Part II: c.1345 to Modern

NAU Archaeology and Norfolk Historic Environment
Part II: c.1345 to Modern

by Elizabeth Shepherd Popescu

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Cover Illustration
Reconstruction of the Norwich Castle area c.1792, demonstrating the effect of levelling and the creation of new roads across the Cattle Market. Painted by Nick Arber
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Stone spindle whorl
by Julia Huddle
A symmetrical, bi-conical spindle whorl, possibly made
of limestone, was recovered from an external dump in
Area 1 (SF5352, not illustrated). A chalk example came
from the barbican well (Chapter 9.III).

? Leatherworking

Iron awls
by Quita Mould, with Jacqui Watson and Sarah Paynter
(Fig. 8.59)
Considerable evidence for leatherworking in this period
came from fills of the barbican well (Chapter 9.III).
Elsewhere on the site, two pointed tools, each originally
with an organic handle, were found and may have been
designed to make holes (SF5250 and 5711) or to act as
a small punch. They may have functioned in leather-
marking, woodworking or with soft metal. The use of a
horn handle on SF5250 may indicate use as a hand-held
tool rather than one to which force was applied with a
hammer or mallet.

SF5250 Awl with pronounced shoulder tapering to a blunt tip,
tang tapers to a small flat head at the other end. Minutely
preserved horn present on the tang from the original handle.
L 88mm max w 12mm
10199, fill of cess pit 10294, Period 5.2, G1/153
SF5711 Awl with slender round sectioned stem and simple open
socket. L 41mm diam 5mm
11237, fill of pit 11309, Period 5.1, G1/22

Antlerworking
by Julia Huddle
A total of four pieces of sawn antler waste (all of red
deer antler) were recovered from contexts dated to this
period, excluding those from the fills of and surrounding
the barbican well (see Chapters 9.III and 10.II).

Hornworking
by Umberto Albarella, Mark Beech, Jacqui Mulville and
Julia Huddle
(Fig. 8.58, Plate 8.11)
The Castle Mall site provides important evidence for the
late medieval hornworking industry. A total assemblage
of 135 horncores (NISP) came from deposits assigned to
Period 5, the majority of which came from fills of the
barbican well (see below). Only three examples came
from Period 5.1, the related activity apparently being
concentrated during the second half of the 15th century.

Of particular interest amongst the faunal assemblage is
the contents of two adjacent pits (pits 11048 and 11064,
Period 5.2, G1/24, ?Property 49) which contained a
total of 46 sheep/goat horncores. Pit 11048 (fill 11030)
contained a collection of 21 horncores, 109 metapodia
and 60 phalanges (all belonging to sheep) (Plate 8.11).
The pit fill dates to the mid 15th century. All horncores
had been chopped off the skull, 22% of the metapodia
bore cut marks, presumably from skinning, whereas no
butchery marks could be found on any phalanges. Cut
marks on both metacarpi and metatarsi were all located
very close to the proximal end. This deposit can be
interpreted as the result of a primary butchery activity,
that is when body parts which carry little or no meat are
discarded. However, due to the total absence of any other
sheep anatomical elements, the contemporary presence
of foot bones and horncores and the historically well
attested importance of leatherworking in the town, the
current authors are more inclined to think that it repre-
sents tanning or tawing waste. Indeed it is known that
in the past foot bones and horncores were left on the
skin when this was brought to the tanner or the tawyer
(Sergeantson 1989). The lower number of horncores
compared to metapodia can be explained either by the
fact that some skins were brought to the tannery with feet
but no horncores, or that some skins derived from polled
sheep. A better preservation of metapodia would also
account for this discrepancy.

Deposits with a high concentration of foot bones or
horncores have been found in several other sites, and
have generally also been interpreted as tanning waste.
For instance, sheep metapodia and phalanges inter-
preted as refuse of leatherworking have been found at
Walmsgate, York (O'Connor 1984), Hungate, Lincoln
(Dobney et al. 1996) and St Peters Street, Northampton
(Harman 1979). The last case had originally been inter-
preted as slaughtering waste, but Sergeantson (1989)
suggests that it could be another case of tanning or tawing
refuse. Association between horncore deposits and

<table>
<thead>
<tr>
<th>Species</th>
<th>Rest of Site</th>
<th>Well Fills</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep/goat</td>
<td>50</td>
<td>70</td>
<td>108</td>
</tr>
<tr>
<td>cattle</td>
<td>1</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>96</td>
<td>135</td>
</tr>
</tbody>
</table>

Table 8.21 Horncores from Period 5 deposits

Plate 8.11 Sheep horncores, metapodia and phalanges
from possible tanning pit 11048, Open Area 38,
Property 49 (Area 1, Period 5.2)
leatherworking activities have also been suggested by Prummel (1978; quoted by Serjeantson 1989) for the site of Hertogenbosch, Netherlands. Castle Mall provides the only case known to the authors of the close association of foot bones and horncores. This is interesting because it represents the first archaeological confirmation of the historically known phenomenon of leaving the cranial and foot bones attached to the skin, and also because it suggests that different practices may have been carried out in different towns.

Similar evidence came from the barbican well (Moreno Garcia, Chapter 9.IV and Part III) and horn was clearly being removed for use as a raw material on the site. Although horn generally has a poor capacity to survive prolonged burial (MacGregor 1985, 95) SEM analysis by Watson and Pynter of two late medieval implements from the site has indicated the use of horn for handles (tool SF5250 below and see SF7139, Chapter 9.III).

**Bone-working**
by Julia Huddle
(Fig 8.58)
A sawn section of cattle-sized long-bone (SF5833) has further been sawn lengthways and may have been prepared for the manufacture of combs or handles. The shape of cattle long-bones is ideally suited for producing long thin strips of relatively thick bone, the grain being straight and even. Similar examples were recovered from post-medieval deposits and are discussed in Chapter 10.III.

**Whetstones**
by J.M. Mills and David Moore
Four whetstones (not illustrated) were recovered from late medieval/transitional deposits, with a further 20 coming from fills of the barbican well, a number of which are illustrated (Chapter 9.III). Of the group of four, one of purple phyllite appears to be residual (SF238, Chapter 4.III). Two of the others are of Norwegian ragstone (SF5324, context 10822, fill of pit 10880, Period 5.1, G1/101 and SF6392, from 90424, fill c: pit 90493, Period 5.2, G9/104) and the third of Coal Measures Sandstone (SF6430, fill of ditch 31295, Period 5.1, G9/37). One example (SF6430) may have been a utilised pebble. Norwegian Ragstone was imported, possibly as hewn stone rather than as finished bones (Ellis and Moore 1990, 280) from Eidsborg in the Telemark region of Norway. The sandstone bone is likely to derive from the Coal Measures of the Midlands of southern Yorkshire, these being the closest known sources to Norwich. Further details of whetstones in general are given in Chapter 13.

**Querns**
by David Buckley
Three querns were recovered from late medieval/transitional deposits other than fills of the well, which contained a further three examples (see Chapter 9.III).

**Commercial Activity**

**Coins**

**by John Davies**
A total of twelve coins came from Period 5 at the Castle Mall site, with an additional four of the period found unstratified. The group includes eight which were retrieved from fills of the barbican well and are detailed in Chapter 9.III.

The earliest are an Edward I–III silver groat (1272–1377) and English Long Cross silver penny (1272–1483). The 15th century is represented by a penny of Henry V (1413–2), a halfpenny of Henry VI (1422–7), a groat of Edward IV (1480–3) and a standard type 'G' penny of Henry VIII (1485–1503). There are two Tudor silver coins. One is a groat of Mary (1553–4) and the other is an incomplete halfgroat, possibly of Henry VII (1485–1503).

The three coins recovered from Period 5.2 deposits at the Golden Ball Street site comprised a residual late 12th to 13th-century cut farthing (SF102; see Chapter 7.III) and two illegible pennies of 14th–15th century date (uncatalogued), one copper alloy (SF174, pitt 170, GBS Group 13) and the other silver (SF173, fill of south bailey ditch, Group 54).

**SF1067** Henry VI silver halfpenny, annulet issue
AD 1422-27
Obv: HEN-----
Wt 0.42g
10195, fill of pit 10196, Period 5.1, G1/77

**SF5035** Edward IV silver groat, second reign
AD 1489–3
mintmark: heraldic enquefoil
(London mint)
Wt 2.93g
10600b, unstratified

**SF5082** Edward I–III silver penny
AD 1272–1377
three illegible fragments
Wt 0.32g
10137, external dump, Period 5.1, G1/70

**SF5174** Henry VII standard type 'G' copper alloy penny
AD 1485–1500
Obv: illegible
Rev: illegible. 'H' in centre
North 1721.
Wt 0.81g
10602, external dump, Period 6.1, G1/109

**SF5777** Tudor, possibly Henry VII fragment of halfgroat
AD 1485–1503
Wt 0.23g
40000, unstratified

**SF6042** Henry V silver penny
AD 1413–22
Obv: illegible
Rev: CIVITAS LONDON (London mint)
Class C. North 1396
Wt 0.79g
90000, unstratified

**SF6751** Mary groat
AD 1553–4
Obv: [MARIA D]I[G] {ANGI FRAZ} [HIB REGI]
Rev: [VEN]RITAS TEMPORIS FILIA]
Wt 1.41g
48000, unstratified

**SF7601** English Long Cross silver penny
AD 1272–1483
Border clipped away, with no legends remaining. Pierced through centre.
Wt 0.39g
91846, fill of pit 91847, Period 5.2, Group 9/112

633
Iron plate armour
by Quita Mould
(Fig. 6.60)
Many fragments (minimum 51) of sheet with round-headed rivets or rivet holes were recovered, a small quantity (18 minimum) may be fragments of plate armour; many of these come from the barbican well (Chapter 9.111) or pit fills of similar date (e.g. SF5184). In addition, two small plates from a jack of plate, a padded protective jacket worn by the common soldiery during the 16th century were found (see discussion of pieces from Beeston Castle, Eaves in Ellis 1993, 161–164). The skirts and collars of some jacks of plate were filled with chain armour rather than plates. The occurrence of fragments of chain armour in the backfill of the well is discussed in Chapter 9.111.

SF5184 Rectangular plate with slightly curved profile and three round-headed rivets remaining. L. 77mm w. 33mm. 16524, fill of pit 10899, Period 3-1, GI, 97
SF6057.1 Two jack plates with cropped corners and central hole. L. 30mm w. 23mm. 90977, fill of pit 90702, Period 5.2, G9, 82

IV. ZOOLOGICAL AND BOTANICAL EVIDENCE

Mammal and Bird Bone
by Umberto Albarella, Mark Beech and Jacqui Mulville
(Plate 8.111)

Assemblage Summary
A total assemblage of 1,165 mammal, bird and amphibian bones and teeth (NISP) was hand collected from late medieval/transitional deposits at the Castle Mall site, with an additional 171.5 bones from Site Riddled Samples (SRS) and 16 from Bulk Samples (BS). The large assemblage from the barbican well shift, detailed separately, amounts to 14,607 mammal bones/bone fragments and 3,888 bird bone fragments (see Moreno Garcia, Chapter 9.111 and Part III). The range of taxa recorded from non-well shaft deposits at Castle Mall is indicated in Table 8.22. A further 258 bones and teeth (NISP) were identified at the Golden Ball Street site (see Curi, Part III). Full details of the complete mammal and avian bone assemblages from both sites are given in Part III.

Refuse Disposal
Most of the refuse attributable to this period came from pit fills, although ditch fills of 16th-century date were evident at the Golden Ball Street site. The few partial animal skeletons recovered are indicated in Table 8.23, although this does not include half a pig carcass which was located in Area 9. In addition, 15 partial dog skeletons and 16 partial cat skeletons were recovered from the barbican well. At least some of these animals appear to have been deposited into the well while still alive (see Chapter 9.111).

Craft Waste
The most significant craft waste of the period came from fills of the barbican well and is detailed in Chapter 9.11.

Elsewhere on the site, a pit fill containing a significant group of sheep hornscores, metapodia and phalanges (pit 11049, Plate 8.11) at 'Property 49 provides evidence for the deposition of tanning/waxing waste and is summarised in Chapter 8.111, with further details given in Part III. This group of 21 hornscores is remarkable for their general small, female-like, size (although they may represent early castrated wethers).

