St. Andrew's Church, Thursby

Osteological Report.

.

Report 82

Carlisle

Katharine Griffiths

Gerry Martin Associates Ltd

Report Commissioned by Gerry Martin Associates Ltd

Report Prepared by
Katharine Griffiths BSc MA
40 Blackfriars St
Canterbury,
Kent.
CT1 2AP
Tel 07936 428594
Email tcrnksg@yahoo.co.uk

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1 Introduction

1.1 Instruction

This report has been undertaken by Katharine Griffiths and was commissioned by Gerry Martin Associates on behalf of Cubby Construction.

1.2 Site Location

The site consists of an area within the old churchyard of St Andrews Church located in the village of Thursby, Cumbria.

1.3 Background

The current St Andrews Church was built between 1845 and 1846, and replaced an earlier church that was demolished in 1836. The earlier church was believed to have been built in the reign of King David I of Scotland between 1124 and 1142, and may have replaced and earlier wooden church erected during the 7th century (Crossman, 1996).

The Parish Register for St. Andrews Church is held at Carlisle Records office and covers the period from 1649 to 1878. No grave plan exists for the old churchyard.

In November 2009 a fire gutted the church seriously damaging the fabric of the building. The refurbishment scheme identified the need for a number of improvements to the facilities within the church and it was therefore necessary for intrusive works to be undertaken within the old churchyard.

The development of the burial ground was covered by Point 2 of English Heritage Guidelines (2005, 4) and was therefore subject to the implementation of a formal programme of archaeological observation and investigation.

1.4 Acknowledgements

The author would like to thank Gerry Martin Associates Ltd for commissioning this osteological report and Stephen Blake and his colleagues for their interest, assistance and unfailing good humour throughout excavations.

2 Field Work

2.1 General Site Information

The excavation area was located in the southeast part of the old churchyard. The site was segregated with fencing to shield the removal of human remains from public view.

The excavations consisted of a hand dug utility trench that ran from the boiler room at the northwest corner of the church, around the eastern end of the church and then proceeded southwards to the southeast gate of the churchyard. Three evaluation pits were also excavated by hand beneath the church floor to assess the possibility of encountering articulated remains during the reduction of the church floor. There was also an archaeological watching brief undertaken during the removal of the church floor and subsequent ground reduction.

2.2 Skeletal Recovery

All skeletal material was excavated and recorded in accordance with published IFA, Church of England and English Heritage Standards and Guidelines.

The articulated skeletons were recovered from intercutting graves. However due to the width of the utility trench (0.60m approx.) most of the recovered skeletons were partial with skeletal elements located beyond the extent of the trench left *in situ*. All the recovered remians were processed and analysed and have since been reinterred within the churchyard.

A large quantity of residual disarticulated bone (charnel) was also recovered during the excavation, and this has been tabulated in Appendix 1.

2.3 Headstones

The excavated trench ran parallel to two rows of headstones arranged north-south along the path from the southeast door of the church to the southeast gate of the churchyard with inscriptions naming multiple family members and dates of interment ranging from 1746 to 1870. However, although it was not possible to consult a grave plan, it is likely that these headstones were not in their original positions. There were a number of interments that did not appear to relate to a headstone and a depiction

of the church (date unknown, but probably 19th Century) shows a path aligned diagonally across the churchyard from the gate to the southwest door of the church. The headstones were reorganised in order to accommodate the new alignment of the path when the church was further restored in 1878.

Fig. 1. Hand excavated utility trench (looking south).

2.4 Coffins and Fittings

The coffins encountered during the excavations at St Andrew's were all constructed of wood (with evidence of lead and copper alloy lining in some cases) and a selection of fittings such as shroud pins, nails, grip plates and handles were also recovered. The iron fittings were badly corroded but some of the copper alloy fittings were relatively well preserved and show designs typical of the 19th century (Litten, 1991).

Fig. 2. Grip plates and handles from burials 17 (left) and 35 (right).

3 Methodology

3.1 Approach

All the articulated human remains recovered from St Andrew's Churchyard were subjected to a thorough osteological examination and assessed for sex, age at death, and stature. Non-metric traits (morphological anomalies) and pathological conditions were also observed and, where possible, osteometric data was collected and interpreted. A summary of the osteological data collected can be found in chapter five.

3.2 Determination of Sex

The sex of an adult skeleton can be reliably assigned by morphological observation of the pelvis and skull, and by osteometric observation of other post cranial skeletal elements, most notably the maximum diameters of the femoral and humeral heads (Bass 2005:19). In general adult long bones are longer and more robust in males than females (Krogman 1962:143). There is however an overlap between the sexes in measurements and morphology (Brothwell 1981:59) and due to the fragmentary nature of much archaeological material it has been suggested that there is a 12% bias in favour of the identification of males (Weiss 1972).

The sex of a sub-adult cannot be assigned by morphological observations, as dimorphic skeletal characteristics do not manifest themselves until puberty (Bass, 2005:19), and therefore no attempt has been made to assign sex to the sub adult sample from St Andrew's Church.

