which had been split longitudinally and one had then been chopped across and three that had the proximal end chopped though.

The jaws and skull have also been chopped or, more properly, hacked. This was possibly to remove the tongue, cheek meat and, possibly from the way they did it, to remove the edible Lymphatic glands (Hammett & Nevell 1946, 239, fig. 52) which are:

Submaxillary: on the inside of the angle of the jawbone

Parotid: below the root of the ear

Pharyngeal: above the pharynx (inside tongue bones).

Again this would indicate that the person who did the butchery had a good knowledge of what was edible. There are some written records which give an indication of military status (Davies 1971) "Tarruntenus provides a list of *immunes* (soldiers excused fatigues), one of these is a butcher (*lani*)". It may be possible to explain the regular way of cutting up the cattle carcasses, if the butchers were instructed to cut up the meat into pieces of predetermined size regardless of the size of, and bone structure of, the animal. This method of butchery could easily be taught to others. This style of butchery is practised today by modern butchers using a band saw, where there is no need to cut round the bones. This method was

observed at Simpson's at Cockfield where four lamb carcasses were processed in ten minutes, a saving in time of something like an hour and ten minutes, the traditional way of cutting up a carcass with a knife and cleaver takes an experienced butcher approximately twenty minutes. While the Roman method may be quick and easy in execution, mindless practice may be inferred from some of the needless or careless chopping of bones, for example the astragalus and calcaneum from context 9091. The astragalus had been chopped though at an angle between the proximal condyles but disarticulated from the calcaneum. A similar practice is also apparent on the pelvis in the area of the acetabulum, where it appears that the rump meat was taken off with part of the pelvis in much the same way as today.

The butchery of the sheep and pigs is not as clear as the cattle due to the smaller amounts of butchered bone. The butchered elements are listed in table 8. The sheep appear to have been cut up in a similar way as today, the highest number of butchery marks are found on the lumbar vertebrae, distal tibia, distal humerus and proximal radius. An explanation for these chop marks as follows: the legs were probably removed whole with the hind leg being removed in a similar fashion to that discussed for cattle, this is borne out by the corresponding marks on the pelvis. The distal tibia appears to have been chopped through in exactly the same way a modern butcher does. The shoulder appears as if it was cut into two through either the distal humerus or proximal radius or both. From the butchery evidence on the vertebrae the main trunk of the animal looks as if it was divided into chops.

The pig bones are dominated by the distal humerus, 34% of the total butchered assemblage. There is a distinct lack of butchery evidence on some body parts for example there are no butchered vertebrae or feet bones although a small number of both are present. It would seem that the pigs were reaching the site already cut up or in the form of processed meat products. Looking at table 8 it seems that the legs and head came on to site but very few vertebrae, possibly because the main body was arriving in the form of bacon. The front legs appear to

have been butchered in a similar way to the sheep. Unlike cattle and sheep, pigs cannot be easily driven, thus it is easier to have the pigs sent already processed.

Type c)

The evidence of the butchery process comes from the 78 scapulae of which 50 were definitely butchered and of these 42 had either the glenoid or spine trimmed, or both. Three examples had a clear hole punctured through the blade. It is thought that the glenoid was trimmed pencil fashion and the spine trimmed to allow the joint to soak in brine before smoking. One scapula treated in this manner had a singed lateral edge. Marples (1974, 123) suggested that the thirteen similarly trimmed scapulae from Longthorpe, near Peterborough were trimmed to make spades for digging. This suggests that the modifications made to the scapula for brining and smoking enhanced their subsequent usefulness for conversion to other artefacts, (see also chapter 6). If brining and smoking were the case, the shoulder was probably removed with part of the brisket and leg of mutton cut attached, leaving the sticking piece and the chuck ribs (see figure 23). There would have been very little meat attached to the blade once the clod and shin, which contain the humerus and radius/ulna respectively, had been removed. These cuts had to be removed to trim the glenoid and the spine of the scapula from the distal to the proximal end. Three scapulae did have knife marks running parallel with the spine and outer edges of the scapula making V shaped pattern on the blade which appear to have been made in the removal of the meat after processing. Schmid (1972, 42) also suggests that the perforated shoulder blades observed in the Roman material at Augst were smoked as this delicacy is still found in southern Germany and northern Switzerland, in Munich the calf shoulder blade "Kalbsschäuferl" is still a speciality.

Type d)

Bone working is the last class of marks on bone and is very distinctive with regular saw or knife marks

Two locations appear to have been used for bone working at South Shields in period 6. Barrack block V room 5 produced a substantial amount of worked material. The floor of this room had small stake holes full of bone shavings and also contained worked antler. Most of the bone and antler were sawn. The rampart building is not so obvious as being a bone working area, but did contain a large number of very selective bone elements such as the femoral heads, horn cores and scapulae (see chapter 6).

Summary

From the butchery evidence it would appear that the cattle and sheep were driven on the hoof to the fort at South Shields. Almost all of the different bone elements for cattle and sheep were found on the site. Only one clear example of marks left by the killing process was observed and no skinning marks, as other colleagues interpret them were recorded. The butchery techniques conform with those observed at Romano-British military sites. The cattle bones exhibited a higher proportion of butchery marks and a greater degree of fragmentation than the bones from the smaller animals. This is the result of the extraction of the bone marrow. The primary use of a cleaver was clear on a large number of the bones especially the trimming of cattle scapulae. The only use of a saw was on bones that had clearly been worked for crafts.

5 SITE COMPARISONS

Direct site comparisons are difficult to make because there is no standard way of recording bones or in presenting the data. Most faunal reports are normally condensed or on microfiche thus not easy to use or they are difficult to obtain due to non-publication. However there are two works on comparative studies of Roman sites.

A comparative survey of bone assemblages from Roman sites in Britain by King (1978) was not used in this work for the following reasons: almost half of the sites cited were based on MNIs; these, he suggests, are comparable with fragment counts. He compares the MNIs of a prehistoric site in Europe which best fits the Romano-British material but he does not take into consideration the fragmentation differences. Most Romano-British site faunal assemblages are made up of very fragmented bone, especially those of cattle, whereas prehistoric sites and hunter gatherer sites normally have less fragmentation due to the differences in butchery. King notes that, in general, the number of bones retrieved per animal increases with sample size and King therefore proposed a relationship between the area of a site excavated and the recovery of skeletal elements from each individual animal deposited. This can only be true if animals are killed and consumed on site. If animals are brought on to site as pieces such as smoked shoulders then no matter how many fragments are recovered no more of that animal than the bones which are left in the joint will be recovered. No consideration was made of how the bones were recorded; most faunal workers record all the bones that can be identified whereas the author and Phillips (1995) have only recorded bones with zones, thus the very fragmented bones are not over recorded. The table in which all the sites are listed is inconsistent, for example the data are presented as percentages, fragment counts, MNIs given as percentages and MNIs as numbers. Horses are included in the some of the percentages.

The seminal work using animal bones as a tool to interpret diet and cultural identity is King (1984). This work has been taken as a benchmark for comparative studies of the South Shields faunal groups. This work also has its shortcomings but is the only other one of its kind. King (*ibid*, 189) states that "each bone can be regarded in a study of this sort as representing a joint of meat". From this statement it is obvious that he knows very little about joints of meat; for example, a shoulder of lamb normally contains the scapula, humerus, ulna and radius and carpals - a total of nine bones, whereas a joint of beef such as the silverside

contains no bone. It is therefore not possible to compare numbers and percentages of bones with relative weights of meat in the diet. This work also included continental sites, both military and civilian, each allotted an agro-climatic zone.

King (*ibid*, 202) suggested that a sample of *circa* 200 bones from the three main domestic species combined was to be considered an adequate minimum sample for site comparisons. However King did use some sites with fewer fragments to gain a large enough number of comparable sites. A total fragment count of 2578 from South Shields Roman fort exceeds King's minimum. Even broken down by period the counts remain high.

