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FULL ANALYSIS OF HUMAN REMAINS FROM FIELD 177/178 OF THE A1 WIDENING SCHEME

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Introduction

Excavations conducted by Northern Archaeological Associates between March 2015 and January 2016 identified two groups of burials in Fields 177 and 178, Catterick, North Yorkshire. The burials consisted of 27 inhumations (two of which were only identified during post-excavation analysis; Table 1) two cremation burials and an assemblage of disarticulated bone. Small quantities of burnt bone were also recovered from the backfill of many of the inhumations (Table 2), however, none of the fragments were diagnostic, and therefore could not be identified as human. Radiocarbon dates for the skeletal remains are outstanding. This document presents the objectives, methods and results of the analysis of these remains.

Objectives

The aim of the skeletal analysis was to determine the age, sex and stature of the skeletons, as well as to record and diagnose any skeletal manifestations of disease and trauma. Additionally, information was sought regarding the cremation techniques.

Methodology

The inhumations were analysed in detail, assessing the preservation and completeness, as well as determining the age, sex and stature of the individuals (Appendix A). All pathological lesions were recorded and described.

With regards to the cremations; the cremated bone was sieved through a stack of sieves, with 10mm, 5mm and 2mm mesh sizes. The bone recovered from each sieve was weighed and sorted into identifiable and non-identifiable bone. The identifiable bone was divided into five categories: skull, axial (excluding the skull), upper limb, lower limb and long bone (unidentifiable as to the limb). All identifiable groups of bone were weighed and described in detail.

Osteological Analysis

Skeletal preservation depends upon several factors, including the age and sex of the individual as well as the size, shape and robusticity of the bone. Burial environment, post-depositional disturbance and treatment following excavation can also have a considerable impact on bone condition (Henderson 1987, Garland and Janaway 1989, Janaway 1996). Preservation of human

skeletal remains is assessed subjectively, depending upon the severity of bone surface erosion and post-mortem breaks, but disregarding completeness. Preservation is important, as it can have a large impact on the quantity and quality of information that it is possible to obtain from the skeletal remains.

Surface preservation, concerning the condition of the bone cortex, of the inhumations, was assessed using the seven-category grading system defined by McKinley (2004), ranging from 0 (excellent) to 5+ (extremely poor). Excellent preservation implied no bone surface erosion and a clear surface morphology, whereas extremely poor preservation indicated heavy and penetrating erosion of the bone surface resulting in complete loss of surface morphology and modification of the bone profile. The degree of fragmentation was recorded, using categories ranging from 'minimal' (little or no fragmentation of bones) to 'extreme' (extensive fragmentation with bones in multiple small fragments). Finally, the completeness of the skeletons was assessed and expressed as a percentage: the higher the percentage, the more complete the skeleton.

Six of the inhumations survived in a very poor state of preservation (Grade 5, Table 1), with heavy abrasion of the bone cortex. A further six skeletons were in a poor state of preservation (Grade 4), while most inhumed remains (nine skeletons) were in moderate condition (Grade 3). Four skeletons survived in a good state of preservation (Grade 2) and only two skeletons were in very good condition (Grade 1, both of whom were perinates).

The vast majority of skeletons from Fields 177 and 178 had suffered from moderate bone fragmentation (Table 1), with approximately one quarter being severely fragmented. Only one skeleton was minimally fragmented.

Nearly a third of the inhumations were between 81-100% complete (Table 1) and just over a quarter were between 21-40% complete. Slightly fewer skeletons (approximately one fifth) were between 41-60% complete. Approximately 15% of skeletons were between 81-100% complete and the remainder were between 0-20% complete.

Preservation of the cremated bone was assessed using a grading system of five categories: very poor, poor, moderate, good and excellent. Excellent preservation implied no bone erosion and very few or no post-depositional breaks, whereas very poor preservation indicated complete or almost complete loss of the bone surface due to erosion and severe fragmentation. Cremation Burials 20107/9 and 20405 were both in a good state of preservation, with the retention of surface detail and sharp margins to the bone fragments. Comparisons between the preservation of urned and unurned cremation burials might suggest that the inclusion of a burial within an urn had a positive effect on the preservation of the cremated remains, but this does not appear to have been the case here.

Moderate warping and bone cracking, which occurs commonly during the cremation process, was evident in Cremation Burial 20107/9, but not in Burial 20405. The fragment size of cremated bone is frequently attributed to post-cremation processes. This is because skeletal elements retrieved from modern crematoria tend to be comparatively large before being ground down for scattering or deposition in the urn. Bone is also prone to fragmentation if it is moved while still hot (McKinley 1994, 340). Bone fragment size varied between the two cremation burials, with Burial 20107/9 containing fragments predominantly derived from the 5mm sieve, while Burial 20405 consisted largely of fragments retrieved from the 10mm sieve. This would suggest that burial within the urn had an impact on bone fragment size, with Burial 20405 being somewhat protected within the urn.

The cremation burials ranged in weight from 176.3 to 257.1 grams, with an average weight of 216.7 grams. Neither of the burials contained the quantity of bone expected from a modern cremation, and in fact weighed considerably less than the average given by (McKinley 1993). The average bone weight produced by modern crematoria tends to range from 1,000.5g to 2,422.5g with a mean of 1,625.9g (McKinley 1993). Wahl (1982, 25) found that archaeologically recovered remains of cremated adults tend to weigh less (between 250g and 2500g) as a result of the commonly practised custom of selecting only some of the cremated bone from the pyre for inclusion in the burial, thereby representing a symbolic, or token, interment. While the two cremated bone assemblages weighed less than the average observed from modern cremations, it is possible that later truncations were partly responsible for the loss of bone rather than solely selective retrieval or selective burial of the cremated remains.

Neither of the cremated bone assemblages were completely calcined. According to McKinley (1989), the body requires a minimum temperature of 500° Celsius over seven to eight hours to achieve complete calcination of the bone. The bone from both cremation burials ranged in colour from white to blueish grey and black, suggesting that the bone had either not reached sufficient temperatures, or not been allowed to burn for long enough. Alternatively, the pyres may not have been well constructed, thus preventing adequate air flow for optimal burning.

It was possible to identify between 57.2% and 78.1% of the cremated bone. In Burial 20107/9 the majority of identifiable fragments were long bone shafts, which could not be identified to a specific region, whereas in Burial 20405 the most frequently occurring identifiable fragments belonged to the upper and lower limbs. It is surprising that skull fragments were not the most abundant skeletal element recognised in either of the cremated bone assemblages, since the cranial vault is very distinctive and easily recognisable, even when severely fragmented; as such, it often forms a large proportion of identified bone fragments in cremated remains (McKinley 1994).

A count of the 'minimum number of individuals' (MNI) recovered from a cemetery is carried out as standard procedure during osteological assessments of inhumations in order to establish

how many individuals were represented by the articulated and disarticulated human bones (without taking the archaeologically defined graves into account). The MNI is calculated by counting all long bone ends, as well as other larger skeletal elements, such as the hip joints and cranial elements. The MNI for the human remains recovered from Fields 177 and 178 was 26. The total consisted of fifteen adults, based on the presence of fifteen adult left femoral heads, three perinates, represented by three right femoral necks, and eight juveniles to adolescents were represented by eight cruciform eminences (base of the skull).

It is not possible to calculate the MNI for the cremation burials, because only a token selection of bone from the pyre tends to be buried. Double burials can be identified only if skeletal elements are duplicated, or if skeletons of different ages are represented in one burial. Double burials were not identified in either of the cremated bone assemblages.

Age is usually determined using standard ageing techniques, as specified in Scheuer and Black (2000a; 2000b) and Cox (2000). Age estimation in adults relies on the presence of the pelvis and uses different stages of bone development and degeneration in order to calculate the age of an individual (Lovejoy et al 1985; Meindl and Lovejoy 1989). Age is split into a number of categories, from foetus (up to 40 weeks in *utero*), neonate (around the time of birth), infant (newborn to one year), juvenile (1-12 years), adolescent (13-17 years), young adult (ya; 18-25 years), young middle adult (yma; 26-35 years), old middle adult (oma; 36-45 years), mature adult (ma; 46+) to adult (an individual whose age could not be determined more accurately as over the age of seventeen).

Overall, one third (33.3%) of the skeletons from Fields 177/178 consisted of non-adults, while the rest of the population were adults (66.6%). A third (33.3%) of the non-adult population consisted of perinates (around birth to one month), another third was made up of young juveniles (33.3%, 1-6 years). A single older juvenile (11.1%, 7-12 years) and an adolescent (11.1%, 13-17 years) were recovered, as well as one skeleton (SK 1223) that could not be aged more accurately than to say it was a juvenile (1-12 years).

A third of the adult population (33.3%) consisted of individuals that could not be aged more accurately than to say they were eighteen years or older when they died. This was due largely to the incomplete nature of the skeletal remains. Just under a quarter of the adult population (22.2%) consisted of old middle adults (36-45 years), equal numbers of individuals (16.6%) were young adults (18-25 years) or young middle adults (26-35 years), and only 11.1% were mature adults (46+ years).

Cremation Burial 20405 contained the remains of an adult, however, because none of the criteria normally used for age determination were present amongst the cremated remains, age determination was based on less reliable criteria, such as bone robusticity, which suggested that the individual was at least sixteen years old but may have been considerably older. Cremation

Burial 20107/9 contained the remains of what appeared to be either an adolescent or young adult. The cremated remains contained a number of fused distal metacarpal heads, which fuse between the ages of fourteen and a half and sixteen and a half years (Schaefer *et al.* 2009, 228) and a fragment of unfused ilium (blade of the pelvis), which completes union with the iliac crest by the age of 23 (*ibid,* 253). The fusion intervals of the two bones would suggest that the individual was at least fourteen and a half years of age, but no older than 23 when they died.

Sex determination is usually carried out using standard osteological techniques, such as those described by Mays and Cox (2000). Assessment of sex in both males and females relies on the preservation of the skull and the pelvis and can only be carried out once sexual characteristics have developed, during late puberty and early adulthood.

Morphological traits necessary for determining sex were present in 88.8% of the adult population. Of the adults for whom sex could be assessed, exactly half were males (50.0%), while just over a third (37.5%) were females. The sex of the remaining 12.5% of individuals could not be determined, as they exhibited neither predominantly male, nor predominantly female characteristics.

Due to the shrinkage and warping of skeletal elements during the cremation process, assessing the sex of any remains must be considered as tentative at best, however, neither of the cremation burials contained any sexually diagnostic skeletal elements.

The term 'ancestry' is used to describe the genetic background of individuals. An attempt was made to determine the ancestry of each individual, based on the visual appearance of traits in the cranial skeleton, as described by Byers (2010, 154-165). A metric method was also applied based on eight cranial measurements (Giles and Elliot 1962 in Byers 2010, 168-171). Unfortunately, the expression of the various traits used to define ancestral groups can be ambiguous and assessing them is subjective; consequently, it can be very difficult to determine ancestry (Byers 2010, 152-154). Based on visual assessment of Skeleton 20957, a mixture of traits were observed; for example, the individual exhibited extremely straight femoral shafts (considered an African morphological trait), while also exhibiting a lack of nasal guttering (considered a Caucasian morphological trait).

Stature depends on two main factors, heredity and environment; it can also fluctuate between chronological periods. Stature can only be established in skeletons if at least one complete and fully fused long bone is present, but preferably using the combined femur and tibia. The bone is measured on an osteometric board and stature is then calculated using a regression formula developed upon individuals of known stature (Trotter 1970). Where possible, bones from the legs were used in preference to those of the upper limb as these carry the lowest error margin (*ibid*).

It was only possible to determine the stature of two of the female skeletons (SK 20117 and SK 20342), who were 158.3m tall (5'2") and 153.5cm tall (5'1/2") respectively. The mean stature for the two women would have been 155.9cm (5' 1") which is shorter than the average female height for the period of 159cm (Roberts and Cox 2003, 142). Stature calculations could be made for three males (SK 20116, SK 20416 and SK 20962), which ranged from 163.75cm to 166.6cm, with an average of 165.1 cm (5'5"). The male average stature at Catterick was considerably shorter than the mean for the period (169cm), but fell within the range for the period (Roberts and Cox 2003, 142).

Different formulae have been developed for different ancestral groups (Trotter 1970). Consequently, where ancestry had been identified as 'white' or 'black', the 'white' or 'black' regression formulae were applied. Where individuals were assessed as mixed ancestry, or ancestry was unknown, the choice of which formula to use was an issue. According to Byers (2010, 153), individuals with mixed white and black traits should be classified as black, so applying the black formula could be appropriate.