3.3 Estimation of Age at Death

Age at death can be reasonably accurately estimated in sub-adult or young adult individuals, but is more difficult to assess in older individuals (Brothwell 1981:64). Broadly speaking age estimation criteria are based on developmental changes up to the age of 25-30 and degenerative changes from there onwards. There is also considerable variability in the formation and degeneration of teeth and bones, which mean age estimations, are usually made within a likely range and not to a specific age in years (Bass 2005:12).

Observing stages of tooth eruption, epiphyseal closure and the length of long bones without epiphyses can within reason, accurately estimate the age at death of sub adults (Bass 2005:13). Ideally a combination of these criteria is used, but with all archaeological samples preservation must be taken into account.

The estimation of age at death in adults ideally requires a combination of criteria that are based on degenerative changes in joint surfaces (osteoarthritis) and levels of dental attrition. However the estimated age ranges tend to be much broader than in sub adults, usually within a ten-year time span. Morphological changes in the auricular surface of the pelvis (Murray and Murray, 1991), and to a lesser extent the pubic synthesis (Katz and Suchey 1986) are also often used in adult age estimation when the pelvis is sufficiently well preserved.

All recovered joint surfaces have been assessed for morphological changes associated with osteoarthritis.

Dental attrition or tooth wear is a valid tool in adult age estimation especially as teeth survive better in most archaeological contexts than joint surfaces. However, opinions differ regarding methodology as populations have different rates of attrition, whilst factors such as diet and tooth structure will affect the results (Bass 2005:18). However, Brothwell (1981) has observed that rates of wear in British populations not little variation from the Neolithic to Medieval periods. This study uses these attrition charts to assess the levels of tooth wear in the St Andrews Church assemblage.

Cranial suture closure can be used as an indicator of the age of an adult. In general, the suture will close at about 20 years of age and will be completely lost by old age. Although this is not considered to be a particularly accurate method of age estimation, it can be used in conjunction with other osteological determinants and in cases where fragmentary remains exist be the primary method of analysis (Brothwell 1981:43).

3.4 Estimation of Stature.

It is possible to estimate the pre-mortem stature of individuals using long bone measurements and mathematical regression equations. Formulae have been calculated for much of the postcranial skeleton, although the long bones are considered to be the most reliable indicators of stature (Trotter and Gleser 1952, 1958). These formulae are based on maximum long bone lengths (with epiphyses

intact) and therefore are limited by archaeological preservation, although some of the St Andrews Church assemblage was sufficiently well preserved for stature calculations.

Where possible, such skeletal indices have been calculated for the St Andrew's Church assemblage. These are a percental relation of two bone measurements used to express the form or shape of bone, and will be discussed in the relevant section of osteological analysis.

3.5 Pathological Analysis and Non-Metric Traits

The study of palaeopathology primarily relies upon the macroscopic observation and description of abnormal changes in skeletal human remains. Many diseases do not involve skeletal changes, the frequency of those that do tending to be low (Brothwell 1981). Apart from trauma, bone changes that can be observed favour chronic disease, where the individual has adapted to a health problem and the body has responded by remodelling affected skeletal elements Some forms of bone remodelling may indicate that a disease process was active at the time of death and others that a health problem had occurred but been overcome. However it must be noted that active lesions do not necessarily represent a cause of death, and it may be also be the case that abnormal changes in the skeleton have been induced physiologically, by, for example, heavy manual labour (Roberts and Manchester, 1995).

The dental health of the sample was assessed, and dental caries increased markedly in British populations during the 19th Century due to the fall in prices of refined sugar from the New World. Dental hygiene was also poor during this period with no British School of Dentistry until 1858.

Osteoarthritis is the most common pathological condition seen in the skeleton and is the result of the degeneration of the articular cartilage that causes a variety of changes in the affected joint surface including:

- New bone formation around the joint margins (marginal osteophytes)
- New bone formation on the joint surface
- Pitting on the joint surface
- Changes in the contour of the joint (usually widening or flattening) and

- Eburnation. An area on the joint surface that appears highly polished in contrast to surrounding non-eburnated surface (Waldron, 2009:27).

Non-metric traits are a range of specific variations in skeletal morphology which tend to be clearly present or absent in an individual. These anomalies can occur in the skull and postcranial skeleton and studies indicate that as they are genetically controlled they can therefore be inherited. A reoccurrence of a particular non-metric trait within a cemetery assemblage may indicate a family relationship between the affected individuals (Brothwell, 1981:90). All the skeletons from St Andrew's Church were assessed for non-metric traits.

4 Osteological Analysis

4.1 Skeleton (01)

4.1.1 Description

Skeleton (01) was the partially articulated remains of an adult, located in grave cut [129]. The skeletal remains consisted of the left and right tibiae and fibulae and a complete set of tarsals and metatarsals.

The recovered bones had a moderate amount of surface erosion (phase 2-3) on the diaphyses and some post-mortem damage to the distal joint surfaces of both tibiae (IFA, 2004).

4.1.2 Determination of Sex

It was not possible to determine the sex of skeleton (01).

4.1.3 Estimation of Age

Skeleton (01) was adult. It was not possible to estimate age more precisely due to the incomplete nature of the remains

4.1.4 Stature

It was not possible to estimate the stature of skeleton (01) due to the damage to the distal joint surfaces of the tibiae.