The count of 626 identified fragments from the preceding periods, periods 4 and 5, are also generous compared to King's desirable minimum number. The periods 4 and 5 animal bones were recovered from two locations, one within the fort and one outside. Both of these groups produced in excess of 200 identifications, 218 and 336 fragments respectively. The two succeeding periods in the same area of the fort as period 6 also exceeded King's minimum. Period 7 produced 264 fragments and period 8, 287. It was therefore considered acceptable to compare the animal bone assemblages from each period both with each other and with assemblages from other sites, although the South Shields material came from a selected part of the whole site. This approach was taken to see if there was any difference between a whole site and part of a site in determining if it was possible to detect any patterns in waste disposal with regard to status.

Table FRAG: A comparison of the five recorded periods and areas within South Shields

	Period 4	Period 5	Period 6	Period 7	Period 8
Cattle & L/ung.	31.2%	35.1%	50.7%	44.7%	62.4%
Sheep/goat & S/ung.	39.4	35.4%	29.6%	29.9%	16.7%
Pig	29.4	29.4%	19.6%	25.4%	20.9%
N	218	336	2578	264	287

King (1978, 211) claimed that "the most distinctive observable trend is the decrease in the number of sheep bones relative to the other two animals by the late Roman times". This pattern could well be considered a classic chronological trend. A trend that is repeated at South Shields at least for the sheep but the pigs also decline slightly. If this increase in cattle is part of an overall national economic trend then by period 8 the cattle figures should have been somewhat higher.

King (1984) states that about 42% of all British military sites have more than 70% cattle but he does not put them into any chronological order. Also five of those sites with more than 70% cattle bones have less than 200 fragments. Taking King's data (*ibid*, 203) the sites with fewer than 200 fragments were removed and replaced with data from South Shields (Stokes 1992, Phillips 1995) Carlisle (Stallibrass 1991 & 1993), Ribchester (Stallibrass 1995), Papcastle (Mainland & Stallibrass 1990) and Piercebridge (Rackham & Gidney 1984) (Table COMPARE (1)). It is clear from the table that there is no chronological trend in the military sites.

Stokes: Spatial patterning of faunal remains from South Shields fort

Table COMPARE (1): Military Sites in ascending order of proportion of

cattle bones

Site Location	Type of Site	Date	Agro-climatic Zone	Cattle	Sheep/goat	Pig	Total of frags
Hod Hill *	aux	1b	c	14.2	74.3	11.5	494
Chelmsford *	aux	1b-c	d	24.3	47.9	27.8	872
Fishbourne *	aux	1b	c	27.8	29.4	42.8	1136
Margidunum *	aux	1b	c	33	64	3	197
South Shields	aux	3a	a	31.2	39.4	29.4	218
South Shields	aux	3b	a	35.1	35.4	29.4	336
Dover *	aux	2a-3a	d	37.7	48.7	13.6	199
Exeter *	leg	1b	b	42.8	33.4	23.8	1161
South Shields	aux	4a-b	a	44.7	29.9	25.4	264
Cirencester *	aux	1b-c	c	48.4	35.8	15.8	533
Chesters, Northgate *	leg	2c-3b	b	49.3	17.1	33.6	298
Carlisle, Old Grapes Lane	??	1c-2b	b	50.5	31.4	18.1	475
South Shields	aux	3b-4a	a	50.7	29.6	19.6	2578
Longthorpe *	leg	1b	d	56.3	29.9	13.8	1995
Carlisle, LEL/CAL/OBL	leg	1c-2b	b	56.7	27	16.3	566
Hayton *	aux	1b	a	59.2	36.7	4.2	578
Chesters, Northgate *	leg	1c-2a	b	60	15.6	24.4	205
Carlisle, Old Grapes Lane	??	2c-3a	b	60.3	21	18.7	1130
Portchester *	aux	4a-b	c	61.6	22.2	16.2	3140
South Shields	aux	4b-c	a	62.4	16.7	20.9	287
Portchester	aux	4a	c	62.7	19.3	18	5539
Portchester *	aux	4a-b	c	65	19.7	15.3	2790
Ribchester	aux/vic	1c-2b	b	66.5	23.2	10.3	2467
Piercebridge Primary Ditch	aux	4c	a	67.4	18.6	14	11015
Carlisle, LEL/CAL/OBL	??	2c-3c	b	67.4	14.6	18	267
Portchester *	aux	4c	c	68.7	17.4	13.9	5035
Watercrook *	aux/vic	2a-b	b	69	23	8	591
Carlisle, Annetwell Street	leg	1c	b	70.2	17.4	12.4	5176
Colchester *	leg/can	1b	d	70.3	15.2	14.5	1458
Watercrook *	aux/vic	1c-2a	b	71	20.3	8.7	462
Vindolanda *	aux/vic	2-4	b	74.5	13.2	12.3	3488
Watercrook *	aux/vic	2b-3c	b	76.3	15.6	8.1	2390
Caernarvon *	aux	4c	b	81.7	3.5	14.9	202
Caerleon baths *	leg/can	3c	b	81.8	6.2	12.2	828
Papcastle	vic	1c-2a	b	84.2	9.4	6.4	913
Caerleon baths *	leg/can	4a	b	84.9	6.5	8.6	2984
Lancaster *	aux/vic	2a-c	b	85.1	7.6	7.2	276
Lancaster *	aux/vic	2	b	89.6	9.8	0.5	386
Bothwellhaugh *	aux/vic	2b	b	91.5	2.1	6.5	527
Caerleon baths *	leg/can	3c	b	93.2	1.9	4.9	370

Little Chester *	aux/vic	2	a	98.2	1.8		655
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All locations marked with an asterisk are from King (1984, 203)

Key

Dates are given in centuries, the letters a, b, c, indicate which third of the century

Type of Site

aux	auxiliary or uncertain
aux/vic	auxiliary <i>vicus</i>
vic	<i>vicus</i> unknown
leg	legionary site
leg/can	legionary <i>canabae</i>

INSERT KINGS ZONE MAP FOR GB

King suggests that there may be geographical factors at play in the provision of the military diet and therefore allotted the sites to agro-climatic zones according to Tran and Broekhuizen's 1965 map

If the trend (Table FRAG) is not a chronological trend then it may be due to the fact that the fort was garrisoned by three different units during its history. This aspect is not considered by King (1984) other than identifying whether or not the troops were an auxiliary or legionary unit. This is possibly due to the difficulty in identifying the unit garrisoning the fort at any one time. At South Shields there are three distinct patterns in the utilisation of the domestic food animals which could indicate three cultural, ethnic or group identities. The proportions of the three major species are radically different between periods 4 and 8. Periods 4 and 5 have almost equal representation of the three species whereas period 8 has a predominance of cattle remains which appears to have been principally achieved by a reduction in the proportion of sheep/goat. Periods 6 and 7 show similarity with

each other, but contrast with periods 4, 5 and 8. The trend in periods 6 and 7 is for approximately half the fragments to derive from cattle, slightly less than a third from sheep/goat and the remainder pig.

Period 5 was definitely garrisoned by the Fifth Cohort of Gauls (Bidwell & Speak 1994) and it was assumed that the same unit was also garrisoned there in period 6 and possibly period 4 too (*ibid*, 18). However, unless the unit changed its recruitment policy, which is doubtful as Dobson and Mann (1973, 193) suggest that the auxiliary units were raised from a single tribe or province and kept up to strength by agreement with the tribe concerned or there was an official change in the diet provided, it is possible to interpret the change in faunal representation of periods 6 & 7 as indicating the presence of a different garrison. One possibility is that such a change may indicate the arrival of the Tigris bargemen.

Period 8 saw the end of the use of the fort as a supply-base. It also coincides with a time of unrest in the north, such that Lupicinus was sent from Germany to the north of England to settle the troubles either by negotiation or by force. It may be coincidental that the species proportions in period 5 are not unlike those from some of the Gaulish sites listed in King (1984, 207), while period 8 is not dissimilar to several Germanic sites (*ibid*, 206), and is also comparable with early and mid fourth century deposits from Portchester.