Skeleton 20957 (old middle adult, male) had extremely straight femoral shafts (a typically African trait); unfortunately, the individual's skull was fragmented and incomplete, making it difficult to assess any further ancestral traits. Due to the uncertainty of the individual's ancestry, stature calculations were made using both the Caucasian and African formula. Skeleton 20957 would have been 156.4cm (5'1 1/2") if they were of African ancestry, or 159.75cm tall (5'3") if they were Caucasian. Both calculations, however, show that the individual would have been considerably shorter than the mean for the period of 169cm (Roberts and Cox 2003, 142), and would only have fallen into the lowermost end of the range for the period if they were Caucasian (*ibid*).

Leg measurements were obtained from the femora and tibiae in order to calculate the shape and robusticity of the femoral shaft (*platymeric* index) and the tibial shaft (*platycnemic* index; Bass 1987). The *meric index* revealed that; nearly all the femora (95%) fell into the *platymeric* range (broad and flat) with only one femoral shaft (5%) falling into the *eurymeric* range (rounded). The *cnemic* index revealed that the shape of the tibiae was slightly more varied; the majority (72.2%) of tibiae were *eurycnemic* (broad), with the remainder being either *mesocnemic* (16.7%, average) or *platycnemic* (11.1%, flattened).

Non-metric traits are additional sutures, facets, bony processes, canals and foramina, which occur in a minority of skeletons and are believed to suggest hereditary affiliation between skeletons (Saunders 1989). The origins of non-metric traits have been extensively discussed in the osteological literature and it is now thought that while most non-metric traits have genetic origins, some can be produced by factors such as mechanical stress (Kennedy 1989) or environment (Trinkhaus 1978). A total of thirty cranial (skull) and thirty post-cranial (bones of the body and limbs) non-metric traits were selected from the osteological literature (Buikstra

and Ubelaker 1994; Finnegan 1978; Berry and Berry 1967) and recorded, with the three most commonly occurring discussed below.

Nine individuals had parietal foramen (small holes in the top of the skull), which transmit a blood vessel 'connecting the superior sagittal sinus, the diploic veins and the surface veins of the scalp' (Scheuer and Black 2000b, 97). Metopic sutures (sutural line in the middle of the forehead) were present in five individuals, including Skeleton 20342 (female, young adult), Skeleton 20603 (indeterminate, young adult) Skeleton 20813 (indeterminate, old middle adult), Skeleton 20844 (male, young middle adult) and Skeleton 20957 (male, old middle adult). The metopic suture usually begins to obliterate at the end of the first year of life (Mann and Hunt 2005, 27). The suture may persist into adulthood in around 1-12% of the population (Krogman and Ishan 1986) and is believed to be a hereditary trait, which may indicate genetic relationships.

Finally, five individuals had ossicles in their lambdoid suture (extra bones in the back of the skull.) The presence of ossicles in the lambdoid sutures has been related to deformation in the shape of the cranium, being found in studies of crania deliberately modified as a cultural practice and those deformed through premature fusion of a suture (Sanchez-Lara *et al* 2007; O'Loughlin 2004). In theory, increased tension placed on the opposite side to the fused suture spreads the suture apart, encouraging the formation of ossicles within the suture to bridge the gap (Sanchez-Lara *et al* 2007). Bennett (1965) has suggested that the formation of ossicles in this suture may be related to stresses placed on the growing cranium during foetal life and early infancy. Non-metric traits were not observed in any of the cremated remains. A full list of observed non-metrics traits recorded in the inhumed remains is available in the catalogue.

Pathological Analysis

Pathological conditions (disease) can manifest themselves on the skeleton, especially when these are chronic conditions or the result of trauma to the bone. The bone elements to which muscles attach can also provide information on muscle trauma and excessive use of muscles. All bones were examined macroscopically for evidence of pathological changes.

CONGENITAL CONDITIONS

Heredity and environment can influence the embryological development of an individual, leading to the formation of a congenital defect or anomaly (Barnes 1994). The most severe defects are often lethal, and if the baby is not miscarried or stillborn, it will usually die shortly after birth. Such severe defects are rarely seen in archaeological populations, but the less severe expressions often are, and in many of these cases the individual affected will have been unaware of their condition. Moreover, the frequency with which these minor anomalies occur may provide information on the occurrence of the severe expressions of these defects in the

population involved (*ibid*), and may provide information on maternal health (Sture 2001).

Transitional Vertebrae and Additional or Absent Vertebrae

The normal human spine consists of seven cervical (neck), twelve thoracic (chest) and five lumbar (lower back) vertebrae, making a total of 24 independent segments. The sacrum (at the base of the spine, forming the back of the pelvis) is usually composed of five fused vertebral segments and the coccyx (vestigial tail) is normally made up of four fused vertebral segments. The overall total of vertebral segments is therefore 33.

Additional vertebrae occur when there is an extra vertebral segment, increasing the total number of segments in the spine. They usually occur at the junction between the thoracic and lumbar vertebrae (where they take on the appearance of a thoracic vertebra), or at the junction between the lumbar vertebrae and the sacrum. In the latter instance, they either appear as an additional (sixth) lumbar vertebra, or become partially or fully incorporated into the sacrum (Barnes 1994, 78).

Transitional vertebrae can occur at the borders between different types of vertebra, when a vertebra from one group takes on some or all of the characteristics of an adjacent group, for example the first lumbar vertebra (in the lower back) may develop vestigial ribs (Barnes 1994, 79-116). The process by which this happens is known as 'border shifting'. The end result is to increase the number of segments in one part of the spine at the expense of the adjoining part (e.g. increasing the number of thoracic vertebrae to thirteen through incorporating the first lumbar vertebra, but decreasing the number of lumbar vertebrae to four). Transitional vertebrae are reasonably common, particularly at the lumbo-sacral border (between the fifth lumbar vertebra and the sacrum, at the base of the spine), but the consequences of the border shift become more severe the higher up the spine it occurs (Barnes 1994, 79-116).

A complete and well preserved spine is required to determine whether any variation in the expected number of vertebrae in each group is the result of a genuine extra vertebral segment (i.e. an additional vertebra) or due to a border shift and if the latter, what kind of shift has taken place. Unfortunately, many of the individuals from Fields 177 and 178 had incomplete spines, or spines so fragmented that it was impossible to reassemble individual vertebrae or to sequence them (i.e. place them in order to identify specific ones).

Skeleton 20395 (young adult male) had a possible vertebral border shift at the lumbar-sacral border of the spine, with the possible lumbarisation of the first sacral vertebra or the partial sacralisation of the fifth lumbar vertebra. A very poorly preserved fragment of what looked like a sacral body appeared to have a wider superior body than inferior. However, the right lamina and inferior articulation were entirely independent, unfortunately, the left lamina and inferior articulation were not present. The body of what was either the first or second sacral vertebra was also present and appeared as a normal first sacral vertebra would. Only these two

fragments of the spine survived, making it impossible to determine whether the shift had been cranial (shifting the border between the lumbar and sacral region towards the skull) or caudal (shifting the border between the lumbar and sacral region away from the skull).

The hamate is one of the eight small carpal bones found in the wrist and it usually has a prominent 'hook' on the palmar surface. In Skeleton 20603 (indeterminate young adult adult) the hook of the left hamate was extremely underdeveloped. In modern populations, absence or underdevelopment of the hook of hamate was found to correlate with the development of carpal tunnel syndrome (Chow *et al.* 2005).

Coxa vara is a condition where the neck of the femur is short and horizontal, so that the collo-diaphyseal angle (angle between the femoral head and the femoral shaft) is below 125 degrees. This causes the head of the femur to lie below the greater trochanter. The condition is not present at birth, but develops slowly due to a congenital ossification defect of the femoral neck (Salter 1999). Because of the defect, the muscles of the hip cannot hold the pelvis level during walking and the individual will have a lurching (although painless) type of limp (*ibid*). Hypoplaysia of the femoral neck results in a shortened femoral neck, (although not as pronounced as in *coxa vara)*, and may also have an impact on the individuals' ambulation (Barnes, 2012).

Skeleton 20395 (young adult male) may have potentially had *coxa vara* of the left femur. The head of the femur was located below the height of where the greater trochanter would have been, although the greater trochanter was not present due to taphonomic alteration.

Skeleton 20416 (old middle adult, male) exhibited short femoral necks, with slight inferior angulation of the heads, which were not so shortened or inferiorly angulated as to represent *coxa vara*, but may have instead represent bilateral hypoplasia of the femoral necks.

The calcaneus (heel bone) can have a small ossicle of bone, known as the *calcaneus secundarius*, located in a crescent-shaped notch in the anterior calcaneal facet (Hodge 1999). In most individuals these ossicles do not cause any symptoms, but they can occasionally cause pain or a restriction in movement at the joint between the talus and calcaneus (Ceroni *et al.* 2006. In archaeological remains the actual ossicle is usually not recovered, but a small crescent with a rough porous surface will be missing from the anterior surface of the anterior facet (Mann and Hunt 2005, 206-207). *Calcaneus secundarius* can be difficult to differentiate from avulsion fractures to the anterior calcaneus (Hodge 1999). Such avulsion fractures to the anterior process are usually the result of forced plantar-flexion and inversion of the foot (Wedel and Galloway 2014, 300). Skeleton 20573 (old middle adult, male) had a small semi-circular lesion on the anterior medial margin of the anterior articular facet of the left calcaneus. The surface of the lesion was smooth, but irregular and was likely to have been the result of *calcaneus secundarius*. Skeleton 20957 (old middle adult, male) may also have had *calcaneus secundarius*,

with crescent shaped lesions present on the anterior-medial borders of both anterior calcaneal facets. The surfaces of the lesions were slightly irregular, but did not appear to be reactive or porotic. However, considering both individuals had experienced traumatic injuries to their ankles (both skeletons had fractured their distal fibulae, see below), avulsion fractures cannot be ruled out as potential causes for the lesions.

METABOLIC DISEASE

Humans require an adequate supply of nutrients during childhood to support normal growth and development. Particular conditions are associated with the lack of specific nutrients, for example scurvy results from a diet lacking in vitamin C (found in fresh fruit and vegetables and marine fish) and rickets from a lack of vitamin D (produced by the body during exposure to sunlight). Diagnosis of nutritional deficiencies in ancient populations is complicated by the fact that the skeletal changes can be difficult to diagnose and that nutritional deficiencies tend not to occur in isolation (a diet deficient in one nutrient is very often deficient in others). In addition, many of the skeletal changes that develop in a child as a response to nutritional deficiency will be largely remodelled by the time the individual reaches adulthood (Ortner 2003, Lewis 2007).

Cribra Orbitalia and Anaemia

Cribra orbitalia is a term used to describe fine pitting in the orbital roof, which develops during childhood and often recedes during adolescence or early adulthood. Until recently, iron deficiency anaemia was the accepted cause of these lesions (Stuart-Macadam 1992), but a strong case has been made by Walker *et al* (2009) for different types of anaemia as the causative factor. These include megaloblastic anaemia in the New World, suggesting a diet deficient in Vitamin B_{12} (i.e. plant-based and lacking in animal products) and/or folic acid. Such dietary deficiency could have been exacerbated through poor sanitation leading to infection and infestation with gut parasites (*ibid*). In malarious areas of the Old World, haemolytic anaemia (e.g. sickle cell anaemia and thalassemia) may be important in the development of *cribra orbitalia* (*ibid*). However, for areas such as northern Europe they have proposed that *cribra orbitalia* may be more likely related to conditions such as scurvy (Vitamin C deficiency) or chronic infections (*ibid*). The argument was countered by Oxenham and Cavill (2010) who stated that iron deficiency anaemia should still be considered in a differential diagnosis. A study in 2016, albeit based on a small sample, conducted by Zarina *et al*. found a correlation between individuals with *cribra orbitalia* and decreased levels of copper and lead in their bone. The same individuals also exhibited significantly lower levels of δ^{15} N isotope levels, suggesting their diet consisted, to a greater degree, of lower trophic level food sources. *Cribra orbitalia* is often used as an indicator of general childhood stress (Lewis 2000, Roberts and Manchester 2005) and is often found associated with agricultural economies (Roberts and Cox 2003).

Five individuals Skeletons 20477 (adolescent), 20603 (indeterminate, young adult), 20721 (mature adult, male), 20813 (indeterminate, old middle adult) and 20844 (young middle adult,

male) exhibited *cribra orbitalia* lesions in the roofs of their orbits. A disarticulated fragment of skull from Context (20564), thought to belong to an adolescent, also exhibited *cribra orbitalia*.