4.1.5 Pathological Analysis and non-metric traits

No pathologies were observed on skeleton (01).

4.2 Skeleton (02)

4.2.1 Description

Skeleton (02) was the partial remains of an articulated sub adult, located in grave cut [136]. The left and right parietal and temporal and the occipital and frontal bones were recovered, as was the left mandible. The 1st deciduous incisor and 1st and 2nd molars were present. There was also a partially erupted permanent 1st molar in the alveolus. The vertebral column was reasonably well preserved, with 6 cervical, 7

thoracic, 3 lumbar and 2 sacral bodies recovered. The two halves of the recovered vertebral arches were fused, but fusion had not occurred between the arches and the bodies. Seven left ribs and clavicle and a fragmentary scapula were also recovered from the torso. The left illium and ischium were reasonably complete.

Surface erosion was minimal on the bones of the upper body and moderate on the innominate.

The disarticulated remains of at least one adult were also recovered from the backfill (135) to grave cut [136] (see table 2).

4.2.2 Determination of Sex

It was not possible to determine the sex of skeleton (02) as it was sub adult.

4.2.3 Estimation of Age

The age estimation for skeleton (02) has been based on the stage of fusion in the vertebral column, and dental eruption.

At birth vertebrae consist of three separate parts: the centrum and a left and right arch. The arches typically unite between 1-3 years and the arch and body between 3-7 years (Bass, 2005:96-97). The two halves of the recovered vertebral arches had fused, but fusion had not occurred between the arches and the vertebral bodies.

The mandibular deciduous molars were fully erupted and the permanent first molar was partially erupted. Unfortunately, it was not possible to observe the root development of the permanent tooth, but the fact that the deciduous first incisor was still present in the dental arcade indicates this individual was approximately 6 years (+-24months) as defined by Ubelaker (1978), although the vertebral fusion stage suggests that skeleton (02) died before the age of 7 years.

4.2.4 Pathological Analysis

The mandibular first deciduous molar shows evidence of enamel hypoplasia (see fig 3). This condition results in either furrow type (the most common) or pit type defects in tooth enamel, and in some cases, large areas of missing enamel (Waldron, 2009:244). The enamel defects observed in skeleton (02) appear to be of the pit type variety. These defects occur as the tooth crown is developing and studies have attributed this condition to a variety of factors including birth trauma, low birth weight,

infections and systemic illnesses. It is also likely that genetic factors are involved (Waldron, 2009:244).

Fig. 3. Skeleton 02. Pit type enamel hypoplasia defects.

4.3 Skeleton (03)

4.3.1 Description

Skeleton (03) was the articulated remains of an adult, located in grave cut [98], beneath skeleton (01). Most of the upper body was recovered and the skeletal remains consisted of a complete skull and mandible, the entire vertebral column (although a number of the thoracic and lumber vertebrae were fragmentary) and 10 ribs from the right side and 10 from the left. The upper and lower arms were also recovered, with mostly well-preserved joint surfaces.

Skeleton (03) was generally well preserved, with minimal (phase 1) surface erosion (IFA, 2004).

4.3.2 Determination of Sex

Sex determination for skeleton (03) has been based on the morphology of the skull and mandible and the diameter of the humeral head.

The skull was generally gracile, with small mastoid processes and temporal areas and a weak temporal line. The zygoma root was located before the external auditory meatus and the nuchal crest and ionion protuberance were not pronounced. The forehead was upright and displayed minimal frontal bossing and the supraorbital ridges were not prominent.

The ascending ramus of the mandible was small and there was very little flaring at the gonial angle. The mental eminence (chin) was rounded, and slightly pointed at midline.

Many metric studies have been conducted on sexual dimorphism of the humerus, and it is considered by some to be "the second best bone for sex estimation" (Bass, 2005:151). One method of assigning sex to the humerus uses the diameter of the humeral head. The vertical diameter of the humeral head of skeleton (03) measured 45.5 mm, which falls into the 'sex indeterminate' category as defined by Stewart (1979:100).

However, the morphology of the skull and mandible both show the characteristics of female crania, and from these skeleton (03) has been identified as female.

4.3.3 Estimation of Age

There are several indications that skeleton (03) died in old age.

The entire dentition had been lost prior to death. Both the maxillary and mandibular alveoli were almost totally resorbed and exhibited significant horizontal bone loss. This sort of tooth loss is usually the result of either caries or periodontal disease and increases with age, often resulting in malnutrition because of difficulties with chewing (Waldron, 2009). In this case the tooth loss has occurred several years before death and jaw has completely remodelled and reduced in size.

The post-cranial skeleton also shows age related degenerative changes.

The vertebrae have been affected by intervertebral disc disease. This condition is particularly associated with ageing and is rare below the age of 40 years and very common above the age of 70 years (Waldron, 2009:43). Skeleton (03) also suffered from osteoarthritis. Although this condition alone should not be used as an indication of age, it is uncommon in individual under 40 years and increases considerably in prevalence thereafter (Waldron, 2009:31).