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Hand collected</th>
<th>SRS</th>
<th>BS</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle (Bos taurus)</td>
<td>312.5</td>
<td>41</td>
<td>11.5</td>
<td>365</td>
</tr>
<tr>
<td>Sheep/goat (Ovis/Capra)</td>
<td>477**</td>
<td>41.5</td>
<td>43</td>
<td>561.5</td>
</tr>
<tr>
<td>sheep (Ovis aries)</td>
<td>(193)</td>
<td>(4)</td>
<td>(5)</td>
<td>(202)</td>
</tr>
<tr>
<td>goat (Capra hircus)</td>
<td>(1)</td>
<td>-</td>
<td>-</td>
<td>(1)</td>
</tr>
<tr>
<td>Pig (Sus domestics)</td>
<td>121.5*</td>
<td>18</td>
<td>15</td>
<td>154</td>
</tr>
<tr>
<td>Equid (Equus sp.)</td>
<td>1.5</td>
<td>-</td>
<td>-</td>
<td>1.5</td>
</tr>
<tr>
<td>Dog (Canis familiaris)</td>
<td>10*</td>
<td>4</td>
<td>-</td>
<td>14</td>
</tr>
<tr>
<td>Cat (Felis catus)</td>
<td>35*</td>
<td>0.5</td>
<td>10.5*</td>
<td>46</td>
</tr>
<tr>
<td>Red deer (Cervus elaphus)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fallow deer (Dama dama)</td>
<td>-</td>
<td>4.5</td>
<td>-</td>
<td>4.5</td>
</tr>
<tr>
<td>Hare (Lepus sp.)</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Rabbit (Oryctolagus cuniculus)</td>
<td>22.5</td>
<td>7</td>
<td>12</td>
<td>41.5</td>
</tr>
<tr>
<td>Rat (Rattus sp.)</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>House/wood mouse (Apodemus/Mus)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Domestic fowl (Gallus gallus)</td>
<td>119*</td>
<td>38</td>
<td>19</td>
<td>176</td>
</tr>
<tr>
<td>Goose (Anser anser)</td>
<td>48*</td>
<td>11</td>
<td>-</td>
<td>59</td>
</tr>
<tr>
<td>Duck (Anas sp.)</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Turkey (Meleagris gallopavo)</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Little Grebe (Tachybaptus ruficollis)</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Swan (Cygnus sp.)</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Pochard/Tufted duck (Aythya ferina/nealgula)</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Coot (Fulica atra)</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Grey partridge (Perdix perdix)</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Crane? (*Grus gena)</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Rock/Crow (Corvus frugilegus/corone)</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Pigeon (Columba sp.)</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Bird</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Amphilien</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>1,165</td>
<td>171.5</td>
<td>116</td>
<td>1,452</td>
</tr>
</tbody>
</table>

Sheep/Goat also includes the specimens identified to species. Case where only 'non-countable' bones were present are denoted by a "*". Pig metapodia and mammalian distal metapodia have been, divided by two, while carnivorae and lagomorph metapodia have been divided by four. Due to the difficulty in distinguishing between upper and lower mesium in equids and upper and lower canines in carnivors, all have been recorded and then divided by two. All totals which include material from partial skeletons are denoted by **: This material is described in further detail in Table 8.23. The figure denoted *** includes a 'special' group of 169 sheep metapodia and phalanges.

Table 8.22 Numbers of mammal, bird and amphibian bones and teeth in Period 5 at Castle Mall by collection category (NISP), excluding the assemblage from the barbican well.

636
### Comparison with the Barbican Well Assemblage

Animal bones recovered from the upper fills of the well within the castle barbican date to the mid 15th to early 16th century and are therefore contemporary with the assemblage from Period 5.2 across the remainder of the site. The well assemblage was analysed by Marta Moreno Garcia and is described and discussed in Chapter 9.1V and Part III. The results of analysis have been compared with those from the remaining assemblage.

The total weight of bird bones in the barbican well is substantially higher (4.3%; sieved and hand-collected) than the Period 5 assemblage (1.3%; hand collected; Part III, Fig.10). However, when the NISP count is considered the difference is not that evident. Bird bones represent 21% of the total number of mammal and bird fragments from the barbican well (this count includes both material hand-collected and from sieving) and are between 15% and 30% (depending on which type of recovery is considered: Part III, Fig.14) from the rest of the site in Period 5. The relatively higher weight of bird bones from the barbican well is partly the result of the inclusion of material from sieving (where a larger number of bones are expected) and partly due to the higher number of bones from the larger goose. The abundance of goose bones in the well deposit can be attributed to the high numbers of carpometacarpi, which are probably the by-product of some industrial activity (see Moreno Garcia).

The MN1 percentage of the main domestic mammals from the barbican well has been compared to the rest of the site for Period 5. A larger number of pigs (30% versus 16%) and a smaller number of cattle (20% versus 39%) were found in the well. However, the counts were very similar when the frequency of taxa calculated through a 'diagnostic zone' system (hand-collected + sieved material) adopted by Moreno Garcia was compared to our NISP (which is also a 'diagnostic zone' system). In general more similarities than differences emerge from the comparison between the well assemblage and that from the rest of the site. The minor differences can be attributed to factors such as differences in preservation, recovery or quantification methods which are of minor archaeological interest.

Wild species are poorly represented both in the barbican well and in the rest of the Castle Mall assemblage. A number of hare and rabbit bones were, however, recorded from the well. It is interesting to note that for the rest of the site, the largest number of lagomorph bones were also found in Period 5 (see Part III, Tables 3–6).

### General Comments

It is notable that nine out of the sheep horacros from the group associated with burning waste have clear thumb prints. This condition is commonly found in archaeological sites and has been associated with environmental stresses such as malnutrition or breeding in elderly animals, which may cause calcium resorption (Hatting 1983, Albarella 1995). Its occurrence in about 25% of the horacros from Period 5 suggests that the condition of these sheep may have been poor. Their rather small size may also be associated with a low plane of nutrition (see Davis 1996). A similar occurrence of depressions (23%) was found by Moreno Garcia (Part III) in her study of the mid/late 15th to early 16th century fills of the barbican well and by Curi in her analysis of the material from Golden Ball Street (Part III).

Variations in animal size and age at death are apparent in a range of species during this period and are fully detailed in Part III. Evidence from Period 5 deposits at both Castle Mall and Golden Ball Street indicates that the shift towards culling of juvenile cattle may have occurred earlier in Norwich than in other parts of the country.

### Fish Bone

by Alison Locker

In this period of some two centuries there was a large assemblage of fish bones of which 61% came from a single context, the barbican well. The fills of this large feature, most of which are dated to Period 5.2 are discussed separately in Chapter 9.1V. The summary shown below (Table 8.24) excludes the fish from the barbican well and is collated from a variety of features including pits and linear features some of which are discussed in the full report (Part III).

The bulk sieved material is 77.6% of the assemblage, with site riddled at 12.6% and hand collected at 9.6%. This contrasts with the comparatively low proportion of fish from bulk sieving in the well despite the greater weight of whole earth samples sieved in the latter feature. These differences may reflect a greater density of fish in the non well samples and also a greater variety with 37 taxa from an assemblage of 1,811 identified bones compared with 28 in the larger sample by both weight and bone number from the well.

Using the bulk sieved sample minus the elasmo-branch herring are 35.3% by bones number and eel are 9.1%. Cod and large gadid together are 8.4%, whiting 6.5% and haddock 2% so the combined gadids, all important food fishes total around 17%. Sprat, a smaller

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### Table 8.23 Summary of partial animal skeletons found within Period 5 features (excluding barbican well)

<table>
<thead>
<tr>
<th>Period</th>
<th>Area/Group</th>
<th>Context</th>
<th>Related feature</th>
<th>Collection method</th>
<th>Species</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>1.97</td>
<td>10976</td>
<td>pit 10899</td>
<td>hand</td>
<td>cat</td>
<td>20 bones</td>
</tr>
<tr>
<td>5.1</td>
<td>1.97</td>
<td>19976</td>
<td>pit 10899</td>
<td>BS sieve</td>
<td>cat</td>
<td>4.5 bones</td>
</tr>
<tr>
<td>5.1</td>
<td>9/66</td>
<td>90765</td>
<td>pit 90766</td>
<td>hand</td>
<td>dem. fowl</td>
<td>16 bones</td>
</tr>
<tr>
<td>5.2</td>
<td>2.73</td>
<td>90171</td>
<td>pit 90261</td>
<td>hand</td>
<td>pig</td>
<td>6 bones</td>
</tr>
<tr>
<td>5.2</td>
<td>2.94</td>
<td>92716</td>
<td>pit 92715</td>
<td>hand</td>
<td>dog</td>
<td>5 bones</td>
</tr>
</tbody>
</table>
Figure 10.64 Antlerworking waste (SF143, 1035 x 2 & 6258); antler hammer (SF7397); faceted bone (SF7612). Scale 1:1
served as shroud pins (see ‘Dress Pins’ above).

Two pins with coiled wire heads were found in pits at the Golden Ball Street site. Both were relatively long at 34mm and 37mm in length (not illustrated).

SF5624 Small dress-making pin with spherical head. L: 23mm. 12351, fill of pit 12350, Period 6.2, T47/2
SF5993 Small dress-making pin with solid flattened head and whitemetal coating. L: 27.5mm. 98251, fill of posthole 980296, Period 7.2. C6976

Copper alloy thimbles
by Alison Goodall
(Fig. 10.65)

Three thimbles came from post-medieval deposits, with another two of similar date found unstratified. The two illustrated examples (SF5654 and SF5752) may date to the late 16th to 17th century. The others are earlier types and one is detailed in Chapter 8.111. The two illustrated examples are both hand-made, machine-made types being introduced in the 17th century (Margeson 1993, 187).

SF5654 Tall thimble of thin sheet with straight sides and rim. The rim is decorated with a band of stamped cross-in-circles between billeted and grooved borders. The sides and top are covered with a spiral of small circular hand-made indentations.
10006b, unstratified

SF5752 Thimble with straight sides, double-stepped rim, and spiral of sub-rectangular hand-made indentations covering sides and top. The indentations on the top for alternate wheels of closely-spaced and more widely-spaced marks. A maker’s mark is placed at the beginning of the spiral.
80000, unstratified

Leatherworking
by Quida Mould

The shoe parts recovered from fills of the barbican ditch (G9/41); see further details above) were heavily worn and several repairs were made secured by wooden pegs. Occasional repair clumps made from reused shoe sole were found (e.g. SF6184.2, not illustrated). Some 15% of the bottom unit components and 4% of the surviving uppers had been deliberately cut up before being discarded which, together with the lack of complete shoes recovered, suggests that the shoe parts were debris from a cobbler’s workshop. A relatively modest quantity of waste leather was recovered from the same deposits, chiefly secondary waste (64 fragments) with a small number of primary waste pieces from the cutting away of hide edges (3 pieces). This leather waste may also be cobbling debris, the trimmings etc. coming from the cutting of clump repair pieces to shape, and is likely to be associated with the shoe parts recovered. An iron awl (SF5638.1, not illustrated) which may have been associated with leatherworking was recovered from a 17th-century context. Further comments on leatherworking are given in Chapter 13 and Part III.

Antlerworking
by Julia Huddle, with Umberto Albarella, Mark Beech and Jacqui Mulville
(Fig. 10.64)

Antler was regarded as a good working material and many pieces recovered from the Castle Mall site are chopped or sawn (Plate 10.15). It was probably imported to the site as part of a general antler trade. A total of 24 pieces of antlerworking waste were recovered from post-medieval deposits, along with four strip fragments and two, probably residual, wedges (see Chapter 4.111). The majority of
the primary waste, in the form of sawn tine (e.g. SF1035), was concentrated around the top of the barbican well (18 pieces; Period 6.1, G/5/2) and was recovered alongside late 16th- to early 17th-century pottery. A strip fragment came from the same deposits along with a possible unfinished knife scale (SF5683), antler knife scale (SF5649), antler-handled knife scraper (SF5656), whittle tang handle (SF5660) and an unidentified antler tool (SF7223). These items are detailed elsewhere in this chapter and the concentration of both primary and secondary waste in the same context as completed objects may indicate the manufacture of antler knife handles in the vicinity. Most identifiable pieces of were from red deer, although fallow deer was also represented.

Another concentration of both waste material and completed objects, at least some being residual, came from post-medieval fills of the barbican ditch in Area 9 (G/9/41) which also contained evidence for ivoryworking (see Riddler below). The group included sawn antler (x 3), a strip, two wedges of Late Saxon type (see Chapter 4.II), two combs and a sawn and further worked section of antler (SF7397) which may have been used as a hammer. Unlike the example from Castle Mall, previous hammers found on British excavations have a transverse perforation running through the severed brow tine into which a narrow handle would have been inserted whilst the head of the hammers were formed at the face of the sawn-off burr (MacGregor 1985, 172, fig. 90, no 4). Apart from one from a 13th- or 14th-century context, previous examples are mostly from undated contexts.

Further comments on antlerworking on the site at all periods are given in Chapter 13 and Part III.

