3 IRON AGE BUTCHERY AT DANEBURY

The methodology for recording and interpreting butchery is presented here, followed by the investigation and discussion of butchery techniques at Danebury. The aim of this chapter of the thesis is to determine what parts the animals were divided into, in order to then assess where these parts (represented by the bone) are found spatially (chapters 4 and 5). The butchery marks are investigated by species, by phase and by feature type, in order to determine any differences to feed into the spatial analysis, but also to provide information on differences that may be representative of social change or diversity. For example the deposits in pits may have been more structured, or the deposits in different phases may be indicative of the consumptions of large or small scale meals. The coded butchery marks are recorded in Appendix 2.

A butchery experiment was performed, and is described in Appendix 3. It aims to identify the potential of different tool types, to assess the influence the tool type may have had on the butchery process, and to enable comparison of the positions of butchery marks created during each process with the interpretations made for the Danebury material.

3.1 METHODOLOGY

There is surprisingly little in the archaeological literature relating to butchery techniques, especially in site reports. They mainly contain comments on the possible tools used and the placement of marks (Grant 1984a; Locker 1990; Hamilton-Dyer & Maltby 2000), or the broad description of body parts that would be produced (Grant 1975; Maltby 1985) rather than the route of division and distribution of the carcass, and quite often butchery is not covered at all (Rackham 1987). This is perhaps to be expected, given the limited time and resources allotted to post-excavation, and to the small sizes of samples from rescue excavations. Exceptions are found for example from Lincoln (Dobney *et al* n.d.) and Ashville (Wilson 1978) where attempts to put the butchery in context are presented. At York integration of the butchery into the overall interpretation of sites provides a good synopsis of the processes (O'Connor 1984; Bond & O'Connor 1999) though again not at a suitable level of detail for comparative purposes.

The main problem as far as this project is concerned appears to be the lack of detail in published reports for the Iron Age, which makes any comparison between sites difficult, if not impossible, especially for generally less well-represented species such as pig. It will often also be partial due to the difficulties of reconciling different recording conventions. A comprehensive approach to the archaeological study of animal butchery has not been undertaken, although many methods have been suggested (described in section 3.1.1). The absence of recorded data or difficulty of accessing and interpreting them makes an inclusive comparative study unworkable at present. However the record for Danebury is present in full in archive form and is thorough enough to form a reliable basis.

To achieve a repeatable, accurate record of the marks is the first aim in such a task. Coding of marks is common in computerised systems and one has been designed by Jones and colleagues (n.d.). However, these are often time consuming to interpret and no overall method has yet been adopted, although several have been suggested. Dobney and Reilly (1988) suggested a method for the recording of marks in zones. This was followed up by Rixson (1989) who described a means of recording based on composite diagrams of individual bones, and by May (1990) who concluded that Dobney and Reilly's method was scientific but could not be interpreted fully in the absence of a pictorial record. O'Connor also suggests a diagrammatic representation can be successful (O'Connor 2000: 47). A pictorial record would effectively preclude the need for an arbitrary zoning of bone areas.

To record the butchery at Danebury it was decided to use a numeric code to record as much detail as possible for future use, but also to include an interpretative code so as to incorporate objectivity and interpretation. Pictorial representation was also used as a means of investigation and of display.

3.1.1 Existing Butchery Records

The butchery marks on bones had been recorded by Annie Grant as the bone was identified, and either drawn or, if the cut was representative of a common technique, given a numeric value. The drawings were interpreted and the mark characteristics recorded in a card catalogue. Figure 3.1 shows a copy of one of the recording cards. The bone illustrated, a pig femur, shows two cuts on its head, resulting from the process of disarticulating the femur from the pelvis.

Once codes for the present study had been devised (Appendix 1), the marks found on the archaeological bones could be coded and the values entered into a relational database that could tie into the main database. This was intended to provide an easily accessible record which could be queried. It was tested for ease, robustness and flexibility by asking specific questions, such as: how many marks indicate skinning activity? Which bones show more than one type of mark? The butchery method derived for pigs was then applied to cattle to see how different the cuts were and whether the coding was robust enough to use on animals of different sizes and builds.

3.1.2 Interpreting Butchery Marks

In order to interpret and understand the butchery marks it is necessary to take account of the muscle conformation surrounding the bone. To identify disarticulation marks, the positions and attachments of muscles and ligaments were extracted from anatomical texts, and drawn onto bones from as many angles as required. Then the positions of the butchery marks were overlain to check co-incidence. Knife disarticulation targets the ligaments so as to enable separation of the bones. Division of the carcass by cleaver produces a very different type of mark, heavy and deep, which can easily be distinguished. Such butchery can disarticulate roughly at joints or chop through bone.

Filleting is likely to be evidenced by horizontal or angled marks across the shafts of the bone where muscle was thickest, and is expected to be concentrated on bones with convex or concave surfaces. Combinations of marks may occur together. For example one butchered pig pelvis bears marks on the ilium for filleting, and around the acetabulum for disarticulation from the femur. Skinning marks might show on the lower limb bones and across the metapodials, where there is only a thin covering of tissue around the bone. Some areas of the carcass carry much flesh, and it is likely that butchery will not have any trace on the bone (see figure 3.6).

In order to attain a fuller understanding of carcass conformation, the author visited a butcher to watch the secondary and tertiary butchery of a maiden heifer (i.e. one having borne no offspring), a sheep and a pig. Primary butchery was performed at the abattoir, and secondary and tertiary butchery took place at the same time, since the meat was to be sold for immediate consumption. If intended for preservation or further dissemination, the secondary and tertiary butchery processes would be separated. By watching the disarticulation and filleting of the three main species, differences between them could be ascertained and recorded. The frequency of cuts and their positions on the bone were also noted, and are explained in full in section 3.2.9. This aided understanding of why marks fell where they did, and assisted in interpretation of the butchery marks from Danebury.

3.1.3 Coding Butchery Marks

The aim of the coding system was to record the butchery in an accessible form which would allow interrogation. It can be difficult to assign butchery marks to a specific character. In designing the database, the marks were coded with increasing definition in separate fields so that different levels of detail could be chosen, for example, cuts to the limb, cuts to the bone, cuts to the proximal or distal end, etc. To facilitate interpretation, each mark was given a possible 'function' which was established not on the basis of a single factor but on a series of judgements which would be difficult to include in the coding - force of cut, angle, exact position - without unwieldy complication. Some general rules do apply: skinning activity creates lateral marks to the midshaft of lower limb bones, filleting creates vertical or diagonal marks on the shafts of bone, and disarticulation forms angled marks at articulations. Though a useful heuristic device it is important to emphasise that there are not hard and fast rules, and further information on, for example, position and force, needs to be considered.

A numbered code was developed (see table 3.1), starting with coarse and ending with fine detail, progressively narrowing the position of the mark down from general body part (A) to more specific body part (B). The bone (C) and position of the mark on it (D) were then determined. Carcass divisions are driven by anatomy, so some parts are more likely to show marks for disarticulation (for example the distal scapula) and some marks for filleting (for example the humerus shaft). Bones were divided into zones with this in mind (figures 3.2, 3.3, 3.4 and 3.5). Using the ulna as an example, area 1 is more likely to show marks that resulted from disarticulation, as this is where the ligament joins the ulna to the humerus (see figure 3.4). Area 2 is also likely to bear disarticulation marks, but was designated separately in order to facilitate distinctions between different butchery techniques. Area 3 is most likely to bear horizontal marks from skinning, and perhaps vertical or diagonal cuts for filleting, whilst area 4 is where any evidence for separation from the lower meat-bearing distal part of the limb might be expected.

The orientation (E) (front, back, medial, lateral) was then noted. The type of mark (F) (cut, chop, saw) was included to facilitate investigation of the different techniques used for dismemberment. The purpose of the mark (G) (disarticulation, chops through, skinning and filleting) was inferred from all the characteristics recorded but also from the depth, direction, orientation, type and precise place of the cut. This could be modified or omitted quite easily if a different interpretation was made later. The number of marks in each position was also noted (H). This enabled the skill, or precision, of the butcher's cuts to be assessed (see Peck 1986). An unknown (unrecorded) butchery mark can be coded as '9' to indicate that a cut was present but had not been further defined.

<table>
<tr><td>A</td><td colspan="2">1:head</td><td colspan="2">2:torso</td><td colspan="2">3:forelimb</td><td colspan="2">4:hindlimb</td><td>5:limb</td></tr>
<tr><td>B</td><td>1:upper</td><td rowspan="2">2:lower
mandible</td><td>1:upper</td><td>2:lower</td><td>1:upper</td><td>2:lower</td><td>1 upper</td><td>2 lower</td><td>2:lower</td></tr>
<tr><td>C</td><td>0:cranium
1:hyoid</td><td>0:sternum
1:scapula
2:cervical
3:thoracic
7:atlas
8:axis</td><td>4:lumbar
5:caudal
6:pelvis
9:vertebra</td><td>1:humerus
2:radius
3:ulna</td><td>3:carpal
4:meta
carpal</td><td>1:femur
2:tibia
3:fibula</td><td>1:astragalus
2:calcaneum
3:tarsal
4:metatarsal</td><td>5:first phalange
6:second phal
7:third phal
8:patella</td></tr>
<tr><td>D</td><td colspan="9">area of bone (see diagrams, figures 3.2 - 3.5).</td></tr>
<tr><td>E</td><td colspan="9">1 anterior 2 posterior 3 medial 4 lateral 5 dorsal 6 ventral</td></tr>
<tr><td>F</td><td colspan="9">1 chop 2 cut 3 saw</td></tr>
<tr><td>G</td><td colspan="9">1 skinning 2 disarticulation 3 filleting 4 portioning 5 organ removal 6 bone working</td></tr>
<tr><td>H</td><td colspan="9">number of same type of marks on this bone (99= more than one)</td></tr>
</table>

Table 3.1: Coding for recording the position and purpose of butchery marks on pig bone; from coarse to fine detail. '9' in fields E-H refers to unknown data.