TRAUMA

The evidence for trauma in archaeological populations is restricted to that visible in the skeletal remains, unless soft tissue is preserved (Roberts and Manchester 2005, 85-86). Therefore, most of the soft-tissue injuries sustained by archaeological populations will be invisible, although occasionally soft tissue injuries can be inferred through ossification of the tissues at the site of damage, known as *myositis ossificans* (*ibid*). Much of the evidence for trauma in archaeological populations focuses on fractures to the bones (Roberts and Manchester 2005, 84-85), although long standing well-healed fractures may be hard to detect (Jurmain 1999, 186).

Skeletons 20573 (old middle adult, male) and 20957 (old middle adult, male) both had healed fractures to the distal shafts of their fibulae. Skeleton 20957 (old middle adult, male) had a healed oblique fracture to the distal shaft of their left fibula. The fracture ran anteriorly-superiorly to posterior-inferiorly, with a slight overlap of the two bone fragments and medial displacement of the inferior fragment. The fracture was surrounded by a smooth, inactive callus, which was well remodelled. Skeleton 20573 (old middle adult, male) had a well healed oblique fracture to the distal shaft of their right distal fibula, with slight anterior angulation of the distal fragment. The fracture was located immediately superior to the distal articulation, and was surrounded by very smooth, and well remodelled callus. The right tibia may also have been affected, with slight impaction of the posterior articular margin, creating a localised pushed in appearance, which was likely to have been the result of compressive forces. Potentially associated with the traumatic incident that caused the fracture was evidence of soft tissue/ligament damage at the insertion of the interosseous ligament (see below).

Skeleton 20573 (old middle adult, male) exhibited further possible trauma to the distal shaft of their left second metacarpal. The distal third of the shaft appeared bowed, with slight inferior angulation to the head, which may have been the result of a well healed fracture, although no callus was evident. The proximal phalanx for the second metacarpal exhibited a thickened nodule of bone on the palmar surface of the distal third of the shaft, possibly an ossified haematoma, and the distal articulation of the phalanx also exhibited moderate porosity and marginal lipping. What was probably the intermediate phalanx for the second metacarpal had an enlarged proximal articular surface with extension of the superior and inferior articular margins, appearing more like a foot joint. The centre of the articulation was irregular with a medium sized foramen penetrating the articular surface. According to Wedel and Galloway (2014, 236), fractures to the metacarpal neck are the most common type of metacarpal fracture and usually result from direct impact, such as hitting with a clenched fist.

Two intermediate and distal pedal phalanges (toe bones) belonging to Skeleton 20813

(indeterminate, old middle adult) had fused to one another. The margins of the joint were still discernible, suggesting the cause was not developmental. In each case, the fusion of the phalanges was smooth and well remodelled, with the distal phalanges in good apposition. The changes observed were potentially the result of crush fractures. According to Wedel and Galloway (2014, 307), fractures of the toes are more frequently observed in males.

Skeleton 20475 (adult, female) had a possible heled depression fracture on their right parietal. A sub-oval depression, located on the medio-anterior region of the bone, measured 25.9mm anterior-posteriorly by 29.5mm medio-laterally and had smooth gradually sloping edges, with smooth sides and base of the lesion. The affected area of impact appeared to be limited to the outer table. According to Wedel and Galloway (2014, 134), fractures to the parietal are among the most common of the cranial vault. These types of trauma are referred to as depressed fractures and are caused by compressive forces collapsing the diploë, which may be followed by the failure of the inner and outer tables, or be limited to the outer table only *(ibid*, 138). In cases where only the outer table is affected, these may be referred to as 'pond fractures' (Knight 1991). Such fractures are more commonly sustained by infants than any other age group (Wedel and Galloway 2014, 139). The left parietal appeared unaffected, suggesting it was not the result of developmental thinning.

When the neural arch of a vertebra separates from the body at the *pars interarticularis* this is termed 'spondylolysis'. It occurs in 4-8% of modern populations, most commonly in the fifth lumbar vertebra, and affects both halves of the arch (Aufderheide and Rodríguez-Martín 1998). The condition has been associated with hyperextension of the spine in young individuals (particularly athletes), and may result from a stress fracture or direct trauma (Dandy and Edwards 2003). However, some individuals may have an underlying genetic predisposition to developing the condition (Aufderheide and Rodríguez-Martín 1998). Although many individuals with spondylolysis will be unaware of their condition (Salter 1999) some will suffer lower-back pain as a result (Dandy and Edwards 2003). Pain may worsen as the individual ages and loses muscle tone (Sture 2001).

Skeleton 20117 (young middle adult, female) appeared to have suffered from spondylolysis of the fifth lumbar vertebrae, although only the left side of the vertebra survived. The inferior surface of the pedicle was generally smooth with a slightly roughened and irregular appearance. The surface of the avulsed fragment was spiculated and irregular, but with a generally smooth appearance. In Skeleton 20957 (old middle adult, male), either the second or third lumbar vertebra exhibited partial spondylolysis, which affected the left side. The fractured surfaces were irregular with well-defined margins, and the lamina and the vertebral facet could be fitted back together perfectly. The right side of the vertebra had been damaged post-mortem, but there were no signs of a fracture through the lamina at the same point as the left.

Osteochondritis Dissecans

Trauma can damage the blood supply to part of a joint surface leading to localised death of the tissue, which can then become detached from the joint surface (Roberts and Manchester 1995). Such lesions are referred to as osteochondritis dissecans (OD) and are visible in the skeletal remains as a roughly circular, porous hollow in the surface of the joint. A smooth circular indentation contiguous with the articular surface was recorded on the distal articulation of the right humerus. The lesion was located on the posterior surface of the trochlea, and was likely the result of OD. Alternatively, the lesion may have been a cortical defect. A second individual, Skeleton 20813 (indeterminate, old middle adult), also had a lesion on the distal articulation of their left humerus. The lesion was located on the inferior surface of the trochlea, and had smooth, shallow sloping, rounded edges and base, which were contiguous with the articular surface. Again, it was not clear if the lesion was the result of OD or a cortical defect. Skeleton 20395 (young adult, male) had a deep crevasse on the proximal articulation of the right proximal phalanx for the first metatarsal. The lesion was located in the centre of the articular surface, with geographic margins and exposed trabecular bone in the base. The lesion was probably the result of OD.

Skeleton 20190 (unsexed, adult) may have experienced a traumatic incident to their right ankle, resulting in soft tissue damage. Ossified spicules were evident on the posterior margin of the posterior/inferior calcaneal facet of the talus and the posterior margin of the posterior talar articular surface of the calcaneus, around the margin of the capsular ligament. Identical spicules of bone were also identified on the distal right tibia, on the antero-lateral margin of the capsular attachment.

Evidence of soft tissue/ligament damage in Skeleton 20573 (old middle adult, male) may have been associated with the traumatic incident that caused the fracture to their right fibula. The surface of the attachment for the interosseous ligament was roughened with spicules of bone extending from the medial-anterior border of the capsular attachment.

INFECTIOUS DISEASE

Infectious disease can involve the skeleton, but since bone cannot respond quickly only evidence for chronic, longstanding infections can be observed in archaeological skeletal remains (Roberts and Manchester 2005, 167). Acute conditions, where the patient either recovers or dies within a short space of time will not be seen. Initial bone formation in response to infection is disorganised (woven bone), but with time, as healing takes place, woven bone is remodelled and transformed into lamellar bone. Consequently, woven bone presence indicates an infection that was active at the time the person died, whilst lamellar bone indicates an infection that had healed. A combination of both suggests a recurring or longstanding infection (*ibid*). Although specific diseases may cause new bone to be deposited on the skeleton, it is almost always impossible to diagnose these from the bones alone. Hence, evidence for infection is discussed as 'non-specific' infection.

One of the most common non-specific infections in past and modern populations is maxillary sinusitis. Sinusitis is characterised by the inflammation of the mucous membrane of the sinuses (cavities in the cheek bones). Acute sinusitis lasts between seven days and one month, but the condition is classed as chronic if it persists for more than three months (Merrett and Pfeiffer 2000, 304). If untreated, chronic sinusitis can persist for years and skeletal changes occur after a number of weeks (Lewis *et al* 1995, 498). In modern groups, around 60% of patients with chronic sinusitis develop bone changes that are radiographically visible (Boocock *et al* 1995:484). Most commonly, the skeletal manifestations take the form of pitting or spicular bone formation on the floors of the sinuses. Symptoms include pain in the forehead, cheeks and eyes, together with fever and a general unwell feeling (Youngson 1992, 551). The quality of life and productivity can be greatly reduced for those suffering from sinusitis. Infection of the maxillary sinuses can result from upper respiratory tract infections, pollution, smoke, dust, allergies, or a dental abscess that has penetrated the floor of the sinus cavity (Roberts and Manchester 2005, 174-176).

Sinusitis was observed in Skeleton 20477 (adolescent), Skeleton 20603 (indeterminate young adult), Skeleton 20721 (mature adult, male) and Skeleton 20573 (old middle adult male).

Lung infections can lead to deposits of new bone on the visceral surfaces of the ribs (Roberts and Manchester 2005) and in a high percentage of individuals these lesions have been associated with tuberculosis (Santos and Roberts 2006, Matos and Santos 2006, Mays *et al* 2002, Santos and Roberts 2001). Tuberculosis was undoubtedly prominent in the nineteenth century and Roberts and Cox (2003) have suggested it may have been responsible for around a quarter of all deaths in London at that time. However, diagnosis of tuberculosis cannot be made solely based on the presence of rib lesions, since other respiratory infections (e.g. chronic bronchitis and pneumonia, Roberts and Cox 2003), exposure to smoky or polluted atmospheres and inhalation of fungal spores (Aufderheide and Rodríguez-Martín 1998) can also cause new bone formation on the ribs. Other parts of the skeleton (e.g. the spine and major joints) are affected in a relatively small proportion of individuals suffering from tuberculosis (Santos and Roberts cite between 1% and 9%, 2001), meaning that direct archaeological evidence for the disease is uncommon. New bone formation elsewhere in the skeleton combined with rib lesions has been associated with tuberculosis and Santos and Roberts (2001) describe a young woman with pulmonary tuberculosis who showed extensive new bone formation affecting much of her skeleton as well as her ribs. However, other respiratory conditions such as bronchitis and pneumonia, exposure to polluted atmospheres and inhalation of fungal spores (Roberts and Cox 2003, 60, 112; Ortner 2003, 326) can also provoke a similar response. On balance, it is safest to attribute rib lesions without associated changes to an unspecified lung infection, although tuberculosis remains a real possibility.

Skeleton 20477 (adolescent), had been suffering from an infection at the time of their death;

woven bone was evident on the pleural surface of the left second to eighth ribs. The woven bone formed a plaque like layer, which largely covered the rib necks and vertebral ends of the shafts.

Bone formation on the internal surfaces of the cranium is more commonly seen in infants and young children rather than in adults. It has been associated with inflammation or haemorrhage of the meningeal blood vessels, but the potential causes of these lesions are not clear at present. In children, possible causes identified include chronic meningitis, trauma, anaemia, neoplastic disease, metabolic diseases (scurvy and rickets), venous drainage disorders and tuberculosis (Lewis 2007; 2004). Less information is available concerning the aetiology of these lesions in adults.

Skeleton 20957 (old middle adult, male) had vascularised lamellar bone within the right transverse sulcus of the endocranial (inner) surface of the occipital. The remodelled nature of the bone would suggest that the inflammation was no longer active at the time of the individuals' death.

JOINT DISEASE

The term joint disease encompasses a large number of conditions with different causes, which all affect the articular joints of the skeleton. Factors influencing joint disease include physical activity, occupation, workload and advancing age, which manifest as degenerative joint disease and osteoarthritis. Alternatively, joint changes may have inflammatory causes in the *spondyloarthropathies*, such as sceptic or rheumatoid arthritis. Different joint diseases affect the articular joints in a different way, and it is the type of lesion, together with the distribution of skeletal manifestations, which determines the diagnosis (Rogers 2000, Roberts and Manchester 2005).

The term joint change encompasses a large number of conditions with different causes, which all affect the articular joints of the skeleton. Factors influencing joint changes include physical activity, occupation, workload and advancing age, which manifest as degenerative joint disease and osteoarthritis. Alternatively, joint changes may have inflammatory causes in the *spondyloarthropathies*, such as sceptic or rheumatoid arthritis. Different joint diseases affect the articular joints in a different way, and it is the type of lesion, together with the distribution of skeletal manifestations, which determines the diagnosis.