SF143 Sawn antler tine end, with cut-out 'notch' at wider end, possible wedge. 92741, fill of barbican ditch 91295, Period 6.2, G/9/41
SF1035 Sawn antler. Sawn sections of antler tine x 4 pieces, with the cancellous issue on two sides removed on each piece. Red deer antler. 50077, makeup dump, Period 6.1, G/5/2
SF6258 Trapezoidal strip with small projection at base, tooth plate trimming. 91408, makeup dump, Period 6.2, G/9/43
SF7397 Artefact. Hammer. Sawn section of antler beam and tine with the tip of the tine removed and the end filed down to form a smooth rounded end: incomplete section of beam is hollowed out (for insertion of a wooden shaft). Red deer antler. 92762, fill of barbican ditch, Period 6.2, G/9/41

Hornworking
by Umberto Albarella, Mark Beech and Jacqui Mulville, with Julia Huddles (Plates 10.17-16.18)
Although there was limited evidence from the site to suggest the use of cattle hooves as a raw material (see Part III), the keratinous material that its post-medieval inhabitants mainly utilised was horn. The assemblage of 185 cattle horncores, 69 of which bear chop or cut marks, found at Castle Mall is distributed throughout all periods although major concentrations were found in Periods 2 (see Chapter 5.III) and 6, sheep/goat horncores having dominated the Period 5 assemblage (Chapters 8.III and

Plate 10.15 Red/fallow deer antler, sawn tine
Plate 10.16 Cattle horncore, sawn near base
Table 10.42 Horncores from Period 6 deposits

was clearly of a large 'long horn type, although metrical data indicates the presence of many others (see Chapter 10.14). Further comments on hornworking in general are given in Chapter 13.

Bownworking
by Julia Huddl, Umberto Albarella, Mark Beech and Jacqui Mulville
(Fig.10.64; Plates 10.19–10.21)

Sawn cattle bones, mainly metapodia (Plate 10.19), illustrate the use of the robust metapodium shaft to make tools. Evidence of bownworking was less common for sheep than for cattle, although a few cases were noted, including the faceting of sheep metapodia. The presence of a hole in the proximal end of another metatarsus from Period 6 (Plate 10.20) indicates that this bone had been used as a handle.

In addition to the items identified during analysis of the faunal assemblage, ten sawn-off articular ends of long bones were Small Found, of which six are cattle-sized, one is a deer bone, one a horse bone and one sheep/goat. The assemblage came from deposits ranging in date from the 12th to the 18th century, although most are from post-medieval deposits (x 7). Whilst sawn-off articular ends of longbones are evidence of bownworking, found on their own they are not enough to determine precisely what the missing shafts were used for. Although some of the bones found at Castle Moll may have been redeposited, it is perfectly possible that they indicate post-medieval activity (e.g. handle or comb manufacture), comple-

<table>
<thead>
<tr>
<th>Species</th>
<th>G5/52</th>
<th>G9/41</th>
<th>G48/10</th>
<th>G1/116</th>
<th>Total</th>
</tr>
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<tr>
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</tr>
<tr>
<td>Cattle</td>
<td>3</td>
<td>31</td>
<td>2</td>
<td>0</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>35</td>
<td>4</td>
<td>1</td>
<td>43</td>
</tr>
</tbody>
</table>

9.111). Most chop and cut marks are located at the base of the horncore (Plate 10.16) and were presumably made to separate the horncores from the skull and to remove the horn sheath from its bony core. This was generally done after soaking the horncore in water for some weeks (MacGregor 1985), but it could also be done through desiccation (Keith Dobney pers. comm.). Strangely, two of the Period 6 horncores had been sawn rather close to their tips (Plates 10.17 and 10.18), perhaps to help the separation of the horn sheath or because there was some specific interest in the horn tip or, more likely, in producing a flat sheet of horn (thanks are extended to Keith Dobney for this suggestion).

The horncores were notably concentrated in barbican ditch fills (G9/41; Period 6.2), although given the scale of deposition here this is hardly surprising. The presence of other bone-, antler- and ivoryworking waste within the deposits around the well and fills of the barbican ditch may attest to the use of several parts of various animals for the manufacture of a range of objects in the vicinity. One of the cattle horncores from the large quarry (G48/10)

Plate 10.17 Cattle horncore, sawn near tip, from late 17th-century barbican ditch fill 92790 (Period 6.2)

Plate 10.18 Cattle horncore, sawn near tip
mention of other evidence relating to the use of antler and ivory.

A few horse bones from post-medieval deposits at Castle Mall had been worked or sawn. Horse bones are very robust and, like cattle bones, make very good tools. Amongst the worked specimens were two quite remarkable right mandibles found together in one of the barbican ditch contexts (Period 6, SF421). Both mandibles are polished at the bottom as a consequence of severe and continuous wear. Their probable use as a sledge is detailed by Huddle under 'Diversions', this chapter.

Other chopping marks were also probably associated with boneworking. A group of cattle and sheep metapodia from Period 6 had been subject to some faceting, including 16 chopped cattle metapodia which were Small Found (pits G1/24 x 2, barbican ditch fill.

Plate 10.19 Cattle metatarsus, sawn

Plate 10.20 Sheep metatarsus with hole in proximal end

Plate 10.21 Boneworking: cattle and sheep metapodia
G6/33 x 1, pits G8/29 x 13). Although these pieces are recovered from different areas of the site, they all bear remarkably similar chop marks (e.g. SF7612 and Plate 10.21). Similar evidence has been found on another metatarsus and a series of metacarpi from Period 6. All of the pieces are trimmed off at the proximal ends with several (?knife) chops forming blunt points. Several of the pieces have their distal epiphysis unfused and absent and apart from two examples where the distal epiphysis are missing, each piece has some slight lateral trimming to the distal ends.

The function of these objects remains a mystery, although they may result from a preliminary stage in bone tool/arrowhead production which was subsequently abandoned. It is possible that these are blanks or roughouts for items such as handles or skates. No attempt has been made, however, to trim the anterior or posterior epiphysis at the distal ends, which would have been required for skates to form a smooth contact with the ice. This interpretation therefore seems doubtful, particularly as different stages in production are not represented. An alternative suggestion is the production of socketed bone points which are also manufactured from the metapodials of cattle. The 'point' is formed at the distal end of the bone by chopping obliquely across the diaphysis (see MacGregor 1985, 174–5). Although socketed bone points are unidentified in terms of function, MacGregor notes that the tips are often smoothed from use in a manner which would indicate they were used with a thrusting or stabbing motion. No such wear is evident on any of the Castle Mall pieces.

Other bownworking waste includes a sawn section of cattle-sized long-bone (SF308, not illustrated) recovered from barbican ditch fills (an almost identical piece was recovered from Period 5.1; SF5833; Chapter 8.111). Three other bone fragments show evidence of having been cut using a saw, although it is impossible to identify these offcuts as coming from any particular bownworking activity. A sawn sheep pelvis from post-medieval fills at the barbican ditch (G9/41) demonstrates that saws were being used as butchery tools by this period, and not just for bownworking. An incomplete section of worked bone (SF252, not illustrated, from modern deposit) as been lightly incised with lines. This piece may have been used by a bone worker as a practice piece.

SF7612 Faceted bone. Cattle metacarpals x 7 pieces, trimmed of at proximal ends with several chops, forming blunt points, slight lateral and medial trimming at distal ends; distal ephysis unfused and absent. 80180, fill of pit 80188, Period 6.2, G8/29

Ivoryworking
by Ian Riddler
Two sections of ivory waste (0.140kg) came from separate contexts within related dumps into the barbican ditch (G9/41). Each piece has been sawn laterally across the tusk at one end and chopped irregularly at the other by a knife. In each case, only the outer 8–10mm of tissue remains, whilst the inner core is absent. It appears, therefore, that this outer part of the tusk was discarded at an early stage of the working process. This small quantity of waste can be related to a series of post-medieval ivory objects from the site which include implement handles, combs and a single example of a scoop. In addition, a facet of bone can be identified as a ‘trial piece’ for ivory comb manufacture (see ‘Combs’ above).

Horticultural and Agricultural Tools
by Quita Mould
(Fig. 10.66) A small range of agricultural and horticultural tools was recovered, including the remnants of iron shoes from wooden spades (SF1040 and SF5739) and a pruning hook (SF6354). Animal husbandry was represented by

Figure 10.66 Spade shoes (SF1040 & 5739); iron pruning hook (SF6354). Scale 1:2

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and wings are picked out with incised lines and these, along with the beak and ears, are coloured brown. The breast is yellow and the back and whistle apple green. The top of the head is pierced to allow for the whistle outlet. H: c. 50mm. Unspecified fill of barbican ditch 91295

Bone sledge runners

by Julia Huddle, with anatomical description by Umberto Albarella, Mark Beech and Jacqui Muirville (Figs 10.69–10.70, Plates 10.23–10.24)

The runners of a child’s sledge, consisting of a pair of horse jaw-bones, were recovered from the post-medieval fills of the barbican ditch. Such sledge are constructed from the mandibles of horse or cattle, with a plank seat fitted over the teeth. Both of the Castle Mall mandibles are polished at the bottom (Plates 10.23 and 10.24) as a consequence of severe and continuous wear. The sledge comes from a deposit firmly dated to the late 17th century, both by pottery and a coin of William III (1694–1702).

Few parallels are known from archaeological sites. An example from Dordrecht, Holland came from a ?14th- or 15th-century context, while an unpublished example is from a medieval deposit excavated at Ebor Brewery, York (MacGregor 1985, 146). Further evidence comes from ethnographical sources and paintings, particularly during the 16th and 17th centuries (Fig.10.70A and B). The earliest illustration known is in the margins of an early 14th-century Flemish manuscript, held in the Bodleian library, Oxford (MS Douce 5, f. 1a; reproduced by Ijzereef 1974). Other jaw-bone sledges are depicted in paintings by Pieter Bruegel the Elder, including one in the painting of St George Gate at Antwerp (dated to 1555) and another in the Adoration of the Magi in 1557 (also reproduced in Ijzereef 1974). These depictions all show a young child sitting between two jaw-bones, each facing the front of the jaw. Later paintings (17th century) by other Dutch artists such as E. Van de Velde and A. Van der Neer, report the same subject. One illustration by Hendrik Avercamp of c.1620, shows a child facing the opposite way so that it is facing the back of the jaw (reproduced by Ijzereef). In each case the child is shown holding two poles used to propel themselves along the ice.

Although none of the paintings mentioned above show more than two jaw-bone runners, Ijzereef has suggested that the fragment from Dordrecht was an inner runner, one of initially four runners making a catamaran-like sledge. This idea is based on calculations he made on the angle of weave marks visible on the sliding edge of the runner and the removal of the vertical ramus of the jaw-bone.

It is not clear from the paintings, or from any of the excavated material, how the seating plank was attached to the runners. The painting by Avercamp shows a (?wooden) dowel through the side of the jaw. As with the two previously excavated examples noted above there are no attachment holes present on the Castle Mall runners. Similarly there are no grooves or highly polished areas, which might suggest a plank had rested or had been attached to a particular part of the jaw-bone. If a plank had merely rested on the top of the jaw over the teeth, it seems highly likely that the runners might have flipped over, or have come away from the plank entirely. The seating plank may have been tied on with rope at the front and back, making the whole sled more robust.

Smaller jaw-bones were also used as skates and a boat skate was recovered from the same ditch fill (see below). Henry Balfour discusses the use of lower jaw-bones of horses or oxen as sled runners and sheep jaw-bones as skates (Balfour 1898). The jaw-bone skate consists of a piece of wood shaped for the foot to rest upon, with three leather loops to attach it to the foot (Fig.10.70 C). The wooden foot rest is itself fixed to the lower sheep mandible.

Balfour gives a rather lovely reference for horse jaw-bone sledges in use in southern Germany where ‘These provided a regular winter amusement for the boys of the town, who used to toboggan down the sides of the moat under the old town wall’ (Harmann 1882). It is pleasing to imagine also the children of Norwich sledding down

Plate 10.23 Horse mandible forming part of a child’s sledge (SF421) found in the barbican ditch (fill 92730, Period 6.2)

Plate 10.24 Horse mandible forming part of a child’s sledge (SF421) found in the barbican ditch (fill 92729, Period 6.2)
Figure 10.69 Bone sledge runners (SF421 x 2). Scale 1:3
the sides of the Barbican ditch. Given the attested presence of these jaw-bone sledges in Holland, it is possible that the Castle Mall sledge runners were made by a Dutch immigrant (or ‘Stranger’) in Norwich during the late 16th or 17th century. Other finds from the site, such as a copper alloy head-dress pin recovered from the Barbican ditch, are thought to have been brought over by the Dutch immigrants and the jaw-bone sledges may also reflect their presence in Norwich (see further discussion in Chapter 10.VI).