4.3.4 Stature

It was not possible to estimate the stature of skeleton (03).

4.3.5 Pathological Analysis and Non-Metric Traits.

The complete tooth loss observed in skeleton (03) is the result of either dental caries or periodontal disease but as no teeth remain, and the jaw has remodelled, it is difficult to decide which of these conditions was responsible

Periodontal disease is the inflammation of the tissues that surround and support the teeth and is caused by bacteria. This results in the loosening, and eventual loss of teeth. This condition has also been linked to other, potentially fatal systemic diseases such cardiovascular and pulmonary disease and diabetes (Waldron, 2009:240).

Skeleton (03) suffered from intervertebral disc disease throughout the vertebral column. This is caused by the collapse of the intervertebral discs which results in the vertebral bodies becoming pitted on the superior and inferior surface and the formation of marginal osteophytes. This is an age related condition and is very common in skeletal assemblages.

Skeleton (03) had osteoarthritis (OA) of both elbows and the right wrist. This was observed as areas of eburnation on the left and right capitulum and radial heads, and on the head and styloid process of the right ulna. OA of the elbow is rare but modern studies have shown that it can occur more frequently in some specific occupational groups that are particularly stressing on the upper body, such as mining, or pneumatic drilling (Resnick and Niwayama, 1988: 1406) and can also have a higher prevalence in some skeletal assemblages (Waldron, 2009:36). In general, osteoarthritis of the upper body is more common in archaeological assemblages than modern populations, which probably reflects a more active lifestyle in the past (Roberts and Manchester, 1995: 114)

There are also areas of eburnation on the articular facets of the cervical vertebrae, which is an area commonly affected by OA (Waldron, 2009:35).

Fig.4. Skeleton 03. Eburnation on capitulum of humerus

Fig.5. Skeleton 03. Eburnation on head of the radius.

4.4 Skeleton (04)

4.4.1 Description

Skeleton (04) was the partial remains of an adult. No grave cut was visible for this burial. The skeletal remains consisted of the left and right distal femora, the tibiae, the shaft of the right fibula, and the left fibula (minus the distal joint surface). Both patella and the first left metatarsal were also recovered.

The bone preservation was generally good with slightly more erosion on the fibulae shafts (phase 3) (IFA, 2004).

4.4.2 Determination of Sex

With no diagnostic skeletal elements recovered it was not possible to reliably determine the sex of skeleton (04).

However, the general robustness of the long bones, in particular the distal epiphyses of the femora, may indicate that skeleton (04) was male.

4.4.3 Estimation of Age

All the recovered epiphyses are fully fused and from this it can be concluded that skeleton (04) was an adult. However, without other diagnostic skeletal elements it is not possible to be precise. The recovered joint surfaces show none of the osteoarthritic degenerative changes associated with advanced years.

4.4.4 Stature

Stature has been estimated for skeleton (04) from the mean maximum length of the tibiae (including the malleolus) using Trotter and Gleser's (1952) stature measurement formula:

2.42 (tibia) + 81.93 +-4.00

This indicates a mean height of 172.95cm, and a possible height range of 168.95cm – 176.95cm.

4.4.5 Pathological analysis and Non-Metric Traits

No pathologies or non-metric traits were identified on skeleton (04).

4.5 Skeleton (06)

4.5.1 Description

Skeleton (06) was the partial remains of an adult. No grave cut was visible for this burial. The skeletal remains consisted of the left tibia and distal joint surface of the fibula. The tarsals and metatarsals of both feet were recovered as were a number of foot phalanges.

Although both joint surfaces were intact, the surface of the tibia was badly eroded (phase 4), but the foot bones were better preserved (IFA, 2004).

4.5.2 Determination of Sex

It was not possible to determine the sex of skeleton (06).

4.5.3 Estimation of Age

All the recovered epiphyses are fully fused and from this it can be concluded that skeleton (06) was an adult. However, without other diagnostic skeletal elements it is not possible to be more precise. The recovered joint surfaces show none of the osteoarthritic degenerative changes associated with advanced years.

4.5.4 Stature

Stature has been estimated for skeleton (06) from the maximum length of the tibia (including the malleolus) and using Trotter and Gleser's (1952) stature measurement formula:

2.42 (tibia) + 81.93 +-4.00

This indicates a mean height of 160.34cm, and a possible height range of 156.34cm – 164.34cm.

4.5.5 Pathological analysis and Non-Metric Traits

No pathologies or non-metric traits were identified on skeleton (06).

4.6 Skeleton (07)

4.6.1 Description

Skeleton (07) was the remains of an articulated adult, located in grave cut [138] beneath skeleton (02). The skeletal remains consisted of a partial torso. All the cervical and 2 thoracic vertebrae were recovered, along with 11 left ribs and the left scapula and clavicle.

Surface erosion of skeleton (07) was moderate (phase 2-3) (IFA, 2004).

4.6.2 Determination of Sex

Although several studies have used measurements of the clavicle to predict the sex of a skeleton the length alone is not thought to be particularly accurate (Bass, 2005:129. However, as this is the only bone available it is worth consideration. The clavicle of skeleton (07) measured 154.5mm, which falls into the male range as defined by Thieme, (1957).