A statistical test was applied to the five periods constructed on the null hypothesis, i.e. there is no significant difference between the four periods at South Shields. Chi-squared was used to test the differences between periods 4 and 5, 5 and 6, 6 and 7 and between 7 and 8. The following results were obtained:-

Periods	Chi-square	degs. of freedom	P values
4 & 5	0.443	2	0.80 - 0.90
5 & 6	5.335	2	0.05 - 0.10
6 & 7	1.126	2	0.50 - 0.70
7 & 8	7.102	2	0.02 - 0.05

The values of P with two degrees of freedom were taken from Fisher & Yates (1963, 47)

Provided that more than one degree of freedom is involved the Chi - square test is satisfactory (Fisher & Yates 1963, 4) therefore the Yates' correction has not been applied.

If the probability that the difference due to chance is less than one in twenty (0.05) there must be a real difference. Therefore the above results show that there is a significant difference between periods 7 and 8. The difference between periods 5 and 6 is not so clear cut. No significant difference was found between periods 4 and 5. Periods 6 and 7 exhibit a statistically significant difference in composition to periods 4 and 5 but no difference between periods 6 and 7. Thus if periods 4 and 5 are similar the Chi - square test could be used to see if there was any difference between periods 4 and 6 the result was Chi - square = 7.995 therefore there is a significant difference between them.

One way of testing the hypothesis that different units were garrisoned at South Shields is to compare the South Shields bone fragment percentages with sites from the country of origin of the units.

A comparison of the five recorded periods and areas within South Shields with other sites. Data for Mesnil-du-Baron, Cirencester, Exeter Portchester and Altenstadt taken from King (1984).

	Cattle	Sheep/goat	Pig	N
Gaulish				
Period 4 S. Shields	31.2%	39.4%	29.4%	218
Period 5 S. Shields	35.1%	35.4%	29.4%	336
Mesnil-du-Baron	30.1%	38.7%	31.3%	326

Stokes: Spatial patterning of faunal remains from South Shields fort

Period 6 S. Shields	50.7%	29.6%	19.6%	2578
Period 7 S. Shields	44.7%	29.9%	25.4%	264
Cirencester	47.2%	32.8%	20.0%	180
Exeter	42.8%	33.4%	23.8%	1161
Germanic				
Period 8 S. Shields	62.4%	16.7%	20.9%	287
Portchester	62.7%	19.3	18.0%	5539
Portchester	61.6%	22.2%	16.2%	3140
Altenstadt	67.1%	13.4%	19.5%	149

These similarities are interesting but cannot yet be explained in terms of garrison for Cirencester and Exeter as the units equivalent to the Tigris bargemen at South Shields are not known.

If the bone assemblages for periods 4 and 5 conform to a Gaulish pattern, this could be attributed to the presence of the Fifth Cohort of Gauls. The faunal assemblage from period 8 appears to exhibit a Germanic pattern, which is also similar to fourth century Portchester where Cunliffe (1975, 430) has hypothesised that Germanic *laeti* were employed as mercenaries in the mid fourth century. King (1984,194) questions why fourth century Portchester was the only site, when he wrote his paper, not to conform to what he describes as a late Roman diet and asked "Were the other military sites separate because of some special distinctiveness and preservation of their Romanized traditions, or were other, perhaps geographical, factors playing an important part?" South Shields and Portchester are certainly not the same geographically, nor are they in the same agro-climatic zone. The high sheep numbers may be due the size of garrison, Dahl & Hjort (1976, 200) state that, with small stock (i.e. sheep and goats), "The meat resulting from slaughter is not more bulky than that it can be consumed by the family itself within a couple of days". A small garrison may find it easier to deal with one or more sheep carcasses than one cattle carcass which, if not consumed within a day or so, will require processing to prevent loss. "Meat can, apart from being stored 'on the hoof', be kept for some time after preparation. Common methods of storing are salting, smoking or sun-drying . Salting meat is historically the most common practice of preserving meat in Great Britain discussed above in chapter 4 above. Smoking meat is usually a secondary process to salting such as the process described in types of butchery marks (c) in chapter 4 above. Sun-drying is a process which takes at least one week and during this period the meat is partly spoilt" (*ibid*, 169) and is more a Mediterranean /African practise. This process could only be done during the summer at South Shields. Sundryed meat would possibly not been known by the Fifth Cohort of Gauls but the Tigris

bargemen would have almost certainly known of its existence. What then of periods 6 & 7? The species proportions from these two periods certainly do not conform to the norm for other contemporary military sites. The patterns are more like those observed for mid-first to second century sites from Cirencester, Carlisle-Old Grapes Lane and Great Casterton. Great Casterton is not included in the data taken from King (1984) above because there is no fragment count information.

Table COMPARE (2) Sites comparable with periods 6 & 7 from South Shields

Site	Type of site	Date	Zone	Cattle	Sheep/Goats	Pig	no of frags
South Shields	aux	4a-b	a	44.7	29.9	25.4	264
Cirencester	aux	1b-c	c	48.4	35.8	15.8	533
Carlisle, Old Grapes Lane	??	1c-2	b	50.5	31.4	18.1	475
South Shields	aux	3b-4	a	50.7	29.6	19.6	2578

Chi-square: 3.802, number of degrees of freedom 6, value of *P* 0.70 - 0.80.

There is therefore no significant difference between the four sites, therefore the probability is that they are the same in terms of species proportions.

Unfortunately the Cirencester animal bones were found in areas with material which was thought to have been redeposited, (Thawley 1982, 211) so the comparison may not be reliable. The epigraphic evidence for the auxiliary garrison at Cirencester indicates that the fort may have been garrisoned by three different cavalry units - one from the province of Germania Superior, one from the lower Rhineland and one unknown.

The sample size at four of the locations in period 6 is sufficiently large (over 200 fragments) to compare with those listed by King. This was done to test what results would be obtained if only selected parts of the site at South Shields had been excavated. This produced some interesting results, which show what one would expect, i.e. that there is no uniformity within the site.

The four locations from South Shields with more than 200 fragments

Location	Cattle	Sheep/Goat	Pig	n
Rampart	65%	24%	11%	422
III-V	56%	30%	14%	378
Bk VI	45%	32%	23%	457
Bk V	36%	39%	25%	444

Looking at King (1984) to find the best match, it becomes clear that South Shields, taken by location, does not conform to the majority of the forts of the third/fourth centuries. King (*ibid*, 189) states that, for those sites with percentages of cattle below 70%, it is possible to divide them into two groups: Legionary sites with relatively high pig percentages of 20% or more and a lesser number of sites where the sheep/goats are high and the pigs low. He suggests that the legionary deposits are a fairly coherent group in which most have fewer sheep bones than the auxiliary sites including those of unknown or uncertain status. Therefore he concludes that it is possible to observe a difference in the legionary and auxiliary diets.

The Rampart building could be considered similar in its percentages of the three main species to that of the fourth century finds at Portchester, (cattle 65%, sheep/goat 19.7%, pig 15.3%) which could have been an auxiliary fort. Other parallels are with first to third century Watercreek, an auxiliary vicus (cattle 65.9%, sheep/goat 23.6%, pig 10.5%); third to fourth century Colchester, a Romanised town (cattle 64.9%, sheep/goat 23%, pig 12.2%) and third to fourth century Winterton, a Roman villa (cattle 64.6%, sheep/goat 23.9%, pig 11.5%). All four sites are located in different agro-climatic zones. All four are different in their use. With one exception, that of second century Watercreek, they are all of the same period as that of Period 6 at South Shields.