**SF421** Two sledge runners each made from a lower right bone mandible. Runner a) lower right horse mandible, length 340mm. Front part of jaw broken, two premolars missing (p2 and p3). Top vertical ramus and back lower curving edge broken. Polished flat bottom surface 220mm long, worn at back and centre to expose medullary cavity. Runner b) lower right horse mandible, length 385mm. Front part of jaw broken, four teeth missing (p2, p3, p4 and l1). Very top of the vertical ramus broken. Polished flat bottom surface 300mm long, worn at rear to expose part of medullary cavity.

92740, fill of Barbican ditch, Period 6.2, G9/41

**Bone skates**
by Julia Huddle
(Fig.10.71)

A post-medieval bone skate (SF166, not illustrated) and a possible unfinished skate (SF5746) were recovered from fills of the Barbican ditch and from a modern dump on the Castle Mound respectively. There are accounts of the use of bone skates in various parts of Europe into the 20th century (Parrington 1979, 1–25). They were in use in London until the 18th century and could still be found in the Fens at the turn of the last century (Smith 1848; Layard 1908, 43).

SF5746 would have been of little use as a skate, since neither side of it is sufficiently flat to form a smooth contact with the ice. Despite the fact that the articular surfaces at the proximal end on the anterior surface have not been trimmed, there are faint wear marks on its surface. This may have been an unfinished skate which was put briefly to some other use, such as smoothing or rubbing.

**SF5746** Faceted bone. Cow metacarpal trimmed at distal end on the anterior and posterior sides with one or two oblique chips. Some faint wear marks on anterior side which appear to stop short of the proximal end. Unfinished skate. L: 170mm. Cow distal metacarpal (left).

12330, makeup dump, Period 7.1, GT47/1

**Hunting**

**Bone powder horn**
by Julia Huddle, who is grateful to the late Sue Margeson for her comments on this object (Fig.10.71)

A highly decorative bone powder horn or powder-flask, (SF6191) was retrieved from fills of the Barbican ditch, dated on the basis of coin and ceramic evidence to the first half of the 17th century. The style of carving, the costume and the subject indicate a date for the object in the middle or second half of the 16th century (Sue Margeson, pen. comm.), suggesting that it was of some age at the time of deposition.
half of the 16th century in Germany, though some were undoubtedly made by Germans living in England. They are often decorated with biblical or mythological scenes. Two examples from Amsterdam date to the third quarter of the 16th century; one depicts a scene of David and Bathsheba and the other a courting couple, possibly a scene from the Judgement of Paris (Baart et al 1977, cat. nos 828 and 829). Most of these decorated powder horns were used for hunting rather than military purposes. Hunting was pursued by the upper classes and the makers of the powder horns were often inspired by the iconography and style of German prints of around 1525 to 1550 (Baart et al 1977, 441).

**SF6191** Pan of a powder horn, carved with incised decoration showing a figure of a man with a dog on a leash and a staff over his shoulder. Large mammal bone, either cattle or horse proximal tibia. H: 119mm.
91600, fill of barbican ditch 91295, Period 6.1, G9/41

**Horse Equipment**

**Iron and copper alloy spurs and spur buckles**

by Blanche Ellis

(Fig. 10.72)

The two copper alloy spurs from the site (SF49 and SF54) and a single iron example (SF33) were found within post-medieval dumping into the barbican ditch. These all have straight sides and short necks. The copper alloy spurs, having unusual broad necks and prominent conical rowel bosses are likely to have been made in the same workshop and date typologically from the end of the 17th century to c.1750. Despite their similarities, they were not a pair. The smaller (SF54) is likely to have been made for a child: boys were taught to ride from an early age and small spurs were sometimes made for them. A single iron hook attachment (SF5408.1, not illustrated) was found in a late 16th- to 17th-century pit fill.

**SF33** Iron rowel spur fragment. The D-sectioned sides are around the back of the wearer’s heel. The front ends are missing but the longer appears to have been horizontally straight. The short neck is gently dawn-curved and the rowel pin and traces of the rowel are present in the rowel box. L: 64mm neck c.23mm.
92758, fill of barbican ditch 91295, Period 6.2, G9/41

**SF49** Copper alloy rowel spur with remains of iron moving parts. Straight sides of rounded-triangular section, complete side tapering to become extremely slender next to the figure-eight terminal. The terminal rings project equally above and below the end of the side, a post-medieval feature, and small fragments of iron attachments for the leathers are present. Short neck is slightly down-curved with an unusual broad,
IV. ZOOLOGICAL AND BOTANICAL EVIDENCE

Mammal and Bird Bone
by Umberto Albarella, Mark Beech and Jacqui Mulville
(Plates 10.15–10.21, 10.23–10.32)

Assemblage Summary
A total assemblage of 1,829 mammal, bird and amphibian bones and teeth (NISP) was hand collected from post-
medieval deposits at the Castle Mall site, with an additional
135.5 bones from Soil Riddled Samples (SRS) and 30 from
Bulk Samples (BS). A further 185 NISP were identified at
the Golden Ball Street site (see Curl, Part III, Chapter 6).
The range of taxa recorded at Castle Mall is indicated in
Table 10.43. Full details of the mammal and avian bone
assemblages from both sites, including metrical and other
data by species, are given in Part III, Chapter 3.

Refuse Disposal
Partial skeletons of the period are indicated in Table
10.44, although more are known from site records and
photographs (e.g. the carcass of a large dog indicated in
Plate 10.25). More bones than indicated in Table 10.44
presumably derive from complete, rather than butchered
and dismembered skeletons. This is probably the case for
many of the bones found in the barbican ditch fills (Period
6, Part III, Fig 9). A substantial number of complete
horse, dog and cat bones was found in these contexts.
Whilst not found in articulation it is probable that these
bones derive from complete skeletons discarded in the
ditch and subsequently reworked. Thus the archaeolo-
egical evidence suggests that the illegal disposal of animal
corpses (mainly horses) continued to be practised in spite
of all prohibitions (see Chapter 10.1). Equids are rare in
any period at Castle Mall, with the remarkable excep-
tion of the post-medieval period (Part III, Table 4). It is
doubtful, however, that this is connected with changes in
the economic system. The high number of horse bones
in the late fills of the castle ditches (mainly the barbican
ditch) is probably the consequence of the different
disposal practises carried out in post-medieval times.

Plate 10.25 Dog skeleton 40046 of greyhound/deerhound-type found within upper fills of the barbican ditch, Area 4
<table>
<thead>
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<th>Taxa</th>
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<th>BS</th>
<th>TOTAL</th>
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<td>36</td>
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<tr>
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<td>25.5</td>
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<td>561.5</td>
</tr>
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<td>1</td>
<td></td>
<td>(136)</td>
</tr>
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<td>(2)</td>
</tr>
<tr>
<td>goat?</td>
<td>(1)</td>
<td>-</td>
<td>-</td>
<td>(1)</td>
</tr>
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<td>18.5</td>
<td>5.5</td>
<td>172.5</td>
</tr>
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<td>85</td>
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<td>+</td>
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<td>11*</td>
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<td><strong>135.5</strong></td>
<td><strong>20</strong></td>
<td><strong>1,994.5</strong></td>
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</tbody>
</table>

Sheep/Goat also includes the specimens identified to species. Cases where only ‘non-countable’ bones were present are denoted by a ‘+’. Pig metapodi and mamma list distal metapodi have been divided by two, while carinate and lagomorph metapodi have been divided by four. Data the difficulty in distinguishing between upper and lower incisors in equids, and upper and lower canines in carnivores, all have been recorded and then divided by two. All teeth which include material from partial skeletons are denoted by ‘+’; this material is described in further detail in Table 10.44.

Table 10.43 Numbers of mammal, bird and amphibian bones and teeth in Period 6 by collection category (NISP)

<table>
<thead>
<tr>
<th>Period</th>
<th>Area/Group</th>
<th>Context</th>
<th>Related feature</th>
<th>Collection method</th>
<th>Species</th>
<th>Notes</th>
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<tbody>
<tr>
<td>5.1</td>
<td>1/87</td>
<td>10023</td>
<td>dog burial</td>
<td>hand</td>
<td>dog</td>
<td>10.5 bones + teeth</td>
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<tr>
<td>6.1</td>
<td>1/98</td>
<td>10521</td>
<td>pit 10760</td>
<td>hand</td>
<td>dog</td>
<td>3 bones</td>
</tr>
<tr>
<td>6.1</td>
<td>1/98</td>
<td>19850</td>
<td>dump</td>
<td>hand</td>
<td>dog</td>
<td>4 bones</td>
</tr>
<tr>
<td>5.2</td>
<td>1/103</td>
<td>10695</td>
<td>pit 19465</td>
<td>SRS sieve</td>
<td>rabbit</td>
<td>6 bones</td>
</tr>
<tr>
<td>6.2</td>
<td>9/41</td>
<td>91387</td>
<td>barbeque dish</td>
<td>91295</td>
<td>pig</td>
<td>3 bones</td>
</tr>
</tbody>
</table>

The number of bones and teeth given is the number of countable specimens from each skeleton

Table 10.44 Summary of partial animal skeletons found within Period 6 features
Most interesting was the presence of a peculiar pattern of wear on the anterior part of a second premolar in a post-medieval mandible from the barbacan ditch (Plates 10.26–10.29) which, as is fully argued in Part III, may be attributable to bit wear.

Craft Waste
Evidence for bone, antler, horn and ivoryworking during the post-medieval period is detailed in Chapter 10.11.

For comments on skinning and butchery practices of the period, see Part III.

Dogs
A notable number of dog burials were recorded in this period and the bones recovered are notably different from those of earlier periods. A similar quantity of cats was also found. The dog skeletons include at least two deliberate interments, one at the top of the Castle Mound.
associated with a group of 17th-century prison burials (Cemetery 5, Period 6.2) and the other with tenements in the southern part of the site (sk.10023, Period 6.1, noted in Table 19.44). Most dog bones of Period 6 belong to very small animals, although there are a few medium, large and very large specimens also present (Part III, Fig.42). The shape of the complete skulls found in Period 6 also confirms the wide variety of dog types. Comparison of these skulls with those in the reference collection of the Ancient Monuments Laboratory (London) indicates that one small rounded skull (Plate 10.30) was very similar to a poodle, whereas another small skull was similar to a beagle. A small-medium size skull was remarkably similar to a terrier (Plate 10.31) whilst a larger specimen resembled a robust version of a Labrador.

Foreign Contacts

The most unusual finds from the Castle Mall assemblage were two parrot bones (Plate 10.32), which probably belong to the same individual. Parrot bones have never been found before on an archaeological site in England. The Norwich Castle bones derive from the fills of a pit dated to the mid-late 17th century (pit 80188, Period 6.2). No other exotic finds were found in this pit, although seeds of pumpkin, a fruit of American origin, were found in a nearby pit of the same date (Murphy, below). Despite careful analysis of the bird bone collection of the Natural History Museum in Tring, it has not been possible to identify these bones to species or even genus level. These bones belong to a medium-large sized parrot, of about the same dimensions as an African grey parrot (Psittacus), Parrots are tropical and sub-tropical birds with some 200 species found on four continents (see further discussion in Part III). Although its place of origin remains unknown, the parrot demonstrates a connection between Norwich and exotic countries. The 17th century was certainly a period of intense travelling and trade and the fact that valuable exotic goods arrived in Norwich suggests that the city had not lost its importance as a centre of exchange and market. The presence of turkey bones from both Period 5 and Period 6 indicates that the species reached Norwich soon after their first recorded presence in England in 1541.

Diet, Economy and the Agricultural Revolution

One of the major contributions of the Castle Mall faunal research project is its contribution to the debate on changes in livestock (including the introduction of new breeds), diet and the economy during the post-medieval period. These are fully detailed in Part III, Chapter 3, with a summary presented in Chapter 13.

Fish Bone

by Alison Locker

Post-medieval deposits at Castle Mall produced a comparatively small fish assemblage mostly from Period 6.1 (late 16th century), with most of the hand collected and bulk sieved fish coming from this phase. The site riddled fish were of approximately the same number (40) from all three sub-periods. Twenty-one taxa were identified, the absence of those species commonly present but in low numbers was notable. Sea breams, gurnards, wrasse, grey mullets were among those missing. Table 19.45 shows the number of fish identified for the whole period.

The Bulk Sieved fish were 67.3% of all fish retrieved, Hand Collected 15.4% and Site Riddled 17.1%. By percentage of bony fishes in the BS material herring was 49.1%, cod and large gadid are 19.6%, eel 9.7%, whiting 3.3%, haddock and ling both 0.6%. The small flatfishes (plaice/ounder and sole) are higher than earlier periods at 11.6%, while mackerel, which has featured consistently, though in small numbers, is at the higher end of its range at 1.5%.

By ‘portion’ cod has increased from Period 5 to 77%, herring is 19%, whiting 3%, haddock and ling are 1%. This shows an increase of cod as the dominant food fish in this period as represented by these deposits. The size range of cod was between 65 to 125cm in length, but the sample was small (8) with 6 between 83 and 105cm.

