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6 Driffield Terrace, York: Vertebrate remains analysis

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Cover photograph: Horse bones 1107 *over skeletons* 1124 *and* 1126*, looking north-west*

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Summary

A moderate quantity of animal bones was recovered from deposits of late 2nd to 4th century date from excavations at 6 Driffield Terrace, York. The vertebrate material discussed in this report came from grave fills, pits and layers associated with an extensive Roman cemetery located to the south of the Roman colonia *adjacent to one of the main Roman roads approaching the city.*

Most of the vertebrate assemblage was recovered from features assigned to Phases 4 and 5, including the part skeletons of several horses associated with the fills of multiple graves from Phase 4. The assemblage was characterised by variable preservation in different areas of the site and a high degree of fragmentation throughout, the latter mainly a result of fresh breakage but also caused by reworking and redeposition of the material during cemetery activity. Most of the non-equine remains appeared to represent primary butchery waste, with some refuse from secondary butchering activities such as processing for marrow and kitchen waste. Although the horse remains were originally thought to be of some ritual significance, the random distribution of the fragments and the presence of other horse bones scattered throughout the cemetery deposits suggests the disturbance and redeposition of material by later human burials rather than the deliberate inclusion of grave goods/offerings.

Keywords: 6 Driffield Terrace; York; Technical Report; Roman; 2nd to 4th Century; Roman Cemetery; Vertebrate Remains; Horses

Introduction

An archaeological excavation was undertaken at 6 Driffield Terrace, York (centred on NGR SE 5928 5095), by York Archaeological Trust between 20 June and 30 August 2005.

The site lies to the south of the Roman *colonia* and the medieval walls of the city, close to a principal Roman road leading south-west from York to Tadcaster. An extensive and prestigious Roman cemetery was known from previous excavations and chance discoveries to exist along the line of this road. The 2005 excavations at the site revealed a long sequence of alternating cut features and deposits associated with the use of this area as a burial ground. Earlier activity at the site showed evidence for pit-digging, with burials becoming increasingly frequent over time.

Dating, provided by both pottery and analysis of the stratigraphic relationships between archaeological features and layers, allowed the identification of a number phases ranging from the late 2nd/early 3rd centuries AD through to the modern period.

The initial assessment of the hand-collected vertebrate remains assemblage (Carrott *et al*. 2005), undertaken by Palaeoecology Research Services (PRS) in 2005, revealed an unusually high concentration of horse bones associated mainly with a Phase 4 multiple burial. These remains included several sequences of articulated vertebrae representing at least four individuals. The vertebrate remains were considered to have potential for further analysis to provide additional information regarding activity at the site.

This report examines the hand-collected animal bone from the Roman phases of the site:

Phase 2: Romano-British clearance and dumping (late 2nd/early 3rd century)

Phase 3: Romano-British possible cemetery (late 2nd/early 3rd century)

Phase 4: Romano-British burials, including decapitations (mid- to late 3rd century)

Phase 5: Romano-British, decapitated burials and a cremation (?4th century)

Table 1 lists the contexts (and phase groups) from which the material was selected for detailed recording. Overall, 1545 bones, representing 59 deposits, were examined; most of these were derived from Phase 4, with considerably less material recovered from Phase 5 and very little from Phases 2 and 3.

Methods

All of the hand-collected animal bone from the selected deposits was examined and semi-quantitative information recorded concerning fragment size, the state of preservation, colour, and the appearance of broken surfaces ('angularity'). Any variations in surface integrity, angularity and colour were then used to grade material from individual contexts into categories of differential preservation: Category 1 = consistent preservation; Category 2 = less than 20% of the fragments differentially preserved; Category 3 = over 20% of the fragments show differential preservation. Contexts which gave fewer than five bones (after refits) were not categorised. Additionally, information was recorded (for individual bones) concerning dog-gnawing, burning, butchery and fresh breaks.

Identifications were made via comparison with modern reference material at PRS and published works (e.g. Schmid 1972). Where possible, fragments were identified to species or species group. Fragments that could not be identified to species were grouped into a number of categories: large mammal (assumed to be cattle, horse or large cervid), medium-sized mammal 1 (assumed to be caprovid, pig or small cervid), medium-sized mammal 2 (assumed to be dog, cat or hare) and totally unidentified.

Distinctions between sheep and goat bones were made using comparative material and with reference to Boessneck (1969); in the event, no goat bones were identified but the possibility of their presence cannot be discounted completely. The equid bones from this site could, besides being horse, possibly represent the remains of mules or donkeys (however, neither of the latter was positively identified within the assemblage).

Selected elements were recorded using the diagnostic zones method described by Dobney and Rielly (1988). Minimum number of individuals (MNI) was also estimated using the zones method, but numbers were too small for detailed interpretation. Fragments which could confidently be refitted have been counted as one bone.

Evidence of butchery was noted where present, as were any pathological conditions or non-metrical traits. Measurements follow von den Driesch (1976) unless specified otherwise. Withers height for horses was estimated using calculations devised by Kiesewalter (in von den Driesch and Boessneck 1974) and are quoted in 'hands' (hh), where each 'hand' is equivalent to four inches (approximately 101.6mm). Withers heights for cattle were estimated as outlined by Foch (1966) and those for sheep followed Teichert (1975). A record of all measurements taken can be found in the Appendix.

Tooth wear stages for caprovids were recorded using the scheme outlined by Payne (1973; 1987), and those for cattle and pig followed the scheme set out by Grant (1982). Where possible, cattle, caprovid and pig mandibles were assigned to the general age categories outlined by O'Connor (1991), but data were extremely limited.

Mammal bones were described as 'juvenile' if the epiphyses were unfused and the associated shaft fragment appeared spongy and porous. They were recorded as 'neonatal' if they were also of small size. Where discussed in the text, epiphyseal fusion data were assigned to age categories outlined by Silver (1969) and O'Connor (1991).

Nomenclature for mammals follows Corbet and Southern (1977).

Results

Excavations at this site produced a moderate assemblage of vertebrate remains from deposits associated with the Roman cemetery. Most of these (68%) were recovered from features assigned to Phases 4 and 5, primarily grave fills, with a significant amount also present in deposits described as cemetery layers (20%). The remainder were mostly retrieved from features described as pits, some of which may also have been graves, although no human remains were present. Horse remains were prevalent, with little material from the other main domesticates (i.e. cattle, caprovid, pig).

The amount of material useful for age-at-death and biometrical data was limited; this was mainly the result of extensive fresh breakage that had occurred during excavation processes. As a result of this dearth of data, little interpretation of these aspects of the assemblage was possible but some general comments regarding age-at-death for cattle, caprovid and pig, and an archive of biometrical data, can be found in the Appendix.

Details of the vertebrate assemblage follow, grouped by phase. Table 1 provides summary details of the contexts from which material was examined, Table 2 details the vertebrate remains by phase, with percentages and frequencies by phase shown in Table 3. Details of the remains by feature type can be found in Table 4, whilst differential preservation information can be found in Table 5. Tables 6 and 7 give details of horse skeletal element representation by phase and by selected context, and horse, cattle and sheep withers heights are listed in Table 8.

Phase 2: Romano-British clearance and dumping (late 2nd/early 3rd century)

Vertebrate material (20 fragments) from this phase was recovered from four deposits, with most of the remains recovered from grave fill Context 1182. Context 1155 was also a fill within the same grave and gave a further three fragments, whilst four came from pit fill Context 1116 and a single fragment from a cemetery layer, Context 1108. The preservation of these remains was good, although extensive fresh breakage was apparent for the material from Context 1182.

The bulk of the identified remains from this phase were identified as horse (or ?horse) and were recovered from the two grave fills, whilst pit fill Context 1116 produced a cattle mandible fragment and a caprovid metacarpal. The unidentified fraction included three medium-sized mammal 1 shaft fragments (two from Context 1116 and one from the cemetery layer, Context 1108) and large mammal scapula and vertebra fragments from grave fill Context 1182. A human bone, possibly a clavicle from a child, was also noted from this deposit.