The location III-V has three parallels. These are a first century legionary fort at Longthorpe (cattle 56.3%, sheep/goat 29.9%, pig 13.8%), Barton Court Farm, a first to second century villa (cattle 56.2%, sheep/goat 30.9%, pig 12.9%) and a first century pre-Roman Iron Age continental civilian site or *oppidum* at Berne Enge (cattle 53%, sheep/goat 31.3%, pig 15.7%). Again all three sites are located in different agro-climatic zones.

Location Bk V is also similar to first century Berne Enge (cattle 34.9%, sheep/goat 41.2%, pig 23.9%).

The fourth location considered from South Shields is Bk VI. This group has four parallels: first century Exeter, a legionary site (cattle 42.8%, sheep/goat 33.4%, pig 23.8%); a first century auxiliary site at Great Casterton (cattle 45.4%, sheep/goat 34%, pig 20.6); the first century auxiliary vicus at Cirencester (cattle 47.2% sheep/goat 32.8%, pig 20%) and a Gaulish site of the fourth century at Montmaurin where the contents of a villa well gave the following proportions: cattle 43.5%, sheep/goat 33%, pig 23.5%. Two other Gaulish sites that were not dissimilar are Paris and Damdron.

By examining the faunal remains from South Shields location by location and comparing them with other sites, it is clear that if only part of the site was excavated and used to determine what type of diet was represented it could be interpreted in many different ways.

This is possibly due to the minimum fragment count of 200, suggested by King (*ibid*), being insufficiently large and therefore liable to distortions. Alternatively South Shields could be unique in that there were more than one part or parts of a unit garrisoned at the supply base.

A minimum of 200 fragments for all three of the domesticates could be considered low for a Romano-British site where there is normally a great deal of fragmentation within the bones especially the cattle bones. A cattle carcass contains approximately 109 bones, counting the skull as one bone. If each bone was fragmented into an average of four pieces, this would give a total of 436

fragments for one bovine animal, sheep and pig have slightly fewer bones than cattle. Taking an average of 100 bones per animal, and taking into account the lower fragmentation in sheep and pig bones, assuming that on average each bone is broken into a minimum of two pieces, a total of 600 fragments is obtained from the dismemberment of a single animal of each of the three main domesticates. Such a scenario generates three times the number of fragments regarded by King as a suitable minimum figure. In assessing whether or not 200 fragments is an adequate sample for comparative purposes, one needs to see how this number was arrived at. King based his number on Gamble (1978, 342) which in turn was based on a study of sampling at Uley. The experimental calculation was carried out on one context from one site. The sample was a random ten percent of the total fragment count of 2320. It was done as an exercise to see if time could be saved in assessing the variability in bone assemblages. With this particular context it was clearly demonstrated that ten percent was sufficient to answer certain very general questions about the variability in a bone assemblage. This single context from the Roman temple site at Uley produced nearly as many fragments as the entire study area at South Shields. It was not possible to take a random sample from South Shields as at the time of writing up the bones had been returned to the site, however it was possible to retrieve the order in which the bones had been entered onto the database.

Using a technique derived from pollen analysis, accumulative percentages of the three domesticates were calculated as blocks of 100 fragments, table 9 and figure 31. Up to approximately 1000 fragments, the percentages fluctuated by up to 5% per species but by approximately 1500 fragments the percentages varied by only one or two percent. Therefore it could be argued that a more accurate and realistic fragment count for comparative analyses should be approximately 1500 fragments.

When King (1984) proposed 200 fragments as a minimum sample no-one knew any better. It was an innovative approach to intersite faunal assemblage

comparisons. The work has continued to stimulate discussion. Using King's methodology for this project highlighted some inherent defects. Testing the methodology of King has indicated that further research on these lines needs a considerably larger sample size than was initially envisaged. King's work remains an invaluable resource as a collection of data, though interpretations by subsequent workers may differ from those of the original author. From this present study it has become apparent that the traditional approach to the excavation of Roman Forts on Hadrian's Wall, yielding small samples of animal bone could produce potentially misleading and biased assemblages of animal bone. The research strategy of area excavation at South Shields has permitted the application of King's method to a site where spatial variation can be accurately pinpointed. Without the meticulous level of excavation at South Shields this project would not have been feasible.

6 SPATIAL PATTERNING OF BONE WITHIN THE FORT

Having thoroughly researched the problems encountered by other authors (Halstead, Hodder & Jones 1982, Kroll & Price 1991, Holl & Levy 1993 & Kovacic in prep.) in attempting spatial analysis of faunal assemblages, the present author commenced this study with an appreciation of some of the potential pitfalls that could be encountered. It was therefore considered that a thorough understanding of the complete assemblage in terms not only of species but also of intra species composition, was essential before attempting analysis of spatial distribution of the discarded faunal debris. It was of paramount importance to understand what was brought into the fort in the way of live stock and carcasses, how these were dismembered and distributed before the bones were dumped as rubbish and in some cases, redeposited after dumping during modifications to the internal layout of the fort.

A investigation into the spatial distribution of bone was done primarily to see if there were any differences in the structures to suggest the source from which the refuse was derived. It was hoped that it would be possible to detect a

difference in the disposal of different types waste and to determine the function of a particular area within that building.

Comparisons with Wendens Ambo

No comparisons were made with the work done by Kroll & Price 1991, Holl & Levy 1993 & Kovacik in prep. as all their work is either ethnographic based on hunter gatherer camp sites or Palaeolithic sites. Bartram et al (1991, 143) conclude their study by saying "We hope that this preliminary look at some of the processes that condition the spatial configurations of bone refuse at contemporary Kua camps can help guide our inferences about spatial patterning in bone assemblages from the prehistoric world.". Other works on spatial patterning of bone are Ijzereef (1989) and Gidney (unpubl.). Ijzereef analysed the contents of 175 dated faunal samples from cess pits and a refuse layer from which it was possible to indicate the social and religious status of the occupants. Ijzereef was also able to locate craft workers by their waste. Gidney in her work on medieval Leicester was also able to show the similar patterns in the disposal of rubbish in plots behind the medieval houses. Halstead *et al*(1978) looked at the refuse patterns at Wendens Ambo for the Iron Age settlement and a Roman villa.

The predictions made by Halstead (1982, 44) that the different skeletal elements tend to be discarded at various stages in the dismemberment of an animal's carcass was based on the work of Lewis Binford and Jack Bertram in their study of American Indians and Nunamiut Eskimos and thus must be treated with caution. He does, however, go on to say that the patterning of both dismemberment and discard varies according to the type of animal, time of year and social context in which the animal had been slaughtered.

Halstead also suggests that there were some generalisations in the process of dismembering the carcass. The first is that the horns, feet, and the hide might be removed and sent off for craft or industrial use, this would be an acceptable suggestion in a urban situation (Serjeantson 1989, 136). It does not appear to be

the case at South Shields as the percentage frequency of metapodials was approximately forty percent, likewise the phalanges and horn cores. From the small concentrations of worked material and craft type waste it could be suggested that craft work was being carried out on site in at least two locations, namely the rampart building and room 5 in barrack block V, these locations are discussed below. Hides could have been tanned near to the site perhaps using the river Tyne; Forbes (1966, 52) describes the tannery in a Roman army camp at Vindonissa but no such structures have yet been discovered at South Shields. With the importance of leather to the Roman army it would be strange if they did not have control of their own hides and the local leather industry.

The head is represented not as whole skulls but as fragments; as suggested (chapter 4) above the only slaughter method detected in cattle is pollaxing. If done correctly this would not have damaged the brain thus would have remained usable; the average ox brain weighs approx. 0.67 kgs (Simon 1952, 414). Halstead (1982, 44) states that the head without the brain and tongue (approx. 1.36 kgs) had very little meat. This is not exactly true from experimental butchery carried out on Dexter size cattle, the head on average without these organs contains approximately 1.8 kgs of edible meat without the ox palate and the edible lymphatic glands, thus the head could generate approximately 3.18 kgs to 4.09 kgs of meat. The quickest and easiest way of obtaining this meat and the brain is to hack the skull into pieces which is exactly what the remains resemble from the site. Fewer skull fragments remain than jaws, but this could be a factor of preservation or relate to the fact that the removal of the tongue from the jaw is less destructive. This meat could be bonus meat. In other words, meat that might not have been accounted for by the quartermaster. The same, too, could be said for the lower limbs from which come cow heel.