The most important strength is the facility the system provides to choose a specific level of definition, enabling the investigator to choose the level of detail a given query demands. For instance, the butchery on meaty or non-meaty portions of the limbs can be defined in a low resolution query, while at a very high level of detail the number of marks in the same position on the distal end of a specific bone can also be investigated, to see how co-incident butchery marks are. The subjectivity of the analysis can therefore be controlled, by excluding certain fields.

This methodology is very fast to use once the operator has familiarised themselves with the method. However, the more subjective interpretations rely on the recorder having an in-depth knowledge of the anatomy and physiology of the animal. The main muscle and ligament positions can be determined from attachments shown in anatomical texts (for example, Thompson 1896; Senning 1937; Sisson & Hillman 1975; Currey 1984), but this takes time and these texts do not provide a complete record. If only the factual information is recorded, the subtle details required for interpretation may be lacking though the information is correct. It is not easy to reinterpret the purpose of the mark without looking at the bone or its drawn record again, or expanding the database with the danger then of over-complication. The coding was designed to be as adaptable as possible to enable further questions to be asked at greater levels of detail as the investigation progressed.

The main use of the butchery database in this investigation is to ask questions of the types of marks (for chopping through, filleting, disarticulating, etc) and where these are found. It is thus easy to compare proportions of mark types in, for example, early phase pits and late phase pits, or to compare the incidence of filleting in pits and layers. The system provides a basis for comparison between, for example, phase and feature type but also between different sites.

Details of the main butchery processes are given below, with a description of the marks that are likely to result. Appendix 1 summarises the information, showing the codes for the marks which each of the main butchery processes would produce on the bone.

3.1.3.1 Slaughter

Two methods of slaughter are commonly in use. **Poleaxing** is performed by punching a hole into the brain with a heavy implement:

> “ a sledgehammer with a bolt some three or four inches in length on one side... would have made a neat hole in the beasts skull killing it outright” (Anon 1975: 33).

The result would be a hole through the frontal part of the skull. This is reliable evidence but is seldom recognised due to the fragile and therefore usually fragmented nature of the cranial bone. One example of a possible pole-axed ox skull, from an Iron Age pit at Gussage All Saints, is noted by Harcourt (1979: 159).

In **sticking** a knife is plunged into the throat to open the blood vessel, often after stunning to allow the blood to run freely for collection and later use e.g. in black pudding. Historical sources say the knife should not touch the bone (Malcolmson & Mastoris 1998: 95), but there is a possibility of marking the hyoid. However, this bone can also cut by decapitation, so this type of mark has a low reliability. Cuts on the hyoid cannot necessarily be considered as representative of slaughter.

3.1.3.2 Primary butchery

Decapitation, the removal of the head, is current practice and also well known in the past. Pigs' heads contain relatively more edible meat than cattle or sheep, and so the patterns may be different between species. The head has been used as a delicacy, where a hog's head was prepared for sale by stuffing with meat, boiling and inserting glass eyes (Douglas 1924: 148).

The marks representative of decapitation are easy to identify and can be reliably interpreted. They can be found on the occipital condyles, the atlas and the axis. Marks may also be seen on the hyoid, in the vicinity of the throat, but these are less reliable as indicators of decapitation as they may be confused with marks produced during sticking. Horizontal cuts to the sides of the atlas and axis are more likely to have resulted from filleting, but vertical cuts and those found on the caudal and cervical ends of the atlas and axis are more likely to represent decapitation.

Feet removal: as the feet contain very little meat, in modern butchery they are normally regarded as waste and disposed of after removal. However, pigs' feet have been used in various dishes, including stews (Anon 1985: 31) and jelly (Finney 1908: 65; Henderson 1799: 368).

Feet may be taken off either by disarticulation at the epiphyses of the tarsals, carpals, metapodials and phalanges, or chopped through these bones. Marks on these bones are not reliable indicators due to the possibility of confusion with skinning, though skinning can be effected by shallower cuts so marks are less likely to be made.

Skinning marks: Skinning may take place before or during the removal of the head and feet: the latter event sometimes involves leaving the head and feet on the skin during tanning. Pigs' skin is more difficult to remove than that of sheep and cattle (R. Boulton pers comm), but is soft and can be used in clothing. It can also be eaten, so skinning of modern animals is less likely to involve pigs than cattle or sheep, although boar skin is not as soft and is covered with much tougher hair.

The bones which are not covered by a great deal of flesh, such as the metapodials, are most likely to be marked, as cuts on more fleshy parts are unlikely to go through to the bone (figure 3.6). Horizontal marks can be expected where skinning starts, either at the trotters or further up the limb, possibly with longitudinal marks along the lower parts of limb bones (figure 3.7). Cuts to the head could be regarded as skinning marks if they are situated where there is little flesh, such as across the frontal part. Cuts to the stomach would not be visible, nor would cuts on the neck, which, especially on a pig, is covered with too much muscle for cuts to penetrate through to the bone.

3.1.3.3 Preparation and portioning

Removal of organs: most of the organs can be used as food, including intestines for sausages, kidneys, lungs, liver *etc.*. Cobbett states that 'here, in the mere offal... [of a pig] there is food, and delicate food, too, for a large family for a week' (Cobbett 1979: 111; also see Seymour 1974; Vigne 1991) .

The removal of offal is normally invisible archaeologically, as most organs can be removed through the stomach cavity. The removal of the eyes can result in scrapes around the orbit, and brain removal can be suggested from evidence of split skulls. Chops to remove the brain might be similar to those for portioning the skull, so this type of mark is unreliable. However, scrapes around the orbit are reliable, as it would be unlikely that this mark would have been produced by any other activity.

Chops through bone or ligaments to split the carcass into required sizes can occur on any bone, and from a purely practical viewpoint, would be expected to occur near the epiphysis or through the weakest part of the bone. In smaller animals the bone can be left inside the meat and still be cooked efficiently, but larger animals are often filleted which reduces size and therefore fuel costs.

On the head, cuts through the skull or mandible to divide the animal into smaller pieces are reliable indicators of portioning, with the exception of splitting the skull through the brain cavity, which may be for organ removal. The fragility of the skull means these marks may not be recognised.

On the limb bones, cuts through the midshaft of the bone probably represent portioning.

On the torso, vertebrae may have transverse processes cut off during removal from the ribs, or may be cut in half or split across their anterior or posterior articulations during separation from other vertebrae or into chunks of spinal material. Longitudinal chops through vertebrae may indicate the splitting of the animal into two halves. Ribs may have been chopped off at their articulation with the spine, or chopped in half to portion the ribcage. In a young animal, ribs can be cut through with a knife. Scapulae could be chopped through along or across the blade. The pelvis could be cut through the ilium, ischium or pubis. The resulting marks normally provide fairly unambiguous evidence of portioning.

Disarticulation at joints can be used to separate the carcass into smaller anatomically dictated parts without chopping through bone. Fine cutmarks normally result, since little force is necessary to divide the bones if cuts are precisely placed on ligaments.

The removal of the mandible from the skull may leave marks where the two join, ie at the articulation between the condyle of the mandible and the skull underneath and posterior to the orbit. The recorded marks are unambiguous.

Cuts on the epiphyses of limb bones may be reliably interpreted as resulting from disarticulation; those further up the shaft may have been intended for disarticulation, but were misplaced, or may be confused with filleting marks, so these may be ambiguous. The femur from layer 551, illustrated previously in figure 3.1, shows a reliable disarticulation mark, and would be coded 4 (hind limb), 1 (upper part), 1 (femur), 1 (proximal), 3 (medial), 2 (cut), 2 (disarticulation), 2 (two marks), see Appendix 1.

Cuts on the scapula and pelvis around the articulation with the humeral and femoral head may have been created during removal of the limbs. Separation of the scapula and pelvis from the spinal column results in cuts to the dorsal or medial side of these bones. Marks on the ilium are likely to result from meat filleting as are marks on the ventral or lateral side of the ischium. Cuts that are not on or bordering the articular surface are unreliable indicators of disarticulation as they may have been created during filleting.

Filleting of meat prior to cooking mainly occurs on larger animals today. Sheep and pig often have bone left in joints, as it helps to cook meat more thoroughly (R. Wood pers comm). In cattle, the larger bones are normally removed.

Marks may be made along the shafts of bones, where there is a covering of muscle, and are more likely to be made lengthways or diagonally in order to fillet more efficiently by taking advantage of the striation of the muscle.

Headmeat from the cheek and across the frontal part of the head, as well as from the tongue, is particularly substantial in pigs. It can be removed by targeting certain areas where the muscle attaches, for example at the zygomatic process and the mandiblular angle. The resulting marks are reliable indicators of the activity.

Meat bearing parts of the limbs, especially upper limbs, and the upper parts of lower limbs, may show marks where muscle tissue is, or starts to become, more abundant. The marks that result are unambiguous.

Meat can be removed from the vertebrae along the spine, from the scapula blade and from the pelvis. Some marks from these activities, for example on the distal scapula, could be mistaken for disarticulation marks. However the interpretation is generally reliable as the angle of marks can help to define the activity: a vertebra with longitudinal cuts would probably have been filleted, while horizontal cuts are more likely to have resulted from disarticulation activity.

3.1.3.4 Consumption and other activities

In order to utilise meat still on the bone after filleting or initial consumption, the bone can be **boiled** for stock. This activity is very difficult to demonstrate as boiling does not affect the appearance of the bone, although extended periods of boiling can soften bone, making it more liable to fragmentation (Pearce & Luff 1994: 55).

Marrow extraction would result in a high degree of fragmentation. Ribs from young animals, for example, may be consumed entirely in this process as the bone can be chewed and swallowed in order to consume the marrow, and some Western desert Aborigines grind the cooked meat on the bone and consume it all (S. Heald pers. comm.; Gould 1980: 13-14). Bone may be split to remove marrow, sometimes after burning which weakens the tensile strength of the bone (Dobney *et al* n.d.).

The main methods of **preservation** are smoking, salting or drying. Some meat is preserved with the bone intact, for example in hams. Hams may be suspended from the femur, but archaeologically only disarticulation marks are likely to be visible. Trotters can be preserved in their own jelly (Finney 1908: 65) and the only marks likely to be produced by this activity are disarticulation marks at the proximal and distal articulations of the metapodials. While no unusual marks are likely to be found from the preservation activities described above, the bone will be 'in use' for longer and so may have a different distribution pattern (see part 4.8). Pierced scapulae from Roman Lincoln are suggested to have resulted from preserving the shoulder (Dobney *et al* n.d.: 26-7) by hanging the meat by the hole in the bone, but no such marks have been found at Danebury.