The horse remains, which were primarily fore limb elements, but with a pelvis and a femur fragment and several horse vertebrae (Tables 6 and 7), represented adult animals. These may be all from the same individual but this could not be determined and the fore limb elements

were not all from the same side so had either been disarticulated when placed in the grave or subsequently disturbed by grave digging activities. It is thought that these remains may be associated with those recovered from several Phase 4 grave fills (see below).

Phase 3: Romano-British possible cemetery (late 2nd/early 3rd century)

Six Phase 3 deposits produced a very small collection of animal bone amounting to 25 fragments. Most (19) of these fragments came from Context 1148, a cemetery layer, whilst two were recovered from Context 1147, a pit or ?empty grave, and single fragments came from each of four other deposits, Contexts 1132 (a cemetery layer), 1162 (?packing/backfill of a ?funerary structure), 1168 (cemetery layer) and 1185 (fill/use of ?rubbish pit). The large mammal ulna fragment from Context 1162 was extremely battered in appearance but the material from the other deposits was consistently of good preservation, with a little evidence of butchery, dog gnawing and fresh breakage; the last was particularly apparent for the material from Context 1148.

Identified remains (four fragments) were mainly concentrated in cemetery layer Context 1148 and were all of horse, with an additional horse bone recovered from Context 1147. These remains included two mandible fragments, an isolated incisor and a piece of scapula. The unidentified component (21 fragments) consisted of large and medium-sized mammal 1 bones, together with a single small mammal shaft fragment. None of the remaining fragments could be identified or assigned to a particular size category.

Phase 4: Romano-British burials, including decapitations (mid- to late 3rd century)

The vertebrate assemblage from Phase 4 amounted to 1125 fragments, representing 33 deposits, seventeen of which were grave fills, ten were cemetery layers and six were pit fills. Just over 70% of the remains were from the grave fills and the bulk of the identified fragments from these deposits were of horse.

Material from some of the deposits showed a significant degree of variation in preservation, angularity and colour, indicating an element of residuality or reworking within these deposits (Table 5). Contexts which were most affected included a number of the grave fills and cemetery layers. However, a considerable proportion of the material showed more consistent preservation, suggesting less disturbance in these deposits. Heavy fragmentation of the remains was widespread and much of this was attributed to recent damage; almost every deposit was affected by fresh breakage, some very severely. The most damage was observed on fragments from Contexts 1107 and 1144 (fills of Graves 1130 and 1150, respectively). The amount of material able to provide age-at-death and biometrical data was limited; again this was partly a consequence of fresh breakage during excavation but may also be a reflection of post-depositional fragmentation occurring during subsequent cemetery activity. Few bones were preserved complete, with those that were being predominantly small, robust elements such as carpals/tarsals and phalanges. Of the long bones that were more than 75% complete, almost all were of horse and most were from the grave fills. A few deposits contained material that was very fragmented, with little or no evidence for excavation damage. In some cases, such as a pit fill Context 1048, this fragmentation had occurred in antiquity, as a result of extensive butchering of the bones.

Dog gnawing was noted on some of the material; it was not particularly extensive, however, and did not affect more than three fragments from any deposit. Some of the chewed bones came from assemblages in which differential preservation was also noted, but several were present in deposits in which the preservation was consistent. A few of the horse bones from the grave fills had been affected, most often to the iliac crest but as this part of the pelvis is very

fragile and prone to crumbling, it was not possible to be certain about all of the suspected tooth-scoring and crenulation.

There was little evidence for butchery on the material but that observed showed the proportion of butchered bone and the evidence for specific butchery techniques to be consistent across the deposits. These consisted of chopped vertebrae and split long bone fragments, indicating division of the carcass and further processing for marrow extraction. A single cattle mandible from Phase 4 (Context 1144) had been chopped through the diastema, a butchery practice typical of the Roman period, particularly on urban sites (e.g. Dobney *et al*. 1996). A few knife cuts were observed on both the dorsal and ventral aspects of large and medium-sized mammal 1 rib fragments; these were probably sustained during skinning or evisceration. In addition, several of the large mammal rib fragments had been chopped laterally, perhaps to reduce them to 'pot size'. Over 50% of the butchered fragments were identified as cattle or categorised as large mammal. Butchery was also recorded on the horse bones, including chopping to some of the pelves, mainly around the acetabular area (Contexts 1095, 1107, 1144 and 1149), as well as chopping and splitting to some of the long bones (Contexts 1048 and 1182). Although these were few in number, most were associated with graves. Far fewer marks were observed on pig or sheep bones but these also made up a proportionally smaller fraction of the assemblage.

Pit fills

One hundred and six bone fragments were recovered from the six pit fills from this phase (Contexts 1069 and 1133 may in fact be fills of graves but no skeletons were encountered), but only Context 1048 (fill of pit/linear 1061) produced more than ten fragments, giving an assemblage of 87 bones (Table 1). As noted above, the material from this fill was dominated by butchered fragments, with chopped vertebrae and split long bones (including a horse metatarsal shaft) present.

The identified remains from Context 1048 included cattle, pig, caprovid and horse, with many of the fragments representing head (skull, maxilla, isolated teeth) and terminal limb elements (metapodials and phalanges) indicative of primary butchery waste. The unidentified component consisted mainly of large and medium-sized mammal 1 rib and vertebra fragments, with smaller numbers of pieces of shaft and cranium.

None of the other pit fills produced remains worthy of note, with few fragments being identifiable; however, part of a horse mandible was recovered from Context 1133 (?empty grave/pit fill), a cattle metatarsal and a phalanx from Context 1140 (packing/fill of post pit) and a cattle mandible (from an elderly individual) from Context 1138. This last fragment had porous and significantly reduced alveolar bone around the molars, possibly the result of periodontal gum disease. It also displayed a non-biometric trait in the form of a reduced third molar due to a partial absence of the distal column. This is a genetic anomaly not uncommon in cattle populations at this period (O'Connor 1988; Dobney *et al.* 1996) but the aetiology is unclear.

Cemetery layers

Ten cemetery layers produced 225 fragments of bone, although, of these, six each gave less than 20 pieces. Those with more bones, i.e. Contexts 1095, 1102, 1109 and 1114, overlay Graves 1103, 1130 and 1150 and were described as upcast from nearby graves or, in the case of Context 1095, a possible grave mound. Preservation of the material from these four deposits was somewhat variable, particularly material from Contexts 1109 and 1114. The presence of an occasional fragment of battered appearance and variations in the colour of the bones suggested that some of the material within these deposits was reworked or redeposited from elsewhere.

The main domestic mammals were represented, with horse remains being prevalent amongst the identified remains from Contexts 1095 and 1114, and to a lesser extent from Contexts 1102 and 1109. For horse, fragments of mandible, isolated teeth and vertebrae were the most commonly occurring skeletal elements (although other parts of the body were present). Cattle, caprovid and pig remains were also identified, and for caprovids a range of skeletal elements were recorded, with mandible fragments and isolated teeth again quite numerous. The scant age-at-death information available suggested that most of the animals represented were adult and the only evidence for immature individuals was a caprovid mandible with deciduous premolars from Context 1095 which represented an individual of two to six months of age.

The unidentified component consisted primarily of large and medium-sized mammal 1 rib, shaft, vertebra and cranium fragments, with quite a large proportion of fragments which were entirely unidentifiable.

Several horse bones showed possible evidence of butchery – a scapula with knife marks on the blade and a chopped pelvis fragment (both from Context 1095) – whilst marks on other bones were rare and limited to chops on large mammal ribs and vertebrae, and two split large mammal long bones.

A horse mandible from a Phase 4 cemetery layer (Context 1102) exhibited a degree of undulation to the occlusal surfaces, a condition commonly referred to as 'wave mouth'. The cause may be absent teeth or defective opposing teeth resulting in uneven grinding surfaces and has been observed to be significantly associated with age in studies on donkeys (du Toit *et al.* 2008) and horses (Brosnahan and Paradis 2003). This can lead to periodontal disease and excessive wear of some of the teeth and eventually to some discomfort or trouble with mastication.