4.6.3 Estimation of Age

The medial clavicular epiphysis was fully united, and whilst union begins around 18 years it can complete as late as 30 years (Brothwell, 1994:66). It can be concluded that skeleton (07) was an adult individual, but without other diagnostic skeletal elements it is not possible to be more precise.

The recovered joint surfaces show none of the osteoarthritic degenerative changes associated with advanced years.

4.6.4 Stature

It was not possible to estimate the stature of skeleton (07).

4.6.5 Pathological analysis and Non-Metric Traits

No pathologies or non-metric traits were identified on skeleton (07).

4.7 Skeleton (08)

4.7.1 Description

Skeleton (08) was a relatively complete articulated neonate burial, located in grave cut [131]. The cranial remains consisted of the left and right parietal, right temporal and zygomatic. Fragments of the frontal bone, pars basillaris and sphenoid and the left and right mandible were also recovered. Both clavicles, scapulae, humeri, the distal portions of both radii, 9 vertebral bodies, 2 unfused vertebral arches and 11 rib fragments were recovered from the upper body and from the lower body the left femur, both tibiae and fragments of both fibulae. Part of the right illium was also recovered as were a number of metacarpals and hand phalanges.

Although some was fragmentary the bone was generally in good condition with minimal (phase 1) surface erosion (IFA, 2004).

4.7.2 Determination of Sex

It was not possible to determine the sex of (08) as it was a sub adult.

4.7.3 Estimation of Age

Age estimation has been based on the shaft length of the humerus, which at 78mm falls between the age categories of 1.5mths (mean 72.4mm) and 3mths (mean 80.6mm) (Maresh, 1970)..

4.7.4 Stature

It was not possible to estimate the stature of skeleton (08).

4.7.5 Pathological analysis and Non-Metric Traits

No pathologies or non-metric traits were identified on skeleton (08).

4.8 Skeleton (09)

4.8.1 Description

Skeleton (09) was the partial remains of an adult, located in grave cut [123]. The skeletal remains consisted of the left and right femora and the proximal portions of both tibiae. The right ilium, left ischium, both patellae and a number of metatarsals were also recovered.

The bone preservation was generally poor (phase 3-4) with the most erosion observed on the tibiae shafts (IFA, 2004).

4.8.2 Determination of Sex

Although the innominate was fragmentary, some diagnostic features were visible.

No pre-auricular sulcus was observed and the sacro-iliac articulation was flat and not raised. These are characteristics of the male ilium.

A technique for assessing the sex of fragmentary femora using the mid-shaft circumference (Black, 1978) suggests that a femoral circumference of greater than 81mm indicates a male individual. The mid-shaft circumference of skeleton (09) was 87mm.

The maximum diameter of the femoral head has also been used as an indicator of sex with some success. Stewart (1979) suggests that a diameter of greater than 47.5mm indicates a male individual. The maximum diameter of skeleton (09) was 50mm.

The skeletal evidence indicates that skeleton (09) was male.

4.8.3 Estimation of Age

All the recovered epiphyses are fully fused and from this it can be concluded that skeleton (09) was an adult individual over 23 years of age. Observation of the auricular surface showed moderate retroauricular activity, moderate marginal irregularity and slight macroporosity. These characteristics indicate skeleton (09) was aged between 50-59 years (Lovejoy et al, 1985).

4.8.4 Stature

Stature has been estimated for skeleton (09) from the mean maximum length of the femora using Trotter and Gleser's (1952) stature measurement formula:

2.32 (femur) + 65.53 +-3.94

This indicates a mean height of 176.95cm and a possible height range of 173.01cm–180.89cm.

4.8.5 Pathological analysis and Non-Metric Traits

No pathologies or non-metric traits were identified on skeleton (09).

4.9 Skeleton (10)

4.9.1 Description

Skeleton (10) was the partial remains of an articulated sub-adult, located in grave cut [210]. The diaphyses of the left and right ulnae and radii were recovered, as were 7 unfused vertebral bodies, 7 metacarpals, 3 carpals and 4 hand phalanges. From the lower body the left leg was reasonably complete (only the distal epiphyses of the tibia and fibula were missing) and the distal portion of the femur, tibia diaphyses and proximal epiphyses, and a fragmented fibula was recovered from the right leg, as were all three elements of the left innominate and the right ilium.

Surface erosion was minimal (phase 1) on this skeleton (IFA, 2004).

The disarticulated remains of at least 1 adult were also recovered from the back fill of grave cut [210] (see table 2).

4.9.2 Determination of Sex

It was not possible to determine the sex of skeleton (10) as it was a sub adult individual.

4.9.3 Estimation of Age

The age estimation for skeleton (10) has been based on the stage of fusion in the vertebral column and the length of the long bone diaphyses.

The vertebral arch and body typically unite between 3-7 years (Bass, 2005:96-97), however, this fusion had not yet taken place in skeleton (10).

The long bone metrics of the femora, radii and ulnae indicate that skeleton (10) was aged between 7 and 8 years although the tibiae length is slightly younger at 5-6 years (Maresh, 1970).