Metapodials and phalanges are also found in and around the barrack blocks. The majority of these bones have been smashed or chopped, only nine out of one hundred remain whole, presumably to remove the marrow.

The generalisation that the lower limbs were used for soups (Van Mensch 1979) or stews is also questionable, using bones in this way is a reasonably modern practice (Stokes in press).

The generalisation that the meat bearing joints were likely to reach the table with the bones in is fine for sheep and pig meat, if the latter is consumed as pork. However, if the pigs had been cured elsewhere than there would be fewer bones. Adult cattle bones would not reach the table. Also the generalisation that the bones from younger animals are more likely to reach the table than those of older animals would depend on how the animal was cooked, Halstead *et al* (1978) also suggest that the old, tough animals' lower limb bones might be stripped of meat (no mention of what happens to the meat), and the bone boiled up for marrow of which there is no need (Stokes in press). Old cull cow beef can be treated like any other meat if the consumer knows what they are doing with it, we are all too ready to assume that our forbears knew very little about culinary practices. The assumption (made by Halstead 1982, 44) that a cow cannot be cooked whole is also incorrect as there are many accounts of a whole roast oxen especially at large feasts and festivals.

The archaeological recognition of the various activities is not quite as simplistic as 'skull and foot bones in the debris equal slaughter/primary butchery'. Serjeantson (1989, 4) suggests that the identification of such waste is rarely straightforward because discarded waste often contains material from more than one source and until only the very recent past all of the carcass of an animal, with exception of the horn and horn core, was cooked and eaten, so all of the animal could be found in waste derived from food waste. There are, however, a few exceptions such as Exeter (Maltby 1979, 11) where the defensive ditches of the legionary fortress contained bone of which 87% was hornless cattle skulls and metapodials - clearly specialised debris.

As at Exeter it is possible that the animals were slaughtered inside the fort and the waste from the rumen plus anything else considered waste, could have

been disposed of easily in the defensive ditches closest to where the animal was slaughtered. As yet no such waste, if it exists, has been found at South Shields.

The carcase divisions (Halstead *et al* 1978, 120) at Wendens Ambo are not equal therefore the patterning of the variations in the relative weights of bone are going to be biased. The trunk as defined by Halstead (*ibid*) consists of 51% of the skeleton's weight. It is not made up of entirely prime cuts of meat but contains both first and second classes of meat.(Kinton & Ceserani 1984). The skull, including the jaws and teeth, comprises 15.5% and the limbs 33.5%. Therefore using weights of bone could be as misleading a technique as Halstead argued for the use of fragment counts.

For Wendens Ambo, it may have made more sense to divide the carcase according to how the meat can be used /cooked or into how much meat is obtained from various parts of the carcase. Both suggestions would mean subdividing the trunk and possibly the lower limbs.

The first part of the trunk would comprise the cervical and thoracic vertebrae, including the atlas and axis, and all of the ribs which contain the lesser cuts such as the sticking piece, brisket and plate, see figure 23. The second part of the trunk would then consist of lumbar and sacral vertebrae and pelvic girdle. Then if the limbs were divided into two upper limbs, consisting of the scapula, humerus, femur and tibia, and two lower limbs. There would be five units of a more equal weight except the first part of the trunk. This discrepancy could be remedied by taking out the ribs and treating them separately.

Carcase division	Percentage weight of bone
Trunk 1 (fore) without ribs	14%
Ribs	15%
Trunk 2 (hind)	17%
Upper limbs	23%
Lower limbs	15.5%
Head	15.5%

The possible answer to why the cattle limb bones should be more frequent on the periphery of the site at Wendens Ambo, is that they are not kitchen waste but butchery or industrial waste. It could be argued that kitchen and table waste would travel together as the food is prepared in the kitchen taken to the dining room then returned to the kitchen before being disposed of as household waste which could include broken pottery both from the table and kitchen. Other points to consider are that cattle limb bones do not travel with the meat these days. The bones are removed from the carcass prior to it being cut into joints. These bones are termed by the butchers as 'non saleable bone'. Even today, with the use of band saws, the majority of the limb bones are removed whole whilst cutting up a beef carcass. The long bones, if fragmentary, were fragmented after removal from the meat by the butcher. The removal of the marrow by the butcher or another processor would also have necessitated the fragmentation of the limb bones. This process does not require any form of cooking. The raw bone fragments would have putrefied very quickly in mild weather and thus needed to be disposed of away from the centre.

Sheep are cooked with all the bones in except the metapodials and head today, these two commodities were in common use up to the mid-nineteenth century (Beeton 1987 facs. 1861). During the mid-eighteenth century it was common for small ungulates to be cooked with their feet still attached and a depiction of this can be seen in a Hogarth print dated 1755 entitled "An Election Entertainment". In this picture a leg of a small ungulate is clearly depicted with its metatarsal, calcaneum and phalanges still attached. Pig bones are more problematic: firstly, pigs are normally consumed at or around six months age secondly if cured come with most of the bones removed

With the above in mind and a knowledge of the butchery techniques and the animal husbandry it was decided that more than one way of analysing the

faunal remains was required at South Shields to see if there was any difference in the patterning.

The first technique was a simple and quick one based on the main body parts to see if there were any patterns within the body (figures 32 to 76). The three main species were divided into the following parts: skull; jaw; front limbs; vertebrae; hind limbs; lower limbs; both fore and hind from the carpals down. The axis and atlas were multiplied by two and the other vertebrae were divided to give an equivalent weighting to the long bones. The cervical vertebrae were divided by four, the thoracics by 7 and the lumbers by 3. All the phalanges were divided by four. The body parts were then counted and recorded as frequencies.

The second way of recording the elements present by location was on diagrams of the three animals (figures 77 to 91), the elements were counted and recorded as frequencies. Those over 75% were coloured red, those less than 75% and over 50% were coloured green, whilst those under 50% and over 25% were coloured yellow, those under 25% were left colourless. These diagrams were particularly useful when looking at the waste disposal from the barracks, especially in the narrow alleyways between the paired blocks.

The third method of recording was by zone was possibly the most detailed way that can be devised to record exactly what was there, and proved particularly useful in the Rampart building figures 92 to 187.

The percentages of the three main species were recorded for each location, Figures 188 to 203, these gave some interesting results. Firstly, and not surprising, is that cattle fragments are constantly higher in the streets and alleyways compared to the barracks or other buildings. It was felt that this effect may be due to the cattle fragments being larger in the alleyways than those in the barracks but Figures 92 to 187 clearly show that this is not the case. The only other, and the most probable, explanation is preservation- the cattle bone survived better in the open than those of sheep and pig because the cattle fragments were by and large derived from adult animals and thus more robust. There appeared to be

considerable variation in the percentages. The cattle fragments ranged from 29% to 72%.

When the locations were placed in geographical order, a pattern appeared in that cattle fragments were more abundant at the south-east end of the area of study and sheep more abundant at the north-west end. The relative proportions of the common domesticates were tabulated for the streets and alleyways in contrast to the five barrack blocks, running south-west north-east. The rampart building is situated on the south-west side of the south-east gate was kept separate because it was clearly not a barrack block. Barrack block IV was also treated separate because it was across the street which runs north-west south-east through the fort, this is also the same street that runs between C14 and C15, very small numbers of bone fragments were recovered from this location. Barrack block IV also runs north-west south-east opposite barracks V, VI and VII, thus it cannot be placed with the other five geographically.