Grave fills

Remains of horse dominated the grave fills, although many of the fragments belonged to several possible part skeletons and were mainly concentrated in a small number of deposits (Contexts 1107, 1144, 1149) which are detailed below. Remains from Contexts 1046 (fill of Grave 1047), 1062 (fill of Grave 1063) and 1111 (fill of Grave 1128) were few and primarily unidentified to species. A single pig scapula fragment and a caprovid calcaneum were recovered from Context 1062, with a dog incisor and a horse mandible fragment from Context 1111. The nine fills from Grave 1103 (Contexts 1104, 1123, 1125, 1208, 1209, 1210, 1211, 1212 and 1213) only produced a small assemblage of bones amounting to just 56 fragments. Thirteen of the bones were identified and included horse (8), cattle (3), pig (1) and dog (1), with the unidentified fraction consisting mainly of large mammal vertebra and rib fragments. Butchery was commonly observed on the vertebrae and, notably, on a horse distal tibia which had been chopped and split. Another assemblage of note was a near complete sheep skeleton within Grave 1118 (see below).

Grave 1118

A sheep skeleton was found lying over a human burial in Grave 1118 (Context 1204), a position which suggests that this may represent a deposit specifically associated with funerary activities. Tooth wear and epiphyseal fusion indicated that the skeleton was from a sheep of approximately three years of age. Most of the skeleton was present, although, possibly as a result of diagenetic processes, the left side of the animal was more complete than the right. The cranium, foot bones (with the exception of a single 2nd phalanx), right lower limb bones and right radius and ulna were not recovered, although a few small pieces of horn core and a fragment of maxilla indicated that the skull had originally been present. Chop marks suggested

that the hind legs, and possibly the forelegs, had been removed and then deposited with the rest of the carcass. The femora had been chopped through close to the proximal articulation and more chop marks were noted on the left tibia. Recent damage to the right tibia precluded the identification of any butchery evidence. The fore limbs showed chop marks mid-shaft to the left radius and ulna. A number of vertebrae and ribs, which could be identified only as sheep/goat or medium-sized mammal 1 but were almost certainly part of the same individual, also showed occasional cuts and chops. There was no charring or scorch marks to any of the bones that might indicate the carcass had been cooked.

Graves 1130 and 1150

The fills of Graves 1130 (Context 1107) and 1150 (Contexts 1144 and 1149) were characterised by the presence of numerous horse bones. Additional horse remains recovered from Phase 2 Grave 1183 (Contexts 1155 and 1182), which lay beneath, may also be associated. Apart from fresh breakage sustained during excavation, all the bones were in relatively good condition, with a high incidence of complete or near complete elements. Grave 1130 contained two very fragmented skulls, together with five articulating sequences of vertebrae and seven pelves. The vertebral columns comprised a complete sequence of cervical vertebrae (including the atlas and axis), several ankylosed thoracic vertebrae and three distinct sequences of lumbar vertebrae. It is likely that the cervical vertebrae related to one of the skulls, but fragmentation or the absence of the occipital area, and recent damage to the atlas, precluded confident determination. The assemblage from Grave 1150 was dominated by limb bones, but also included scapulae, pelves, two shorter sequences of articulating vertebrae and two mandibles with additional isolated mandibular teeth. Fresh breakage damage restricted the measurement of the bones but measurements and visual examination confirmed the presence of a pair of skeletal elements, left and right radii from Context 1144. The fills of Graves 1130 and 1150 both included remains representing at least four horses (i.e. the minimum number of individuals for each deposit was four).

As a result of the fragmentary nature of the material, estimating the ages of the horses was problematic. Epiphyseal fusion was complete on all skeletal elements with the exception of a few vertebral physes. Two lumbar vertebrae from Context 1107 and three cervical vertebrae from Context 1144 had posterior physes that were fusing or just fused. These bones typically fuse at five years of age or over, with the cervical vertebrae possibly later than the others (Bennett 2008). Most of the remains, therefore, were from animals likely to be over five years old, with at least one individual which was younger (approximately five years in age). However, these estimates of age are only a guide, given that a number of factors, including poor nutrition, can seriously delay epiphyseal fusion.

There were no intact incisor rows, but five isolated incisors were refitted with the mandible of a (probably) male horse. All of these had lost the central infundibular, suggesting an estimated age of at least nine years (Silver 1969). The remaining loose incisors (with the exception of one from Context 1144) were similar, suggesting that these also represented mature animals.

There was some evidence for butchery to the horse skeletons; this was mostly noted around the acetabular area of some of the pelves. Several long bones also seemed to have been split or smashed. This process is usually associated with marrow extraction but damage to the bones could have occurred during later disturbance and would be difficult to distinguish from butchery processes if the bone was still relatively ‘green’. One of the fragmented skulls from Context 1107 also showed evidence of numerous knife marks.

Despite the small number of measurements that could be taken as a result of the extensive

fresh breakage damage, it was possible to estimate withers heights from some of the horse bones. These were calculated from the greatest lateral length measurements of complete skeletal elements from Contexts 1144 and 1149 (Table 8). These calculations produced a range of height values, from 1301.2 to 1441.5mm. When converted to 'hands', these indicate the presence of ponies and horses of between 12.3 and 14hh.

Several pathological conditions were seen on some of the horse bones from the grave fills. A sequence of eight thoracic vertebrae from Context 1107 displayed varying degrees of spondylosis resulting in a severe case of intervertebral ankylosis. Pathological bone growth had formed a bridge between the centra of the 11th, 12th and 13th vertebrae, with 'finger-like' projections of bone extending from the ventral aspect of the centrum on some of the others, showing an earlier stage of the condition. The aetiology of this condition is not clearly understood but it has been attributed to excessive flexion of the vertebral column which leads to overstretching of the intervertebral disc. A study of 245 equids, including several species of non-domesticated horses and zebras, found the condition to be present only in the domesticated horses (Stetcher and Goss 1961). An extreme case was reported by Bartosiewicz (2002) on a Migration Period horse skeleton from Hungary in which a column of eleven thoracic and six lumbar vertebrae had become fused. It has been linked with repeated overloading and also with aged broodmares who have had repeated pregnancies. However, the isolated horse teeth from the same deposit included a large canine more likely to represent a male animal and the pelves that could be sexed all showed male characteristics (Pam Cross pers. comm.) it is, therefore, possible that the vertebrae are from a male horse in which case the cause is more likely to be overloading. Although fusion of the vertebrae may have caused a stiffening of the back, it is possible that the symptoms were mild (Miller *et al*. 1996, quoted in Bartosiewicz 2002).

The 2nd premolar of a horse mandible from Context 1144 had a distinct bevel to the rostral cusp which may be evidence of bitwear (Anthony and Brown 1991). This mandible was from a horse estimated to have been at least nine years old. By contrast, a mandible from a different individual in the same deposit displayed no bevel to the second premolar.

Context 1149 contained a fragment of horse metacarpal with an accessory medial metacarpal fused to the main metacarpal, a condition commonly known as a 'splint'. It is more frequently observed on the metacarpals than the metatarsals and on the medial rather than the lateral side, possibly because those areas carry a greater burden and are more subject to stress (Bendray 2007). Repetitive stress on, or trauma to, the connective ligaments between the metapodials leads to their ossification. Splints are most usually formed while the horse is young but development in old horses is not unknown.

Horse remains from the underlying deposits (Contexts 1155 and 1182), the fills of Grave 1156/1183, were very similar in appearance and preservation although not as numerous. These remains may be associated with the horse bones from the graves in the later features. Skeletal elements present in these fills included fore limb elements (scapula, humerus, radius, ulna), although not all from a single leg, pelvis and femur fragments, and a number of vertebrae.

Overall, from both phases, there was a total absence of caudal vertebrae and a scarcity of terminal limb bones: just three phalanges, one metacarpal and an accessory metapodial were recovered. The lack of caudal vertebrae in the deposits may be due to taphonomic processes or recovery bias, but it may also indicate that the horses had been skinned before burial and the tails removed with the hides. Small cuts to one of the skulls were also probably sustained during skinning.