Freshwater fish were few. Only tench is exclusively found in freshwater, eel, salmon and smelt migrate between fresh and salt water as part of their life cycles. The barbican ditch produced a large quantity of mammal bones but few fish. These have been discussed in the full report (Part III), but Albarella has commented on the complete skeletons found in this feature and the lack of fish may reflect a different type of disposal, not typically household waste.
13. Trade, Industry, Technology and Economy

'In provisioning the Castle of Norwich, by the King's writ with 100 loads of corn, ... 100 bacon ... salt ... iron ... 3 handmills ... cords ... 100 cheeses ...'
Pipe Rolls 19 Henry II, 117

'... It is ordained and established that each man or woman of whatsoever cast or condition he may be, who has boar, sow or other pig within the said city, that they keep them within their enclosure as well by day as by night'

19 November 1354
Hudson and Tingley, Records of the City of Norwich II, 1919, 205–206

'my grete scythe, with the belshous [belows], all my hammers, my grynston and my other tools belonging to the Smithes craft'
Will of John Brynstomer 1493

Castle Fee Properties 16, 17 and/or 59 (St Michael at Plea), NCC Will 70 Multon

1. INTRODUCTION
This chapter draws together the evidence presented in preceding text and in Part III to provide an overview of the implications of the artefactual and ecofactual assemblages from the Castle Mall and Golden Ball Street sites which span the Anglo-Saxon to post-medieval periods. It represents one of the major research themes and mirrors the founding objectives of the Castle Studies Group, detailed in Chapter 12, which emphasise the significance of the role of castles in their wider social and economic setting; this is particularly pertinent in relation to the interaction of Norwich Castle with the surrounding city's developing topography. Amongst the areas investigated is trade, which encompasses all site periods and has some interesting implications at a local, regional, national and, to a lesser degree international level. Within the evidence for craft, industry and manufacturing technologies, little-understood categories such as hornworking and late medieval/transitional leatherworking, founding and metalworking are addressed below. Diet and patterns of provisioning are also highlighted. Economic activity is explored in the context of evidence for local farming and fishing, animal husbandry and butchery practices. Of particular note is the evidence for changing animal breeds relating to the agricultural revolution, an issue of considerable relevance in the transition from late medieval to post-medieval traditions. In Norwich, the influence of Dutch immigrants is particularly apparent in this transition; evidence for their presence in the Norwich Castle area has been discussed in Chapter 10.1, 10.11 and 10.16 and in Part IV, Chapter 3. As in previous chapters, individual authors of the constituent parts of the text are indicated below: where no author is shown, the text was written by Elizabeth Shepherd Popescu.

II. ENVIRONMENT AND ECONOMY: PATTERNS OF PROVISIONING AND DIET

Introduction
Excavations at Castle Mall yielded the largest faunal assemblage ever recovered from Norwich with the greatest, most continuous chronological spread. A total assemblage of 937kg of mammal and avian bone was collected (Albarella et al., Part III, Chapter 3), of which 131kg (14%) of mammal bones and 6kg (0.5%) of avian bones came from mid to late 15th- to early 16th-century fills of a major castle well sited at the foot of the castle bridge (Moreno Garcia, Chapter 9.1V and Part III, Chapter 4). Additional material was obtained from 1,898 (site-riddled samples (SRS) producing 764 measurable bones and bulk samples (BS) accounting for a further 561 measurable bones). Over 14,000 fish bones were identified, of which 2,882 (20%) came from fills of the well (Locker, Chapter 9.1V and Part III, Chapter 5). An additional 54kg of mammal and avian bone and 0.322kg of fish bone was retrieved from the excavations at Golden Ball Street (Curl, Part III, Chapter 6).

The faunal remains from both sites are summarised by period in Chapters 4-10 of Parts I and 2, where significant assemblages are highlighted (in Sections II and IV of each chapter). The relevant sections of the following text draw largely upon the more detailed evidence presented in the zooarchaeological study (Part III), to which the reader is referred for methodologies, detailed data, analysis and discussion.

As noted above, nearly two thousand environmental samples were taken from the Castle Mall site and the sampling policies for both this site and Golden Ball Street are outlined in Part I, Chapter 1 and Appendices 3 and 4. Plant macrofossils are again detailed and discussed by assemblage and period in Chapters 4-10 (Sections II and IV of each chapter), with the overall discussion and conclusions presented below.
Mammal and Bird Bone at Castle Mall
by Umberto Albarella, Mark Beech and Jacqui Mulville
(Figs 13.3–13.5 and Part III, Figs 4–9 on CD)

Summary
The large assemblage (800kg) of mammal and bird bone recovered from the Castle Mall site, detailed in Part III, Chapter 3, has been divided into six main periods that range in date from the late 9th or 10th to the 18th centuries AD (Late Saxon to post-medieval; see Chapter 1.4V for further definition). The assemblage is dominated by the major domesticates, such as cattle, sheep, pig and domestic fowl. Beef was consistently the main meat consumed, with pork making an important contribution to the diet in the early periods and mutton in the later periods. Meat supply derived from three main sources: some animals were bred on site, others were brought to the site on the hoof while pieces of dressed carcasses were purchased from the market. The local breeding of cattle and sheep may have died out in post-medieval times, whereas pigs continued to be reared within the city. The practice of intramural stock rearing confirms that open areas remained available, Norwich providing a mixture of rural and urban environments.

While the majority of remains represent butchery and kitchen refuse, many are also associated with craft and industrial activities such as bone-, horn-, antler- and leatherworking (see ‘Occupations, Craft, Industry and Trade’ below). Taked as a whole the bones indicate a variability in the quality of diet which is typical of urban sites. No evidence of high status faunal remains was found in Periods 2 and 3 when the castle was most active as a royal residence. The bones do not, therefore, appear to represent the remains of banquets, royal or otherwise. The presence of two parrot bones in a 17th-century context points to the existence of trade with distant countries.

An increase in animal size and morphological changes are found in the post-medieval and, in some cases, the late medieval levels. These changes are related to the agricultural revolution and indicate the presence of improved breeds. A difference in the kill-off patterns in later periods attests to a change in use. Cattle, which had mainly been used for traction throughout the Middle Ages, became more important for meat production. Sheep remained extremely important for their wool, but their size increase after the 16th century suggests also an emphasis on mutton production. There is a particularly early increase in the size of domestic fowl which represents an original contribution that the Castle Mall assemblage can provide to the debate on the beginning of the agricultural revolution.

Species Present
Table 13.1 indicates the range of species present in all periods at Castle Mall, excluding the large assemblage from the barbican well (see Moreno Garcia below). Part III, Chapter 3 contains discussions of analytical methodology and recovery biases, as well as species-specific details of anatomical distribution, ageing data, considerations of animal size, shape and sex, non-metric traits, abnormalities and pathologies, butchery practices and boneworking.
Figure 13.2 Location of previous excavations in the Norwich Castle area, showing position of Thetford-type ware kilns and waste (see also Fig.13.10) and other relevant find spots. Scale 1:2500

The Occurrence and Relative Importance of Different Species Over Time

As noted above, the Castle Mill animal bone assemblage, like those from most other medieval sites in Britain, is dominated in all periods by the main domestic livestock — cattle, sheep, pig and domestic fowl. However, a variety of other mammals and birds was also found at the site (Table 13.1 and Part III, Tables 3–6). Some of these
taxa may not have an anthropogenic origin, and certainly not all of them represent food animals. Nevertheless, it is obvious that most of the animals were associated with people and certainly the bulk of the bones originate from animals which were eaten.

Comparison between different periods
Although there are problems in combining information from different areas and types of context an attempt to compare the frequency of the main mammals and birds between different periods was undertaken. Only a few contexts clearly contained bone deposits which were different from the usual mixture of butchery, food and
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<tr>
<td>sheep (Ovis aries)</td>
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<td>Cat (Felis catus)</td>
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<td>Red deer (Cervus elaphus)</td>
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<td>Fallow deer (Dama dama)</td>
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<td>Roe deer (Capreolus capreolus)</td>
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<td>Lagonorhaphus</td>
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<td>Rat/water vole (Rattus/Arvicola)</td>
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<td>Goose (Anser anser)</td>
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<td>Duck (Anas sp.)</td>
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<td>Turkey (Meleagris gallopavo)</td>
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<td>Little Grebe (Achrynsatis fulvicollis)</td>
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<td>Swan (Cygnus sp.)</td>
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<td>Teal/Garganey (Anas crecca/Crecca crecca)</td>
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</tbody>
</table>

**Table 13.1:** Presence of mammal, bird and amphibian taxa in all levels at Castle Mall
<table>
<thead>
<tr>
<th>Period</th>
<th>Element</th>
<th>Cattle % MNI</th>
<th>Sheep/Goat % MNI</th>
<th>Pig % MNI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>incisors</td>
<td>4%</td>
<td>4%</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>astragalus</td>
<td>20%</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>2 and 3</td>
<td>incisors</td>
<td>4%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>astragalus</td>
<td>24%</td>
<td>3%</td>
<td>7%</td>
</tr>
<tr>
<td>4</td>
<td>incisors</td>
<td>6%</td>
<td>3%</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>astragalus</td>
<td>25%</td>
<td>10%</td>
<td>-*</td>
</tr>
<tr>
<td>5</td>
<td>incisors</td>
<td>5%</td>
<td>2%</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>astragalus</td>
<td>9%</td>
<td>7%**</td>
<td>5%</td>
</tr>
<tr>
<td>6</td>
<td>incisors</td>
<td>3%</td>
<td>1%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>astragalus</td>
<td>14%</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Pits (all periods)</td>
<td>incisors</td>
<td>5%</td>
<td>2%</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>astragalus</td>
<td>17%</td>
<td>6%**</td>
<td>10%</td>
</tr>
<tr>
<td>Ditches (all periods)</td>
<td>incisors</td>
<td>4%</td>
<td>1%</td>
<td>7%</td>
</tr>
</tbody>
</table>

% MNI is calculated as follows:
incisors: [MNI of incisors (MNI incisors + MNI premolars + MNI 1st and 2nd molars + MNI 3rd molar)] x 100
astragalus: [MNI astragalus (MNI femur + MNI fibula + MNI astragalus + MNI calcaneus + MNI metatarsi)] x 100.
* - not calculated due to small sample size
** - a special group with many sheep metatarsi has been excluded from this count
*** - no pig astragalus out of 37 hind-limb bones

Table 13.2 Percentages of small elements in different periods at Castle Mall

Working refuse found in most urban medieval sites. Only one of these 'special' assemblages — a pit full of sheep homoeos, metapodia, and phalanges from Period 5 — was large enough to severely bias the analysis of taxon frequency, and it was excluded from this comparison.

Another consideration was the possibility that variation in the recovery rate of hand-collected bones had occurred between different periods. This could affect the relative frequency of species and thus create artificial differences between periods. The problem was tackled by calculating the relative number of small elements (incisors and astragali) within each period (Table 13.2, left). Although the small elements were heavily underrepresented in the early periods, a recovery bias affects the hand-collected assemblage in all periods and that no large differences in the frequency of the species due to differential recovery occur as a result. Although not the most numerically frequent species (Part III, Tables 8 and 9), cattle, due to their large size, must have provided the bulk of meat in most periods at Castle Mall. While the frequency of cattle remained stable throughout the Castle Mall chronologically sequence, in the later periods sheep became more common at the expense of pig.

Although many varied factors are affecting these percentages, they still demonstrate an interesting trend. Despite possible differences in preservation, in the use of the archaeological features and in disposal practices between different periods, the change in the frequency of the main domestic mammals reflects the results of previous research. Several authors have noted a country-wide trend (e.g. Grant 1988; Albarella and Davis 1996) for a high frequency of pigs in early medieval periods and an increase in the importance of sheep, probably connected to the rise of the wool industry, in the late Middle Ages. A decline in the number of pigs in late medieval times has been identified in another area of Norwich, Fishergate (G. Jones 1994).