The bone is softer after boiling and more brittle after roasting (Coy 1975; Pearce & Luff 1994), so cutting boiled meat from the bone is more likely to result in marks if the knife impacts on the bone. However, cooked meat is less tensile, so removing it from the bone would be easier and could be effected in ways which would not require a knife (tearing, cutting, pulling etc.). It is therefore suggested eating cooked meat would not necessarily create marks, and that any marks which were visible are more likely to have resulted from filleting raw meat.

3.1.3.5 Industrial activity

At Danebury, the bones that had been worked were recorded as small finds, so are not present in the faunal database; the bones identified to element and species are given in part 2.4.4. Other activities that may not have been noticed are given below.

Gluemaking would be difficult to evidence, as the bone would be boiled down and may then be fragmented.

Tanning would require the skinning of the animal; skinning marks as described in Appendix 1 may be found on the head and feet bones. The feet may have been taken off with the hide, and disarticulation marks on the phalanges or metapodials may have resulted.

3.1.4 Tools used for butchery

The tools found at Danebury that may have been used for butchery include iron knives and saws, and possibly flint tools (Cunliffe & Poole 1991: 336-7). No cleaver type tools were in evidence, although some of the knives were large enough to have been used to chop through bone. Saws may be used to cut through bones, and are often used for this purpose today, although iron saws are softer that steel ones and would blunt more rapidly. Appendix 3 explores the use of flint and iron tools in butchery.

3.1.5 Unmarked bone

Non-marked bone may have been butchered in an identical fashion to marked bone, but less vigorously or more meticulously. The protective cover over the bone surface (the periosteum) means that only a very small proportion of cuts may mark the bone, though more are likely where the bone shape is complex, for example the distal humerus (M. Wood pers. comm.) This has important methodological implications, particularly in respect of any discussion of the incidence of cut marks or of particular butchery processes (see Appendix 3). Bone without marks may still be from carcasses that were extensively butchered.

Alternatively, it is possible that non- marked bone resulted from cooking whole animals, a method which would allow the cooked meat to be pulled from the bone. Bones often fall apart in the course of cooking as the ligaments denature (R. Boulton pers. com), leaving no need for further butchery. It is also possible that meat would have been carved, and if it were, this is also unlikely to be archaeologically visible, since roasted bone is more resistant to cutting (Pearce & Luff 1994).

3.1.6 Summary

Detailed records of butchery are often missing from published reports, and there is a need to record butchery in an accessible form, preferably one which is universally accepted. Previous coding methods have been complex and are time consuming to interpret. A code was developed which incorporated a field for interpretations, so that the activity (skinning, disarticulation, filleting, etc) could be included as well as factual information, giving the author's own interpretation of the marks while also allowing re-interpretation. The records were tiered from coarse detail (which part of the carcass) to fine (exact position of the cuts) so that the investigation could be targeted according to scale: characteristics such as the relative frequencies of marks on each bone could be investigated by phase or feature type.

The first section in this chapter describes the incidence of butchery, and the types of butchery marks on pig bones at Danebury; then interpretation of the marks and changes over the phases and between features are identified. The features are investigated separately in order to define the extent and nature of any difference between pits, which may contain structured or special deposits, and layers, which might be more representative of 'ordinary' disposal. The overall divisions of the carcass are described as these will be used as the basis for spatial investigation.

Possible biasing factors, such as fragility of the bone, are also addressed. The extent to which the robusticity (and therefore age) of bone may have affected the butchery patterns was investigated by linking the butchery database to the overall database, and checking co-incidence of butchery marks on bone from young and mature animals.

The pig butchery is followed by similar description of the cattle butchery. This is followed by a comparison of pig and cattle butchery at two sites around Danebury, investigated by Cunliffe in the Danebury Environs programme of excavations (Cunliffe 2000). The differences in butchery and consumption between the environs sites and Danebury are then described, in an attempt to provide information about their relationship to each other.

3.2 PIG BUTCHERY AT DANEBURY

3.2.1 Incidence of butchery marks

	LAYERS				PITS				TOTAL
CERAMIC PHASE	Total bone fragments	% of all bone fragments	total butchered bone	% of bone butchered	Total bone fragments	% of all bone fragments	total butchered bone	% of bone butchered	
1-3	**270**	**7.2**	**11**	**4.1**	**1651**	**23.6**	**55**	**3.3**	**3.4**
4-6	**825**	**22.1**	**24**	**2.9**	**1724**	**24.6**	**48**	**2.8**	**2.8**
7-8	**2630**	**70.6**	**60**	**2.3**	**3623**	**51.8**	**110**	**3.0**	**2.7**
Total	3725		95	2.6	6998		213	3.0	2.9

Table 3.2: Pig butchery incidence by phase: teeth and unassigned fragments of skull are excluded, as are bones that are undated or insecurely dated (e.g. to cp 6-8).

The overall incidence of butchery marks observed on pig bones is relatively low, at 2.9% of identified bone (table 3.2). Butchery marks are found on a very small proportion of all bones, and the variation of a few percent between the phases and features may not be significant. In the early phases (1-3) there was a higher incidence in layers (4.1%), but by the late phase (7-8) the incidence had dropped to 2.3% in layers, but showed little difference in pits. Indeed, statistical tests (χ^2) showed no significant difference between phases in pits (P=0.668, df2), but a significant difference in layers (P=0.174, df2). The only statistically significant difference in incidence found between pits and layers was found in the late phase, although when all pit and all layer contexts were compared, a significant difference in incidence was found (P=0.157, df1).

Phase	EARLY (%)		MIDDLE (%)		LATE (%)	
Feature	Pits	Layers	Pits	Layers	Pits	Layers
Chop	20	13	8	12	14	18
Cut	63	50	68	76	63	62
Skin	2	25	8	0	1	3
Fillet	15	13	16	12	22	18
Total (no.)	**55**	**11**	**48**	**23**	**110**	**60**

Table 3.3: Pig butchery: incidence of types of mark as a percentage of the total numbers of butchery marks.

The incidence of different mark types shown in table 3.3 is broadly similar across phase and feature, although there is a slight increase in filleting marks over time in both pits and layers. This increase is not statistically significant for pits (P= 0.619 at 2 degrees of freedom), but the layers did not contain enough material to test all mark types.

3.2.2 Butchery incidence by bone element

It can be seen from table 3.4 that certain bone elements, especially the tarsals at the astragalus and calcaneum, and the cervical vertebrae, show a high incidence of butchery throughout the phases. This must reflect the separation of the feet from the upper limb and the head from the torso. These marks suggest that removal of the feet and head was frequently carried out, but also that such butchery was particularly likely to leave marks on the bone. As might be expected, there are also numerous marks to the main meat bearing parts such as the scapula, humerus, pelvis and lumbar vertebrae, and to a lesser extent on the radius and ulna in the middle and late phases.

	EARLY			MIDDLE			LATE		
	Total	Butchered	Butchery %	Total	Butchered	Butchery %	Total	Butchered	Butchery %
Cranium	424	0	**0.0**	353	2	**0.6**	956	8	**0.8**
Mandible	119	3	**2.5**	129	2	**1.6**	310	3	**1.0**
Atlas	24	4	**16.7**	21	6	**28.6**	42	5	**12.0**
Axis	10	3	**30**	7	0	**0**	15	1	**6.7**
Scapula	81	6	**7.4**	67	3	**4.5**	181	11	**6.1**
Humerus	80	6	**7.5**	87	3	**3.4**	196	18	**9.2**
Radius	58	2	**3.4**	65	3	**4.6**	128	4	**3.1**
Ulna	49	2	**4.1**	53	3	**5.7**	131	8	**6.1**
Pelvis	58	5	**8.6**	85	4	**4.7**	158	15	**9.5**
Femur	71	3	**4.2**	98	2	**2.0**	147	7	**4.8**
Tibia	79	1	**1.3**	86	2	**2.3**	188	4	**2.1**
Ast/calc	80	10	**12.5**	81	9	**11.1**	140	10	**7.1**
Metac	37	1	**2.7**	64	0	**0.0**	101	0	**0.0**
Metat	41	0	**0.0**	53	1	**1.9**	70	1	**1.4**
Thoracic vertebrae	178	8	**4.5**	129	6	**4.7**	262	13	**5.0**
Lumbar vertebrae	72	6	**8.3**	35	4	**11.4**	95	5	**5.3**
Phalanges	125	1	**0.8**	213	1	**0.5**	235	0	**0.0**
Total	1586	62	**3.9**	1626	54	**3.3**	3355	116	**3.3**

Table 3.4: Pig butchery in pits at Danebury by bone element. Elements with no evidence for butchery in any phase have been excluded.
Deeper shading indicates higher incidence of butchery (shading graded at 2.5 % intervals).

The exception to this is the femur, possibly due to its fragility, although the femur is almost as well represented in early phase pits as the humerus (Grant 1984a: 515). Other usually poorly represented bone, such as the phalanges, also show a low incidence of butchery although this is probably due to the lack of meat on these parts.

The lack of marks on the cranium could be due to the fragility of this bone and difficulties involved in identifying fragmentary skull parts. It is possible that the scarcity of marks on this part in the early phase is due to small sample size, although there are marks on the skull from the middle phase, despite a lower sample size here than in the early period.

3.2.3 Pig butchery: pits

3.2.3.1 Pig butchery: early phase pits (figure 3.8)

Head: Central splitting is evidenced in one mandible and the only other evidence of butchery from the early period is a horizontal cut on the lateral back of the ramus. This is interpreted as resulting from the removal of the masseter muscle, which is fairly substantial in pigs.

Torso: Cuts on the atlas run across its dorsal surface, at right angles to the spine. The axis also shows examples of cuts for disarticulation across the ventral surface, parallel to the spine, and vertically on the side of the body. These both suggest cutting between the atlas and axis, probably during the removal of the head, and possibly to avoid cutting into the skull. One thoracic vertebra has a heavy cut on the side, perpendicular to the spine, as if to portion the thorax into parts. Another such mark is found on a lumbar vertebra and some of these also display marks on the dorsal surface parallel to the spine. These latter marks probably result from stripping of the flesh from either side of the spine, and where the cut falls on the transverse process, from removal from the side of the vertebra too.