Phase 5: Romano-British, decapitated burials and a cremation (?4th century)

This phase was represented by 11 grave fills, three cemetery layers and two pit fills, which produced a total of 375 fragments. The largest quantities of bone came from within the graves (262 fragments), whilst the layers gave 72 fragments and the pits 40 fragments. Almost 40% (144 fragments) of the remains were recovered from a single grave fill, Context 1022, but much of the material was small unidentified fragments which were collected during the recovery of cremated human remains; this level of recovery would not normally be achieved during hand-collection and has artificially increased the number of fragments from this context relative to the rest of the assemblage.

Overall, preservation of the remains from this phase was similar to that seen from Phase 4, with the fragments generally being in good condition (Table 5). Some variability of angularity and colour was noted; this was particularly evident from cemetery layer Contexts 1031 and 1032, pit fill Context 1087 and two of the grave fills, Contexts 1008 and 1203. Fresh breakage damage was recorded throughout but was most frequent within the material from Contexts 1031 and 1087. Dog gnawing and butchery marks were also observed in most of the assemblages but neither affected many of the bones.

Pit fills

Of the two pit fills, most of the vertebrate material was recovered from Context 1087, with just a single large mammal cranium fragment from possible pit fill Context 1059. Most of the identified remains from pit fill 1087 represented the main domestic mammals, including pig, horse, cow and caprovid. The horse remains, a humerus, radius and ulna, may represent the fore limb of a single individual, whilst the pig remains included two mandibles, together with maxilla, cranium and scapula fragments. Only single fragments of cattle and sheep were recovered. Two fragments of red deer (*Cervus elaphus* L.), a calcaneum and a piece of mandible were also present, representing the only wild mammal remains from the site. The unidentified component consisted mainly of large and medium-sized mammal 1 rib and vertebrae fragments, with a small number of shaft fragments. The rather variable preservation and mixed appearance of the material, together with the presence of several human bones (returned to the excavator following the assessment) strongly suggested that some of the material was residual or, at least, that not all the remains derived from the same origin or activities.

The two pig mandibles (from Context 1087) were from adult individuals of approximately two to two-and-a-half years of age. Where epiphyseal fusion data were available the bones were mostly fused, the exceptions being two vertebra fragments.

Cemetery layers

The three cemetery layers, Contexts 1031, 1032 and 1049, produced a total of 72 fragments, of which only thirteen could be identified to species. Cattle and horse remains were the most commonly occurring, with small numbers of pig bones and single fragments of caprovid and dog. Large and medium-sized mammal 1 rib and vertebra fragments were prevalent in the unidentified component, with some cranium and shaft fragments also recorded. These remains appeared to represent general refuse, with some of the bones likely to be residual or reworked during grave digging as evinced by the variable preservation noted and the somewhat battered appearance of some of the fragments. Not surprisingly, human remains were recovered from Context 1031 (noted during the assessment – Carrott *et al*. 2005); again these are indicative of residual components within these deposits.

Epiphyseal fusion and dental attrition data were scant and insufficient to provide any useful details regarding the age of the animals at death.

Grave fills

The bulk of the animal bone (260 fragments) from this phase was recovered from the eleven grave fills, but as already noted above over half of these fragments were recovered from Context 1022 and many (122) were small and completely unidentifiable. Of the remainder of the fills, only three others (Contexts 1020, 1026 and 1033) produced more than ten fragments.

The main domestic mammals (cattle, caprovid, horse, pig) were recorded from the deposits, with caprovid remains being most numerous. Many of the identified remains represented head (mandibles, isolated teeth) or terminal limb (metapodials, carpals, tarsals and phalanges) elements. This was even the case for the dog remains recovered from Context 1022 which included two phalanges and a carpal. Large and medium-sized mammal 1 rib and shaft fragments and large mammal vertebrae were prevalent within the unidentified assemblage.

No one species was concentrated in any of the fills and the differential preservation noted for several of the deposits (Table 5) suggested that, as seen for Phase 4, the vertebrate remains were likely to be reworked or residual. The skeletal elements (for cattle, caprovid and pig) that dominated the assemblage were typically those interpreted as primary and secondary butchery waste. There was no evidence for the deliberate placement of animal bones in the graves, although the fragments of dog in Context 1022 may be related to the human cremation, in spite of the fact that there was no evidence for burning.

Discussion

The vertebrate assemblage from 6 Driffield Terrace, York, was of moderate size and primarily recovered from grave fills and cemetery layers dated to the 3rd and 4th centuries AD. Remains of domestic mammals predominated, with horse bones prevalent throughout. Differential preservation of the bone assemblage from many of the feature fills and layers suggested an element of residuality and potential reworking of some of the deposits, an interpretation not altogether surprising given the context of an extra-mural cemetery. Reworking of the deposits was also indicated by the presence of occasional fragments of human bone in pits and cemetery layers, noted during the assessment of the assemblage (Carrott *et al*. 2005). Evidence for butchery in the animal bone assemblage was low (approximately 8% of fragments affected), so the high degree of bone fragmentation noted clearly occurred post-mortem. Fresh breaks indicated that most of the fragmentation took place during the excavation, although some had also clearly occurred in antiquity. Much of this can be attributed to breakage caused by grave digging and attrition caused by trampling of bone material as it was subsequently incorporated into paths and other hard surfaces.

Given the preservation of the material, together with the size and composition of the assemblage, and the nature of the features from which it was recovered, little insight could be gleaned into aspects of agro-economic activities in Roman York during this period. However, some aspects of funerary rituals, potentially involving animal remains, were further explored.

Despite an examination of the assemblages from different feature types, no clear patterns emerged regarding the distribution of the cattle, caprovid or pig remains. Butchery practices encountered, such as split and heavily chopped pieces of cattle and large mammal long bone (particularly evident on the bones from Context 1048) were not dissimilar to those seen on Roman material from other urban centres of this date (see, for example, O'Connor 1988; Dobney *et al*. 1996). There was little indication that any of the butchered cattle, caprovid and pig remains constituted the remains of joints of meat intended as grave offerings, and body part representation for these taxa seemed to show a prevalence of bones more likely to represent waste from primary butchery and from secondary carcass preparation, with the large and

medium-sized mammal component generally showing an emphasis on rib, vertebra and shaft fragments.

Additionally, there was a near absence of burnt bone, which (if present) might have suggested cooked or cremated grave offerings or redeposited pyre debris similar to that recovered from deposits at Brougham Roman cemetery in Cumbria (Bond and Worley 2004); charred or calcined fragments were limited to just eleven tiny unidentifiable pieces at Driffield Terrace. With the exception of the sheep skeleton from grave 1118 (Phase 4), the remains of the major domestic mammals from 6 Driffield Terrace provided no evidence that they represent the remains of deliberately deposited ritual offerings or sacrificial remains.

The most significant aspect of the assemblage was the considerable quantity of horse remains deposited mainly in the northern corner of the site. These differed from the rest of the mammal bone assemblage in that their preservation was mostly consistent, with some of the skeletal elements being in a state of near completeness. Many of the equid bones were concentrated in the fills of Graves 1130 and 1150 (Phase 4) and may have originally represented part skeletons, although only two part vertebral columns were clearly articulated *in situ*. Small numbers of horse remains were also recovered from Grave 1103 and possible associated remains were recorded from the underlying fills (Contexts 1155 and 1182) of Phase 2 Grave 1156/1183. Also of interest was the presence of horse remains within the general cemetery layers (Contexts 1095, 1102 and 1114) that overlay Graves 1130 and 1150. These deposits produced horse long bones, representing both the fore (scapula, radius) and hind (femur, tibia, calcaneum) limbs, together with fragments of mandible, pelvis and several isolated teeth. The horse bones from Grave 1150 (the large pit reused as a grave for Skeleton 23) contained predominantly limb bones (Table 7), whilst Grave 1130 (containing the remains of three decapitated inhumations) produced fragments representing two horse skulls and several rows of articulated vertebrae.