Degenerative joint change (DJC) is the most commonly observed of all the joint diseases. DJC is characterised by both bone formation (osteophytes) and bone resorption (porosity) at and around the articular surfaces of the joints, which can cause great discomfort and disability (Rogers 2001).

Three individuals exhibited degenerative changes in their axial skeleton, with degeneration in

the cervical (neck region) and thoracic (central) spine observed in Skeleton 20116 (mature adult, male), Skeleton 20416 (old middle adult, male) and Skeleton 20573 (old middle adult, male). Degenerative changes were also observed in the lumbar (lower) spine of Skeleton 20416.

The appendicular skeleton was also affected, with both shoulders, hips, and the right foot affected in Skeleton 20116 (mature adult, male). Both hips were affected by degenerative changes in Skeleton 20197 (adult, female). Only the left hip was affected in Skeleton 20416 (old middle adult, male). Both hips, the right ankle and left hand exhibited degenerative changes in Skeleton 20573 (old middle adult, male). Finally, Skeleton 20813 (indeterminate, old middle adult) was affected by degenerative changes in their left hip, an unsided hand phalanx and their left foot.

Osteoarthritis (OA) is a degenerative joint disease of synovial joints characterised by the deterioration of the joint cartilage, leading to exposure of the underlying bony joint surface. The resulting bone-to-bone contact can produce polishing of the bone termed 'eburnation', which is the most apparent expression of OA. Other features associated with degeneration of the joint include osteophytes (bone formation) on the surface or around the margins, porosity on the surface and the development of cysts (Rogers 2000; Roberts and Manchester 2005). OA is frequently associated with increasing age, but can be the result of mechanical stress and other factors, including lifestyle, food acquisition and preparation, social status, sex and general health and body weight (Larsen 1997; Roberts and Manchester 2005). OA was recorded as present when eburnation alone was observed.

Osteoarthritis was observed in the cervical (neck region), thoracic (central) and lumbar (lower) spine of Skeleton 20116 (mature adult male). In Skeleton 20573 (old middle adult male) OA was observed in the thoracic vertebrae and right hip.

Schmorl's nodes are another condition that can affect the spine. They manifest as indentations in the upper and lower surfaces of the vertebral bodies caused by the pressure of herniated vertebral discs (Aufderheide and Rodríguez-Martín 1998). Discs may rupture due to trauma, but vertebrae weakened by infection, osteoporosis or neoplastic disease may be more vulnerable (Roberts and Manchester 2005). Schmorl's nodes are often associated with degenerative changes to the vertebral bodies (Aufderheide and Rodríguez-Martín 1998, Hilton *et al* 1976) and are most commonly seen in the lower thoracic vertebrae (Hilton *et al* 1976). The poor preservation and therefore underrepresentation of vertebral bodies should be considered when examining the data on Schmorl's nodes. Skeleton 20116 (mature adult, male) had Schmorl's nodes in the thoracic spine, affecting three of nine preserved vertebral bodies. Skeleton 20395 (young adult, male) also had Schmorl's nodes in the thoracic spine, affecting one of two preserved vertebral bodies.

NEOPLASTIC CONDITIONS

The term 'neoplastic' literally translates as 'new growth' and it refers to the uncontrolled growth of any tissue, including bone (Roberts and Manchester 2005, 252). Benign lesions are contained within a local area and have discrete boundaries; they are usually slow-growing. In contrast, malignant neoplasms grow and spread at an uncontrolled rate and frequently distribute themselves throughout the body (Roberts and Manchester 2005). Neoplastic conditions are infrequently reported among archaeological populations, but routine radiography (rarely carried out unless part of a research project) would be required to identify internal bone changes before they become visible macroscopically and it seems likely that the true prevalence is being under-diagnosed (*ibid*).

Ivory osteomas are small dense round nodules of lamellar bone that appear as smooth well-demarcated lumps on the external surface of the cranium (Roberts and Manchester 2005, 255). These are benign lesions and cause no symptoms (*ibid*). Skeleton 20721 (mature adult, male) had two small button osteomas on the central anterior region of the left parietal. Both osteomas, comprised of small nodules of bone, which were contiguous with the ectocranial surface of the parietal, and measured 3.9mm and 3.3mm in diameter.

MISCELLANEOUS

Assorted lesions were observed that either did not fit into the categories discussed above, or were ambiguous in terms of what had caused them.

Skeleton 20957 (old middle adult, male) had an enigmatic lesion on the buccal surface (cheek side) of the right mandible. The suboval lesion with thinned, sharp margins measured 13.2mm medio-laterally by 9.6mm superior-inferiorly. Within the lesion was an island of bone attached to the outer margins of the lesion by tiny bridges of bone, creating a trough of resorbed bone at the margins of the lesion. On close inspection, the internal 'island' of bone appeared to be slightly vascularised. The lesion may have been the result of trauma, however, there was no evidence of displacement of the bone fragment or damage to the surrounding teeth. The lesion could, potentially, have been associated with the attachment of the buccinator muscle.

Skeleton 20416 (old middle adult, male) had small crescent shaped lesions on the antero-inferior margin of the bodies of the first and second thoracic vertebrae. In both cases the margins of the lesions were irregular but smooth, and measured between 7-10.5mm in diameter. The lesions could have potentially been the result of disc herniations, or avulsion of the annular rings. Although the lesions appeared to be erosive in nature, it was not felt that they exhibited the hallmarks of tuberculosis.

A spherical lesion was present on the shaft of the left femur of Skeleton 20957 (old middle adult, male). The lesion was located on the posterior distal surface at the insertion of the medial head of *gastrocnemius*, and had sharp, well defined margins and an irregular base. *Gastrocnemius* is involved in flexing the leg at the knee, and plantar flexing the foot (Stone and Stone 1990, 184).

Skeleton 20585 (young middle adult, female) had a hiatus in the anterior lateral margin of the right transverse foramen of the second cervical vertebra. It is possible that the wall of the vertebral foramen was eroded due to the pressure of the vertebral artery, or alternatively, may have been filled by ligamentous tissue.

Dental Health

Analysis of the teeth from archaeological populations provides vital clues about health, diet and oral hygiene, as well as information about environmental and congenital conditions. All teeth and jaws were examined macroscopically for evidence of pathological changes.

A total of nineteen individuals had 367 permanent teeth and 256 tooth positions between them, while three individuals had twenty deciduous teeth and 30 tooth positions between them.

Calculus (mineralised dental plaque) is commonly observed in archaeological populations whose dental hygiene was not as rigorous as it is today. If plaque is not removed from the teeth effectively (or on a regular basis) then these plaque deposits mineralise and form concretions of calculus on the tooth crowns or roots (if these are exposed), along the line of the gums. Mineralisation of plaque can also be common when the diet is high in protein (Roberts and Manchester 1995; Hillson 1996).

A total of 180 permanent teeth, from the articulated skeletons, were affected by calculus, of which slightly more male teeth (57.9%) were affected than female teeth (55.8%). Of the deciduous teeth 10.0% were affected by calculus, compared to 53.3% of permanent teeth, suggesting calculus deposits increased with age. Two disarticulated permanent teeth from Context (20384) belonging to an adult also exhibited flecks of calculus (see Table 2).

Dental caries (tooth decay) forms when bacteria in the plaque metabolise sugars in the diet and produce acid, which then causes the loss of minerals from the teeth and eventually leads to the formation of a cavity (Zero 1999). Simple sugars can be found naturally in fruits, vegetables, dried fruits and honey, as well as processed, refined sugar; since the latter three contain the most sucrose they are most cariogenic. Complex sugars are usually less cariogenic and are found in carbohydrates, such as cereals. However, processing carbohydrates, including grinding grains into fine powders or cooking them, will usually increase their cariogenicity.

Nineteen permanent teeth from the articulated skeletons were affected by caries, of which

slightly more female teeth (9.1%) were affected than male teeth (6.7%). Overall, 5.7% of permanent teeth were affected by caries, while none of the deciduous teeth were. One disarticulated deciduous tooth from Context (20820), belonging to a young juvenile, also exhibited a carious lesion (see Table 2).

Dental abscesses occur when bacteria enter the pulp cavity of a tooth causing inflammation and a build-up of pus at the apex of the root. Eventually, a hole forms in the surrounding bone allowing the pus to drain out and relieve the pressure. Abscesses can form as a result of dental caries, heavy wear of the teeth, damage to the teeth, or periodontal disease (Roberts and Manchester 1995).

Only permanent tooth positions (1.6%) were affected by abscesses, all of which belonged to males (2.1% of male tooth positions). This is perhaps surprising, considering that females had a higher frequency of caries and may suggest that factors other than caries contributed to the cause of abscesses amongst population at Catterick.

Dental enamel hypoplasia (DEH) is the presence of lines, grooves or pits on the surface of the tooth crown, which occur as a result of defective formation of tooth enamel during growth (Hillson 1996). Essentially, they represent a period when the crown formation is halted, and they are caused by periods of severe stress, such as episodes of malnutrition or disease, during the first seven years of childhood. Involvement of the deciduous (milk) teeth can indicate pre-natal stress (Lewis 2007).

DEH was identified on the surfaces of 101 permanent teeth (27.5%) belonging to the articulated skeletons, and were considerably more likely to affect females (50.0% of teeth) than males (19.0% of teeth). Non-adults' permanent teeth (56.1% of teeth) were more likely to be affected than adults (19.7% of teeth), suggesting that non-adults with DEH were less likely to survive into adulthood. Ten permanent teeth from the disarticulated Context (20692) were also affected by DEH, eight of which belonged to adults and another two were young juvenile unerupted permanent crowns. Finally, a deciduous crown from Context (20829) had a series of pits across its surface, which were thought to be caused by DEH (see Table 2).

Ante-mortem tooth loss (AMTL), or the loss of teeth during life, can occur as a result of a variety of factors, including dental caries, pulp-exposure from heavy tooth wear, or periodontal disease (occurring when inflammation of the gums, gingivitis, spreads to the underlying bone). Gingivitis can result when deposits of calculus on the teeth aggravate the gums. Once the tooth has been lost, the empty socket is filled in with bone.

Seven of the adults had experienced AMTL and the condition affected male teeth slightly more frequently (17.1% of male tooth positions) than female teeth (9.4 % of female tooth positions). This would also suggest that factors other than caries contributed to the cause of tooth loss in

the Catterick population.

Teeth can be absent from the erupted dentition due to a genuine failure of the tooth to develop (congenital absence), or because the tooth develops but fails to erupt (impaction). Full impaction means the tooth remains completely within the jaw, but teeth that erupt at an angle can be considered partially impacted. In well preserved archaeological skeletal remains it is usually impossible to tell without a radiograph whether a tooth has not erupted because it is impacted or because it is congenitally absent. Occasionally, it is possible to observe that a tooth is impacted if post-mortem damage exposes the impacted tooth. Since systematic radiographs were not taken of all the jaws from Catterick, teeth that were absent from the erupted dentition were recorded as 'not present/ unerupted' unless there was definite evidence for impaction.

Skeleton 20813 (indeterminate, old middle adult) had four impacted teeth, which were visible as a result of post-mortem damage. Both individual's mandibular third molars were orientated horizontally, with the crowns lying medially and the roots distally. The permanent maxillary right canine had also failed to erupt, with the crown evident in the roof of the maxilla. Finally, the individual's left mandibular second premolar was also impacted and, due to taphonomic alteration, was evident within the crypt. A further four adults (3 male and one female) had a total of eight teeth which had failed to erupt, all of which were third molars (3.3 % of adult tooth positions).

Four of the adults (three males and one female) exhibited tiny chips on the occlusal margin of a total of 25 teeth. Overall, small enamel chips were observed in 4.7% of adult teeth. The non-adult population did not exhibit any enamel chips on their permanent or deciduous dentition.

An old middle adult male (Skeleton 20416) had a broken left maxillary first premolar. All that remained was the root, which appeared smooth and well rounded, with no sign of damage to the surrounding alveolar bone. The type of force applied to the teeth results in differences in the pattern of teeth fractured. The anterior (front) teeth are usually fractured if they are hit directly (e.g. banging the teeth against an object in a fall, or following a direct blow to the face), whereas the molars and premolars are more likely to be injured when the lower jaw is forced against the upper jaw (e.g. following a fall onto, or a blow delivered to, the underside of the chin; Glendor *et al* 2007, 235). Crown fractures of the molars and premolars have also been reported due to violent tooth clenching seen in drug addicts (*ibid* 233). Damage to the teeth without damage to the surrounding tissues is more common with high velocity impacts and sharp objects are more likely to cause crown fractures with minimal tooth displacement, whereas blunt objects are more likely to cause root fractures and displacement of teeth (*ibid* 235-236).