There do not seem to be any cuts on the ribs, though the difficulty of assigning ribs to species may have resulted in fewer being recorded, and in the earlier records they were not recorded to species (see chapter 2).

Forelimb: A variety of marks was found on the scapula. Some are on the ventral side across the neck and some cut transversely across the blade. The latter are interpreted as filleting marks produced after the forepart had been separated, as is a cut on the top of the spine. Those cuts nearest to and across the neck are likely to have resulted from disarticulation of the scapula from the humerus. Other marks probably resulting from the same activity are found on the anterior surface cutting into the glenoid border.

Five slightly different positions of marks on the humerus, on different aspects and at different angles, all represent the disarticulation of the humerus distally from the radius and ulna. The proximal articular surface of the ulna also shows marks on the medial side indicative of the disarticulation from the humerus. One chop mark on the distal articulation of the humerus shows a heavier or cruder separation technique.

Hindlimb: Cuts are found in many different positions on the pelvis. Cuts across the ilium and ischium may represent meat removal, following disarticulation of the femur, which is evidenced by cuts along the pubis and on the medial side of the acetabular border.

There are very few marks on the femur, despite the fact that this bone was almost as common as the humerus (table 3.4). Like the humerus, the cuts lie horizontally on the lateral surface, possibly resulting from disarticulation from the tibia. As the butchery of ‘meaty’ parts generally leaves fewer marks on the bone in modern practice (May 1990), it may be concluded that the meat was stripped from this part, leaving no trace. However, this does not explain the relatively greater incidence of butchery on the humerus.

Marks on the astragalus and calcaneum suggest the removal of feet at this point. Cuts on the lateral surface of the calcaneum shaft suggest disarticulation from the tibia, and are mirrored by heavy horizontal cuts on the medial and anterior side of the calcaneum (the latter lower down). The astragalus has horizontal cuts to match, on its medial side.

One cut was noted on the dorsal side of a first phalange. This is likely to represent hoof removal, and there may be some significance in the separation of the metapodial from the hoof, both of which bear little meat and are generally removed together early on in modern butchery. It is possible that this cut could represent skinning, but the position of the cut to the distal epiphysis is more suggestive of disarticulation. There is no other evidence of skinning, on the head for example, and skinning marks are more likely to have been made further up the leg.

3.2.3.2 Pig butchery in pits: middle phases (figures 3.8 and 3.9)

Head: In phase 4 there is a unique example of a cut around the orbit (see figure 3.8), which could have resulted from eye removal. It is hard to envisage another reason for this marking, as the removal of head meat would demand cuts below the orbit, not on it.

In phase 5, cuts were noted on the inside of the jaw, midway up the ramus. These probably resulted from disarticulation of the jaw from the skull (see figure 3.9).

In phase 6 (figure 3.9) there was evidence of cuts (inside the mandible), further down, near the angle. These may have resulted from disarticulation from the skull, while finer vertical cutmarks could represent muscle or tongue removal.

Torso: In phase 4, marks on the atlas are similar to those made in the early phase, and may have resulted from the separation of atlas from axis during the removal of the head. A phase 4 lumbar vertebra shows evidence of cuts intended to separate it from its neighbouring vertebra. A cut across the sternum is likely to have resulted from exposure of the ribcage when opening the torso to remove the internal organs.

In phase 5 pit deposits there are similar cuts to lumbar vertebrae, though there is no parallel in phase 6 bone.

Marks on bone from phase 6 are small in number, but a cut across the ventral surface of the atlas appears to have been intended to separate the skull from the spine at the occipital condyle.

Forelimb: Marks on phase 4 bones again correspond to those from the early phases. Cuts along the caudal and cranial borders of the scapula blade suggest muscle stripping, while the cut across the posterior surface of the neck again represents disarticulation of the scapula from the humerus at this point (also found in phase 6).

A phase 5 bone has a disarticulation cut across the articular surface- a different cut for the same purpose.

Butchery marks on the humeri from phase 5 are similar to those of early phases: cuts across the distal epiphysis probably resulted from disarticulation of the radius and humerus. Marks on this bone in phase 6 pits have more in common with those from the late phase, occurring mainly on the lateral surface, but again probably resulting from disarticulation with the lower limb. A unique example from phase 6 bears marks across the centre of the shaft. On the lateral side one probably represents removal of the triceps, and on the anterior, another represents the removal of the pectoral muscle.

Cuts are relatively rare on the lower limb. In phase 4, marks are found on the lateral side of the ulna, on the articular surface, and probably result from disarticulation from the humerus, as these match cuts on the proximal surface of the radius. Cuts on a phase 6 carpal suggest disarticulation of the foot at this joint.

Other marks on the lower forelimb lie across the shaft of the radius and are from a phase 6 pit. These may represent skinning, coinciding with those midshaft on the ulna’s lateral side. It is unlikely that this cut was made during skinning since it would not have needed to be so deep. Otherwise it could be argued that they represent meat stripping as this is where the muscle attaches and the cut may have been made while cutting into the start of the muscle mass.

Hindlimb: The cuts on phase 4 pelves correspond to those of the early phase. These are the cuts for disarticulation of the femur, and those on the ilium caused by meat stripping. Those from phase 5 show chopping to separate the femur from the pelvis. Again phase 6 is different, with no cuts recorded on the pelvis.

Very few marks are found on the femur: only two phase 6 bones with marks for filleting of meat were found. However there are 802 pig bones from phase 6, compared to 504 from phase 4 and 236 from phase 5. Overall there are 24 butchered bones in phase 6 contexts compared to 14 in phase 4 and 10 in phase 5, so it is possible that lack of evidence for femur butchery from phases 4 and 5 is due to the smaller sample. The absence of cuts on phase 6 pelves thus may be significant.

No cuts are recorded on the tibia or fibula, but cuts on the calcaneum are common. In phase 4 these are found horizontally on the anterior and posterior sides, to disarticulate the lower limb from the upper parts of the limb, leaving the tarsals with the hoof. In phase 5 cuts are noted on the distal epiphysis, on the lateral and anterior sides, probably resulting from the removal of the foot from the metapodials downwards, leaving the tarsals with the upper limb. These marks are mirrored in phase 5 by cuts horizontally on the proximal metatarsals which were probably created during disarticulation. The different positions of cuts in the middle phases may be significant as evidence of different techniques in place or different butchers. It is likely here that the varied positions of cuts represent no more than normal variations produced by one butchery technique, since the exact positions of bone and joints within the flesh are often difficult to predict.

3.2.3.3 Pig butchery in pits: late phase (figure 3.10)

Head: There is evidence for the splitting of the head centrally along the skull and between the two halves of the mandible. Splitting of the entire carcass into two symmetrical halves facilitates the removal of the skull from the mandible. In this case, splitting may have been necessary to remove the brain. Cuts under the orbit are common and probably result from removal of the masseter muscle.

Torso: There are cuts on the atlas on the ventral surface, running parallel to the spine. These might represent stripping of the muscle from the upper body of the pig. There is also evidence of many cuts and chops to separate vertebrae from the skull and from each other.

The varied nature of these cuts may reflect the larger sample for the period, but also could demonstrate the presence of differing techniques or people. Thoracic vertebrae have cuts along the spine representative of meat stripping. On the lumbar vertebrae, however, cuts are more varied, ranging from those on the transverse processes, to chop through and remove ribs (the ribs also show evidence of having been chopped through to portion them), to those on the body to split the trunk into portions, and on the spine, to fillet meat.

Forelimb: The scapula shows evidence for disarticulation, with cuts across the neck on the anterior and posterior surfaces. There is one cut across the spine, almost at the terminus, which must have resulted in the removal of the levator muscles to the spine. This suggests filleting**.**

The humerus also bears marks of knife disarticulation around the proximal epiphysis. There are filleting marks on the posterior and medial and lateral sides, and further evidence of disarticulation at the distal epiphysis, on the medial and lateral sides only.

These are mirrored by the cuts on the anterior proximal ulna, anterior, posterior and medial radius and the articulation, and on the ulna’s posterior shaft and articular surface for removal of the humerus from the lower limb bones. Possible skinning marks are also recorded midshaft on the ulna, though not the radius.

Hindlimb: Cuts on the pelvis are similar to those from earlier phases, and are found across the ilium and ischium, probably resulting from meat removal. Marks are found on the acetabular border on the medial side and on the pubis, for femoral disarticulation.

Marks on the femur occur just below the head, on the lateral and anterior sides and are interpreted as disarticulation from the pelvis. There are few horizontal cuts on the distal articular surface for disarticulation from the tibia.

Disarticulation marks on the tibia are found on the medial side, cut vertically into the epiphysis, and across the fibula on the medial and lateral sides. There are horizontal marks near the base of the fibula and these probably represent skinning. On the anterior side of one tibia are heavy chops, probably splitting the bone in half.

Diagonal cuts on the anterior calcaneum suggest disarticulation. There are also cuts horizontally across the posterior astragalus, which probably resulted from disarticulation of the astragalus from the lower foot. Other evidence of cuts on the hoof was found on the distal articulation of a metatarsal. This would suggest that phalanges were being separated from the rest of the foot.

3.2.3.4 Pig butchery in pits: summary

Interpretation of the butchery marks suggests that skinning occurred only during the later periods, when it is evidenced by cuts across the lower limb bones. This might suggest either the introduction of a new process (skinning), or of a new technique for doing so. Alternatively, the force of the cuts may have been increased in this period, leaving marks on the bone when previously the process had been carried out without leaving any cuts.

The units produced from butchery evidenced in pits are relatively small and have an anatomical basis. Evidence of more divisions of the spine in the early and late periods compared to the middle phases indicates the use of smaller vessels in cooking. However, apparent differences may be due to the small sample size for middle phase contexts.

Evidence for the removal of the head is found in all phases except 5. The head is removed at the atlas/ axis division, rather than nearer to the skull, except in phase 6, where chops hit the occipital condyle and are unusual in their position and force. Marks for filleting of the meat from the skull are found in phase 4 and the late phase, while removal of meat from the spine, limbs and torso are common in all phases except phase 5.