The spatial distribution of the skeletal elements within Graves 1130 and 1150 was initially interpreted as showing intentional and considered redeposition, leading the excavator to conclude that the horse remains were part of the burial ritual. Whether these horse remains represent ritual offerings or general refuse is difficult to ascertain. Clearly, where animal deposits (in particular complete skeletons or articulated limbs) are associated with certain structures, or site types such as the cemetery at Driffield Terrace, and/or there is evidence of deliberate placement, or association with other artefacts, then there is reason to suspect the remains could represent some form of ritual activity.

There is considerable evidence for the use of animals in the varied ritual activities of the Roman period (Philpott 1991; Lauwerier 2004). However, despite the evidence for the use of horses as votive offerings, or as foundation deposits (Luff 1982), equid remains directly associated with human burials from this period are rare.

Vertebrate assemblages recovered from previous excavations in the immediate vicinity have produced similarly high proportions of equid remains. At Trentholme Drive, 2nd/3rd century AD phases of the cemetery produced a small assemblage of animal bone in which horses were again the most commonly represented non-human remains recovered. Although the deposits were recorded as being of a disturbed nature and the horse bones were (as also seen at Driffield Terrace) single elements with no signs of articulation, the few horse bones associated with human skeletons were interpreted as being originally buried with the dead (Fraser and Ryder 1968). Within the 3rd century deposits at Moss Street Depot (Jaques 2006), equids were once again the most prevalent taxa recovered. Here the material was not found in association with inhumations (although graves were encountered at the site), but was instead concentrated

in adjacent ditches and thus thought to represent 'fly-tipping'. Nearby at Mill Mount, a small number of horse bones were found in association with 2nd/3rd century AD cremation burials and inhumations but there was no suggestion that these (mostly lower limb elements) were associated with ritual activity linked with the cemetery (Johnstone 2005). More recent excavations at the adjacent 1–3 Driffield Terrace, York, also produced several bones from the hind limb of a horse found in association with a burial and these were felt by the excavator to have been deliberately interred as part of the funerary rites. However, they were not recorded as being articulated *in situ* and dog gnawing was observed on two of the bones, which cast some doubt on their being of any ritual significance (Foster 2011). Further afield, quantities of horse remains recovered from the Roman Eastern cemetery in London (together with bones of other domestic species) were, for the most part, interpreted as waste (possibly from industrial processes involving the rendering of animal carcasses) that had been 'casually disposed of' (Barber and Bowsher 2000). Here, it was suggested that the location of the cemetery on the periphery of the Roman settlement made it an ideal place for dumping noxious waste as the area was already considered 'unclean'.

Instances where horse remains seem to have been deliberately deposited as part of funerary activities include Brougham cemetery in Cumbria (Bond and Worley 2004), where burnt horse bones were recovered from 3rd century pyre-debris deposits associated with the cremation of adults. There, the presence of relatively large amounts of horse remains, among the more conventional offerings of cattle, caprovid and pig, was considered very rare for the Roman period, and a phenomenon more prevalent in early Saxon burials (Bond 2010). At Brougham, the horses may have been symbolic of the status of the deceased, or a personal possession, but other ritual significance was not ruled out. For example, it was suggested that there may have been an association with the Celtic horse goddess Epona. The amount of burnt bone from Driffield Terrace was negligible, however, and there do not appear to be any similarities with the Brougham material.

A Late Antique (240–420 cal AD) inhumation from Usseau, France (Gleize *et al*. 2010), contained articulated horse bones that appeared to have been deliberately placed on top of two incomplete human skeletons – the human bones comprised skulls and long bones and seemed to have been selected from an earlier burial. It was thought that a horse pelvis, sacrum and an articulated set of cervical vertebrae had been interred at the same time as the reburial of (possibly) high-status individuals, although the authors did not suggest that the horse remains were definitely grave offerings or an accompanying food deposit for the dead.

Lauwerier and Hessing (1992) discuss the horse remains that were discovered in a large number of pits in a Roman cemetery outside an auxiliary fort at Kesteren in the Netherlands. In several cases, the horse bones, some still partly anatomically articulated, were found in combination with human burials and originally interpreted as 'horse and rider' graves. However, many were disarticulated and scattered and this, along with the presence of horse bone outside the area of the graves (considered to have no direct relationship with human burials) and new dating evidence, led to the conclusion that the site had been previously used as a convenient dumping ground for the carcasses of dead horses. Later cemetery activity had then disturbed these horse burials, with the bones being incorporated into the graves during backfilling. This scenario also fits well with the data from Driffield Terrace.

There is little other evidence for horse remains being included in human burials, although horse burials/sacrifices associated with cemetery sites are not unknown. They are sometimes found in places where there was already a strong tradition in the Iron Age for the use of horses for such activities. From some sites in Gaul, there is evidence for horse remains being deposited

in the boundary ditches of sanctuary sites and at temples during the Iron Age, with some continuation of this into the Roman period (Arbogast *et al*. 2002). The horse carcasses were treated in a variety of ways, with some remains deposited as whole individuals and others left to decay. At a few sites, only selected parts of the horses were found, the bodies having decayed elsewhere and parts subsequently redeposited into pits or ditches. It was not always apparent whether this was sacrificial waste or refuse from primary butchery of the carcasses from ritual meals.

On the basis of the available evidence, the equid bones from Driffield Terrace most likely represent the disposal and burial of multiple individuals (possibly as many as six), which were disturbed during later cemetery activity – the remains being incorporated back into the reworked grave deposits. The large pit or grave (1150) containing Skeleton 23 does not resemble a conventional grave for a human burial, being very large and round, and it is likely it was originally excavated (probably during Phase 4) for the burial of the horses and later cut into for the inhumation. The initial digging of the pit did not disturb an underlying inhumation (Skeleton 24) from Phase 2. Subsequently, later graves were dug, cutting into the pit and it is likely that at this time the horse bones were unearthed and then reinterred with the backfill of these graves. Despite the fact that the horse remains in the uppermost fill of Grave 1130 (Context 1107) appeared to lie in 'a rectangular spread' which the excavators suggested showed that they were originally deposited within a coffin (the presence of a coffin or box being implied by surviving nails), there appears to be little evidence for any real anatomical patterning, and there is every indication that the bones were disarticulated on deposition. If the horse skulls and vertebrae were redeposited with the backfill following the interment of the human remains, the confines of a narrow grave cut may have kept them within the periphery of the coffin edges. Subsequent decay of the coffin and settlement of the grave fill would have allowed the bones to collapse into the void beneath.

Terminal limb bones (metapodials, carpals, tarsals and phalanges) were almost entirely absent from the Driffield Terrace assemblage and only two mandibles were present. A study of the processes of decay and disarticulation of zebra carcasses (Hill 1979; Hill and Behrensmeyer 1984, quoted in Lyman 1994) found that the feet, mandibles and caudal vertebrae were the first elements to become detached, whilst the vertebral column was the last to disarticulate. The lack of any articulation of long bones at Driffield Terrace, and the close proximity of two parallel sequences of articulated vertebrae *in situ,* strongly suggests that the remains were in an advanced state of decay when redeposition occurred and that the mandibles and terminal limb bones would have become detached from the rest of the bones during the grave-digging. The larger and more obvious horse bones were then reinterred during the backfilling of the graves (probably the easiest means of disposal), whilst the smaller elements were most likely overlooked. Smaller amounts of similarly preserved horse remains, also in a state of near completeness, seem at this time to have been incorporated into the underlying Phase 2 grave (although still without disturbing the inhumation). There seems to have been little opportunity for dogs to scavenge the bones and the very limited evidence for gnawing suggests that either reinterment was reasonably prompt or that decay was so advanced as to make the bones unappetising. The chop marks to the pelves (mostly concentrated around the acetabular area) are not severe and it is possible that they were sustained when surviving tissues between the pelvis and femoral head were cut to make the carcasses more manageable.

The additional fact that Contexts 1107 (Grave 1130), 1144 and 1149 (Grave 1150) also included more 'general' refuse – including a relatively large amount of cattle and large mammal bone (some butchered) and abundant unidentified fragments – provides some support for the interpretation that the equids had been dumped with other refuse rather than being part of

a ritual deposit. Furthermore, the presence of horse remains within the cemetery deposits overlying the graves, rather than solely present within the graves themselves, implies that horse remains were being upcast into other deposits.