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Appendix

Table 1 Summary of the osteological and palaeopathological results

Skeleton No	Preservation*			Age	Sex	Stature (cm)	Dental Pathology	Pathology
	SP	F	C					
1223	4	Mod	10%	J 1-12	-	-	-	-
20116	3	Mod	80%	MA 46+	M	166.6 +/- 3.27	Calculus, moderate periodontal disease, antemortem tooth loss, heavily slanted wear on the left mandibular canine and first premolar	DJD in the left clavicle, the right humerus, and auricular surface, both femora, the right first metatarsal, cervical and thoracic Spine. OA in the cervical, thoracic and lumbar spine. Schmorl's nodes in the thoracic spine. Possible well remodelled OD on the distal right humerus.
20117	4	Mod	70%	YMA 26-35	F	158.3 +/- 3.72	Calculus, DEH, caries, antemortem tooth loss	Spondylolysis of L5
20118	3	Severe	60%	YJ 1-6	-	-	Calculus, chips on the enamel	-
20119	4	Severe	20%	YJ 1-6	-	-	Calculus	-
20120	3	Severe	40%	YJ 1-6	-	-	-	-
20188	2	Mod	40%	P 0-1 mnth	-	-	-	-
20190	3	Mod	30%	A 18+	-	-	-	Trauma to the capsular attachment of the right ankle, affecting the distal

								tibia, talus and calcaneus
20197	5	Severe	60%	A 18+	F	-	-	DJC in both femora and right acetabulum
20226**	1	Min	30%	P 0-1 mnth	-	-	-	-
20342	5	Severe	70%	YA 18-25	F??	153.5 +/- 3.66	Calculus, DEH.	-
20395	2	Mod	80%	YA 18-25	M	-	Calculus	Schmorl's nodes in the thoracic spine. Possible lumbarisation of S1. Possible cox vara of the left femur. Possible cortical defect / OD on the proximal articulation of the right proximal phalanx for MT1
20416	3	Mod	100%	OMA 36-45	M	163.75 +/- 3.27	Antemortem tooth loss, calculus, DEH, broken tooth, abscess, moderate periodontal disease.	DJC in the cervical, thoracic and lumbar spine, and the left femur. Enigmatic lytic lesions on the anterior body of the 1st and 2nd thoracic vertebra. Bilateral hypoplasia of the femoral necks.
20475	5	Mod	60%	A 18+	F??	-	Calculus, DEH, chipped enamel.	Possible depression fracture on the right parietal.
20477	3	Mod	75%	ADO 13-17	-	-	Calculus, DEH.	Woven bone on the pleural surface of the 2nd-8th left ribs. Cribra orbitalia. Sinusitis.
20543**	1	Mod	40%	P 0-1 mnth	-	-	-	-
20573	3	Mod	80%	OMA 36-45	M	-	Antemortem tooth loss, calculus, caries, abscess, slight periodontal disease.	DJC in the cervical and thoracic spine, both hips the right ankle and the left hand. OA in the thoracic spine and right hip. Calcaneus secundarius, in the left calcaneus. Well healed fracture to the right distal fibula, with associated ligament damage. Possible compression fracture to the posterior margin of the distal right tibia. Possible healed fracture to the distal shaft of the left second metacarpal, and associated trauma to the proximal and intermediate phalanges for the metacarpal. Cribra Orbitalia. Sinusitis.
20585	4	Mod	80%	YMA 26-35	F	-	Antemortem tooth loss,	Hiatus in the right transverse foramen of the

							calculus, caries, DEH, slight periodontal disease, chips on dental enamel	second cervical vertebra.
20603	3	Mod	90%	YA 18-25	Ind	157.2 +/- 2.99 (M) 153.6 +/- 3.55 (F)	calculus, slight periodontal disease, chips on dental enamel	Sinusitis. Cribra Orbitalia. Hypoplasia/underdevelopment of the left hook of hamate.
20604	5	Mod	40%	A 18+	-	-	Caries, abscess.	-
20615	5	Mod	50%	A 18+	F?	-	Calculus, chips on dental enamel	-
20691	4	Mod	70%	OJ 7-12	-	-	DEH	-
20721	5	Mod	60%	MA 46+	M?	-	Calculus, caries, chip on dental enamel, abscess, periodontal disease	Button osteomas on the left parietal. Cribra Orbitalia. Sinusitis.
20813	2	Mod	80%	OMA 36-45	Ind	173.3 +/- 2.99 (M) 170.8 +/- 3.55 (F)	Calculus, caries, impacted teeth	Cribra Orbitalia. DJC in the left hip, an un-sided intermediate hand phalanx, and a left proximal pedal phalanx. Cortical defect/ OD on the distal left humerus. Possible crush fractures, to two intermediate and distal pedal phalanges.
20844	2	Severe	25%	YMA 26-35	M??	-	Calculus, caries, DEH	Cribra Orbitalia.
20957	3	Mod	90%	OMA 36-45	M	156.4 +/- 3.53 (African) 159.8 +/- 2.99 (Caucasian)		Healed fracture to the distal left fibula. Bilateral calcaneus secundarius. Asymmetrical spondylolysis of L2 or L3. Enigmatic lesion on the buccal side of the right mandible. Vascularised lamella bone on the endocranial surface of the occipital. Spherical lesion present on the posterior, distal surface of the shaft of the left femur.
20962	4	Mod	90%	A 18+	M?	165.0 +/- 4.05	Antemortem tooth loss, caries, abscess.	-

* Preservation: SP = surface preservation, graded according to McKinley (2004); F = fragmentation; C = completeness. ** identified during analysis

Table 2 Summary of disarticulated bone

Context	Bone Element	Detailed Description	Side	%	SP	Frags	Age	Sex	Other
20115	vertebrae	x 3 thoracic arch frags	R	10	1	3	Juv	-	-
20384	Proximal hand phalanx	Complete		100	2	1	Adult	-	0 DJC
20384	Permanent tooth	Maxillary canine	L	100	2	1	Adult	-	DEH, wear G5
20384	Permanent tooth	Maxillary first premolar	L	100	2	1	Adult	-	Flecks of calculus, wear=G5
20384	Permanent tooth	Maxillary second premolar	L	100	2	1	Adult	-	Flecks of calculus, wear= G5
20433	Femur	Proximal, mid and distal shaft	L	60	2	1	Ad	-	Ap= 23.6mm Ml= 32.7mm
20438	Tibia	Mid-shaft fragment	L	30	2	1	Adult	-	-
20541	Femur	Mid-shaft fragment	-	30	2	1	Adult	-	-
20550	Femur	Distal end of shaft and lateral condyle	L	15	1	1	Adult	-	-
20564	Skull	Occipital, L+R frontal, R temporal	-	60	3	1	Ado	-	Jugular growth plate unfused, cribra orbitalia in R orbit, ossicle in R lambdoid, possible premature suture fusion of R coronal suture
20564	Skull	Fragments of occipital and parietal	-	30	4	8	Y Juv	-	Thinner vault fragments and duplicated elements from above, different individual
20692	Permanent tooth	Mandibular first premolar, crown only	R	50	2	1	Adult	-	DEH, wear=G2
20692	Permanent tooth	Mandibular canine, crown only	R	50	2	1	Adult	-	DEH, wear=G2
20692	Permanent tooth	Mandibular lateral incisor, crown only	R	50	2	1	Adult	-	DEH, wear=G2
20692	Permanent tooth	Mandibular second premolar, crown and half a root (broken)	R	70	1	1	Adult	-	Wear= G2
20692	Permanent tooth	Mandibular second molar, crown and half a root (broken)	R	70	1	1	Adult	-	-
20692	Permanent tooth	Mandibular first molar, crown and half a root (broken)	R	70	2	1	Adult	-	DEH, wear=G2
20692	Permanent tooth	Maxillary second molar, crown and half a root (broken)	L	80	2	1	Adult	-	DEH, wear=G1
20692	Permanent tooth	Maxillary first premolar, crown and half a root (broken)	R	80	2	1	Adult	-	DEH, wear=G2
20692	Permanent tooth	Maxillary second premolar, crown and half a root (broken)	R	90	2	1	Adult	-	DEH, wear=G2
20692	Permanent tooth	Mandibular canine, crown and 1/4 root (broken)	L	50	2	1	Adult	-	DEH, wear=G2
20692	Permanent tooth	Maxillary second molar, crown 3/4 complete	R	40	2	1	Y Juv	-	DEH
20692	Permanent tooth	Maxillary second molar, crown 3/4 complete	L	40	2	1	Y Juv	-	DEH
20692	Permanent tooth	Mandibular first molar, crown half complete	R	30	2	1	Y Juv	-	-
20692	distal hand phalanx	Unfused, complete	-	100	2	1	Juv	-	-

20692	distal hand phalanx	Unfused, complete	-	100	2	1	Juv	-	-
20692	distal hand phalanx	Unfused, complete	-	100	2	1	Juv	-	-
20692	intermediate hand phalanx	Unfused, complete	-	100	2	1	Juv	-	-
20692	intermediate hand phalanx	Unfused, complete	-	100	2	1	Juv	-	-
20692	intermediate hand phalanx	Unfused, complete	-	100	2	1	Juv	-	-
20692	Skull	Vault fragment	-	5	3	1	Juv	-	-
20692	Skull	Fragment of petrous	-	5	4	1	Juv	-	-
20692	Humerus	Distal articulation and lateral condyle	L	5	2	1	Juv	-	-
20811	Os-coxa	Ilium, ischium, pubis	L	40	2	29	Adult	-	0 DJC, too incomplete to age or sex
20811	Femur	Mid-shaft fragment	-	5	2	2	Adult	-	-
20820	Skull	L+R frontal, L+R parietals, L+R temporals, occipital and sphenoid	-	60	3	50+	Y Juv	-	R deciduous mandibular M2 had small caries on the mesial side of the crown
20829	Deciduous tooth	Maxillary lateral incisor crown and 3/4 root (broken)	R	70	3	1	Y Juv	-	DEH (pits), wear=G2
20829	Deciduous tooth	Mandibular central incisor, crown only (broken)	L	50	2	1	Y Juv	-	Wear=G2
20829	Permanent tooth	Mandibular central incisor, crown only (developing)	L	50	1	1	Y Juv	-	Unerupted
20829	Permanent tooth	Maxillary first molar, crown only (developing)	L	50	1	1	Y Juv	-	-
20829	Permanent tooth	Maxillary first premolar, crown only (developing)	L	50	1	1	Y Juv	-	-
20829	Skull	Sphenoid, greater wing	L	35	4	1	Juv	-	-
20829	Skull	Vault fragments	-	5	3	25	Juv	-	-
20829	Deciduous tooth	Maxillary lateral incisor, crown only, broken	L	50	1	1	Y Juv	-	-
20841	proximal manual phalanx for MC1	Missing half of the distal articulation	-	90	2	1	Adult	-	0 DJC
20845	Skull	R temporal, R frontal, R parietal, R occipital	R	40	2	4	O juv - Ado	-	Basilar unfused
20848	Permanent tooth	Mandibular M2	L	100	2	1	Adult	-	Wear= G6 (33-45 yrs)
20887	Intermediate hand phalanx	Missing distal artic	-	90	2	1	Adult	-	-
20961	Femur	Proximal end and shaft	L	20	2	2	Adult?	-	-

Disarticulated Burnt Bone

Context	Bone Element	Detailed Description	g.	Frags	SP	Other
20572	Burnt bone	unidentifiable fragments	1.0	3	-	cannot positively identify as human, approx. 2mm
20115	Burnt bone	Unidentifiable vault and shaft fragments	0.5	11	1	cannot positively identify as human, approx. 2-5mm
20158	Burnt bone	unidentifiable fragments	0.2	5	1	cannot positively identify as human, approx. 2mm
20177	Burnt bone	unidentifiable fragments	1.2	18	1	cannot positively identify as human, approx. 2mm
20189	Burnt bone	unidentifiable fragments	0.15	6	1	cannot positively identify as human, approx. 2mm
20341	Burnt bone	unidentifiable fragments	2.4	13	1	cannot positively identify as human, 5mm sieve
20341	Burnt bone	unidentifiable fragments	2.3	50+	1	cannot positively identify as human, 2mm sieve