The results are shown in table 10. The streets and alleyways from the north-west to the south-east show a marked increase in cattle fragments with corresponding decline in the sheep and pig fragments. This trend is also seen in the barrack blocks in which there are generally smaller numbers of cattle fragments compared to those in the alleyways and streets. There were also higher percentages of sheep and pig fragments within the barracks with the one exception of barrack block VII where pig fragments totalled only six percent of the total fragment count for the three main species. This may, however, be due to there only being 68 recorded bone fragments at this location. The trend is also seen in other two buildings to a lesser extent. From this, it is clear that there is a difference in waste disposal across this part of the fort which could suggest that there were differences in the status, ethnic or cultural make up in the occupants of the individual barracks across the site. It is possible that there may have been a difference in the command structure in that the officer in charge of the barracks at the south-east end was stricter about the cleaning of barracks and alleyways. This

would raise questions such as:- Was there more than one unit or parts of units garrisoned at South Shield at one time? Although it can not be directly applied to South Shields Watson (1985, 73) notes that men from a unit posted in Egypt were sent to carry out duties at a granary elsewhere, whilst others were temporarily posted to other units. Thus all the men at the granary or the other unit were not necessarily the same ethnic or cultural group.

What other explanation could produce to this patterning?

(a) Chance? This would be very unlikely to give such a clear and precise a pattern.

(b) Caused by bias in recovery? Again unlikely, as stated above the recovery of bones at this site was, by and large, very good given the number of very small bones recovered by hand.

(c) Incorrect phasing? Again unlikely but possible. The north-west end retains a period five appearance and the south-east a period eight appearance whilst the centre appears like a period seven assemblage, thus it is therefore most unlikely to have been caused by the archaeologist misphasing in such a regular and consistent way.

(d) A factor caused by the fragment numbers? There is a great fluctuation in the overall fragment count, with both high and low values from each building/area thus the pattern is unlikely to have been caused by the number of fragments recovered from each location. The pattern thus appears to be a genuine historical pattern.

Locations

The locations discussed below are placed in order, as far as possible, across the site from the north-west to south-east.

Between Granaries C14 & C15

The area between granaries C14 and C15 was a street an area that one might have expected to be clean in terms of bone debris because of its proximity to the granaries. There were, however, a small number of bones recovered (n = 71) consisting of cattle, sheep/goat and pig with the addition of dog, domestic fowl and eagle. One explanation is that this material has been redeposited from elsewhere to mend or make-up the street surface. The proportions of the three main species are unlike any other locations (figures 32 to 34, 77 & 93 to 97) therefore it is possible that the bones from the street come from elsewhere. Here the presence of eagle may be the clue since no other eagle bones were recovered from period six. Eagle was found in contexts from the commandant's house in period 7 (Stokes 1992) suggesting that it was associated with high status occupation. The period five *principia*, to the north-east, was turned into a granary in period six (crosshall granary) and at the same time a great deal of work was carried out on the street between it and granary C8 which lies immediately north-east of C15. The same street passes between C14 and C15 and therefore it is not inconceivable that the lower end of the street was repaired at the same time and that the bone derived from the *principia* demolition. This was also the only street to have any dog bones. Domestic fowl bones are found on three other streets and may be derived from the Roman equivalent of fast food.

Barrack Block III & Barrack Block Bk.

Initially they were treated as two locations as it was unclear which barrack block the archaeologist was referring to as Bk.

These two locations are now being treated as one and the same. Barrack block III is one of the period 6 barracks and is one of a pair divided by a street to the north-east of barrack block IV. Block Bk is a period 7a barracks which was constructed over block III. The bone material labelled Bk is from period 7a construction phase and is almost certain to be residual debris from period 6 block III. Figures 78 & 79 clearly show that the same body parts are represented in both and therefore they have been amalgamated. The combined fragment count totalled 133, of which only 29% were cattle bones (figure 80) mainly consisting of jaws, hind and lower limbs. Sheep/goat bones were the most numerous totalling 53 or 40%, most elements were present (figure 80) including two horn cores. There was an unusually high percentage of pig bones, 31%, comprised mainly of limb bone fragments (figure 80). A *Gadus sp.* fragment and a horse phalanx were also found at this location.

Between Barrack Blocks III & V

This narrow alleyway between barrack blocks III and V is the dirtiest of all the streets or alleyways from the area of study with 378 fragments of bone recorded. Comparing the figures 80 & 82, 110 to 115 and 134 to 139 of barrack block III and barrack block V figures 81 & 116 to 121 for the alleyway) it is clear that both sets of occupants were depositing their waste into the alleyway. For example there are neither cattle scapulae, humerus or skull nor sheep frontal and femur in barrack block III but these elements were present in the alleyway and barrack block V. There were pig skull fragments in barrack block V and the alleyway but not in barrack block III

Barrack Block V & Rooms CY1, 2, 3, 4, 5, 6 & 10

Again the Period 7a deposits are lumped together with those of Period 6, since it is clear that the Period 7a deposits are residual Period 6 from the worked bone. Period 6 Room 5 barrack block V produced a number of artefacts, in the form of worked antler and bone shavings. Worked antler was also found in the construction phase of Room 4 of the court yard building, this room being built immediately over room 5 of the barrack block.

Between Barrack Blocks V & VI & CYNV

This is a street running south-west north-east between barrack blocks V and VI and is like that of C14-C15 in it is moderately clean in terms of bone debris (n = 89). One fragment of roe deer was recovered from this street, namely a tibia that had clearly been butchered. It had been chopped though the proximal articulation similar to many of the cattle bones. Roe deer was also present in the alleyway at the back of VI therefore it is possible that the only roe deer from this period was waste from barrack block VI. Two periwinkle shells and three chicken bones were also in the street again, like C14-C15, they too are possibly casual waste thrown down when passing through the street.

Barrack Block VI, CYCY, CYEV, & Rooms CY8 & 9

VI contains more body parts than alleyway VI-VII especially for sheep/goats and pigs. This location had the second highest number of species present. Other than the three main domesticates there were horse, domestic fowl, dog, goose, red deer, mussel, starling and *Gadus sp.*. The horse is one of only six from the site and one of three that can be precisely located, it was a lateral

metacarpal. Three dog fragments were found in this location the highest number from a single location. A red deer phalanx and a goose ulna along with a mussel and a fish bone may indicate that someone in this barrack block had time to hunt and fish perhaps using a dog. The horse lateral metacarpal may have been gathered to make a tool such as a needle for a net.

Between Barrack Blocks VI & VII

This location is one of two narrow alleyways, less than 1 metre wide, between two barrack blocks. It is much cleaner than alleyway III-V, in that there were only 114 fragments of bone compared to 378 from alleyway III-V. Table 11 and figures 164 to 169 for the alleyway, 158 to 163 and 170 to 175

for the barracks on either side clearly show that there is a different waste from that of the two barracks either side, suggesting that the two barracks disposed of their waste elsewhere. An alternative suggestion is that it might have been a result of the alleyway being cleaned out as there was red deer in the alleyway and barrack block VI also there was pigeon in barrack block VII and not in the alleyway. There was no chicken or goose bones in the alleyway but there was in both barrack blocks.

Barrack Block VII & Rooms CY11, 12, 13 & 14

The combined total number of bone fragments for this location were only 80. However other than the three main domesticates there were domestic fowl, goose, hare, goat and pigeon making this the location with the third highest number of species.

Barrack Block IV

This building is on the north-east side of the *via praetoria* and was a building retained from Period 5; it had originally served as a barrack with five *contubernia* which were each divided into two rooms and a side passage. The internal walls, with the exception of the officer's quarters, were wattle and daub. The function of this barrack block in Period 6 is still uncertain (Bidwell 1994, 25).

Only three room locations so far have been excavated. These together contained a small number of bone (n=35 from IV1 and n= 5 for the locations IV2, IV3 and IVwNE). The bones came from the three main domesticates with two exceptions, namely one goose skull and a chicken synsacrum. With the exception of the piece of acetabulum the rest of the cattle bones could have been interpreted as primary butcher's waste consisting of a very small number of cattle lower limbs and skull fragments but this is not so for the pig and sheep/goat bones.