3.2.3.5 Change over time

Although there is a predominance of techniques of disarticulation rather than chopping through bones in all phases, there is some variation within this general scheme. Butchery marks from phase 4 contexts tend to be similar to those of the early phase. Most marks from these periods are very similar, with the exception of a unique cut around the orbit in phase 4. There is, however, an absence of some significant marks in phase 4 deposits, such as the filleting marks on the masseter, splitting of the mandible, cuts to disarticulate the hooves from the metapodials, and chop marks in general. Butchery marks from phases 5 and 6 appear very different, though what this owes to small sample size is unclear. The late phase is different again, with skinning marks, chops through and cuts on the head more common. The disarticulation marks in this period are extremely consistent.

Comparison of the periods shows the early and late to be superficially similar (see table 3.3), but there are some evident differences. For example there is no evidence of the cutting of the cranium in the early phase pits (although there is evidence from layers and postholes). Cuts for decapitation in the early phase also avoid the skull, occurring on the axis and only the distal part of the atlas.

Overall there are more distinct differences in the butchery of the skull than of any other bone. This may reflect the 'special' status of the skull proposed by Grant (1984a: 533). If the skull was deliberately treated in a particular manner (for example, detached carefully, avoiding butchery marks) in the pit deposits of certain phases, this could be reflected in the pattern of butchery observed. This is further discussed in chapter 6.

Another difference in the middle period is the lower proportion of cuts on the distal metapodials and the phalanges. Such cuts on bones from other phases are interpreted as removal of the hoof. The small sample size may be a factor, so while it is possible that in the middle phases a different technique was prevalent, small differences such as this could simply be variations due to slight differences in the techniques of individual butchers.

A greater variety of cuts in the later phases, on bones such as the humerus, might imply that these parts were more often butchered in the late phase than in the earlier phases. However a greater variety of cuts is to be expected in the late phase since there are more bones in the sample.

3.2.3.6 Pig carcass divisions from pits

The interpretation of the butchery cuts indicates that the main method of pig butchery is disarticulation at joints. Such butchery would produce relatively small units of meat, especially as the pigs were normally killed when quite young (see section 2.4.3). Figures 3.11, 3.12 and 3.13 show the relative sizes of the meat parts that would be produced from the butchery, using disarticulation cuts and chop marks, i.e., excluding filleting cuts.

Chops through the humerus, pelvis and tibia observed in deposits from layers (and one from a late period pit), provide a contrast; they would result in relatively smaller joints of meat at an earlier stage of butchery. However the size of the animal is also an important factor: a large animal would need more butchery to produce joints of an equivalent size to those of a small animal. The number of chops found along the spine of the differently sized animals may vary according to whether the size of meat or specific cuts of the animal are important. The state of bone fusion can give some indication of the age; the relationship between the age (and so size) of animals and butchery technique is tested in part 3.2.7.

In the late period, chops to remove the head are found in pit and layer deposits, and evidence of splitting in pit deposits: these are probably due to primary and secondary butchery respectively. There is a possibility that skulls are split to remove organs or to portion the parts into smaller pieces, as the meat from the head is fairly substantial in pigs: a whole head provides over 2kg in modern animals (see Appendix 3).

It is difficult to determine whether in those phases where the cut marks suggest little division of the carcass, there was a tradition which demanded less cutting up of animals, or there is simply an issue of sample size. There may be some interesting patterns that suggest the small sample size is not a real shortcoming. In the pits of phase 6 few divisions are suggested, although this phase contains more bone than phase 4, in which the butchery suggested a greater number of carcass divisions. Conversely, the layers of the middle phase have few examples suggesting carcass division, with phase four having the least. There is little evidence for carcass division in the early and late phase pits but they differ in, for example, the incidence of evidence for hoof removal on bone from pit contexts. In the late phases the evidence for carcass divisions is very similar in pits and layers.

3.2.3.7 The sequence of dismemberment of pigs from pit deposits

The sequence of dismemberment is particularly difficult to identify. Here a sequence is proposed using evidence from the butchery. Assumptions are flagged as such.

Early phase

a). Removal of head and feet.

Ethnographic and historical analogy suggests that the feet were removed as part of primary butchery. Trotters were separated at the proximal phalanges.

b). Primary division

Removal of the limbs at the proximal femur and humerus scapula certainly occurred. It is suggested that this happened before the removal of the lower limbs, as it would be unwieldy to separate the radius from the humerus, for example, while the latter was attached to the main body. The occurrence of knife marks all round the distal part of the humerus and femur would suggest that limbs could be turned and therefore were not still part of the carcass.

c). Further disarticulation

The scapula and pelvis were then removed from the torso, and the tibia and radius/ulna from the upper limb parts. Vertebrae were probably split singly or into chunks after the removal of the limbs.

d). Filleting

Meat was removed from the vertebrae, scapula, pelvis and mandible.

There is no evidence for further processing such as marrow removal.

Middle phases

There is insufficient evidence of butchery to provide detailed sequences for butchery in the middle phases. The middle phases appear to be similar to the early phase.

Late phase

a). Removal of head and feet; skinning may take place at the same time or immediately before or after.

The feet were probably removed, either at the phalanges or metapodials. Metapodials may have been removed after the phalanges or with the phalanges and separated from them later, possibly for bone working (see part 2.4.4).

b). Primary division

Removal of the limbs at proximal femur and humerus again occurred. Again it is suggested that this happened before the removal of the lower limbs. In layers the carcass may have been split longitudinally down the spine, sometimes splitting the body of the vertebrae in two.

c). Further disarticulation

The scapula and pelvis were probably then removed from the torso, and the tibia and radius/ulna from the femur and humerus. The metapodials would now be removed from the limb or from the phalanges.

Ribs might then have been separated from the vertebral column, and the vertebrae split into chunks or individual joints

d). Filleting

Meat might then have been stripped from the vertebrae, scapula, pelvis, humerus and skull.

e). Further processing

One chopped tibia from this phase may have resulted from marrow processing or chopping to portion the parts without filleting. This rapid division is not a common method in Iron Age sites and could have been influenced by Roman techniques, which employ chopping more commonly. Larger animals such as cattle also tend to show more evidence of chopping, and the tibia could have been from a large pig.

Further processing could also include brain removal and other activities such as glue making which are hard to demonstrate archaeologically.

3.2.4 Pig butchery: layers

Here the layer material is presented mainly in terms of the difference in butchery compared to the material from pits, as there are a smaller number of bones with cuts from layers, and the nature of the evidence from these two features is generally similar. The incidence of butchery is discussed below, followed by the detailed discussion of butchery marks by phase.

Table 3.5 shows the incidence of butchery by bone. Some bones appear to have a high incidence across the phases, for example the atlas and humerus, which is no doubt due to the position of these bones in the carcass. The atlas for example is often cut when removing the head from the body, and the humerus when removing the less meaty lower limb from the very meaty upper limb. There is no evidence for butchery of metapodials in any of the phases, suggesting that these parts were not targeted in butchery at Danebury. However there are some variations in butchery incidence between the phases, which cannot be explained by such functional reasons.

	EARLY			MIDDLE			LATE		
	Total	Butchered	Butchery %	Total	Butchered	Butchery %	Total	Butchered	Butchery %
Cranium	46	3	**6.5**	196	2	**1.0**	515	9	**1.7**
Mandible	27	0	**0**	83	1	**1.2**	265	2	**0.8**
Atlas	6	2	**33.3**	12	1	**8.3**	30	3	**10.0**
Axis	1	0	**0**	5	1	**20.0**	7	0	**0**
Scapula	10	1	**10.0**	47	2	**4.3**	160	8	**5**
Humerus	16	1	**6.3**	45	4	**8.9**	151	10	**6.6**
Radius	7	0	**0**	30	0	**0**	90	3	**3.3**
Ulna	3	0	**0**	28	0	**0**	92	6	**6.6**
Pelvis	6	0	**0**	42	5	**11.1**	123	8	**6.5**
Femur	15	0	**0**	25	3	**12.0**	106	6	**5.7**
Tibia	16	0	**0**	31	0	**0**	133	0	**0**
Ast/calc	8	1	**13.0**	28	4	**14.3**	83	2	**2.4**
Metac	6	0	**0**	21	0	**0**	46	0	**0**
Metat	4	0	**0**	18	0	**0**	45	0	**0**
Thoracic vert	17	0	**0**	38	1	**2.6**	83	1	**1.2**
Lumbar vert	22	2	**9.0**	28	0	**0**	65	2	**3.1**
Phalanges	13	1	**7.7**	28	0	**0**	98	0	**0**
Total	223	11	**4.9**	705	24	**3.4**	2092	60	**2.9**

Table 3.5: Pig butchery in layers at Danebury by bone element. Elements with no evidence for butchery in layers or pits have been excluded.
Deeper shading indicates higher incidence of butchery (shading graded at 2.5 % intervals).

Differences between phases are most apparent in butchery to the head and feet, the limbs and the vertebrae. In the early phase, butchery to the cranium is relatively frequent, while in the middle and late phases there is a very low incidence. Butchery on the atlas and axis is frequent throughout the layer deposits, but more so in the early periods. The butchery to the tarsals and phalanges is also relatively more common in the early and middle phases with fewer marks in the late phase. This could suggest that in the early periods there is more emphasis on removing the less meaty head and feet than in the later phases.

On the limbs, there is frequent evidence of butchery to the scapula and humerus throughout the phases. However the rest of the limbs show no evidence of butchery in the early phase at all. By the late phase, all limb elements except the tibia show a similar incidence of butchery, possibly indicating that the carcass was being cut into smaller pieces in this period. The high incidence of butchery on the pelvis and femur in the middle phases could also be of importance: maybe these meat-bearing parts were cut up but the lower limbs left intact to be cooked on the bone.

The vertebrae also show a different incidence of butchery by phase, with a higher incidence of butchery on lumbar vertebrae in the early phase than the late and middle phases. Butchery of thoracic vertebrae is at a low incidence throughout. The small numbers of examples of vertebrae may influence the results here: there is evidence of butchery on only six of the vertebrae from all layers.