20341	Burnt bone	unidentifiable fragments	0.05	-	1	cannot positively identify as human, approx. 2mm
20415	Burnt bone	unidentifiable fragments	1.2	30	1	cannot positively identify as human, approx. 2mm
20419	Burnt bone	unidentifiable fragments	0.3	8	1	cannot positively identify as human, approx. 2mm
20429	Burnt bone	unidentifiable fragments	0.1	10	1	cannot positively identify as human, approx. 2mm
20433	Burnt bone	unidentifiable fragments	0.05	6	1	cannot positively identify as human, approx. 2mm
20438	Burnt bone	unidentifiable fragments	0.1	9	1	cannot positively identify as human, approx. 2mm
20456	Burnt bone	unidentifiable fragments	0.2	22	1	cannot positively identify as human, approx. 2mm
20479	Burnt bone	unidentifiable fragments	1.2	51	1	cannot positively identify as human, approx. 2mm
20533	Burnt bone	unidentifiable fragments	1.2	8	1	cannot positively identify as human, 5mm sieve
20533	Burnt bone	unidentifiable fragments	3.0	89	1	cannot positively identify as human, 2mm sieve
20541	Burnt bone	unidentifiable fragments	0.05	4	1	cannot positively identify as human, < 2mm sieve
20602	Burnt bone	unidentifiable fragments	2.2	9	1	cannot positively identify as human, 5mm sieve
20602	Burnt bone	unidentifiable fragments	3.3	91	1	cannot positively identify as human, 2mm sieve
20602	Burnt bone	unidentifiable fragments	0.2	-	1	cannot positively identify as human, approx. 2mm
20605	Burnt bone	unidentifiable fragments	0.5	12	1	cannot positively identify as human, approx. 2mm
20613	Burnt bone	unidentifiable fragments	0.2	5	1	cannot positively identify as human, approx. 2mm
20663	Burnt bone	unidentifiable fragments	1.1	23	1	cannot positively identify as human, approx. 2mm
20814	Burnt bone	unidentifiable fragments	1.3	37	1	cannot positively identify as human, approx. 2mm
20829	Burnt bone	unidentifiable fragments	0.5	17	1	cannot positively identify as human, approx. 2mm
20841	Burnt bone	unidentifiable fragments	1.3	25	1	cannot positively identify as human, approx. 2mm
20848	Burnt bone	unidentifiable fragments	1.1	36	1	cannot positively identify as human, approx. 2mm
20868	Burnt bone	unidentifiable fragments	0.1	12	1	cannot positively identify as human, approx. 2mm
20887	Burnt bone	unidentifiable fragments	0.2	2	1	cannot positively identify as human, approx. 2mm
20956	Burnt bone	unidentifiable fragments	2.1	25	1	cannot positively identify as human, approx. 2mm
20961	Burnt bone	unidentifiable fragments	0.2	8	1	cannot positively identify as human, approx. 2mm

Appendix A Skeletal Catalogue

Skeleton Number	**1223**
Preservation	Poor (Grade 4)
Completeness	10%
Age	1-12 years, Juvenile
Sex	-
Stature	-
Non-Metric Traits	-
Pathology	-
Dental Health	0 tooth positions, 0 teeth present

	Right Dentition								Left Dentition							
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maxilla	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Mandible	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**

Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Skeleton Number	**20116**
Preservation	Poor (Grade 4)
Completeness	80%
Age	46+ years, mature adult
Sex	Male
Stature	166.6 cm +/- 3.27
Non-Metric Traits	*Mandibular torus* (bilateral), *septal aperture* (left), *Allen's fossa* (bilateral), *lateral tibial squatting facet* (bilateral), double anterior calcaneal facet (left).
Pathology	DJD in the left lateral clavicle, the right proximal humerus, and auricular surface, both proximal femora, the distal articulation of the right first metatarsal, cervical and thoracic bodies, and thoracic articular facets. OA in the cervical, thoracic and lumbar spine. Schmorl's nodes in the thoracic spine. Possible well remodelled OD on the distal articulation of the right humerus, with a smooth circular indentation contiguous with the articular surface, located on the posterior surface of the trochlea, which measured 4.1mm in diameter, alternatively the lesion may have been a cortical defect.
Dental Health	15 tooth positions, 4 teeth present, 10 lost antemortem, 1 not present. Calculus on 4/4 teeth, slight to heavy deposits, moderate periodontal disease, heavily slanted wear on the left mandibular canine and the left mandibular first premolar.

	Right Dentition								Left Dentition							
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	-	AM	AM	P	AM	P	AM	AM	AM	AM	P	P	AM	AM	AM	NP
Calculus	-	-	-	Fd	-	Hb Fl	-	-	-	-	Mdm Sb	Sb Mdl	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	3	-	2	-	-	-	-	4	6	-	-	-	-

Skeleton Number	**20117**
Preservation	Poor (Grade 4)
Completeness	70%
Age	26-35 years, young middle adult
Sex	Female
Stature	158.3cm +/- 3.72
Non-Metric Traits	*Ossicle in lambdoid* (left), *parietal foramen* (right), *mastoid foramen extrasutural* (left), *absent zygomaticofacial foramen (bilateral), septal aperture* (left), *accessory sacral facet* (right), *Allen's fossa* (bilateral), *hypotrochanteric fossa* (bilateral), *third trochanter* (bilateral), *vastus notch*

	(bilateral).															
Pathology	Spondylolysis of the fifth lumbar vertebrae. Only the left side of the body survived, however; the inferior surface of the pedicle was generally smooth with a slightly roughened and irregular appearance. The surface of the avulsed fragment was also speculated and irregular, but with a generally smooth appearance.															
Dental Health	15 tooth positions, 23 teeth present, 1 lost post-mortem, 4 lost antemortem, 14/23 teeth had calculus, flecks to heavy deposits, 2 caries on 2 teeth, 16/23 teeth had DEH, 1/15 teeth not present															
	Right Dentition								Left Dentition							
Present	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Calculus	Sl	Fbl	Ml Fb	Sl	Sl	-	-	-	-	-	-	-	-	Fb Sl	Fb Ml	Ml Sd
DEH	-	-	-	G	G	G	G	G	G	G	G	G	G	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	Sd	Lo	-	-	-
Wear	2	2	4	3	3	4	5	5	5	4	3	3	-	4	3	2
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	NP	AM	AM	B	PM	P	P	P	AM	P	P	P	P	AM	-	-
Calculus	-	-	-	-	-	Sb	Fb	Hb	-	Mb	-	Sl	Sl	-	-	-
DEH	-	-	-	-	-	G	G	-	-	G	G	G	G	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	3	4	4	-	3	3	3	3	-	-	-

Skeleton Number	**20118**															
Preservation	Moderate (Grade 3)															
Completeness	60%															
Age	1-6, young juvenile															
Sex	-															
Stature	-															
Non-Metric Traits	-															
Pathology	-															
Dental Health	8 tooth positions, 20 teeth present, 1/20 teeth had calculus flecks, enamel chips on the mandibular left central, and right lateral incisors.															
	Right Dentition								Left Dentition							
Present	-	-	-	P	P	P	P	P	P	P	P	P	P	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	1	2	3	2	3	3	2	2	2	2	-	-	-
Maxilla	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Mandible	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Present	-	-	-	P	P	P	P	P	P	P	P	P	P	-	-	-
Calculus	-	-	-	-	Fl	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	2	2	2	3	3	3	3	2	2	2	-	-	-

Skeleton Number				**20119**												
Preservation				Poor (Grade 4)												
Completeness				20%												
Age				1-6, young juvenile												
Sex				-												
Stature				-												
Non-Metric Traits				-												
Pathology				-												
Dental Health				0 tooth positions, 8 teeth present, 1/8 teeth had calculus flecks.												
	Right Dentition								Left Dentition							
Present	-	-	-	-	-	-	P	P	-	P	P	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	2	3	-	2	2	-	-	-	-	-
Maxilla	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Mandible	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Present	-	-	-	P	-	P	-	P	-	-	-	P	-	-	-	-
Calculus	-	-	-	-	-	-	-	Fm	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	2	-	2	-	3	-	-	-	2	-	-	-	-

Skeleton Number				**20120**												
Preservation				Moderate (Grade 3)												
Completeness				24%												
Age				1-6, young juvenile												
Sex				-												
Stature				-												
Non-Metric Traits				-												
Pathology				-												
Dental Health				0 tooth positions, 14 teeth present, and 3 unerupted crowns.												
	Right Dentition								Left Dentition							
Present	-	-	-	UE	P	P	P	P	P	P	P	P	UE	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	1	1	1	1	1	1	1	1	-	-	-	-
Maxilla	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Mandible	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Present	-	-	-	-	P	P	P	-	-	P	P	P	UE	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	1	1	1	-	-	1	1	1	-	-	-	-

Skeleton Number	**20188**
Preservation	Good (Grade 3)
Completeness	40%
Age	Birth-1 month, Perinate
Sex	-
Stature	-
Non-Metric Traits	-
Pathology	-
Dental Health	0 tooth positions, 0 teeth present.

	Right Dentition								Left Dentition							
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maxilla	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Mandible	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Skeleton Number	**20190**
Preservation	Moderate (Grade 3)
Completeness	30%
Age	18+ years, Adult
Sex	-
Stature	-
Non-Metric Traits	-
Pathology	Trauma to the capsular attachment of the right ankle; ossified spicules were evident on the posterior margin of the posterior/inferior calcaneal facet on the talus and the posterior margin of the posterior talar articular surface of the calcaneus, around the margin of the capsular ligament. Identical spicules of bone were also identified on the distal right tibia, on the antero-lateral margin of the capsular attachment.
Dental Health	0 tooth positions, 0 teeth

	Right Dentition								Left Dentition							
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Skeleton Number	**20197**
Preservation	Very poor (Grade 5)
Completeness	60%
Age	18+ years, adult
Sex	Female
Stature	-
Non-Metric Traits	*Vastus fossa* (right).
Pathology	DJD in the right acetabulum, and both proximal femora
Dental Health	0 tooth positions, 7 teeth present.

	Right Dentition								Left Dentition							
Present	-	-	-	P	P	-	-	P	P	-	-	P	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	5	5	-	-	6	6	-	-	6	-	-	-	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	-	-	-	-	-	P	P	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	7	7	-	-	-	-	-	-	-	-	-

Skeleton Number	**20226**
Preservation	Very Good (Grade 1)
Completeness	30%
Age	Birth-1 month, perinate
Sex	-
Stature	-
Non-Metric Traits	-
Pathology	-
Dental Health	0 tooth positions, 0 teeth present.

	Right Dentition								Left Dentition							
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maxilla	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Mandible	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Skeleton Number	**20342**
Preservation	Very poor (Grade 5)
Completeness	70%
Age	18-25 years, young adult
Sex	Female
Stature	153.5 $^{+/-}$ 3.66
Non-Metric Traits	*Ossicle at lambda, ossicile in lambdoid* (bilateral), *parietal foramen* (right), *metopic suture, bridging of the supraorbital notch* (left), Allen's fossa (left), hypotrochanteric fossa (left), lateral tibial squatting facet (bilateral).
Pathology	-
Dental Health	10 tooth positions, 31 teeth present, 1/31 teeth with calculus flecks, DEH on 20/31 teeth.

	Right Dentition								Left Dentition							
Present	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Calculus	-	-	-	-	-	-	-	-	-	Fb	-	-	-	-	-	-
DEH	-	-	G	G	-	G	-	G	G	-	G	G	G	-	G	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	2	2	3	2	2	2	2	3	3	2	2	2	2	3	2	2
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	P	P	P	P	P	P	P	-	P	P	P	P	P	P	P	P
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	L	-	G	G	G	G	-	G	G	G	G	G	-	G	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	2	2	3	2	2	2	2	-	3	3	2	2	2	3	2	2

Skeleton Number	**20395**
Preservation	Good (Grade 2)
Completeness	80%
Age	18-25 years, young adult
Sex	Male
Stature	-
Non-Metric Traits	*Double anterior calcaneal facet* (bilateral), *double inferior talar facet* (right).