Rampart Building

The building structure L (Miket 1983, 35) is tucked into the rampart backing and at the angle where the fort wall meets the west wall of the western guard chambers of the south-east gate. This small structure measured 3.46m. east-west and 4.96m. north-south and was constructed from stout, upright timbers set in a deep foundation trench. It was subdivided by an east-west wooden partition. The floor surface was irregular flagstones which were overlain by a sandy loam containing a large quantity of bone; this bone was, not however burnt as the printed description reports (ibid). Structure L was interpreted as a butcher's workshop because of the amount of bone waste. The northern room of the structure is large enough to have been used as butcher's work place (3.46m x 2.74m), indeed, all of the experimental butchery described above (chapter 4) was done in an area slightly less in size. The waste suggests (figures 182 to 187 & 91) that it could possibly have been a craft working area. There are a number of cattle, head of femur, zone 1 fragments (N =14) but without the corresponding acetabular

fossa (zone 5), see figure 183. If it was a butcher's then from the way in which the leg was disarticulated the head of femur would have travelled with the pelvis and meat (rump) attached.. Small finds from the site include bone counters which were made from the head of femur (Bidwell 1994, 190).

There are also a disproportionately large number of scapulae especially zone 2: glenoid cavity, 3: origin of the distal spine and 5: posterior of neck with foramen, see figures 182. These, it could be argued, could have derived from butcher's waste in that 77% were trimmed for brining, ie the spine and glenoid trimmed to allow the brine to penetrate down the bone. There is evidence for this type of scapula being used for artefacts, see photograph below,



All the other cattle bones from structure L are robust and dense bones which would be ideal for working. The rampart building produced 44% (N = 12) of all the horn cores from period six of which 92% (N = 11) came from context L9 which also contained 72% (N = 16) of the scapulae and 64% (N = 9) of the neck of femur.

The room also contained sheep and pig bones. The sheep bones were dominated by metapodials and distal tibiae without the corresponding carpals, tarsals and phalanges (figures 184 & 185) giving the appearance that they, like the cattle bones, were deliberately selected. The metapodials are commonly worked an

unstratified worked metatarsus is illustrated in Bidwell (1994, 190). The distal tibia is also workable and ten of the thirteen from this structure were sufficiently complete to have been workable.

The pig bones numbered 45 in total thus too small a sample to do much with. However, a tibia from context L9 looked as if it had had the proximal end sawn off, this certainly was not done by the butcher as all the butchered bones from the site were chopped and the use of saws in butchery is relatively new. This location had more gnawed bones than any other from the site, canid gnawing is discussed above (chapter 3).

Spatial Variation of Species and Bone Elements

The three main domesticates are present at every location, see Table 11, and the percentages of which are discussed above (chapter 5). Domestic fowl is the next most common food animal with 58% (n = 36) from location Barrack block V and some 80% of which derived from the 7a construction phase from rooms CY4, 5 & 6 in the court yard building. Room CY4 and part of CY5 were themselves built on top of room 5 barrack block V which was thought to be a craft working area thus not a normal barrack block. Part of room CY5 and all CY6 were built over the officer's quarters of barrack block V. CY5 contained a small passerine and CY6 had two of the three hare bones, the only duck and a goose fragment; again it may indicate a difference in status. Hunting played a great part in the sporting pastimes of the rich (Hyland 1990, 243) to a strict code which was mainly concerned with hunting the hare. The partial skeleton of the first Romano-British puffin was found in the alleyway III-V and may also have derived from barrack block V. The metatarsal and first phalange of red deer were also found in this location. This could suggest that the officer or someone else from barrack block V had time to hunt or the opportunity to obtain hunted species. Of interest the goose and fish bones were only found in barrack blocks.

Barrack blocks V and VI contained the most species, 14 and 11 respectively, followed by barrack block VII which had 8 present, whereas the other locations averaged only 6 each. A total of 22 species was recorded from the site as a whole. One other interesting spatial trend was in the unfused cattle bones, where the epiphyses fuse between the first and second year of life, 50% of these were located between barrack blocks III & V with a further 30% within barrack block III itself.

The element that was the most frequent at all the locations in general was the jaw. In six out of ten locations the jaw frequency of all three of the main domesticates was over 25%, at three locations 50% and within barrack block V over 75%.

Spatial Patterning of Butchered Bones

The percentage of butchered bones of all species combined from each location is shown in figure 24. The numbers refer to the total of the bone fragments of the three main domesticates found at that location. With the exception of the rampart building and barrack block VII the percentage of butchered bones found in buildings is lower than outside. This exercise was then repeated individually for cattle, sheep and pig to see if there was any variation in their distribution figures 25, 26 & 27 clearly demonstrate that the sheep and pigs bones were responsible for the higher percentage of butchered bone in barrack block VII and that the cattle bones were the main component of the butchered bones found in the rampart building. There were no butchered sheep or pig bones in barrack block IV. The numbers of fragments in both barrack block IV and VII were small, thus could be distorting the overall picture. The butchered bones by location were then plotted with the overall total percentages of bone found at each location to see if there was any correlation between them. Figures 28, 29 & 30 again show clearly that barrack blocks IV and VII and the rampart building were not like the other locations. Barrack block IV contained fragments of sheep and

pig bones but none of these were butchered. In contrast the rampart building and barrack block VII contained small percentages of pig bones, of which a high percentage were butchered.

Within -Site Patterning Comparisons with Wendens Ambo

Halstead and Hodder (1982, 59) discussed the contents of the different types of deposit and include all aspects of butchery from kill to eat stages at Wendens Ambo and concluded that the pits in phase R4 were dug to bury rubbish because of the high density of refuse in them. The pits also contained what they termed 'fine kitchen' and 'coarse kitchen' wares in equal quantities which was not informative. They then looked at the carcass distribution of the cow-sized bones which they state clearly points to a kitchen or butchery context. After a detailed examination they suggested that the pits contained waste from butchery and described it as "butchery waste *par excellence*". This was deduced from thirteen limb bone fragments of which seven were phalanges and three distal metapodials, the rest was skull fragments. Similar patterns of refuse were found at South Shields across the site at most of the ten locations. This pattern of material would suggest that it was derived from secondary butchery preparation carried out before cooking. There are several reasons for proposing that this indicates kitchen waste. Firstly, the majority of the metapodials were smashed. It is extremely difficult to chop through the metapodials while they are attached to the carcass. The metapodials are much easier to smash once removed from the carcass, therefore such material is unlikely to represent primary butchery. Secondly this material is spread across the site and not dumped in one area. The Wendens Ambo material could equally have derived in the same way as it was mixed with kitchen wares. The refuse from the rubble spread at Wendens Ambo had a predominance of cattle metapodials and because there were equal numbers of proximal to distal ends and only one phalanx in association with 'fine kitchen' ware it was classed as table or

kitchen waste. With Wendens Ambo being a Roman villa it is difficult to see how the table waste and kitchen waste could be separate since the table waste would almost certainly go back to the kitchen and thus be deposited with kitchen waste, the villa owners would not be clearing their own tables and depositing it separately. Also breakages are more likely to occur in the kitchen. Table waste would also consist of small and possibly immature bones. Cattle metapodials can and have been served to the table but these would be from young animals and would almost certainly have been split longitudinally. From the disposal waste patterns at South Shields it would appear that the waste from the barracks consisted of both bones that had been further processed and small bones from the mess. Since they are mixed it looks as though the soldiers prepared and ate their food in their barrack blocks, further substantiated by the presence of a hearth in each *contubernia* and not on hearths and oven set into the ramparts as suggested by Breeze (1983, 54).