So, it appears that in the early phases, head and feet bones were butchered more intensively than the rest of the carcass, gradually changing so that by the late phase butchery was more consistent throughout the carcass, with a similar frequency on the upper limb bones. This might indicate that larger parts of the carcass were cooked in the early phases, becoming smaller in the later phases.

3.2.4.1 Pig butchery in layers: early phase (figure 3.8)

Such little evidence of butchery as was found from the early phase layers correlates with that in the pits: the disarticulation of the head at the atlas, the cutting up of the spine and the filleting of meat from it. There are cuts to the skull around the orbit and above the toothrow, interpreted here and in pit contexts as removal of head meat. Although only a small number of cuts was recorded, there is a contrast with those from pit contexts, where cuts on the body, especially the limbs, are relatively common, but there are none on the cranium.

3.2.4.2 Pig butchery in layers: middle phases (figures 3.8 and 3.9)

There are no marks recorded on bone from phase 4 layers. There is a clear correlation between marks on pig bone from pits and layers in phase 5. Cuts suggest the removal of the feet at the tarsals, and the disarticulation of the hind limb at the pelvis. Other cuts, such as those resulting from separation at the distal humerus, are rather varied in position, suggesting that the butchers were less practised or that butchery was not at this time a specialised craft. They are also found more frequently, possibly because this bone part survives relatively well.

In phase 6 layers there are fewer cuts than on bone from pits, but again a greater intensity of marks on certain joints. There are cuts on the middle and upper cervical vertebrae possibly for decapitation and/ or portioning the neck. There are cuts to disarticulate the scapula and humerus and the femur and tibia, and there are many different positions of knife and chop cuts separating the femur from the pelvis. There are no marks on the skull, though this may be due to small numbers of bone from this phase. There are none of the filleting cuts on the mandible, femur and humerus, common on the pit material. Bones from layers include more examples of disarticulation on, for example, the upper limb joints.

3.2.4.3 Pig butchery in layers: late phase (figure 3.10)

In the latest phases the pit and layer butchery marks are more similar than in other phases, although this could, to an extent, be due to larger numbers in the late phase providing more examples of all types of cut. Evidence of filleting of the meat from the bone is noted on a higher proportion of the bone from layers, but on fewer bone elements, and may represent a difference in butchery technique between the two feature types, where different bones are targeted for meat stripping.

There are similar cuts on bone from both feature types, including those to disarticulate the major long bones of the limb from each other, and possible skinning marks on the radius. In both types of context the spine appears to have been chopped into manageable units, the head removed at the atlas or axis, and it seems, split to remove the brain; the masseter muscle was removed by cutting under the orbit and on the lateral mandible. On bone from layer deposits, the cuts which hit the mandibular ascending ramus might have resulted as the follow through of a blow to disarticulate the head at the atlas. Longitudinal splitting of the carcass into two symmetrical parts may be evidenced by a split vertebra in addition to the split skull; there is no evidence for such splitting from pit deposits.

3.2.4.4 Pig butchery in layers: summary

Overall the pig butchery from layers differs in only minor ways to that from pits, the differences consisting mainly of increased incidence of knife cuts for disarticulation on the joints and filleting marks on the bone shafts. Chop marks are found especially in the late phase for portioning and meat stripping, for example on the head and vertebrae. Possible skinning marks are found across the lower limbs.

In the early phase butchery marks from layers are generally very similar to those from pits. An exception is the fairly common cuts to the cranium on bone from layers, found on bone from pit deposits until the late phase, despite the larger amount of bone from pits. A cut around the eye in phase 4 provides the only evidence of cuts in early- middle phase crania butchery. This difference between pits and layers is tentative but if verified by other species, suggests that, in the early phase at least, the material dumped in different feature types resulted from different activities. It is possible, for example, that skulls in pits were deposited still fleshed, or that meat was removed without using knives, perhaps by boiling whole.

The overall impression from the middle phase layer data is that of a more careless division in a less proscribed way: bones from layers have marks in more positions but for the same purposes. This could suggest some sort of change in the butchery methods used in this phase. Marks are concentrated on certain key areas (the distal humerus in phase 5 and the proximal femur in phase 6), which suggests common disarticulation at these points, as in other phases and features. Slightly poorer preservation in layers may have resulted in the recovery of the most common types of cut but not the infrequent ones, if a number of the bones with marks on them had their surface eroded.

Why butchery on one particular joint is more common in one phase than in another is difficult to understand, although sample size may be a significant factor. It is difficult to determine whether the cuts in the middle period do represent a change in butchery technique. Overall the middle phases provide a considerably larger sample than the early phase, but still offer no evidence for filleting or chopping through bones or vertebrae, suggesting that the meat was being cooked on the bone, and possibly therefore being eaten by large groups of people.

In the late phase there appears to be a more intensive use of the carcass, also suggested by the bone from the pits. Some longitudinal splitting is evidenced on vertebrae as well as the skull, although this is not common. Filleting marks are present which could suggest that the animals were being divided up at an earlier stage and possibly for distribution to more or smaller groups of people. Filleting marks are not found on the hind limb bones in the layers, nor on the fore limb bones except the scapula. It is not likely that poorer preservation in layers eroded the surface of the less robust bone and led to filleting evidence being restricted to certain parts, since the difference was minimal.

However, layer material overall shows only slightly less evidence for butchery than pit material (2.5% compared to 2.8%), and in the late phase the difference is statistically insignificant. It is thus possible that certain practices have been preserved in certain deposits- the limb bones from layers may have been more commonly cooked with meat attached and then distributed, while pit deposits contain bone deposited directly after butchery before the meat was cooked. Alternatively the evidence from layers may be from animals split into relatively smaller parts, and so may be the remains of meals of those of lower status (if meat eating had high status). The differences between pits and layers are however fairly slight.

There is no evidence in any period of splitting bone for marrow extraction, suggesting a fairly unintensive use of the carcass.

3.2.4.5 Pig carcass divisions from layers

The relative scarcity of the marks from the layer material makes this a difficult topic to address. Where divisions can be postulated, they are often found in the same positions as those from the pit deposits. One possible difference is seen in the early phase, where the cervical vertebrae are separated from the thoracic, as is the case in late phase pit and layer material. This could be suggestive of the carcass being split into more parts in early layer deposits, possibly a result of smaller parts being required in certain contexts. Remains from these activities could then have been specifically deposited in layers. This trend may have been reversed in the middle- late phases where the layers appear to have less intensively butchered contents. Any differences are tentative due to the small sample size: there are only 11 butchered pig bones from early phase layers, although there are 55 in the early phase pits and 60 in late phase layers.

3.2.5 Differences between features: pit and layer comparisons

3.2.5.1 Differences between features: early phase

There are so few examples of butchery from layers in the early phase it is difficult to offer meaningful comparisons. Similarities include evidence for primary butchery such as the removal of the hooves at the first phalange and tarsals, and the removal of the head at the atlas and axis in both types of context.

Secondary butchery such as the disarticulation of the limb joints at the distal scapula and between the lumbar vertebrae is seen on pit and layer material. Other disarticulation marks, such as those on the proximal and distal femur, which are found on bone from pits are not found in layers, though as layers contain less than one sixth the number of bones found in pits, this may not be significant. Disarticulation marks on the occipital condyles of the skull are found on bone from layers, but not from pits; this may derive from different treatments of the head in different contexts.

Tertiary butchery is represented by marks indicating filleting on bones from both pits and layers. Bones from pits also show filleting which does not occur on layer bone, for example the removal of the cheek muscle from the mandible, but there is also - and more significantly - some filleting marks on layer bone that are not evidenced on pit material. Skull bone from layers bear marks for the removal of the masseter, while the vertebrae show fine marks across the spine representing meat stripping from either side of an intact spinal column.

It is difficult to determine whether the lack of marks for disarticulation in the layer material results from the smaller sample or is indicative of butchery into larger pieces. The generally younger animals from the pits (see section 3.2.8) would have needed less disarticulation to divide into manageable chunks, so age does not appear to be a factor, as there are more remains from the smaller younger animals in pits.

3.2.5.2 Differences between features: middle phase

There are no butchery marks from layers in phase 4. Sample size may be a significant factor (there are only 137 bones in phase 4 layers), but equally small sample sizes do show evidence of butchery: in phase 5 layers 5 of 137 bones are butchered. A lack of evidence for butchered bone from layers might then suggest some different process at work.

The marks from phase 5 features are very few in number, and concentrate on the disarticulation of the humerus from the radius, with 3 different types of mark for this purpose in the layer deposits. Other marks coincide with those from the pit material.

Phase 6 has the largest middle phase sample. The pits therefore show more evidence of primary butchery and this could indicate a differential depositional activity where layers do not contain material from animals that had been skinned. Again, the possibility of cuts not marking the bone make such negative conclusions extremely unreliable.

The separation of the femur from the pelvis in layer material is evidenced by a variety of cuts. There are none on the animals from pits although these are often younger, therefore probably smaller (see section 3.2.8), so might not require as much butchery to produce comparable sized meat portions to the older animals deposited in layers. Apart from cuts on the distal scapula from disarticulation, which are common to both feature groups, there are other differences in the rest of the marks. Cuts to separate the femur from the pelvis and the tibia, for example, are only found on the bones from layers.

Filleting marks are absent from bones in layers. In pit deposits, filleting of the meat from the humerus, femur and mandible suggests that meat was cooked off the joint, while in the layers the deposits may be remains of meat cooked on the bone.

Thus there appear to be differences between butchery processes on the bone deposited in the two feature types in this phase, with layers showing more evidence of division at primary and secondary butchery points and less tertiary butchery. This could be a reflection of consumption habits: perhaps bone that was deposited in layers had been cooked with the meat on, and that from pits had been filleted before cooking.

3.2.5.3 Differences between features: late phase

There is a slightly lower incidence of butchery on the later phase layer bones: 2.3%, compared to 3.0% from the pits. Where found, the marks interpreted as skinning marks are identical between feature types, as are those from primary butchery: removing the feet at the tarsal (and at the phalanges in pits) and the head at the occipital condyles. Chops through the tibia and atlas are found only in pits.