The presence of a large number of pig bones has been linked to high status sites (Grant 1988, Albarella and Davis 1996). Pigs are typically 'meat animals' and are expected to be more common on sites with a higher meat consumption. Periods 2 and 3 at Castle Mall are those associated with the most active period of castle life, and thus it is possible to speculate that the higher frequency of pigs in these periods is an indication of status. However, as will be discussed below, no other evidence of high status, either from the animal or plant assemblages (Murphy, 'Plant Remains' below), could be found. This suggests rather that the decrease in

### Hand-collected bones and teeth

<table>
<thead>
<tr>
<th></th>
<th>Period 1.2–1.3</th>
<th></th>
<th>Period 1.4</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Cattle</td>
<td>421</td>
<td>57</td>
<td>119.5</td>
<td>37</td>
<td>540.5</td>
<td>51</td>
</tr>
<tr>
<td>Sheep / Goat</td>
<td>159</td>
<td>20</td>
<td>86</td>
<td>27</td>
<td>236</td>
<td>22</td>
</tr>
<tr>
<td>Pig</td>
<td>162</td>
<td>22</td>
<td>114.5</td>
<td>36</td>
<td>276.5</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>733</td>
<td>320</td>
<td>1,053</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### SRS and BS bones and teeth

<table>
<thead>
<tr>
<th></th>
<th>Period 1.2–1.3</th>
<th></th>
<th>Period 1.4</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Cattle</td>
<td>70.5</td>
<td>35</td>
<td>8</td>
<td>8</td>
<td>78.5</td>
<td>33</td>
</tr>
<tr>
<td>Sheep / Goat</td>
<td>48</td>
<td>24</td>
<td>17</td>
<td>17</td>
<td>65</td>
<td>27</td>
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<tr>
<td>Pig</td>
<td>83</td>
<td>41</td>
<td>14.5</td>
<td>14.5</td>
<td>97.5</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>201.5</td>
<td>39.5</td>
<td>241</td>
<td></td>
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</tr>
</tbody>
</table>

Table 13.3 Period 1 — numbers and percentages (NISP) of the main taxa in pre-Conquest (Period 1.2 and 1.3) and pre/post-Conquest contexts (Period 1.4) at Castle Mall

999
<table>
<thead>
<tr>
<th></th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
<th>Period 5</th>
<th>Period 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ditch</td>
<td>Pit</td>
<td>Ditch</td>
<td>Pit</td>
<td>Ditch</td>
<td>Pit</td>
</tr>
<tr>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Cattle</td>
<td>14</td>
<td>45</td>
<td>37</td>
<td>174</td>
<td>38</td>
<td>144</td>
</tr>
<tr>
<td>Sheep/Goat</td>
<td>10</td>
<td>32</td>
<td>185*</td>
<td>15</td>
<td>59</td>
<td>18</td>
</tr>
<tr>
<td>Pig</td>
<td>4</td>
<td>13</td>
<td>258*</td>
<td>21</td>
<td>35</td>
<td>11</td>
</tr>
<tr>
<td>Equid</td>
<td>2</td>
<td>7</td>
<td>35*</td>
<td>3</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Dog + Cat</td>
<td>1</td>
<td>3</td>
<td>129*</td>
<td>11</td>
<td>75*</td>
<td>23</td>
</tr>
<tr>
<td>Domestic fowl</td>
<td>-</td>
<td>0</td>
<td>166*</td>
<td>14</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>1,221</td>
<td>324</td>
<td>407</td>
<td>85</td>
<td>30</td>
</tr>
</tbody>
</table>

Corrections for the number of metapodia (see Part 3, Table 44) have not been carried out for this table. Only hand-collected material is included.

* These figures include bones from partial skeletons (see Table 13.5 for details).

Table 13.4 Frequencies of main taxa (NISP) in ditch and pit fills at Castle Mall
the number of pig bones in later periods is a consequence of a genuine change in the animal economy noted at a countrywide level. This question is discussed further in the section 'Comparison with Other Sites'.

A substantial increase in the number of pigs was noted in the later part of Period 1 (Period 1.4, Table 13.3), namely in the immediately pre-Conquest or early post-Conquest period. This again could be interpreted as a consequence of the high status that the site acquired with the erection of the castle, but it is more probably due to some change in animal exploitation or in the use of the site which was brought about by the arrival of the Normans (although see further comments in 'Comparisons with Other Sites' below).

Another expected trend is a decrease in cattle, relative to horse, in late medieval and post-medieval times (Albarella and Davis 1994). In Norfolk in particular, horses increased in importance very early, already during the Middle Ages (Langdon 1986). Equids are rare in any period at Castle Mall with the remarkable exception of the post-medieval Period 6 (Part III, Table 4). However, it is doubtful that this is connected with changes in the economic system. The high number of horse bones in the late fills of the castle ditches (mainly the barbican ditch) is probably the consequence of the different disposal practices carried out in post-medieval times. Historical evidence of the illegal disposal of horse skeletons in the castle ditches is abundant (e.g. see Tillyard, Chapters 8.1 and 10.5). Horses are typical farm animals and are
generally not common in urban sites: they were used in towns, but they were generally bred or slaughtered elsewhere. Very low frequencies of horse bones have also been noted for the other Norwich sites of Alms Lane (Cartledge 1985), St Martin-at-Palace Plain (Cartledge 1987) and Fishergate (G. Jones 1994).

Among the main domestic birds, domestic fowl represents by far the most common species, with goose relatively common and duck only occasionally present. A slight increase in the importance of goose was noted after Saxon times: a possible consequence of minor cultural and economic changes. Slightly higher percentages of goose bones have been found in the 10th-12th-century levels at Fishergate (Norwich) (G. Jones 1994) and Thetford (G. Jones 1993), although this may only reflect differences in the efficiency of recovery.

Spatial analysis

Bone assemblages within each period have so far been considered as single units. However, the possibility must be considered that variation occurs between different areas of the site and types of context. This analysis is aimed at the identification of possible differences and similarities in use of the site in different areas and to assess to what extent these affect the frequency of the species in different periods.

Due to the nature of the archaeological evidence the analysis of lateral variation in animal bone distribution in terms of a comparison between different ‘activity areas’ could only be undertaken for Period 1 (Fig. 13.3). (See Chapter 4.1V for a general comparison of these areas and Albaraelia et al, Chapter 4.1 for the distribution of hom- 
cores and antlers. The frequency of the main domestic taxa is presented for each area in Fig. 4.109.) For other periods the comparison was limited to the study of the contrast between the contents of pit and ditch fills.

Although bones were recovered from floors, external layers and other contexts, the majority of the Castle Mall animal bones derive from pit and ditch fills (Table 13.4). The assemblages from Periods 2, 3, 4 and 6 are more or less evenly distributed between these two types of context, whereas bones from Periods 1 and 5 derive almost entirely from pits, with the exception of the small grooves from the Late Saxon buildings. Differences between the distribution of bone in ditches and pits have been noted by several authors (Malby 1982; Coy 1983; Wilson 1994). Wilson (1994) also suggested that ditches have a tendency to contain higher frequencies of the bones of larger animals (cattle and horses). If the small, and possibly misleading, assemblages are ignored this tendency is confirmed at Castle Mall (Table 13.4). Although the difference is not striking, cattle hom-cores are relatively more common in pit fills. The figure for Period 6 must be carefully considered as the percentages are affected by the high number of equid and carnivore bones presumably derived from complete bodies discarded in the barbian ditch.

The main difference between ditch and pit fills is the larger number of domestic fowl bones in the latter contexts. This is particularly evident for Period 6. The large number of chicken bones in pit fills can be associated with the possibly more ‘domestic’ nature of these features and with the fact that their small bones are more easily tolerated in the vicinity of domestic activities. No major differences in the recovery rate could be noted between ditch and pit fills.

Variation in the frequency of taxa between different types of contexts thus occurs but is not particularly striking and does not severely affect the interpretation of differences between periods. However a slight under- 
representation of cattle in Periods 1 and 5, which are found mainly in pit contexts, must be taken into account. The hypothesis that the higher number of bird bones in Period 4 is due to a genuine change in diet/economy rather than the nature of the excavated deposits (Table 13.4 above) is confirmed.

A high concentration of partial skeletons was found in a series of pits in the eastern part of the settlement in the 11th century (Open Area 8, G9/109, Periods 1-13, Figs 4.22 and 4.43 and Part III, Fig. 4 on CD, Table 13.5) suggesting that in Late Saxon times these pits were used to dispose of dead bodies. The contexts then remained undisturbed, as indicated by the presence of bones in articulation. More bones than indicated in Table 13.5 presumably derive from complete, rather than butchered and dismembered skeletons. This is probably the case for many of the bones found in the barbian ditch fills (Period 6, Part III, Fig. 9 on CD). A substantial number of complete horse, dog and cat bones was found in these contexts (e.g. Plate 10.25). Whilst most were not found in articulation it is probable that they derive from complete skeletons discarded in the ditch and subsequently reworked. Thus the archaeological evidence suggests that illegal disposal of animal corpses (mainly horses) continued in spite of all prohibitions (Tillyard, Chapter 10.1).

Comparison with the barbian well assemblage

A comparison of the barbian well assemblage with the faunal assemblage from the remainder of the Castle Mall site is given in Chapter 8.1V.

Comparison with other sites

The comparison of the frequency of species between different sites is one of the most difficult tasks in zooarchaeology (King 1978, Payne 1985; Albaraelia 1995). Differences in butchery patterns, waste disposal, preservation, excavation strategies (especially recovery) and quantification methods can severely affect the frequency of taxa and therefore the interpretation of variation between sites.

Two possible approaches can be adopted. One possibility is to compare two assemblages, trying to take into consideration all possible biases which may have affected the frequency of species at the two sites. One this ‘background noise’ has been eliminated differences and similarities are interpreted on the basis of environmental and economic factors. This is the approach that has been adopted in the comparison of the barbian well with the rest of the site (see Chapter 9.1V).

The other approach is to examine a large number of assemblages, without exploring in detail all the variables which can affect the frequency of species in each assemblage. It is then possible to observe whether, despite all biases, general trends can still be detected. This approach has successfully been undertaken by King (1978 and 1984) who analysed a large number of Roman sites and succeeded in identifying patterns of regional variation within Europe. More recently Albaraelia and Davis (1994 and 1996) have applied a similar method to medieval and post-medieval England. By considering a large number of sites from across the country some of the trends initially
suggested by Grant (1988), such as the higher number of pig bones in early medieval and high status sites, were confirmed. Naturally many exceptions to these general trends occur; this method therefore cannot be used to determine the status or the cultural context of an individual site.

The latter approach has been used to compare Castle Mall with other contemporary sites in England. The list of sites taken into account can be found in Part III, Table 14 and includes a larger number of sites than originally used by Albarella and Davis (1996). In particular Saxon sites and important sites in the same geographic area as Norwich and within the city itself have been added. The list is far from complete, but the majority of the main Saxon to post-medieval sites have been incorporated. The sites have been divided on the basis of their type of settlement (Fig. 13.4): towns, villages and castle. This division is very approximate, as the status of a site is not always clear, urban castles occur (Castle Mall is an example), monastic sites and manor houses are not easily assigned to one of these categories, etc. However, the aim, as stated above, is only the identification of broad trends. Castle Mall has been considered as a ‘town’ in Periods 1, 3, 4, 5, and 6 and a ‘castle’ in Period 2, when the excavated features are more closely associated with the castle.

The Castle Mall assemblage is located within the main cluster of urban sites, which tend to be characterised by a high frequency of cattle (in most cases above 40%) and a relatively small number of pig bones. An exception is Period 1.4, which stands out as having a higher percentage of pig (Fig. 13.4). In general there is a higher variability in castle sites, but even though many exceptions occur they tend to have a larger number of pigs. This is not evident at first sight, but if a line is drawn separating sites with more than 20% pig from the others, this group would contain 49% of the castles, 32% of the villages and only 16% of the towns. With its 25% pigs, Castle Mall Period 2 is within the >20% pig category. It is not until Period 4 that the pig frequency at Castle Mall drops below 20%. This suggests that the relatively high percentage of pigs in the early phases is not a consequence of status, but is a feature of the early medieval economy.

This can be better illustrated by dividing the assemblages by chronological period (Fig. 13.5). The frequencies of sites with more than 20% pigs are distributed as follows: Saxon 38%, early medieval 38%, middle medieval 33%, late medieval 26% and post-medieval 8%. For sheep the frequency of sites with more than 40% of this species is: Saxon 29%, early medieval 28%, middle medieval 38%, late medieval 43% and post-medieval 62%. The steady decrease of pig and increase of sheep are countrywide phenomena and the Castle Mall assemblage — apart from the unusual Period 1.4 (see above) — lies well within the main distribution of sites for each period.

### Environment and Economy at Castle Mall: the Evidence of the Animal Bones

#### Food Provision

One of the most interesting findings from the Castle Mall animal bones was the evidence of on-site breeding. The
main evidence for this is the presence of neonatal bones of the main domestic animals: cattle, sheep, pig, horse and domestic fowl. These bones are not very abundant, but this is likely to be a result of their small size and fragility which cause poor preservation and recovery. Neonatal cattle and sheep bones are more common in early periods, whereas newborn pig bones were more commonly found in Periods 5 and 6.