7 CONCLUSIONS

The aims of the project are ordered in the way in which they were discussed in chapters 3-6 as follows:

(i) To look at the evidence for animal husbandry practices and, in particular, any chronological variation. For example any changes in the size or conformation of the sheep and cattle might be indicative of "improvements" in the indigenous livestock types by the introduction of imported livestock. This could have happened at South Shields when the fort was used as a supply base. In historical times live animals were transported as a source of fresh meat and any not consumed at the end of the voyage entered the breeding pool, (Epstein and Bichard 1984,151).

(ii) To ascertain if any changes could be detected in the representation of the three main domestic species (cattle, sheep/goat and pig) through time from c

AD 205 to AD 369. Such changes could be related to dietary preferences of different garrisons.

(iii) To examine the evidence for butchery practices, predominantly the dismemberment of cattle, to see whether or not there were any chronological and/or cultural changes.

(iv) To interpret any patterning found in the spatial distribution of the deposition of faunal debris. The results were to be compared with those of Halstead *et. al.* (1978) and Halstead and Hodder (1982), as these were the only similar studies for a Roman site. They suggested that the spatial patterning of bone waste could be linked to discard after specific activities such as slaughter and butchery, the preparation of food and the consumption of food. If bone refuse can be shown to derive from only these three sources, they argue that it may be possible to locate the areas in which these specific activities took place:

Aim (i)

There are no detectable changes in animal husbandry at South Shields during period 6 either spatially or chronologically. The stature of the cattle at South Shields falls into a range observed not only at the nearby fort of Corbridge (Meek & Gray 1911, Hodgson 1967), but also at Carlisle (Stallibrass 1991) north-west and at Exeter (Maltby 1979) in the south-west. These size differences are mirrored in a modern Dexter herd kept in a traditional way in Weardale Co. Durham. From the pathology and congenital creases on certain bones and the large number of jaws with the absence of p2, it is possible that the cattle were sourced locally from the Tyne Valley and that some were in-wintered from the presence of spavin. There is no evidence for any improvement to the livestock during period 6. The bulk of the beef obtained was from old animals, from the pathology some were kept for some considerable time in some degree of discomfort which may

indicate that they were either lactating or due to calf. The rest were possibly old cull cows which could almost certainly have been obtained cheaply and were suited to being salted and boiled.

All the sheep at South Shields appear to have been of a primitive sort, comparable with the modern day North Ronaldsay and Soay. Again there are no detectable improvements nor any sign of imported larger breeds of animal within period 6. The sheep were also compared with those from Roman Corbridge, Carlisle and Exeter and, like the cattle, no differences were apparent. Some 19% were culled as milk fed lambs and two-thirds of the sheep were culled before the ages of two and a half and three.

From the skull fragments, the pigs at South Shields appear to have been a primitive, long snouted type with some tooth crowding, which suggests a managed population. The pigs at South Shields were slightly smaller than the west country animals. No data were available for comparisons with the north-west. Most of the pig bones were from immature animals, some 85% of the pigs were slaughtered before two and a half to three years of age.

There appears to have been no "improvements" in the indigenous livestock types or any introductions of imported livestock during period 6 at South Shields.

Aim (ii)

Changes in the representation of the three main domestic species through time from c AD 205 to AD 369 were found in three of the five archaeological periods. The assemblages from periods 4 and 5 appeared to be similar. Periods 6 and 7 also appeared to be similar to each other but differed from periods 4 and 5. The assemblage from period 8 was not comparable with those from the earlier periods (figure 205) and table FRAG. chapter 5). These changes in the animal bone assemblages may indicate a change in the garrison at the fort. Periods 4 and 5 could be a Gaulish pattern which may indicate that the Fifth Cohort of Gauls

was garrisoned at South Shields during those periods. The change during periods 6 and 7 may show that the Tigris bargemen were garrisoned at South Shields during those periods. Period 8 is not dissimilar to several Germanic sites (King 1984, 206), and is also comparable with early and mid fourth century deposits from Portchester which Cunliffe (1975, 430) hypothesised was garrisoned by Germanic *laeti*. Therefore it could be suggested that the changes in the representation of the three main domestic species could be related to dietary preferences of the different garrisons.

Aim (iii)

There appeared no differences in the cattle butchery techniques between periods 6 and 7 (Stokes 1992) the patterns were similar to those from the late fourth century deposits from Lincoln (Dobney et al 1996, figures 27a-e and 27 f-l, 80 to 81). Other sites for which comparable butchery techniques have been recorded are Portchester (Grant 1975), Sheepen (Luff 1982) and at Caerleon (O'Connor 1986). This technique of cutting up cattle carcasses into predetermined pieces, "Block Butchery", would have been easily taught to others, quick and easy to execute. The butchery of pigs and sheep at South Shields was not as clear as the cattle due to the smaller amounts of butchered bone, also these animals would not have needed to be dismembered in the same way due to the size difference. The army butcher appears to have been trained in the "Block Butchery" technique using a cleaver regardless of cultural or ethnic background.

Aim (iv)

The reading of any patterning found in the spatial distribution of any faunal remains is open to individual interpretation. This author, for example, has already suggested other aspects of interpreting the work done by both King (1984) and Halstead *et al* (1978). It is freely envisaged that the current author will be open to

similar critique by other workers. The three patterns or interpretations of the faunal debris at South Shields that this author has observed are:

The waste from the barracks especially in the alleyways consisted of both bones that had been further processed and small bones from the table/mess. Since they are mixed it appears as though the soldiers prepared and ate their food in their barrack blocks, this is further substantiated by the presence of a hearth in each *contubernia*. Again the "Block Butchery" is a good indication that cooking was carried out on a small scale, unlike that of the armies from at least the 16th century (Paston-Williams 1995, 52) to the present day where the catering has been carried out in large messes. From these waste patterns, the suggestion made by Breeze (1983, 54) that the Roman soldiers cooked on hearths and oven set into the ramparts appears very unlikely. There is no evidence as yet that any ovens or hearths exist in the ramparts at South Shields for period 6 (see plan 2).

Craft working is an activity that can be located through spatial patterning to at least two locations, room 5 barrack block V and the rampart building within period 6 fort.

Status in terms of the species found at a location can be inferred. Hare, red deer, duck, goose and fish bones were all found within a fairly small area in and around barrack blocks VI and V which could be interpreted as hunting activities associated with offices. The faunal content of these deposits is not unlike those from the Commandant's House period 7 (Stokes 1992, 13).

Primary butchery is an activity that can not be seen in any of the waste with any degree of confidence. There is one deposit of lower limbs and skull fragments of cattle but this is far too small to be interpreted as primary butcher's waste as the total bone assemblage, with sheep and pig, only amounts to 35 fragments. It is possible that if any primary butchery was carried out within the fort it was done away from the barrack blocks and granaries, possibly in the southern most corner which is blank in plan 2 for period 6. Two buildings C18 and C19 are recorded by

Dore and Gillam (1979, 54) in that area but they are thought to belong to period 3, they have remained buried since the excavations of 1875.

It is difficult to see any other clear pattern of activity within the fort during period 6. Halstead et al (1978, 129) noted that the Iron Age patterning was clearer than that of the Roman site, stating that "It was a reasonable assumption that the Roman villa at Wendens Ambo was architecturally and functionally more complex and was more densely occupied" therefore there were more constrictions on the disposal of waste. The fort at South Shields possibly had more constraints and restrictions than most Roman forts as two thirds of its area was occupied by granaries.

The spatial analysis at South Shields could not have been possible without the very detailed and meticulous recording of the open area excavations. The first site the author attempted to use for this study failed due to the records not being easily accessible.

At South Shields it has been possible to give an interpretation of some of the waste disposal patterns with regard to the barrack blocks. It is hoped that this study may give others in the field a starting point in which they may further understand the waste disposal patterns within Roman forts . It would be interesting to compare a standard Roman fort with that of South Shields to try to determine how much difference being a supply base made to the waste disposal. It would also be worthwhile to compare the entire period 6 fort with the area under study and other periods. The biggest problem with this sort of study is computer power as in the final stages of writing up it became obvious that the computer, with 4 MB RAM, only just coped.



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