Evidence for secondary butchery, portioning, also appears to be similar between feature types. Chops through bone are proportionally slightly more frequent in layer material. Rough portioning by chopping occurs on the vertebrae of both features, but splitting of the skull, presumably for brain extraction, is more common on the layer material.

Cuts made during filleting are similar where found, but seen on a greater proportion of the bone in pits. The skull shows evidence of similar butchery in both feature types, though with a greater variety of marks from the layer material.

The greater variety of marks on the bones recovered from layers, such as the evidence for removal of cheek meat and disarticulation of the pelvis, skull and humerus, could suggest that two different butchery processes were in practice. Alternatively it is possible that more people could have been involved in the butchery of animals deposited in layers, creating a greater variety of cuts on the bones from these features.

Statistical analysis is required to check that the perceived differences in this phase are significant, but sample size limits the scope for such analysis for this species. Overall there seems to be little difference in butchery techniques between the features in the late phase.

3.2.6 Pig butchery conclusions

There appears to be a good correlation of butchery techniques between feature types in the late phase, and a poorer correlation in the middle and early ones. A possible hypothesis to explain this could be that the increasing homogeneity between the features over time is potentially linked to a less specialised deposition in pits, or less importance given to the specific depositional context. This is explored further in the discussion. However, the smaller numbers of bones and butchery examples in the earlier periods might account for the apparent differences. In the later phases the differences between pit and layer deposits are illustrated only by a greater variety of marks on a relatively larger percentage of bones in the layers, not by differences in the placement of butchery marks. In the earlier phases differences between feature types might be explained as an adaptation of butchery to the older and larger pigs in the pits. These would require more butchery to produce similarly sized meat parts to younger, smaller animals, leading to different patterns between feature types.

Particular differences include evidence for the utilisation of the head meat: the skull shows marks made during filleting of meat only in the layers in early and middle phases, but in both feature types in the late phase. The evidence for the removal of the eye in the phase 4 pit deposit is the exception: this is not strictly the same process, although the eyes can be eaten. The removal of hooves at the phalanges, rather than or in addition to the metapodials, occurs only in early and late phase pits, and only in early layer deposits. The difference may be the result of smaller cuts being produced, so the trotters could be cooked separately, or of personal differences in techniques used by different butchers.

Less evidence for filleting in the early and middle phase layer deposits could suggest these deposits were made after meat had been cooked on the bone, while those from the pits had been filleted at the time of butchery.

In respect of carcass divisions, there is very little variety between feature types, and it seems that the cuts of meat produced are similar in both, although the placement of cuts may differ. Cuts for separation of the cervical and thoracic vertebrae in the early layers and late pits may have served to produce smaller meat parts in these contexts. This may be reflected by the evidence for cuts to remove ribs from vertebrae and metapodials from phalanges in the late phase pits.

These potential patterns are tentative due to the often small numbers of examples. It is only by considering more species that true distinctions may be identified.

3.2.7 Biasing factors: Age of pigs that had been butchered

Animal size was investigated to see if it affected the butchery patterns. Smaller carcasses require less butchery to produce standard sizes of meat parts, whereas larger carcasses require more butchery. Also younger bones are more fragile so may be under-represented, although such bias is unlikely to affect this analysis, since bone preservation was very good at Danebury.

The average sizes of mature pigs at Danebury ranged between 64.4-73.8 cm in height (using Matolcsi 1970), a difference of 9.4cm. However, the main determinant of size is the age of the animal. Immature animals will have been significantly smaller than the average mature pig (68.9cm), and the presence of younger animals can be identified from the fusion status of certain bones. The hind limb was chosen for investigation, since the pelvis, femur and tibia fuse at different ages, allowing identification of butchered bones from animals under 12 months (the age at fusion of the pelvis), over 24 months (the age at fusion of the distal tibia) and over 42 months (the age at fusion of the proximal and distal femur).

Chop marks were investigated first to see if portioning activity was more common on bones of mature individuals, but the small numbers of bone which could both be aged *and* bore butchery marks hindered this investigation. Of the bones bearing chop marks indicating cutting through joints, only the pelves could be aged. Filleting marks were also considered, as they might be expected on bones from larger animals, as these carry more meat.

Phase	Chopped pelves		Filleted pelves		% of pelves in this context which were fused	Total number of pelves in this context
	Total number	Fusion status	Total number	Fusion status		
Early	1	Fused	1	Fused	58	52
Middle	1	Unfused	1	Fused	54	35
Late	1	Fused	4	Fused	64	187

Table 3.6: Fusion status of butchered pig pelves (pits and layers).

Unfortunately, chop marks were found on only two fused and one unfused pelvis (table 3.6), Filleting marks were found only on fused pelves throughout the phases, although there were only six examples. The relatively high proportion of chopped and filleted pelves in comparison to the unfused pelves suggests that there was a greater concentration of butchery on the bones of the larger animals. However, as the pelvis is a bone that fuses relatively early (12 months for modern animals, Silver 1969), the findings have limited significance.

In the early and middle phases, there were no butchered distal tibiae with fusion data. In the late phase two butchered distal tibiae were fused; one had been chopped and the other had knife cuts indication disarticulation. Both were from pits, where in the late phase only 28% of tibiae were fused. The distal tibia fuses at 24 months in modern animals (Silver 1969). It can be suggested that butchered examples were more likely to be fused and therefore larger, supporting the hypothesis that larger (older) animals are more likely to be butchered than smaller (younger) ones.

There were only four butchered femora recovered from the early and middle phases. Where butchery evidence could be related to fusion, these were all unfused bones. However, both proximal and distal epiphyses fuse late in modern pigs (42 months, Silver 1969), and the vast majority of pigs from all phases had been slaughtered before reaching this age.

In the late phase, six out of seven butchered femora were from animals whose fusion of this bone was not yet completed. All but one butchery cut was related to disarticulation, a process that is likely to have been carried out on all but the smallest of animals.

The number of bones which were butchered and could be aged was very small, and this makes the results of this analysis very tentative. However, overall it appears that older and therefore larger animals were subject to more butchery. Thus the age profiles of animals in different contexts could affect the interpretation of butchery and therefore of spatial patterning of the parts produced from butchery.

3.2.8 Biasing factors: Ages of pigs in pits and layers

The age at death profiles of pigs from layers and pits were investigated in order to see if any difference between these features might have impacted on the incidence of butchery marks or spatial patterns: a carcass cut into more parts might be distributed more widely. Epiphyseal fusion analysis was chosen to investigate the relative ages, and to compare the age at death profiles from the pits and layers.

PITS		Early			Middle			Late		
Age at fusion*	Bone	F	UF	%F	F	UF	%F	F	UF	%F
1 yr	Scapula D	16	14	**53**	17	20	**46**	46	36	**56**
	Humerus D	10	22	**31**	9	28	**24**	64	51	**56**
	Radius P	17	19	**47**	16	26	**39**	46	38	**55**
	2nd phalange	19	24	**44**	33	42	**44**	55	34	**62**
	All	**62**	**79**	**44**	**75**	**116**	**39**	**211**	**159**	**57**
2 - 2 ¼ yrs	Metacarpal D	5	19	**21**	0	57	**0**	4	67	**6**
	Metatarsal D	3	28	**10**	4	46	**8**	8	46	**15**
	Metapodial D	6	38	**14**	1	28	**36**	6	52	**10**
	1st phalange	31	46	**40**	20	106	**16**	45	92	**33**
	Tibia D	8	38	**17**	7	39	**15**	30	71	**30**
	Calcaneum P	5	25	**17**	4	28	**13**	7	50	**12**
	All	**58**	**194**	**23**	**36**	**304**	**11**	**100**	**378**	**12**
3 ½ yrs	Humerus P	0	27	**0**	2	27	**7**	2	41	**5**
	Radius D	2	26	**7**	1	38	**3**	3	53	**6**
	Ulna P	0	21	**0**	0	30	**0**	1	52	**2**
	Femur P	1	33	**3**	0	45	**0**	1	45	**2**
	Femur D	4	32	**11**	2	56	**3**	2	65	**3**
	Tibia P	3	31	**10**	1	36	**3**	1	43	**2**
	All	**10**	**170**	**6**	**6**	**232**	**3**	**10**	**299**	**3**

Table 3.7: Age at death of pigs from pit deposits at Danebury. * Silver 1969.

There seems to be a consistency through the phases in the kill patterns of pig from pits. Approximately 40-55% of animals survived their first year (table 3.7), with the number of animals reaching the age of two years dropping to 11-23%, and only a very small proportion reaching the age of three and a half years. The majority of animals died early, before their second year.

In the layer deposits, the pattern is slightly different, with most animals (c.75-80%) surviving their first year, approximately a third reaching their second year, and between 10 and 25%

reaching the age of three and a half years (table 3.8). This suggests that pig bones disposed of in layers were from animals on average older and therefore larger than those deposited in pits.

In both pits and layers the average age at death after the first year appears slightly lower in the later periods. To form similar sized meat units, more butchery would therefore have been required in the earlier phases. As can be seen in part 3.2.8 this is not the case, and in fact animals are less butchered in the early phases in pits. This suggests that the size of the animal was not the only determinant of the extent of butchery that it received; in the earlier phases larger pieces of meat may have been required.

LAYERS		Early			Middle			Late		
Age at fusion*	Bone	F	UF	%F	F	UF	%F	F	UF	%F
1 yr	Scapula D	3	0	**100**	21	2	**91**	52	10	**84**
	Humerus D	3	1	**75**	13	8	**62**	46	18	**85**
	Radius P	3	2	**60**	15	3	**83**	42	9	**82**
	2nd phalange	4	1	**80**	9	1	**90**	22	8	**73**
	All	**13**	**4**	**76**	**58**	**14**	**81**	**162**	**45**	**78**
2 - 2 ¼ yrs	Metacarpal D	0	2	**0**	1	14	**7**	3	20	**13**
	Metatarsal D	1	1	**50**	3	5	**38**	2	16	**11**
	Metapodial D	1	1	**50**	1	5	**17**	2	21	**9**
	1st phalange	3	3	**50**	8	8	**50**	29	33	**47**
	Tibia D	2	2	**50**	8	4	**67**	23	33	**41**
	Calcaneum P	1	3	**25**	2	4	**33**	1	30	**3**
	All	**8**	**12**	**40**	**23**	**40**	**37**	**57**	**133**	**30**
3 ½ yrs	Humerus P	0	1	**0**	2	8	**20**	1	15	**7**
	Radius D				0	8	**0**	1	16	**6**
	Ulna P	0	1	**0**	0	5	**0**	3	13	**23**
	Femur P	2	4	**33**	1	4	**20**	4	22	**15**
	Femur D	2	2	**50**	2	10	**17**	4	30	**12**
	Tibia P	0	3	**0**	0	8	**0**	4	16	**20**
	All	**4**	**11**	**27**	**5**	**43**	**10**	**17**	**112**	**13**

Table 3.8: Age at death of pigs from layer deposits at Danebury. * Silver 1969.