Archive

All material relating to the works reported here, together with paper and electronic records, is currently stored by Palaeoecology Research Services (Unit 4, National Industrial Estate, Bontoft Avenue, Kingston upon Hull), pending return to the excavator.

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Table 1 6 Driffield Terrace, York: Summary details of the contexts from which the hand-collected vertebrate remains were examined. Key: Frags = total number of fragments

Context	Phase	Date	Context description	Frags
1008	5	?4th C	Fill of grave 1028, decapitated skeleton, with coffin nails	10
1020	5	?4th C	Fill of grave 1021, decapitated skeleton, with coffn nails	13
1022	5	?4th C	Fill of grave 1023, cremation burial (with unburnt human skull)	144
1026	5	?4th C	Fill of grave 1027, decapitated skeleton	29
1031	5	?4th C	Cemetery layer	42
1032	5	?4th C	Cemetery layer	29
1033	5	?4th C	Fill of grave 1065, decapitated skeleton	19
1035	5	?4th C	Fill of grave 1036, decapitated skeleton	8
1037	5	?4th C	Fill of grave 1039, no skull or legs – plough damage or decapitated?	8
1040	5	?4th C	Fill of grave 1042 overlying skeleton	9
1043	5	?4th C	Fill of grave 1042 with decapitated skeleton and coffin nails	7
1045	4	mid- to late 3rd C	Cemetery layer	7
1046	4	mid- to late 3rd C	Fill of grave 1047, double burial, one decapitated?	6
1048	4	mid- to late 3rd C	Fill of pit/linear feature 1061	87
1049	5	?4th C	Cemetery layer	1
1051	4	mid- to late 3rd C	Cemetery layer	4
1054	5	?4th C	Fill of grave 1056, decapitated skeleton, with coffin nails	5
1059	5	?4th C	Fill of feature of uncertain function 1060, no skeleton or coffin nails	1
1062	4	mid- to late 3rd C	Fill of grave 1063	10
1067	4	mid- to late 3rd C	Cemetery layer	2
1069	4	mid- to late 3rd C	Fill of ?grave 1071, no skeleton	1
1070	4	mid- to late 3rd C	Cemetery layer	5
1072	4	mid- to late 3rd C	Cemetery layer	2
1087	5	?4th C	Fill of pit 1089	40
1091	4	mid- to late 3rd C	Cemetery layer	14
1095	4	mid- to late 3rd C	Grave marker or cemetery layer	92
1102	4	mid- to late 3rd C	Cemetery layer	35
1104	4	mid- to late 3rd C	Fill of grave 1103, multiple burial, 4 bodies in same coffin? (2 decapitated)	19
1107	4	mid- to late 3rd C	Fill of grave 1130, multiple burial with horse bones including skulls	272
1108	2	late 2nd/early 3rd C	Cemetery layer or dump	1
1109	4	mid- to late 3rd C	Cemetery layer	23
1111	4	mid- to late 3rd C	Fill of grave 1128, with skull in correct position	38
1114	4	mid- to late 3rd C	Cemetery layer	41
1116	2	late 2nd/early 3rd C	Fill of large pit 1117	4
1123	4	mid- to late 3rd C	Fill of grave 1103, multiple burial, 4 bodies in same coffin? (2 decapitated)	2
1125	4	mid- to late 3rd C	Fill of grave 1103, multiple burial, 4 bodies in same coffin? (2 decapitated)	6
1132	3	late 2nd/early 3rd C	Cemetery layer	1
1133	4	mid- to late 3rd C	Fill of ?grave 1134, only half excavated	4

Context	Phase	Date	Context description	Frags
1138	4	mid- to late 3rd C	Fill of rubbish pit 1157	10
1140	4	mid- to late 3rd C	Fill of post pit 1141	3
1144	4	mid- to late 3rd C	Fill of grave/large pit 1150 with ?decapitated inhumation, stone and horse bone	313
1147	3	late 2nd/early 3rd C	Fill of pit or ?empty grave 1164	2
1148	3	late 2nd/early 3rd C	Cemetery layer	19
1149	4	mid- to late 3rd C	Fill of grave/large pit 1150 wih ?decapitated inhumation, stone and horse bone	12
1153	4	mid- to late 3rd C	Post pit or pit 1154	2
1155	2	late 2nd/early 3rd C	Fill of grave 1156/1183	3
1162	3	late 2nd/early 3rd C	Packing or backfill of gully 1162. ?Funerary structure	1
1168	3	late 2nd/early 3rd C	Cemetery layer	1
1182	2	late 2nd/early 3rd C	Fill of grave 1156/1182	12
1185	3	late 2nd/early 3rd C	Fill of ?rubbish pit 1186	1
1201	4	mid- to late 3rd C	Fill of grave/large pit 1150 with ?decapitated inhumation, stone and horse bone	12
1203	5	?4th C	Fill of grave 1039, no skull or legs – plough damage or decapitated?	10
1204	4	mid- to late 3rd C	Fill of grave 1118; sheep skeleton lying over skeleton	74
1208	4	mid- to late 3rd C	Fill of grave 1103, multiple burial, 4 bodies in same coffin? (2 decapitated)	4
1209	4	mid- to late 3rd C	Fill of grave 1103, multiple burial, 4 bodies in same coffin? (2 decapitated)	2
1210	4	mid- to late 3rd C	Fill of grave 1103, multiple burial, 4 bodies in same coffin? (2 decapitated)	3
1211	4	mid- to late 3rd C	Fill of grave 1103, multiple burial, 4 bodies in same coffin? (2 decapitated)	17
1212	4	mid- to late 3rd C	Fill of grave 1103, multiple burial, 4 bodies in same coffin? (2 decapitated)	2
1213	4	mid- to late 3rd C	Fill of grave 1103, multiple burial, 4 bodies in same coffin? (2 decapitated)	1

Table 2 6 Driffield Terrace, York: Hand-collected vertebrate remains by phase. Key: * = sheep skeleton; some of the sheep/goat and medium-sized mammal 1 bones from this phase are also likely to represent the same animal

Species		**2**	**3**	**4**	**5**	**Total**
Canis f. domestic	dog	–	–	2	5	7
Equus f. domestic	horse	9	4	195	15	223
cf. *Equus* f. domestic	?horse	2	–	52	2	56
Sus f. domestic	pig	–	–	13	11	24
Cervus elaphus L.	red deer	–	–	–	2	2
Bos f. domestic	cattle	1	–	31	15	47
cf. *Bos* f. domestic	?cattle	–	–	1	–	1
Ovis f. domestic	sheep	–	–	26*	3	29
Caprovid	sheep/goat	1	–	29	12	42
Homo sapiens	human	–	–	1	–	1
cf. *Homo sapiens*	?human	1	–	–	–	1
Anser sp.	goose	–	–	1	–	1
Gallus f. domestic	chicken	–	–	4	1	5
Sub-total		14	4	355	66	439
Large mammal		3	3	158	61	225
Medium-sized mammal 1		3	1	94	53	151
Medium-sized mammal 2		–	2	3	3	8
Small mammal		–	1	–	–	1
Chicken-sized bird		–	–	1	–	1
Unidentified bird		–	–	–	1	1
Unidentified		–	14	514	191	719
Sub-total		6	21	770	309	1106
Total		**20**	**25**	**1125**	**375**	**1545**

Table 3 6 Driffield Terrace, York: Fragment counts – NISP (number of identified specimens) values and frequencies for the (positively identified) main domestic mammals, by phase

	Phase 2		**Phase 3**		**Phase 4**		**Phase 5**	
	NISP	%	NISP	%	NISP	%	NISP	%
horse	9	82	4	100	195	66	15	27
pig	–	0	–	0	13	4	11	19
cattle	1	9	–	0	31	11	15	27
sheep/goat	1	9	–	0	55	19	15	27

Table 4 6 Driffield Terrace, York: Main domesticates and unidentified material (excluding medium-mammal 2 and human remains) from graves, cemetery layers and pits, by phase