Stock breeding within the town may be unexpected, as towns are primarily considered to be consumer sites. In fact animals were reared in the area of Castle Malling confirming other evidence that the town was not fully urbanised until at least post-medieval times (much of the excavated areas forming the castle baileys from the Norman period onwards). These rural areas within the walls were probably used as pasture rather than cultivated land, as the evidence from the plan remains suggests that most grains were imported to the site as semi-cleaned prime product at all periods (Murphy, 'Plant Remains' below). The absence of local agriculture is also suggested by the presence of large numbers of latrine pit assemblages, these indicate that there was no need to use human sewage locally as manure or ‘night soil’ (Murphy, ‘Plant Remains’ below).

The scarcity of cattle and sheep neonatal bones in post-medieval times implies that breeding of these animals in the town gradually died out, or became much reduced. This is consistent with the growth of the Norwich population and the increasing urbanisation of the castle surroundings. However, pig breeding continued. This is
not surprising as pigs need much less space and could be raised in house courtyards and fed with household food scraps (see also Hudson and Tingley 1910, 205–206 and Moreno Garcia, Part III, Chapter 4).

The evidence from Castle Mall contrasts with that found in other Late Saxon and early medieval towns, such as Southampton (Bourdillon 1994) and York (O’Connor 1994). In these sites the presence of all skeletal parts of the livestock body, combined with the absence of neonatal bones, was taken as evidence that animals were imported to the site on the hoof. In other words, the breeding of animals took place elsewhere but the slaughtering and primary butchery occurred in town. Can it therefore be suggested that Norwich had more open areas and was less urbanised than Southampton and York? This does not seem probable. It is more likely that these differences are due to assemblages coming from different areas of the town. There probably were areas in Southampton and York where stock rearing occurred. It is also possible that Norwich in Late Saxon times still had a rather rural aspect. In the subsequent medieval period the presence of the castle and its earthworks contributed to the fact that much of the area was not developed and retained ‘open land’ characteristics suitable for animal pasturing (see Parts I and II). The north-east bailey in particular (the Castle Meadow) continued in use as rough pasture. Full details of the use of the castle baileys for animal grazing (e.g. the trampling of herbivores attested by micromorphology; see MacPhail, Part I) and the various phases of the post-medieval and later Castle Market are given throughout Parts I and II of this report.

The town and the castle were probably only partly supplied with products derived from local breeding. Norwich had an important market and, as already noted, the arrival of livestock on the hoof is historically well attested. Moreover the evidence from the distribution of body parts indicates that, although complete carcasses were present, selected cuts of meat were also sometimes imported or just distributed. For example, the presence of a large number of sheep scapulae in the post-medieval fills of the barbican ditch can be interpreted as the acquisition of selected parts of the carcass, not necessarily from the countryside but perhaps from butchers elsewhere in the town.

Diet

Isotopic analysis of the human remains from the Late Saxon cemeteries at Castle Mall is detailed by Bayliss et al in Part I, Chapter 4.4V, allowing broad consideration of the contribution that animal products make to the diet compared to cereals. The direct evidence for dairy products is poor. The kill-off patterns of cattle and sheep within Norwich do not suggest a particular emphasis on milk production, but the situation might have been different in the countryside, and milk and dairy products could regularly have been sold in urban markets. It is however possible to find historical sources describing the difference in the patterns of animal protein consumed by urban and rural populations, and the rich and the poor. Those in towns ate more meat than those living in villages, although for both cereals would have made a significant contribution to the diet, and by the early 15th century cereal foods accounted for 63% of the diet. Fish (Locke these volumes; Locke 2001) and dairy products were also an important food source, and the latter formed the major source of animal protein for peasants and artisans (Dyer 1989).

Even taking into account the obvious over-representation of cattle bones, it is quite clear that beef was the most consumed meat during all periods. Pork was particularly important in Late Saxon and early medieval times. Mutton was also consumed but was of secondary importance to the main use of the sheep, which was the production of wool. Horse and dog meat may occasionally have been eaten, perhaps in periods of crisis, but the flesh of these animals was more likely to have been used to feed dogs.

Chicken and goose meat provided a secondary but constant contribution to the diet. This probably increased in post-medieval times when these birds began to be bred specifically for their meat, rather than for eggs or feathers. The contribution of wild game to the diet was negligible. Venison and wildfowl were only very occasionally eaten, perhaps in special circumstances and only by the more wealthy townsfolk.

Status

The presence of a royal castle in Periods 2 and 3 might lead to the expectation that evidence of high status would be found in these periods. In fact this was not the case and the typical high status animals, such as deer and wild birds, are as rare during the castle phases as they are in earlier and later times. Continuity, rather than change, could be observed in the transition from Period 1 to 2. Thus it appears that the excavated features, even if belonging to the castle, did not contain refuse from royal banquets or those of castle officials. This is not surprising as visits of the king, for example, were only very occasional (Tillyard, Chapters 5.1, 6.1 and 7.1) and may have left traces in other areas of the castle, untouched by this excavation. The findings from the plant remains are consistent with the animal bone results: no exotic species or any other indication of high status was observed (Murphy, Plant Remains below).

Some findings, such as the evidence for falconry in the 11th century, or a rather high proportion of pig bones in Late Saxon to early medieval periods — roast pork was ‘the most consistent source of more delicate meat’ (Dyer 1989, quoted by Serjeantson forthcoming) — or even the presence of exotic species, such as a parrot in a 17th-century pit fill, may hint that some evidence of high status is indeed present. However, this is not necessarily related to the castle, but is more probably a consequence of the variation and inequality of the distribution of the wealth within towns (Dyer 1989). For instance, the parrot might have belonged to a rich merchant (Plate 10.32; see ‘Foreign Contacts’, Chapter 10.4V and 10.V1) and, as discussed elsewhere in this report (Chapter 4.4V, ‘Hunting’), the goshawk was not necessarily a bird associated with the highest aristocracy.

Use of Space and Disposal Practices

As these volumes have demonstrated, the topography of the site changed enormously in different periods, and any comparison between periods also entails comparisons between different types of sites. Whatever the type of building present or the organisation of the space, in all periods the animal bones mainly derived from pits and ditches that were filled with a mixture of food and industrial refuse.
# Table 13.6 The main domestics: changes in age, shape and size over time

<table>
<thead>
<tr>
<th></th>
<th>Period 1–2+3</th>
<th>Period 2+3–4</th>
<th>Period 4–5</th>
<th>Period 5–6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>Age</td>
<td>stable</td>
<td>stable</td>
<td>decrease</td>
</tr>
<tr>
<td></td>
<td>Size</td>
<td>stable</td>
<td>stable</td>
<td>increase?</td>
</tr>
<tr>
<td></td>
<td>Shape</td>
<td>stable</td>
<td>stable</td>
<td>?</td>
</tr>
<tr>
<td>Sheep</td>
<td>Age</td>
<td>stable</td>
<td>stable?</td>
<td>increase</td>
</tr>
<tr>
<td></td>
<td>Size</td>
<td>stable</td>
<td>stable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shape</td>
<td>stable</td>
<td>change</td>
<td>stable</td>
</tr>
<tr>
<td>Pig</td>
<td>Age</td>
<td>stable</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sex</td>
<td>stable</td>
<td>stable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Size</td>
<td>stable</td>
<td>stable</td>
<td>stable?</td>
</tr>
<tr>
<td></td>
<td>Shape</td>
<td>stable</td>
<td>stable</td>
<td>change</td>
</tr>
<tr>
<td>Domestic fowl</td>
<td>Age</td>
<td>stable</td>
<td>stable</td>
<td>stable</td>
</tr>
<tr>
<td></td>
<td>Sex</td>
<td>stable</td>
<td>stable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Size</td>
<td>stable</td>
<td>stable</td>
<td>increase</td>
</tr>
<tr>
<td>Goose</td>
<td>Age</td>
<td>stable</td>
<td>stable</td>
<td>stable?</td>
</tr>
</tbody>
</table>

In Period 1 the site was loosely organised as a settlement with several ‘properties’ (Fig 13.3; see Part I, Chapter 4.IV). Although no obvious division between domestic and industrial areas could be detected, lateral variation occurred in the distribution of the animal bones. Not only did the frequency of different species vary in different areas, but also for the type of animal — in particular horn- and antlerworking. The significance of this variation is not completely understood but it might be related to the disposal of food refuse on site, and to the spatial distribution of different workshops.

From Period 2 onwards, most of the features excavated consisted of the outer and inner ditches of the castle and pit groups associated with the developing tenements surrounding the castle, both within and outside the Castle Fee, as well as a few minor structures. Some differences in the contents of ditches and pits have been noted, which are probably due to the different use of these two types of features. Ditches may have mainly been used for large scale dumping of the town refuse, whereas pits were associated with small scale domestic activities. In particular, the disposal of the carcases of dead animals in the barbian ditch (see Part II, Chapter 10) seems to have been common practice during late medieval and post-medieval times. Many complete horse bones were found in the ditch, but they were not in articulation, which suggests that these are not primary deposits and that reworking of the barbian ditch fills occurred at some stage.

A lower frequency of gnawing marks in later periods probably indicates a prompter burial of bone refuse and thus a more organised system of waste disposal. This would have become necessary as the density of population increased and is consistent with the increasing urbanisation of the town in late and post-medieval times as suggested above.

**Animal Economy and the Agricultural Revolution: the Castle Mall Contribution**

The type of animals and the husbandry techniques found in the Late Saxon and medieval periods at Castle Mall are both consistent with other archaeological sites in England and with information from historical sources. It has also become apparent that the age, sex and size of the animals are inter-related factors which must all be considered in any study of the evolution of husbandry techniques.

From the late 9th/10th century (Period 1) to at least the mid 14th century (Period 4) the principal uses of the main domestic stock at Castle Mall and throughout the country were probably as follows: cattle were mainly exploited for traction, sheep were a precious source of wool, pigs provided almost exclusively meat (and fat) and domestic birds produced eggs and feathers. All animals were at some point eaten, but in some cases their flesh may have represented only a secondary product. This is obviously an over-simplification, because variation occurred across the country and in some periods other products may have become predominant, but in very broad terms these were the main uses of the animals.

In medieval times, partly due to the primitive techniques then available and partly due to the type of animal use, the livestock was of a relatively small size. This is well attested by historical sources and has been confirmed by the study of the Castle Mall animal bones. However, this does not mean that the animals were all identical across the country. Variation occurred and even if it is not yet possible to talk of genetic breeds in the modern sense, regional types were present (Trow-Smith 1957). The high homogeneity of the medieval sheep, in particular, has hitherto been emphasised in the zooarchaeological literature. However, using a technique which allows the comparison of different measurements on the same axis (Davis 1996), it appears that the medieval sheep at Castle Mall, even being of roughly the same size, show some shape variation between periods. This suggests that the homogeneity of the medieval sheep might have been overemphasised due to the way the measurements have been examined so far.

After a period of relative stability which lasted for several centuries, some major changes in the type of use and in the size and shape of the animals occurred between the end of the Middle Ages and the beginning of the modern period. When exactly did these changes occur? The evidence available from other sites suggests that many of these changes had already begun during the 16th century (Davis 1997). This is consistent with the
Table 13.7 The main domesticates: changes in use over time

<table>
<thead>
<tr>
<th></th>
<th>medieval</th>
<th>late medieval - post-median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>TRACTION, meat, milk</td>
<td>MEAT, milk (traction in limited areas)</td>
</tr>
<tr>
<td>Sheep</td>
<td>WOOL, meat, milk</td>
<td>WOOL, MEAT, milk</td>
</tr>
<tr>
<td>Pig</td>
<td>MEAT, fat</td>
<td>MEAT, fat</td>
</tr>
<tr>
<td>Goat</td>
<td>milk, meat</td>
<td></td>
</tr>
<tr>
<td>Horse</td>
<td>traction</td>
<td>TRACTION</td>
</tr>
<tr>
<td>Domestic fowl</td>
<td>EGGs, meat</td>
<td>MEAT, eggs</td>
</tr>
<tr>
<td>Goose</td>
<td>FEATHERS, meat</td>
<td>MEAT, feathers</td>
</tr>
</tbody>
</table>

view of some historians who suggest that the ‘agricultural revolution’ was an earlier and more gradual phenomenon than often claimed (see for instance Kerridge 1967). Unfortunately the 16th century at Castle Mall is either poorly represented or not securely dated, therefore this animal bone assemblage cannot provide a major contribution to the question of when livestock improvement began. However, interesting data have been found concerning the changes in husbandry techniques and consequent modifications of animal size and shape that the agricultural revolution brought about.

Before entering into a detailed discussion of the exploitation of the main species at Castle Mall it will be useful to summarise the data for age, sex, size and morphology (Table 13.6).