Pathology	Schmorl's nodes in the thoracic spine. Possible lumbarisation of S1. A very poorly preserved fragment of what looked like a sacral body, with a wider superior body than inferior the right lamina was entirely independent, as was the inferior body, unfortunately the left lamina was not present, the body of S1/2 was also present and appeared as a normal first sacral vertebra would. Possible cox vara of the left femur, the head of the femur sat below the height of where the greater trochanter would have been, although the greater trochanter was not present, as a result of taphonomic alteration. Possible cortical defect / OD on the proximal articulation of the right proximal phalanx for MT1; a deep crevasse was present on the centre of the articular surface, which had irregular, geographic margins, exposing the underlying trabecular bone. The lesion had an inactive appearance and measured 6.2mm in diameter.
Dental Health	2 tooth positions, 4 teeth present, 4/4 teeth with calculus, flecks to slight

	Right Dentition								Left Dentition							
Present	P	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	Sm	-	Sl Fb Md	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	2	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	Sdl	Flmd	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	3	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Skeleton Number	**20416**
Preservation	Moderate (Grade 3)
Completeness	100%
Age	36-45 years, old middle adult
Sex	Male
Stature	163.75 cm +/- 3.27
Non-Metric Traits	*Ossicle in lambdoid* (bilateral), *parietal foramen* (right), *ossicle at asterion* (left) *mastoid foramen extrasutural* (right), *sutural mastoid foramen* (bilateral), *accessory supraorbital foramen* (right), *circumflex sulcus* (bilateral), *acetabular crease* (left), *exostosis in the trochanteric fossa* (left), *lateral tibial squatting facet* (bilateral), *absent anterior calcaneal facet* (bilateral).
Pathology	Schmorl's nodes in the thoracic spine. DJC in the cervical, thoracic, and lumbar spine, and both proximal femora. T1 and T2 both exhibited small crescent shaped lesions on the antero-inferior margin of the body, in both cases the margins of the lesions were irregular but smooth, measuring between 7-10.5mm in diameter, potentially disc herniations, or avulsion of the annular rings. Bilateral hypoplasia of the femoral necks. Both femoral necks were short, with slight inferior angulation of the heads, which were no so shortened and inferiorly angulated as to have coxa vara. The left femoral fovea, was not particularly deep and appeared to be partially infilled.
Dental Health	19 tooth positions, 24 teeth present, 2/19 lost post mortem, 2/19 lost antemortem, 1/24 teeth broken 23/24 teeth with calculus, flecks to moderate deposits, DEH on 5/24 teeth, 4/19 tooth positions NP, externally draining abscess on the left maxilla, moderate periodontal disease. The entire crown of the left maxillary first premolar had been broken off, with the remaining exposed root exhibiting a polished/ worn appearance.

	Right Dentition								Left Dentition							
Present	NP	P	P	P	P	P	P	P	P	P	P	B	P	P	P	NP

Calculus	-	Fm	Sbl	Sb	Sb	Fm	Mb Fd	Sbl	Sbl	Mb Sl	Mb Sl	-	Sbl	Hb Sl	Sbl	-
DEH	-	-	-	-	-	G	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	3	5	4	4	3	4	5	5	4	4	-	3	6	5	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	NP	P	P	AM	P	P	P	PM	PM	P	P	P	AM	P	P	NP
Calculus	-	Sl Fd	Ml Fm	-	Sbl	Sbl	Sb	-	-	Fbm	Slm	Fl Sb	-	Mbml	Mbd Sl	-
DEH	-	-	-	-	G	G	G	-	-	-	G	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	4	6	-	3	4	5	-	-	4	4	3	-	7	6	-

Skeleton Number	**20475**
Preservation	Very poor (Grade 5)
Completeness	60%
Age	18+ years, adult
Sex	Female ??
Stature	-
Non-Metric Traits	*Mastoid foramen extrasutural* (right).
Pathology	Possible depression fracture on the right parietal; a sub-oval depression measured 25.9mm ap x 29.5mm ml, and had smooth gradually sloping edges, with smooth surfaces to the sides and the base of the lesion, which was located on the medio-anterior region of the bone. The left parietal appeared unaffected, suggesting it was not the result of developmental thinning.
Dental Health	0 tooth positions, 14 teeth present, 11/14 teeth with calculus flecks, DEH on 5/14 teeth.

	Right Dentition								Left Dentition							
Present	P	-	-	-	-	P	-	-	-	P	-	-	-	-	-	-
Calculus	Fbl	-	-	-	-	-	-	-	-	Fd	-	-	-	-	-	-
DEH	-	-	-	-	-	G	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	3	-	-	-	-	5	-	-	-	4	-	-	-	-	-	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	P	P	-	-	P	P	P	P	-	P	P	P	P	-	-	P
Calculus	Fl	Fl	-	-	Fd	-	Fbl	Fmd	-	-	Ff	Fd	Fld	-	-	Fd
DEH	-	-	-	-	G	G	G	-	-	-	G	G	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	6	6	-	-	4	4	4	5	-	5	4	4	4	-	-	4

Skeleton Number	**20477**
Preservation	Moderate (Grade 3)
Completeness	75%
Age	13-17 years, adolescent
Sex	-

Stature	-
Non-Metric Traits	*Ossicle in lambdoid* (right), *parietal foramen* (right), *palatine torus, hypotrochanteric fossa* (bilateral).
Pathology	Cribra Orbitalia. Sinusitis. Woven bone on the pleural surface of the second to eighth left ribs. The woven bone formed a plaque like layer, largely covering the rib necks and vertebral ends of the shafts.
Dental Health	3 tooth positions, 31 teeth present, 1/3 lost post-mortem, 5/31 teeth had calculus, slight deposits, 16/31 teeth had DEH.

	Right Dentition								Left Dentition							
Present	P	P	P	P	P	P	P	P	PM	P	P	P	P	P	P	P
Calculus	-	-	-	-	-	-	-	Sb	-	-	-	-	-	-	-	-
DEH	-	G	G	G	-	G	-	-	-	-	-	G	G	-	G	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	1	2	2	2	2	2	2	2	-	2	2	2	2	2	2	1
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Calculus	-		Sl	Sl	-	-	-	-	-	-	-	-	-	Sl	Sl	-
DEH	-	G	G	G	G	G	-	-	-	-	G	G	G	-	G	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	1	2	3	2	2	2	2	2	2	2	2	2	2	2	2	1

Skeleton Number	**20543**
Preservation	Very Good (Grade 1)
Completeness	40%
Age	Birth-1 month, perinate
Sex	-
Stature	-
Non-Metric Traits	-
Pathology	-
Dental Health	0 tooth positions, 0 teeth present.

	Right Dentition								Left Dentition							
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maxilla	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Mandible	**-**	**-**	**-**	**e**	**d**	**c**	**b**	**a**	**a**	**b**	**c**	**d**	**e**	**-**	**-**	**-**
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Skeleton Number	**20573**
Preservation	Moderate (Grade 3)
Completeness	80%
Age	36-45 years, old middle adult
Sex	Male
Stature	-
Non-Metric Traits	*Mastoid foramen extrasutural* (right), *circumflex sulcus* (bilateral), *hypotrochanteric fossa* (bilateral), *vastus notch* (right), *double anterior calcaneal facet* (bilateral).
Pathology	Cribra Orbitalia. Sinusitis. DJC in the cervical and thoracic, spine, the right acetabulum, both proximal femora the right distal tibia, and the proximal and intermediate phalanges for the left second metacarpal. OA in the thoracic spine, and right acetabulum. Calcaneus secundarius in the left calcaneus, a small semi-circular lesion was present on the anterior medial margin of the anterior articular facet. The surface of the lesion was smooth, but irregular. The avulsed fragment was not present. The right distal fibular had a well healed oblique fracture to the distal shaft, with slight anterior angulation of the distal fragment. The callus was very smooth, and well remodelled, with good apposition of the two fragments. The fracture was located immediately superior to the distal articulation, with possible associated soft tissue/ligament damage; the surface of the attachment for the interosseous ligament was roughened with spicules of bone extending from the medial-anterior border of the capsular attachment. The posterior margin of the distal right tibia, articular surface may have also been involved, with atrial impaction of the articular margin, creating a pushed in appearance. Further possible trauma to the distal shaft of the left second metacarpal, which had a slight inferior angulation to the distal shaft and articulation, creating a curved appearance. The proximal phalanx for the second metacarpal exhibited a thickened nodule of bone on the palmar surface of the distal third of the shaft, possibly an ossified haematoma, the distal articulation of the phalanx also exhibited moderate porosity and marginal lipping. What was probably the intermediate phalanx for the second metacarpal had an enlarged proximal articular surface with extension of the superior and inferior articular margins, appearing more like a pedal articulation, the centre of the articulation was irregular with a medium sized foramen penetrating the articular surface.
Dental Health	31 tooth positions, 28 teeth present, 2/31 lost post mortem, 1/31 lost antemortem 13/28 teeth with calculus, slight to moderate deposits, 1 caries on 1/28 teeth, externally draining abscess on the right maxilla, slight periodontal disease.

	Right Dentition								Left Dentition							
Present	P	P	P	P	P	P	PM	P	P	P	P	B	P	AM	P	PM
Calculus	Sb	Sl Sb	Sb	Slb	Sl	Sb	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	Sm	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	4	5	6	5	5	5	-	5	7	8	7	6	5	-	5	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	P	P	P	P	P	P	P	-	P	P	P	P	P	P	P	P
Calculus	Sb Ml	Sb Ml	Ml	Slb	Slb	Slb	Slb	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	4	5	8	4	4	4	4	-	4	4	4	4	4	4	5	6

Skeleton Number	**20585**
Preservation	Poor (Grade 4)
Completeness	80%
Age	26-35 years, young middle adult

Sex	Female
Stature	-
Non-Metric Traits	*Parietal foramen* (left), *mastoid foramen extrasutural* (right), *acetabular crease* (left), *hypotrochanteric fossa* (left).
Pathology	Hiatus in the anterior lateral margin of the right transverse foramen of the second cervical vertebra, possibly eroded due to the pressure of the vertebral artery, or filled by ligamentous tissue.
Dental Health	28 tooth positions, 30 teeth present, 1/28 lost antemortem, 16/30 teeth with calculus, flecks to slight deposits, 5 caries on 5/30 teeth, slight periodontal disease, DEH on 13/30 teeth, chips on the dental enamel of 10/30 teeth.

	Right Dentition								Left Dentition							
Present	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Calculus	-	-	-	-	-	Fb	-	-	-	-	-	-	Sb	Fbl	Fb	Sd
DEH	G	G	-	-	-	G	-	G	G	-	-	-	-	-	-	-
Caries	Sb	Mm	Lo	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	3	3	-	4	4	4	5	5	5	5	4	4	4	4	3	3
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	P	P	AM	P	P	P	P	P	P	P	P	P	P	-	P	P
Calculus	-	-	-	Fb Sd	Fd Sl	Fm Sd	Sl	Sl	Sl	Fd Slb	Fdb	Sl Fb	Fb	-	-	Fd
DEH	-	G	-	G	-	-	G	G	G	G	G	-	-	-	G	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mm	Mm
Wear	3	4	-	4	4	4	5	5	5	5	4	4	4	-	4	4

Skeleton Number	**20603**
Preservation	Moderate (Grade 3)
Completeness	90%
Age	18-25 years, young adult
Sex	Indeterminate
Stature	157.2 $^{+/-}$ 2.99 (M) 153.6 $^{+/-}$ 3.55 (F)
Non-Metric Traits	*Metopic suture, sutural mastoid foramen* (left), *posterior condylar canal open* (right), *acetabular crease* (right), *vastus notch* (left), *double anterior calcaneal facet* (bilateral), *double talar facet* (bilateral)
Pathology	Cribra Orbitalia. Sinusitis. The left hamate had an underdeveloped hook of hamate, only a small, smooth protrusion was present, probable hypoplasia.
Dental Health	32 tooth positions, 30 teeth present, 2/32 lost post-mortem, 22/30 teeth with calculus, flecks to moderate deposits, slight periodontal disease. chips on the dental enamel of 8/30 teeth.

	Right Dentition								Left Dentition							
Present	P	P	P	P	P	P	P	P	P	P	P	P	P	P	PM	P
Calculus	Sb	Fl Mb	Flb	Sm	Mb	-	-	-	-	-	-	-	Sb	Fbl	-	Sbl
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	3	3	3	2	2	2	3	4	4	3	3	2	2	3	-	3
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

Present	P	P	P	P	P	P	P	PM	P	P	P	P	P	P	P	P
Calculus	-	Sl	Slb	Sdb	Sm	Sl Fb	Sl	-	Slm	Sbm	Sdl	Sbl	Fl	Sb Fl	Sbl	Sbld
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	3	3	3	3	3	3	4	-	4	4	3	2	2	3	3	3

Skeleton Number	**20604**
Preservation	Very poor (Grade 5)
Completeness	40%
Age	18+ years, adult
Sex	-
Stature	-
Non-Metric Traits	*Parietal foramen* (bilateral), *mastoid foramen extrasutural* (left).
Pathology	-
Dental Health	0 tooth positions, 11 teeth present, 1 caries on 1/11 teeth, externally draining abscess on the left mandible at the root of the second molar.