		Phase 2			Phase 3			Phase 4			Phase 5			
Species		graves	layers	pits	graves	layers	pits	graves	layers	pits	graves	layers	pits	Total
Canis f. domestic	dog	–	–	–	–	–	–	2	–	–	4	1	–	7
Equus f. domestic	horse	9	–	–	–	3	1	161	25	9	9	3	3	223
cf *Equus*	?horse	2	–	–	–	–	–	42	9	1	–	1	1	56
Sus f. domestic	pig	–	–	–	–	–	–	3	6	4	4	2	5	24
Bos f domestic	cattle	–	–	1	–	–	–	17	4	10	9	5	1	47
cf *Bos*	?cattle	–	–	–	–	–	–	–	1	–	–	–	–	1
Caprovid	sheep/goat	–	–	1	–	–	–	6	18	5	11	1	–	42
Ovis f. domestic	sheep	–	–	–	–	–	–	23	3	–	2	–	1	29
Anser sp.	goose	–	–	–	–	–	–	–	–	1	–	–	–	1
Gallus f. domestic	chicken	–	–	–	–	–	–	–	4	–	1	–	–	5
Large mammal		3	–	–	–	2	–	74	60	24	35	19	7	224
Medium-sized mammal 1		–	1	2	–	1	–	50	22	22	24	16	13	151
Unidentified		–	–	–	–	13	1	413	71	30	161	22	8	719
Total		14	1	4	–	19	2	791	223	106	260	70	39	1529

Table 5 6 Driffield Terrace, York. Differential preservation, by context, in features identified as graves compared with cemetery layers and pits. Differential preservation is defined as variation in structural integrity, angularity and colour. Key: 0 = less than 5 bones from this context (following refits to freshly broken material where possible); 1 = consistent preservation; 2 = differential preservation to less than 20% of assemblage from this context; 3 = preservation very mixed, over 20% differential preservation; * = more than 50 fragments from this context (following refits to freshly broken material where possible)

	Phase 2			**Phase 3**			**Phase 4**			**Phase 5**		
Differential preservation score	grave	layer	pit	grave	layer	pit	grave	layer	pit	grave	layer	pit
0	1155	1108	1116	–	1132 1168	1147 1185	1046 1123 1208 1209 1210 1212 1213	1051 1067 1072	1069 1133 1153 1140	1054	1049	1059
1	1182	–	–	–	–	–	1104 1107* 1125 1149 1211	1045 1091 1095* 1102	1048* 1138	1020 1022* 1033 1035 1037 1043	–	–
2	–	–	–	–	1148	–	1062	1114	–	1026 1040	1031	1087
3	–	–	–	–	–	–	1111 1144* 1201 1204*	1070 1109	–	1008 1203	1032	–

Table 6 6 Driffield Terrace: Total fragment counts for individual skeletal elements for horse by phase. Key: * = some from same individuals. Numbers in parentheses are cf. horse

Skeletal element	Phase 2	Phase 3	Phase 4	Phase 5	Total
cranium/maxilla	–	–	18 (+ 9)*	–	18 (+ 9)
mandible	–	2	15 (+ 2)		17 (+ 2)
isolated teeth	–	1	31*	1	33
scapula	1	1	5		7
humerus	1	–	7	1	9
radius	2	–	5	1	8
ulna	1	–	1	2	4
metacarpal	–	–	1	–	1
pelvis	1	–	15	1	17
femur	1	–	13 (+ 1)	1	15 (+ 1)
tibia	–	–	9	–	9
astragalus	–	–	2	2	4
calcaneum	–	–	3	–	3
carpal/tarsal	–	–	–	–	0
metatarsal	–	–	1	1	2
metapodial	–	–	1	1	2
phalanx 1	–	–	3	2	5
phalanx 2	–	–	1	1	2
phalanx 3	–	–	1	–	1
sacrum	1	–	2	1	4
atlas	1	–	1	–	2
axis	–	–	3	–	3
vertebra	(2)	–	49 (+ 20)*	(2)	49 (+ 24)
rib	–	–	8 + (20)*	–	8 (+ 20)
Total	**9 (+ 2)**	**4**	**195 (+ 52)**	**15 (+ 2)**	**223 (+ 56)**

Table 7 6 Driffield Terrace, York: Total fragment counts for individual skeletal elements for horse from Phase 2 Grave 1183, Phase 4 Graves 1130 and 1150 and cemetery layers overlying Graves 1130 and 1150. Numbers in parentheses are cf. horse

	Grave 1130	**Grave 1150**		**Grave 1183**		**Cemetery layers**		
Skeletal element	Context 1107	Context 1144	Context 1149	Context 1155	Context 1182	Context 1095	Context 1102	Context 1114
cranium/maxilla	16	–	(1)	–	–	1	–	–
mandible	–	8	–	–	–	1	2	–
isolated teeth	10	10	–	–	–	2	2	1
scapula	–	3	–	–	1	1	–	–
humerus	1	3	1	–	1	–	–	1
radius	–	2	–	–	1	–	–	1
ulna	–	1	–	–	1	–	–	–
metacarpal	–	–	1	–	–	–	–	–
pelvis	7	4	1	–	1	1	–	–
femur	(1)	10	–	–	1	3	–	–
tibia	–	6	–	–	–	–	–	1
astragalus	–	–	–	–	–	–	–	–
calcaneum	–	–	–	–	–	1	–	2
carpal	–	–	–	–	–	–	–	–
tarsal	–	–	–	–	–	–	–	–
metatarsal	–	–	–	–	–	–	–	–
metapodial	–	–	1	–	–	–	–	–
phalanx 1	2	–	–	–	–	–	–	–
phalanx 2	–	–	–	–	–	–	–	–
phalanx 3	–	1	–	–	–	–	–	–
sacrum	1	1	–	–	1	–	–	–
atlas	–	1	–	1	–	–	–	–
axis	1	1	–	–	–	–	–	–
vertebrae	35 (+ 11)	14	–	(2)	–	(4)	–	(2)
rib	–	8 (+ 18)	–	–	–	–	–	(1)

Table 8 6 Driffield Terrace, York: Estimated horse, cattle and sheep withers heights in mm and hands

Phase	Context	Id no.	Species	Element	Measurement description	Measurement (in mm)	Withers height	Height in hands
4	1144	631	horse	humerus	GLI	296	1441.52	14
4	1149	717	horse	metacarpal	LI	203	1301.23	12.3
5	1020	65	horse	metatarsal	LI	229	1220.57	12
4	1144	629	horse	radius	LI	311	1349.74	13.1
4	1144	630	horse	tibia	LI	317	1382.12	13.2
4	1144	652	horse	tibia	LI	311	1355.96	13.1
4	1140	627	cattle	metatarsal	GL	211	1149.95	n/a
4	1204	800	sheep	metatarsal (skeleton)	TL	136	613.36	n/a

Appendix

Age-at-death

Main domesticated mammals

Very few mandibles useful for estimating age-at-death were present. Most of the tooth rows were of adult/elderly animals, with fewer from immature or juvenile individuals. Epiphyseal fusion was also recorded where possible and, in the main, these data supported the information from the tooth wear. Epiphyses were, almost without exception, fused with very little evidence for immature animals. However, a bias towards more robust, early fusing elements such as distal tibiae and humeri suggests taphonomic issues may be a factor and the lack of more fragile immature bone could reflect attrition due to disturbance of the deposits and trampling of the surfaces rather than an actual absence of juvenile animals.

Cattle

The mandibles and isolated teeth were almost exclusively from adult or elderly cattle, with the only evidence for a younger animal being an unerupted premolar from a Phase 4 grave fill (Context 1048) which probably represented redeposited material. All of the cattle long bone epiphyses were fused, including a proximal tibia (fuses at approximately three-and-a-half to four years of age). Of the large mammal vertebrae, some of which are assumed to be cattle, most were also fused cranially and caudally, although a small number displayed unfused physes suggesting animals of under eight years of age.

Sheep/goat

Only five mandibles representing four individuals were suitable for tooth-wear recording. Four of these (including both mandibles of a sheep skeleton found in association with a burial, Context 1118) indicated adult animals. With the exception of an unfused proximal tibia from Context 1095, all epiphyses were fused, although all of the recorded fragments were from more robust, early fusing elements such as distal tibiae and humeri.