The skeletal evidence, although approximate, indicates that skeleton (10) was a child aged between 5-8 years old.

4.9.4 Pathological Analysis

No pathologies were observed on skeleton (10).

4.10 Skeleton (11)

4.10.1 Description

Skeleton (11) was the remains of an adult. No grave cut was visible for this burial. The skeletal remains consisted of a badly fragmented vertebral column, the fragments of the right scapula and arm bones, the left and right femora (minus the distal joint surfaces) and portions of tibiae shafts. Fragments of the ilium were also recovered along with both tali and the right calcaneus.

This burial was badly bioturbated and the bone surface erosion was extensive (phase 4-5) (IFA, 2004).

4.10.2 Determination of Sex

Although there were no diagnostic features visible on the innominate, the robust muscle attachments on the proximal femur and prominent linear aspera may suggest that this individual was male.

4.10.3 Estimation of Age

The proximal epiphysis of the femora were fully united and from this it can be concluded that skeleton (11) was an adult, and over 19 years of age (Schaefer et al, 2009). However, without other diagnostic skeletal elements it is not possible to be more precise. The recovered joint surfaces show none of the osteoarthritic degenerative changes associated with advanced years.

4.10.4 Stature

It was not possible to estimate the stature of skeleton (11).

4.10.5 Pathological analysis and Non-Metric Traits

No pathologies or non-metric traits were identified on skeleton (11).

4.11 Skeleton (12)

4.11.1 Description

Skeleton (12) was the partial articulated remains of an adult. No grave cut was visible for this burial. All that remained of skeleton (12) was the right femur shaft and the shaft and distal joint surface of the right fibula.

This burial was badly disturbed and the bone surface erosion was extensive (phase 4-5) (IFA, 2004).

4.11.2 Determination of Sex

It was not possible to determine the sex of skeleton (12).

4.11.3 Estimation of Age

The distal epiphysis of the fibula was fully united and from this it can be concluded that skeleton (12) was an adult individual over 18 years of age (Schaefer et al, 2009) but without other diagnostic skeletal elements it is not possible to be more precise. The recovered joint surface shows none of the osteoarthritic degenerative changes associated with advanced years.

4.11.4 Stature

It was not possible to estimate the stature of skeleton (12).

4.11.5 Pathological analysis and Non-Metric Traits

No pathologies or non-metric traits were identified on skeleton (12).

4.12 Skeleton (13)

4.12.1 Description

Skeleton (13) was the partial remains of an articulated sub adult, located in grave cut [125]. The skeletal remains consisted of the mandible, deciduous first incisor, canine, first and second molar and a partially erupted permanent first molar. Also, the diaphyses of both humeri, radii and ulnae, the right scapula, 13 unfused vertebral bodies and a number of arch fragments, 3 metacarpals, 1 carpal and 5 hand phalanges were recovered. From the lower body both legs were reasonably complete and all three elements of the right innominate were recovered, as were a number of foot bones

Surface erosion was minimal/moderate (phase 1-2) on skeleton (13) (IFA, 2004).

The disarticulated remains of at least 1 adult and 1 neonate were also recovered from the back fill (124) of grave cut [125] (see table 2).

4.12.2 Determination of Sex

It was not possible to determine the sex of skeleton (13) as it was a sub adult individual.

4.12.3 Estimation of Age

Age estimation for skeleton (13) has been based on the stage of dental eruption and the length of the femoral diaphyses.

The mandibular deciduous molars were fully erupted and the permanent first molar was in the very early stages of eruption. This stage of dental development is defined by Ubelaker (1978) as between 5-6 years +- 24 months.

The femoral diaphyses measured 238mm, which indicates skeleton (13) was aged 4.5 years (Maresh, 1970).

The skeletal and dental evidence suggest skeleton (13) was aged between 4-5 years old.

4.12.4 Pathological Analysis

No pathologies were observed on skeleton (13).

4.13 Skeleton (14)

4.13.1 Description

Skeleton (14) was the partial articulated remains of an adult, located in grave cut [119]. The skeletal remains consisted of the left femur (minus the proximal joint surface) and the left tibia shaft. A number of small long bone shaft fragments were also recovered.

This burial was badly disturbed and fragmentary, the bone surface erosion being extensive (phase 4-5) (IFA, 2004).

4.13.2 Determination of Sex

Although no sexually diagnostic skeletal elements were recovered the robustness of the femur shaft may suggest that this individual was male.

4.13.3 Estimation of Age

The distal epiphysis of the femora were fully united and from this it can be concluded that skeleton (14) was an adult individual over 19 years of age (Schaefer et al, 2009). Without other diagnostic skeletal elements it is not possible to be more precise. The recovered joint surfaces show none of the osteoarthritic degenerative changes associated with advanced years.

4.13.4 Stature

It was not possible to estimate the stature of skeleton (14).

4.13.5 Pathological analysis and Non-Metric Traits

No pathologies or non-metric traits were identified on skeleton (14).