3.2.9 Contemporary butchery of pigs

The purpose of investigating contemporary butchery was threefold. Firstly it was hoped to enable the author to check the interpretations made from the Danebury material. For instance, cuts to the distal lateral femur had been interpreted as arising from disarticulation, so when the femur was being disarticulated from the tibia in modern butchery, the position of the knife and any cuts or places where cuts would be likely to fall could be noted and compared to the cuts from the Iron Age material. Secondly, it was anticipated that watching the butchery of three species of animal would enhance understanding of the process of butchery, including differences due to conformation and size of the animal. Thirdly, I needed to develop my comprehension of ligament and muscle conformation in order to build upon the knowledge gained from anatomical texts, to facilitate further interpretations of butchery for other species.

The author visited M. Woods organic butchers in Leicester to witness the butchery of a half cow, half pig and a whole lamb. All of these animals were young when slaughtered, the heifer 29 months, the lamb 9 months and the pig 4 months of age. These may have been significantly larger than Iron Age examples, although Mr Woods noted the cow was small for its age. He uses traditional methods for division and secondary processing (e.g. sausage making), and knows the age and provenance of each animal carcass. The marks produced from different processes were recorded, as were the places where disarticulation occurred.

3.2.9.1 Primary butchery

This followed a similar pattern to the Iron Age examples from Danebury. In modern butchery the trotters are removed at the proximal metapodial. However, cuts on the first phalange at Danebury suggest that, here, the metapodials remained on the lower limb, or a separate cut was produced that consisted only of the metapodials and their associated meat. Mr Wood recalled people buying this cut in the past for food, and noted that although there was little meat on them, even the ligaments broke down into soft edible parts when sufficiently cooked. Mr Wood removed the head exposing the occipital condyles and the atlas, though no marks were produced in this process. The periosteum protects the bone to a certain degree, and it would be possible to carefully butcher and fillet a whole animal leaving no trace on the skeleton (Guilday *et al* 1962).

3.2.9.2 Secondary butchery

The secondary division of the carcass produced butchery marks that were comparable with the Danebury material on certain joints. For example many marks across the distal articulation of the femur were made during separation from the tibia (marks are also found on the proximal tibia). There were also filleting marks along the femur shaft, and cuts on its proximal end produced during separation from the pelvis. The scapula also shows disarticulation marks around the distal epiphysis, with cuts along the blade created during boning out (an example of this type of cut on a cattle scapula is illustrated in figure 3.14).

Some joints were more difficult to disarticulate than others. Mr Wood stated that pigs' legs altered position during transport. This made it difficult to accurately predict the location of the joint between the distal scapula and the proximal humerus, which is covered by a considerable quantity of meat. He used a cleaver to cut through the flesh and then a knife to disarticulate the bones from each other. He found the joint first time, and attributed this to practice. Potentially though, this separation could result in many marks around this area as the joint was searched for, either due to inexperience or shifting in position of the leg after death. This might explain the proliferation of marks on many of the Iron Age distal humeri. Mr Wood had difficulty locating the joint between the trotters and the metapodials, and cut through the distal metatarsal. However this was due to his lack of recent practice at this cut, since the current method is to remove 'unproductive' parts of the leg at the tarsals and carpals.

3.2.9.2 Tertiary butchery

Tertiary division shows some differences, for example the cuts on the spine and transverse processes of the pig vertebrae from Danebury. These were thought to result from filleting meat either side of the vertebral spine, from the back of the animal. This differs from modern methods, which for sheep involve filleting the meat off the bone from the outside of the ribcage, leaving one cut of meat and the intact ribcage (illustrated in figure 3.15). For pigs, the ribs are sawn through the middle, the flesh filleted from the bottom half (figure 3.16) and each vertebra separated leaving meat on the vertebra and top half of the rib as a 'chop'. Mr Wood kindly offered to attempt to take meat from the back of a pig, leaving its vertebrae and ribs intact. This left more meat on the lower part of the ribs than would normally have resulted, but he said it was relatively simple once he had got used to the shape of the bone. Fine cut marks were made on the medial surface of the ribs during this process.

There was also a distinct difference in the position of cuts on the pelvis and proximal humerus. In the modern examples the cuts are designed to reflect the quality of the meat for roasting. The rump at the back of the pelvis is of higher quality than at the front, and so a saw on the ilium further towards the anterior/dorsal part of the pelvis produces a larger cut of the higher quality meat than disarticulation further back towards the tail. The proximal humeral articulation is sawn through, instead of being disarticulated at the proximal joint, for the same reason. Thus, there is a different system in place for Iron Age divisions, suggesting that the same basis of economic variance has changed, or that it held no meaning in the Iron Age.

Mr Wood offered to remove the eye, a task he had practised in his training in order to improve his knife skills. This produces a very distinctive cut around the orbit which is extremely similar to one from Danebury illustrated in figure 3.8. He suggested that the eye would have been removed not to eat but because it tasted unpleasant when cooked. A substantial quantity of meat was removed from the maxillary and mandibular region (figure 3.17; see Appendix 3 for weights).

3.2.9.4 Comparison with Danebury

The parts that an Iron Age pig may have been divided into before deposition in late phase pit deposits clearly coincide with contemporary examples (see figure 3.18: gross divisions are made by chops and/or saws). Late phased pits were chosen as these have the most evidence of butchery due to greater numbers of examples. The removal of the limbs occurs in the same place, as do the primary butchery marks from trotter and head removal. The chop through a tibia found in a late pit is more similar to the cuts on contemporary lambs limbs where the humerus and tibia are left in the meat and separated from the rest of the limb. This could be because the smaller size of Iron Age pigs makes them of a similar size to modern sheep (figure 2.2), although this modern animal was a lamb, while the particular example given above was from an Iron Age pig of over one year old**.**

In modern practice the rump is of a higher value than the ribs, and so the two parts are carefully separated. The importance of cutting correctly is emphasised by Gerrard (1964), who notes that the loin is 75% of the total value of the animal, and the flank 25%. The profit made by the butcher depends on where the cut between them is made (1964: 255). There is no evidence for this type of practice in the Iron Age, and nor should we expect it to have been a consideration for the butcher(s) at Danebury. Once filleted, the resulting meat may have held different values depending on where it had come from, but there is no evidence for chopping through the pelvis to separate parts.

At Danebury, there are divisions through the vertebrae, although it is not possible to determine exactly where on the spine these fell, and the ribs appear to have been removed at their articulation with the vertebrae. This is a very different method to that of contemporary butchers, who saw through the ribs and fillet the bottom halves to isolate the belly meat, then cut between the vertebrae and adjoining upper parts of the ribs to form chops.

Similar filleting methods are demonstrated by the cuts on the skull and limbs of the modern and Iron Age pigs. The removal of the eye and cheek meat from the mandible and the skull are similar. The pelvis, scapula and humerus from pigs at Danebury appear to have been filleted in the same manner as the contemporary carcass. Numerous marks are found on the scapula and pelvis, which are difficult to remove. There is no evidence for filleting of meat from the lower limbs or femur at Danebury, though this does not mean it did not happen. It is possible that the lowest parts of the limbs were not filleted but cooked with the meat on, as these form relatively small joints that would not be difficult to cook with the bone inside, and the meat on the femur could be preserved as a joint of ham. Again the main difference between modern butchery and that interpreted for Danebury is the torso, where in the Iron Age the vertebrae are filleted, instead of being chopped apart and cooked on the bone as is current practice.

It is possible to cut easily through ligaments between bones, and some cases desirable to do so:

> 'As would be expected in a craft based on primitive custom, there appears to be a broad, general correlation between all these [butchery techniques], based on the skeleton of the animal. No individual, not even an ancient Briton, would go to the trouble of chopping through a bone if it were possible to find a convenient joint which could be severed with far less physical effort' Gerrard 1964: 28.

Although Gerrard clearly believes that this is the case, it is demonstrable that for certain reasons at certain times, this has not been the accepted method. For example in Roman butchery, animals were divided into equally sized parts by chopping through (Stokes 2000; Maltby 1979). He also goes on to say that the pelvis is an exception and can be cut through, which is not strictly true. The disarticulation of animals based on anatomy is practised at Danebury, but whether it is for ease or other reasons it is not yet possible to say.

By using disarticulation to a greater extent than chopping or sawing through in the Iron Age, blunting of tools would be lessened, so that metal implements might last longer. Alternatively, saving time by chopping and sawing rather than disarticulating awkwardly shaped bones, was not so important in the Iron Age as in modern butchery. Maybe cooking small boneless meat parts, which would save on fuel, was more important.

3.2.9.5 Conclusions

The major difference between contemporary and Iron Age butchery is the greater use of disarticulation at Danebury. In many cases, it seems that most bones were disarticulated: ‘a single bone… reflecting only the envelope of meat with which it alone was associated’ (Gilbert & Singer 1982: 26). This could imply a lesser concern with the differing values of meat as determined by texture and cooking techniques, inability to easily chop through bone, or a desire not to. Many of the differences could be explained by technological differences, since steel tools will saw and chop through bones with far less attrition to the blade than those of iron tools. The effect that tool types may have had on the butchery process is explored in the butchery experiment (Appendix 3).

The greater amount of meat left on modern ribs when attempting to replicate Iron Age patterns, suggests that the food value of these bones, for use in soups, etc., was higher in the Iron Age. These may have formed a separate cut, if we assume that meat consumption was low, or if meat consumption was high, may have been discarded, perhaps as a form of conspicuous consumption.