Pig

Very few pig remains were present and evidence for age-at-death was very limited. The mandibles were of immature and sub-adult animals as well as adults but elements surviving with epiphyseal fusion apparent consisted only of a complete metacarpal and a distal tibia (both fused).

Measurements archive by species, skeletal element and context

Measurement descriptions follow von den Driesch 1976. Measurements are in mm.
Key: Id no. = number unique to each bone

Horse measurements

Context	Phase	Id no.	Element	GL	BFcr	BFcd	GLF
1155	2	726	atlas	99	93.85	91.03	95.3

Context	Phase	Id no.	Element	BFd	GB	GH	LmT
1031	5	118	astragalus	43.68	54.56	49.56	–
1031	5	119	astragalus	49.83	60.85	55.96	55.09

Context	Phase	Id no.	Element	DS	GL
1114	4	575	calcaneum	38.55	119

Context	Phase	Id no.	Element	GLl	GLC	SD	Bd	BT	HT	HTC
1087	5	328	humerus	–	–	39.14	82	75.81	51	35.56
1107	4	458	humerus	–	–	28.36	66.4	63.15	42.8	–
1144	4	631	humerus	296	276	37.35	83.76	77.5	54.6	39.53
1144	4	632	humerus	–	–	–	72.49	65.79	42.2	32.45
1144	4	654	humerus	–	–	–	69.05	63.68	41.4	32.41
1149	4	715	humerus	–	–	35.9	78.6	73.71	46.7	37.92
1182	2	742	humerus	–	–	–	66.23	–	–	31.57
1211	4	821	humerus	–	–	–	–	76.36	51.2	39.1

Context	Phase	Id no.	Element	GL	LI	SD	BFp	Bp	BFd	Bd
1144	4	629	radius	328	311	35.94	75.08	84.1	63.19	74.11
1114	4	657	radius	–	–	–	–	–	62.96	74.32
1182	2	736	radius	–	–	32.16	67.73	75.9	–	–
1182	2	737	radius	–	–	–	–	–	57.02	69.04
1201	4	749	radius	–	–	–	73.9	82.2	–	–

Context	Phase	Id no.	Element	GLP	SLC	LG
1095	4	367	scapula	96.33	57.24	56.67
1144	4	655	scapula	86.02	60.65	56.02
1144	4	660	scapula	–	–	–

Context	Phase	Id no.	Element	GLC	SD	DC	Bp	Bd
1095	4	368	femur	–	–	51.56	–	–
1144	4	639	femur	321	36.99	–	–	87.23
1144	4	640	femur	355	41.9	–	114	93.01
1144	4	645	femur	–	40.32	–	–	90.28
1144	4	646	femur	–	35.38	–	–	88.42
1144	4	649	femur	–	–	48.57	92.2	–
1144	4	651	femur	–	–	50.54	105.2	–

Horse measurements continued

Context	Phase	Id no.	Element	GL	LI	SD	Bp	Bd	Dd
1048	4	227	tibia	357	–	37.55	–	–	40.84
1144	4	630	tibia	350	317	38.98	91	–	–
1144	4	641	tibia	–	–	42.92	–	75.44	49.83
1144	4	642	tibia	–	–	38.45	93.5	–	–
1144	4	643	tibia	–	–	35.82	–	66.17	39.84
1144	4	652	tibia	347	311	37.3	94.6	73.67	42.08

Context	Phase	Id no.	Element	GL	GLI	LI	SD	Bp	Dp	BFd	Bd	Dd
1149	4	717	metacarpal	212	209	203	32.34	47.84	33.71	–	49.19	37.56
1020	5	65	metatarsal	243	233	229	25.02	44.81	39.39	44.25	44.37	33.79

Context	Phase	Id no.	Element	GL	SD	Bp	BFp	BFd	Dp	Bd
1048	4	228	phalanx 1	78.54	32.31	52.58	47.86	–	37.52	–
1054	5	293	phalanx 1	87	34.3	54.45	49.58	44.53	34.92	47.65
1107	4	473	phalanx 1	84.28	35.94	57.98	54.03	–	39.98	–
1107	4	474	phalanx 1	87.33	34.51	58.2	53.53	45.28	40.31	46.76

Cattle measurements

Context	Phase	Id no.	Element	Bd	DI	GLI
1144	4	634	astragalus	42.37	35.46	62.23
1144	4	635	astragalus	38.3	33.81	61.5

Context	Phase	Id no.	Element	SD	Bd	Dd
1144	4	638	tibia	42.03	67.56	48.06
1149	4	716	tibia	37.75	66.57	48.33

Context	Phase	Id no.	Element	GL	SD	Bp	Dp	Bd	Dd
1140	4	627	metatarsal	211	24.41	43.37	41.95	51.88	28.17

Context	Phase	Id no.	Element	Length	Breadth
1037	5	195	LM3	36.35	15.85
1138	4	622	LM3	33.96	16.6
1144	4	659	LM3	35.46	12.91

Sheep/goat measurements

Note: Bones from Context 1204 were positively identified as 'sheep' and represent a complete skeleton

Context	Phase	Id no.	Element	C	C+D	DS	GL
1204	4	799	calcaneum	12.4	18	17.18	52.4

Context	Phase	Id no.	Element	GLC	SD	Bp	Bd	BT	HT	HTC
1067	4	306	humerus	–	–		27.79	26.8	17.61	13.49
1204	4	803	humerus	124.2	14.3	37.7	28.85	–	17.1	13.4
1204	4	804	humerus	–	–	37.5	–	–	–	–

Context	Phase	Id no.	Element	BFp	Bp	BFd	Bd
1008	5	35	radius	21.77	23.03	–	–
1114	4	590	radius	–	–	–	28.63
1204	4	810	radius	26.96	29.6	–	–

Context	Phase	Id no.	Element	GLP	SLC	LG	BG
1204	4	805	scapula	31.16	18.21	24.31	20.7
1204	4	806	scapula	30.87	17.86	24.09	20.7

Context	Phase	Id no.	Element	SD	DC	Bp	Bd
1204	4	792	femur	15.29	–	–	36.01
1204	4	793	femur	–	19.37	43.6	–
1204	4	794	femur	–	–	–	36.02
1204	4	795	femur	–	19.17	43	–

Context	Phase	Id no.	Element	SD	Bp	Bd	Dd
1037	5	193	tibia	11.45	–	21.3	17.08
1095	4	378	tibia	11.97	–	21.1	16.68
1102	4	422	tibia	12.69	–	24	19.74
1204	4	796	tibia	13.7	–	24.5	20.04
1204	4	798	tibia	13.69	–	24.9	20.02
1204	4	797	tibia	–	39.26	–	–
1087	5	341	tibia	–	39.04	–	–

Context	Phase	Id no.	Element	SD	Bp	Dp
1022	5	80	metacarpal	13.24	21.63	15.67
1116	2	606	metacarpal	–	20.79	15.67
1204	4	801	metacarpal	12.65	21.16	15.27

Context	Phase	Id no.	Element	GL	Bp	Dp	Bd	Dem	Dvm	Dim
1204	4	800	metatarsal	135.8	18.37	18.6	22.46	10.38	15.25	13.3

Context	Phase	Id no.	Element	Length	Breadth
1102	4	420	LM3	17.24	6.7
1204	4	808	LM3	15.51	6.22
1204	4	809	LM3	15.45	5.8

Pig measurements

Context	Phase	Id no.	Element	Bd	Dd
1091	4	355	tibia	27.21	24.37

Context	Phase	Id no.	Element	Length	Breadth 6	Breadth 7
1087	5	339	LM3	33.36	15.83	15.34

Red deer measurements

Context	Phase	Id no.	Element	C	DS
1087	5	327	calcaneum	13.39	33.35

Chicken measurements

Context	Phase	Id no.	Element	GL	SC	Bp	Bd	Dd
1095	4	393	humerus	65.65	6.25	16.96	13.85	–
1095	4	396	tibiotarsus	–	–	–	–	11.47