Details of how these results were obtained and their interpretation are presented in the relevant sections of Part III and will not be repeated here. This concluding section will make some very general comments. In both cattle and sheep, variation in the kill-off patterns precede size and morphological changes. In the case of cattle it is plausible to assume that a new type of animal use, more specifically aimed at the production of meat, was associated with a different kill-off pattern and led to the selection of larger beasts. The situation for sheep is more complex, as changes in size and mortality do not go in the same direction. The shift towards older animals is evidence that wool production was increasing in importance, whilst the size increase suggests that large animals capable of producing more mutton were also being selected. In fact the two changes do not go together, but they are perfectly compatible, because large sheep can also produce good quality wool. Many of the best ‘wool’ breeds, such as the Lincoln Longwool, are actually very large (Keith Dobney, pers. comm.).

The situation is different for pig where both the main changes are concentrated in the post-medieval period. The use of pig for meat and lard production continued and the only reason for these changes was to increase productivity. It is probable that this was achieved by the importation of new stock, which was larger, faster growing and could thus be killed at an earlier age.

The role of domestic fowl has been neglected in the study of changes connected to the agricultural revolution. However, the Castle Mall evidence suggests that already in Period 5 (i.e. almost certainly during the course of the 15th century) these birds had been subject to a size increase; possibly the consequence of selective pressure towards higher meat production. This improvement was successfully completed in the subsequent period, where an age decrease implies the increasing importance of meat. The evidence from Castle Mall alone is not enough to suggest that the increased size of domestic fowl represents one of the first results of the agricultural revolution, but it certainly provides a stimulus for further investigation of this question on other sites.

Now that it has been demonstrated how the Castle Mall animals changed, it is appropriate to summarise the innovations in their type of use. The following table illustrates this by taking into account both the Castle Mall data, and what is known from the rest of the country, from both historical and archaeological sources. The animal products or uses of greater importance have been indicated in capital letters (Table 13.7).

Certainly, these changes did not all occur contemporaneously and in some areas they did not happen at all. In addition some of the data presented above are still under debate. Nevertheless, it is only by trying to generalise that the Castle Mall data can be put in a wider context and contribute to the history of animal husbandry in Britain. One general consequence, which is clear from the above table and concerns most animals, is that the agricultural revolution gave rise to a much greater emphasis on meat production. This was probably caused by the growth of the urban population which required an increasingly larger meat supply.

Norwich was one of the largest medieval towns in Britain and a very important market place (the development of which has been outlined in Chapters 4–11). Any study of the economic history of England must consider this town which had the advantage of being situated in a convenient position for contacts with the continent. The Low Countries, from where so many technological and economic innovations originated, have always had close contacts with the Norfolk area. If improvements in either the animals or husbandry techniques occurred, it is to be expected that they began earlier in Norfolk than in many other parts of the country. Potentially, the Castle Mall data can contribute to current understanding of the economic development of the town and of the country as a whole. At the same time there may be more animal bones recovered from secure 15th- to 17th-century contexts in the city. Information from such contexts may provide answers to the important question of when improvement started which could not be firmly established in this report.

The Barbican Well Assemblage
by Marta Mereno Garcia

The most significant single faunal assemblage from the site was recovered from mid/late 15th- to early 16th-century fills of the barbian well which has been discussed in Chapter 9.IV, with a summary of species present given in Table 9.13. Full details of this important group are given in Part III, Chapter 4 and the feature is located in Fig.9.2. The evidence will not be repeated here but, in summary, the excellent preservation and recovery of the barbian well animal bone has allowed a detailed study of the relative occurrence of the main domestic taxa of the period in question. Analysis of this important assemblage (comprising 131kg of mammal bone and 6kg of avian bone) has gone some way to fulfil the vital need for well preserved and well recovered late medieval
of the Barbican well (noted above and see Moreno Garcia, Chapter 9.14 and Part III; Huddelle, Chapter 9.11).

Elsewhere on site, bone- and hornworking was particularly evident in Period 2 (see Chapter 5.11). A remarkable group of four sheep skulls from which the horns had been removed was recovered (pit 40200, Fig.5.11, Plate 5.17). Additionally, horncores and bone strips came from a number of adjacent pits within the early castle bailey, attesting to the manufacture of horn combs with bone side-plates during the late 11th or early 12th century. One such pit, adjacent to that containing the sheep skulls, yielded 20 cattle horncores with chop/ cut marks, along with nearly 200 bone strips (pit 20059, G2/5, Period 2.1; see Huddelle, Chapter 5.11 and discussion in Chapter 5.5).

Evidence for craft activity at Golden Ball Street was limited, although antler-, bone- and hornworking were apparent. Bone working was evident only in early fills of the castle ditches. Probable hornworking utilised the horns of cattle, sheep and goat. As is commonly the case, none of the actual horn was preserved and the bony horncore is all that was recovered. As at Castle Mall, the tips of some of the Golden Ball Street horncores had been removed as part of the process of removing the horn sheath.

Further evidence for hornworking at the Castle Mall site came from the post-medieval period, where a pit in Area 8 contained 8 worked cattle metapodials (pit 80/888, G8/29, Open Area 39, ?Property b, Period 6.2), along with other related evidence. The craft evidently entailed tool production, although the function of the finished objects has yet to be established (see Huddelle et al., Chapter 10.3). This pit may have had an association with a public house (see Chapter 10.6).

Antler and horn were also used for making tools. The presence of horn-handled artefacts at the Castle Mall site has been attested by analysis of mineral-preserved organics on a number of knives (see Watson and Pyntner in previous chapters). Abundant evidence for the use of cattle, sheep and goat horns has been found in all periods at Castle Mall (well over 300 horncores being recovered in total, a large proportion of which were cut, chopp ed or sawn). Sheep horns are more common in Period 5, a phenomenon also noted in fills of the Barbican well. The presence of a number of goat horncores, in contrast to the rare occurrence of post-cranial bones, attests to the existence of an independent horn trade and thus to a specific interest in this material. The same was true for antlers (see below), which are found in large numbers, despite the rare occurrence of deer bones.

It is possible that the hornworker was closely associated with the tanner — or tawyer — as horncores and foot bones were generally still on the skin when it arrived at the tannery (Serjeantson 1989). A mid 15th-century pit at Castle Fee Property 49 (a garden facing onto the Shorehouseyard) contained a large assemblage of sheep bones, including 21 horncores, 109 metapodials and 60 phalanges (pit 11048, G1/24, Period 5.2, Fig.8.32, see Chapter 8). This large group (Plate 8.11) can indeed be explained as the dump of a tannery workshop. Further comments on skinning and leatherworking are given elsewhere in this chapter and in previous chapters.

That hornworking continued into the post-medieval period is attested by a group of 87 cattle horncores from post-medieval fills of the Barbican ditch which continued.

BONE- AND HORNWORKING
by Umberto Albarella, Mark Beech, Jacqui Mulville, Elizabeth Shepherd Popescu and Julia Huddelle

Bone tools found at the Castle Mall site were generally made from cattle and horse bones, although bones of other animals were occasionally utilised. Due to their robust shaft, cattle and horse metapodia were the bones most commonly used; evidence of sawing and faceting has been found on these bones. Many other objects, such as spindle whorls, handles, skates and a sledge were also found (see Huddelle Parts I and 2 passim). Spectacular evidence for the use of goose feathers for making quills or fletching arrows and for the utilisation of goose bones as tools has been found in late medieval/transitional fills

1030
a large assemblage of other animal bones (Trial Hole 1, G9/41, Period 6.2; see Chapter 10). Although still used for decorative purposes, by the post-medieval period, the main use of horn was in the manufacture of cutlery handles and the waste from urban tannery and horn workshops of the period has been found at Northampton and London (Crossley 1994, 221). The London evidence includes 17th-century horn- and bowneworking at Aldgate (Armitage in Thompson, Grew and Schofield 1984, 131–143) and pits containing large numbers of horncores at numerous sites including St Mary Graces (the Royal Mint; Richenda Goffin, pers. comm.).

Antlerworking
by Julia Huddles and Elizabeth Shepherd Popescu (Fig. 13.2)

Antlerworking waste was recovered from much of the site (Areas 2, 5, 7, 9, 202, 21, 22, 46 and 47 and watching briefs, Figs 13.1 and 13.2), although it was not recorded across the southern part of the excavation area, except at the Golden Ball Street site where two additional pieces of primary waste were recovered. The Castle Mall assemblage consists of a total of 75 pieces including a number of tools. The material was recovered from all periods, with some notable concentrations. Some may be residual (Periods 3–4), although that from Periods 1, 5 and 6 appears to relate largely to contemporary working. In the Saxo-Norman period, the main product was the single-sided composite comb, a type familiar from many sites of the period both locally and nationally. In the late medieval to post-medieval periods, the production of cutlery and other implement handles is evident.

Deer bones in general are rare from the site although thirteen identified specimens of post-crannial deer bone were found within the barbacan well (see Moreno García, Chapter 9.14 and Part III). This low ratio of deer bone to antlers is reflected at other Norwich sites and indicates that the majority of the antlers here were naturally shed and had been collected off site. At the adjacent Greyfriars site (Site 845N), the majority of antlerworking waste was recovered from Late Saxon deposits although post-crannial deer bones were found in deposits earlier than the 13th century (Moreno García, in Emery 2007). Most of the identifiable pieces from Castle Mall came from post red deer, although fallow and roe deer bones were present (none of the latter being worked). Antlers associated with the barbacan well in Area 5 (G5/24 Period 5.2; and G5/52; Period 6.1) include both fallow and red deer.

The assemblage from Castle Mall consists of primary and secondary waste (Table 13.24). Primary waste includes all split and or sawn antler, while secondary waste is sawn and further worked, its shape often reflecting the intended finished item.

The various stages of antlerworking are described by MacGregor (1985, 55–71), where analytical work on excavated material by Ulbricht (1978), Ambrosiani (1981) and Christophersen (1980) is summarised. The Castle Mall waste fits neatly into these known stages. A recent analysis of antler waste has been carried out on the material from Fishergate, York (Rogers 1993), which includes a considerable quantity of comb waste.

A small concentration of waste at Castle Mall was found in a Late Saxon pit in Area 9 (pit 918/6, G9/39, Open Area 1/6, Period 1.3) which contained 5 sawn fragments and an antlerworking wedge. In addition to the composite horn and bone combs from the Castle Mall site noted above, up to ten pieces of single-sided antler combs were recovered from Period 2 deposits. Small quantities of primary and secondary antler waste were also recovered, largely from Area 9 (all from red deer), suggesting the manufacture of antler combs on or near the site. Further antler objects and antlerworking waste of possible Late Saxon date had been recovered during earlier excavations in the north-east bailey (including a comb fragment, a tool used to split cores for comb manufacture and twelve probable comb blanks; Ayers 1985, 45–47). Various other sites around the perimeter of the castle have also produced quantities of worked antler (Sites 16N, 17N, 356N, 417N, 718N and 845N), all of them lying to the north-east (Fig. 13.2). Excavations in 1979 within the north-east bailey produced a few pieces of antler debris, which were identified as uncut tooth segments and antler blanks for the production of Late Saxon composite combs (Site 416N; Margeson and Williams 1985). Significant amounts of antlerworking waste dating to the 11th to 12th century have recently been excavated at Greyfriars (Site 845N, Huddleson Emery 2007). This group amounts to 460 pieces, again relating to manufacturing debris for the production of composite combs. The distribution of antlerworking waste therefore has a notable concentration around the Castle Meadow and indicates antlerworking in the vicinity in the Late Saxon and/or Norman periods, although the general scatter indicated in Fig. 13.2 simply reflects the suggested extent of the contemporary settlement.

The utilisation of antler at the Castle Mall site was evident again in the late medieval/transitional and post-medieval periods. The mid/late 15th- to early 16th-century fills of the barbacan well contained, inter alia, a near-complete fallow deer antler, along with the post-cranial bones noted above (Period 5.2; see Chapter 9.11). A late 16th- to early 17th-century layer around the top of the barbacan well contained 18 worked antler fragments and other evidence for the manufacture of handles (layer 50077, G5/52, Period 6.1; see Huddles, Chapter 10.1.1).

Ivoryworking
Post-medieval bone workshops were also supplied with more exotic raw materials and, at Castle Mall, ivoryworking waste was found in fills of the barbacan ditch (Riddler in Chapter 10.3). The evidence includes a comb trial piece and fragments of discarded elephant tusk. A number of London sites near the Tower (Tower Hill West

<table>
<thead>
<tr>
<th>Period</th>
<th>Primary waste</th>
<th>Secondary waste</th>
<th>Wedge</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>1</td>
<td>2</td>
<td>18</td>
</tr>
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<td>3</td>
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<td>3</td>
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</tr>
<tr>
<td>5</td>
<td>14</td>
<td>3</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>6</td>
<td>24</td>
<td>4</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>unstrat.</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>61</td>
<td>11</td>
<td>4</td>
<td>76</td>
</tr>
</tbody>
</table>

Table 13.24 Quantity of antler-working waste and antler-working tools recovered by period at Castle Mall.

1031