4.14 Skeleton (15)

4.14.1 Description

Skeleton (15) was the partial remains of an articulated sub adult, located in grave cut [198]. The skeletal remains consisted of a single thoracic vertebra (arches and body fused), the diaphyses of the left humerus, the distal epiphyses of both femora and tibia, and the proximal epiphyses of both tibiae. The right ilium and pubis were also recovered, as were 2 tarsals.

Skeleton (15) was fragmented and badly eroded.

The disarticulated remains of at least 1 adult were also recovered from the back fill of [198] (see table 2).

4.14.2 Determination of Sex

It was not possible to determine the sex of (15) as it was a sub adult.

4.14.3 Estimation of Age

The age estimation for (15) has been based solely on the stage of fusion in the vertebral column as the other skeletal elements were too badly damaged to make a precise age estimation.

At birth vertebrae consist of three separate parts: the centrum and a left and right arch. The arches typically unite between 1-3 years and the arch and body between

3-7 years (Bass, 2005:96-97). As the vertebral arches and bodies were fused it can be concluded that skeleton (15) was aged over 7 years.

4.14.4 Pathological Analysis

No pathologies were observed on skeleton (15).

4.15 Skeleton (16)

4.15.1 Description

Skeleton (16) was the partial articulated remains of an adult. No grave cut was visible for this burial. All that remained of skeleton (16) was the right femur shaft and the shaft and distal joint surface of the right fibula.

The bone surfaces of skeleton (16) were moderately eroded (phase 2-3) (IFA, 2004).

4.15.2 Determination of Sex

It was not possible to determine the sex of skeleton (16).

4.15.3 Estimation of Age

The distal epiphysis of the tibia and fibula were fully united and from this it can be concluded that skeleton (16) was an adult individual over 18 years of age (Schaefer et al, 2009) but without other diagnostic skeletal elements it is not possible to be more precise.

The recovered joint surface shows none of the osteoarthritic degenerative changes associated with advanced years.

4.15.4 Stature

It was not possible to estimate the stature of (16).

4.15.5 Pathological analysis and Non-Metric Traits

No pathologies or non-metric traits were identified on skeleton (16).

4.16 Skeleton (17)

4.16.1 Description

Skeleton (17) was the partial articulated remains of an adult, located in grave cut [126]. The skeletal remains consisted of the left and right tibiae and fibulae, and a number of metatarsals and tarsals.

The bone surfaces of skeleton (17) were moderately eroded (phase 2-3) (IFA, 2004).

4.16.2 Determination of Sex

It was not possible to determine the sex of skeleton (17), however, the stature calculations (see below) may suggest that (17) was male.

4.16.3 Estimation of Age

The distal epiphysis of the tibiae and fibulae were fully united and from this it can be concluded that skeleton (17) was an adult individual over 18 years of age (Schaefer et al, 2009). However, pathological observations (see below) may indicate that skeleton (17) was an older individual.

4.16.4 Stature

Stature has been estimated for skeleton (17) from the mean maximum length of the tibiae (including the malleolus) and fibulae, using Trotter and Gleser's (1952) stature measurement formula:

2.42 (tibia) + 81.93 +-4.00

This indicates a mean height of 181.63cm, and a possible height range of 177.63cm – 185.63cm.

2.60 (fibula) + 75.50 +-3.86

This indicates a mean height of 179.24cm, and a possible height range of 175.38cm – 183.1cm.

4.16.5 Pathological analysis and Non-Metric Traits

There is periosteal bone growth on the disto-lateral surface of both fibulae. Remodelling of bone can be initiated to repair small cracks or defects, or in response to strain (Waldron, 2009:17). The circumference of cortical bone also tends to

increase with age (Waldron, 2009:19) although the joint surfaces of the fibulae show none of the osteoarthritic degenerative changes associated with advanced years.

Fig.6 Skeleton 17. Periosteal bone growth on the disto-lateral fibula.

4.17 Skeleton (18)

4.17.1 Description

Skeleton (18) was the partial articulated remains of an adult, located in grave cut [133]. The skeletal remains consisted of the left and right tibiae and fibulae, both patellae and the metatarsals and tarsals.

The bone surfaces of skeleton (18) were moderately eroded (phase 2) (IFA, 2004).

4.17.2 Determination of Sex

It was not possible to determine the sex of skeleton (18), and although the osteoarthritis observed (see below) is more commonly found in females this is not sufficient evidence on which to determine the sex of skeleton (18).

4.17.3 Estimation of Age

The distal epiphysis of the tibiae and fibulae were fully united and from this it can be concluded that skeleton (18) was an adult individual over 18 years of age (Schaefer et al, 2009), however, degenerative osteoarithritic changes observed may indicate (18) was an older individual.

4.17.4 Stature

Stature has been estimated for skeleton (18) from the mean maximum length of the tibiae (including the malleolus) and fibulae, using Trotter and Gleser's (1952) stature measurement formula:

2.42 (tibia) + 81.93 +-4.00

This indicates a mean height of 167.84cm, and a possible height range of 163.84cm – 171.84cm.

2.60 (fibula) + 75.50 +-3.86

This indicates a mean height of 165.72cm, and a possible height range of 161.86cm – 169.58cm.