	Right Dentition								Left Dentition							
Present	-	-	-	P	-	-	P	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	5	-	-	5	-	-	-	-	-	-	-	-	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	-	-	-	P	P	P	P	-	-	-	P	P	P	-	P	P
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mm
Wear	-	-	-	4	2	3	4	-	-	-	4	4	4	-	3	3

Skeleton Number	**20615**
Preservation	Very poor (Grade 5)
Completeness	50%
Age	18+ years, adult
Sex	Female?
Stature	-
Non-Metric Traits	*Ossicle at lambda, parietal foramen* (bilateral), *mastoid foramen extrasutural* (right), *sutural mastoid foramen* (right), *double anterior condylar canal* (right).
Pathology	-
Dental Health	0 tooth positions, 2 teeth present, 2/2 teeth with calculus, flecks to moderate deposits, dental chips on 1/2 teeth.

	Right Dentition								Left Dentition							
Present	-	-	-	-	-	-	-	-	-	-	P	-	P	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	Mb	-	Fd	-	-	-

DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	2	-	5	-	-	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Skeleton Number	**20691**
Preservation	Poor (Grade 4)
Completeness	70%
Age	7-12 years, older juvenile
Sex	-
Stature	-
Non-Metric Traits	*Ossicle at lambdoid.*
Pathology	-
Dental Health	0 tooth positions, 10 teeth present, 7/10 teeth with DEH

	Right Dentition								Left Dentition							
Present	-	-	-	-	-	P	-	-	P	-	P	-	P	P	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	G/P	-	-	G	-	G/P	-	P	G	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	2	-	-	-	-	2	-	5	-	-	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	-	-	-	-	-	-	-	-	-	P	P	P	P	P	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	G	-	-	G	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	-	-	-	-	-	-	-	-	2	2	2	2	2	-	-

Skeleton Number	**20721**
Preservation	Very poor (Grade 5)
Completeness	60%
Age	46+, mature adult
Sex	Male?
Stature	-
Non-Metric Traits	*Parietal foramen* (right), *mastoid foramen extrasutural* (left), *maxillary torus* (bilateral), *accessory supraorbital foramen* (right).
Pathology	Cribra Orbitalia. Sinusitis. Two small button osteomas were present on the central anterior region of the left parietal. Both osteomas, comprised of small nodules of bone, which were contiguous

	with the ectocranial surface of the parietal, and measured 3.9mm and 3.3mm in diameter.															
Dental Health	10 tooth positions, 16 teeth present, 1/10 lost post mortem, 4/16 teeth with calculus, Flecks to heavy deposits, 2 caries on 2/16 teeth, 1/16 teeth with chip out of enamel, externally draining abscess on the right maxilla.															
	Right Dentition								Left Dentition							
Present	-	-	P	P	P	P	P	P	PM	P	P	P	P	P	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	Fl	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	Md	Sm	-	-
Wear	-	-	7	6	4	4	4	7	-	2	2	3	3	4	-	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	P	-	-	-	-	-	-	P	-	-	-	-	P	-	P	P
Calculus	Fl	-	-	-	-	-	-	-	-	-	-	-	-	-	Sb Fl	Hb
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	4	-	-	-	-	-	-	4	-	-	-	-	4	-	3	2

Skeleton Number	**20813**															
Preservation	Moderate (Grade 2)															
Completeness	80%															
Age	36-45, old middle adult															
Sex	Indeterminate															
Stature	173.3cm +/- 2.99 (M) 170.8cm +/- 3.55 (F)															
Non-Metric Traits	*Ossicle in lambdoid* (left), *Parietal foramen* (right), *metopic suture, mandibular torus* (bilateral), *femoral plaque* (bilateral), *vastus fossa* (bilateral).															
Pathology	Cribra Orbitalia. DJC in the left acetabulum and proximal left femur, an un-sided intermediate hand phalanx, and a left proximal pedal phalanx. Cortical defect/ OD on the distal articulation of the left humerus. The lesion was located on the inferior surface of the trochlea, and had smooth shallow sloping, rounded edges and base, which was contiguous with the articular surface. The lesion measured 2.2 mm in diameter. Two intermediate and distal pedal phalanges had fused to one another; the margins of the joint were still discernible, suggesting the cause wasn't developmental. The fusion of the phalanges was smooth and well remodelled, with the distal phalanges in good apposition in both cases (possible crush fractures).															
Dental Health	27 tooth positions, 28 teeth present (4 of which are impacted but visible in crypts), 1/27 lost post mortem, 17/28 teeth with calculus, Flecks to moderate deposits, 1 caries on 1/28 teeth. Both mandibular M3s were orientated horizontally with the crowns medial and the roots distal. The crown of the right maxillary canine was evident in the roof of the maxilla, due to taphonomic alteration, the left mandibular PM2 was also evident within the crypt as a result of taphonomic damage to the internal surface of the mandible.															
	Right Dentition								Left Dentition							
Present	P	-	P	P	P	P	P	P	P	P	I	P	P	-	-	p
Calculus	Sm	-	-	-	Fm	Sb	-	Sl	Sl	-	-	Fm	Mb	-	-	Ma
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	Md	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	3	-	5	4	4	3	5	5	5	5	-	4	3	-	-	1
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	I	P	P	P	P	P	P	P	P	P	P	PM	I	P	P	I

Calculus	-	Fd	Sl	-	Fd	Sb Ml	Mb Sl	-	-	Mb Sl	Mb Sl	-	-	Fb Ml	Mb Sl	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	3	5	4	4	3	5	5	5	5	3	-	-	4	3	-

Skeleton Number	**20844**
Preservation	Good (Grade 2)
Completeness	35%
Age	26-35, young middle adult (based on tooth wear alone)
Sex	Male??
Stature	-
Non-Metric Traits	*Metopic suture, accessory supraorbital foramen* (right).
Pathology	Cribra Orbitalia.
Dental Health	19 tooth positions, 31 teeth present 22/31teeth with calculus, Flecks to slight deposits, 1 caries on 1/31 teeth, 18/31 teeth with DEH.

	Right Dentition								Left Dentition							
Present	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	p
Calculus	Sl Fm	Sl	Sl Fb	Fm	-	-	-	-	-	Sl	-	Sl	Fm	Sl	Sl	Sl
DEH	G	-	-	-	G	G	-	G	G	-	-	-	-	-	-	-
Caries	-	-	-	Md	-	-	-	-	-	-	-	-	-	-	-	-
Wear	3	3	4	3	3	4	3	4	6	3	4	4	4	4	4	3
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	P	P	P	P	P	P	P	P	PM	P	P	P	P	P	P	P
Calculus	Sd	Sl	-	Sl	Sd	Fl	Fl	-	-	Fl	Fl	Fl	Sl	Sl	-	Sl
DEH	-	G	G	G	G	G	G	-	-	G	G	G	G	G	G	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	3	3	4	2	2	3	3	3	-	3	3	3	3	3	3	3

Skeleton Number	**20957**
Preservation	Moderate (Grade 3)
Completeness	90%
Age	36-45, old middle adult
Sex	Male
Stature	156.37cm +/- 3.53 (African) 159.75+/- 2.99 (Caucasian)
Non-Metric Traits	*Parietal foramen* (right), *metopic suture, foramen of Huschke* (left), *open foramen spinosum* (left), *double atlas facet* (right), *posterior atlas bridging* (right), *transverse foramen bipartite* (left), *acetabular crease* (right), *femoral plaque* (left), *hypotrochanteric fossa* (bilateral), *lateral tibial squatting facet* (left).
Pathology	Healed fracture to the distal shaft of the left fibula the fracture appeared to be oblique, and travelled anteriorly-superiorly to posterior-inferiorly, with slight overlap and medial displacement of the inferior fragment. the fracture was well remodelled with a smooth callus. Bilateral calcaneus secundarius, small crescent shaped lesions were present on the anterior - medial borders of the anterior calcaneal facets, the surface of the lesion presented a slightly irregular topography, but did not appear to be reactive or porotic the second or third lumbar vertebrae had a partial spondylolysis. The fractured surfaces were irregular with well-defined

	margins, the lamina and the vertebral facet could be fitted back together perfectly. The right side of the vertebrae had been damaged post-mortem, but there were no signs of a fracture through the lamina in the same place as the left. An enigmatic lesion was present on the buccal surface of the right side of the mandible; a sub oval lesion with thinned, sharp margins measured 13.2mm ml x 9.6mm si within the lesion was an area of sub oval bone attached to the outer margins of the lesion by tiny islands of unaffected bone creating a trough of resorbed bone at the margins of the lesion. On close inspection, the internal 'island 'of bone was slightly vascularised. Possible trauma, however there is no evidence of displacement of the bone, potentially associated with the attachment of the buccinator muscle. Vascularised lamella bone was present on the endocranial surface of the occipital, within the right transverse sulcus. A spherical lesion was present on the posterior, distal surface of the shaft of the left femur, located at the insertion of the medial head of the gastrocnemius, the lesion had sharp, well defined margins and an irregular base.
Dental Health	18 tooth positions, 28 teeth present 1/18 teeth lost antemortem 2/18 teeth not present, 22/28 teeth with calculus flecks to moderate deposits, 2 caries on 2/28 teeth, chips on 4/28 teeth, slight periodontal disease.

	Right Dentition								Left Dentition							
Present	P	P	P	AM	P	P	P	P	P	P	P	P	P	P	P	p
Calculus	Sb	Slb	Sd	-	-	Sl	-	-	-	Fl	Fb	Sl Fb	Sl	Sl	Sl	Sbd
DEH	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Sd	Mm
Wear	2	4	5	-	3	4	4	4	5	4	3	3	3	4	4	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	NP	P	P	P	P	P	P	P	P	P	P	P	-	P	P	NP
Calculus	-	Sl Fd	Ml	Slb	Sl	Fl	Fl	-	-	Sl	Sl	Sl	-	Sb Sl	Ml	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wear	-	3	4	2	3	4	4	5	5	4	4	3	-	5	4	-

Skeleton Number	**20962**
Preservation	Poor (Grade 4)
Completeness	90%
Age	18+, adult
Sex	Male?
Stature	165.0cm +/- 4.05
Non-Metric Traits	*Mastoid foramen extrasutural* (bilateral), *hypotrochanteric fossa* (right).
Pathology	-
Dental Health	27 tooth positions, 14 teeth present 8/27 teeth lost antemortem, 5/27 teeth lost post-mortem, 5 caries on 4/14 teeth, externally draining abscess on the right mandible at the root of the canine., the anterior teeth were extremely worn, while the posterior teeth were only moderately worn (possible tool use)

	Right Dentition								Left Dentition							
Present	-	AM	AM	PM	P	P	PM	P	PM	P	P	PM	AM	AM	-	-
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	-	-	-	-	Md	Mm	-	-	-	-	-
Wear	-	-	-	-	7	8	-	8	-	7	7	-	-	-	-	-
Maxilla	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**

Mandible	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Present	P	P	AM	AM	P	P	P	-	-	P	PM	P	AM	AM	P	P
Calculus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caries	-	-	-	-	-	Md	-	-	-	-	-	-	-	-	Sm Ld	-
Wear	3	3	-	-	8	7	8	-	-	8	-	8	-	-	4	4

Table 1 Summary of cremated bone assemblages

Cremation No	**Feature Type**	**Period**	**Artefacts and Inclusions**	**Bone Colour**	**Preservation**	**Weight (g)**	**Percentage of Expected Quantity of Bone**
20107/9	Pit	Roman	Decorative bone inlay, glass or bone ring, numerous iron nails and the base of a small statue	White, greyish and black	Good	176.3	10.8%
20405	Pit	Roman	Cremation in urn	White and grey	Good	257.1	15.8%

Table 2 Summary of cremated bone fragment size

Cremation No.	**10mm (g)**	**10mm (%)**	**5mm (g)**	**5mm (%)**	**2mm (g)**	**2mm (%)**	**Residue (g)**	**Weight (g)**
20107/9	21.4	13.3	101.2	62.8	36.9	22.9	1.7	161.2
20405	125.2	48.7	94.8	36.9	30.3	11.8	6.8	257.1

Table 3 Summary of identifiable elements in the cremation burials

Burial No	**Skull (g)**	**Skull (%)**	**Axial (g)**	**Axial (%)**	**UL (g)**	**UL (%)**	**LL (g)**	**LL (%)**	**UIL (g)**	**UIL (%)**	**Total ID (g)**	**Total ID (%)**	**Total UID (g)**	**Total UID (%)**
20107/9	20.5	12.7	12.0	7.4	11.7	7.3	3.8	2.4	44.2	27.4	92.2	57.2	69.0	42.8
20405	49.7	19.3	30.6	11.9	55.0	21.4	54.9	21.4	10.7	4.2	200.9	78.1	56.2	21.9