4.17.5 Pathological analysis and Non-Metric Traits

There was eburnation on the right patella. The patellofemoral joint is a relatively common site of osteoarthritis, strongly linked to obesity. Females are more often affected than males (Waldron, 2009:37).

There was also eburnation, slight porosity and marginal lipping on the left first metatarsal affecting the tarsometatarsal joint.

4.18 Skeleton (19)

4.18.1 Description

Skeleton (19) was the partial articulated remains of an adult, located in grave cut [139]. The skeletal remains consisted of the left and right tibiae and fibulae, all the metatarsals (minus the first left) and tarsals (minus the right first cuneiform).

The bone surfaces of skeleton (19) were moderately eroded (phase 2) (IFA, 2004).

4.18.2 Determination of Sex

It was not possible to determine the sex of skeleton (19).

4.18.3 Estimation of Age

The distal epiphysis of the tibiae and fibulae were fully united and from this it can be concluded that skeleton (19) was an adult individual over 18 years of age (Schaefer et al, 2009) but without other diagnostic elements it is not possible to be more precise.

The recovered joint surfaces showed none of the degenerative changes associated with advanced years.

4.18.4 Stature

Stature has been estimated for skeleton (19) from the mean maximum length of the tibiae (including the malleolus) and fibulae, using Trotter and Gleser's (1952) stature measurement formula:

2.42 (tibia) + 81.93 +-4.00

This indicates a mean height of 169.53cm, and a possible height range of 165.53cm – 173.53cm.

2.60 (fibula) + 75.50 +-3.86

This indicates a mean height of 168.58cm, and a possible height range of 164.72cm – 172.44cm.

4.18.5 Pathological analysis and Non-Metric Traits

No pathologies were observed on skeleton (19).

4.19 Skeleton (20)

4.19.1 Description

Skeleton (20) was the partial articulated remains of a sub adult, located in grave cut [151]. The skeletal remains consisted of the shaft and distal joint surface of the right tibia and a fragmentary right fibula,

The bone surfaces of skeleton (20) were moderately eroded (phase 2) (IFA, 2004).

4.19.2 Determination of Sex

It was not possible to determine the sex of skeleton (20).

4.19.3 Estimation of Age

The epiphyses of the tibia were unfused and from this it can be concluded that skeleton (20) was a sub adult and without other diagnostic elements it is not possible to be more precise, although the size of the tibia shaft suggests skeleton (20) was an adolescent.

4.19.4 Stature

No attempt was made to estimate the stature of (20).

4.19.5 Pathological analysis and Non-Metric Traits

No pathologies were observed on skeleton (20).

4.20 Skeleton (21)

4.20.1 Description

Skeleton (21) was the partial articulated remains of a sub adult, located in grave cut [152]. The skeletal remains consisted of a fragmentary crania, maxilla and mandible. The right maxillary deciduous molars, permanent first molar, un-erupted second molar and an un-erupted mandibular right canine were also recovered.

The skull had minimal erosion (phase 1) while the mandible was moderately eroded and badly fragmented (phase 2-3) (IFA, 2004).

4.20.2 Determination of Sex

It was not possible to determine the sex of skeleton (21) as it was a sub adult individual.

4.20.3 Estimation of Age

Age estimation for skeleton (21) has been based upon stages of occipital fusion and dental eruption.

The Pars lateralis and Pars basilaris were fused. Studies have shown that although this union may begin as early as 2 years of age (Molleson & Cox, 1993) it does not complete until 7-10 years (Madeline & Elster, 1995).

The first permanent molar had erupted and the second permanent upper molar was still within the alveolus, as was the mandibular right canine, although the root was nearly fully developed. This indicates that skeleton (21) was 9 years +- 24 months (Ubelaker, 1978).

The skeletal and dental evidence indicate that skeleton (21) was aged between 7-10 years.

4.20.4 Stature

It was not possible to estimate the stature of skeleton (21).

4.20.5 Pathological analysis and Non-Metric Traits

No pathologies were observed on skeleton (21).

4.21 Skeleton (22)

4.21.1 Description

Skeleton (22) was the partial articulated remains of an adult, located in grave cut [157]. The skeletal remains consisted of the left ulna and fragments of femoral shaft. A right first cuneiform and a number of other small bone fragments were also recovered.

All bones recovered from skeleton (22) were badly eroded (phase 5) and fragmentary (IFA, 2004).

4.21.2 Determination of Sex

It was not possible to determine the sex of skeleton (22).

4.21.3 Estimation of Age

The proximal epiphysis of the ulna were fully united and from this it can be concluded that skeleton (22) was an adult individual over 18 years of age (Schaefer et al, 2009) but without other diagnostic elements it is not possible to be more precise.

The recovered joint surface showed none of the degenerative changes associated with advanced years.

4.21.4 Stature

It was not possible to estimate the stature of (22).

4.21.5 Pathological analysis and Non-Metric Traits

No pathologies or non-metric traits were observed on skeleton (22).

4.22 Skeleton (23)

4.22.1 Description

Skeleton (23) was the partial articulated remains of an adult, located in grave cut [159]. The skeletal remains consisted of the shaft and distal joint surface of the left tibia, the left and right calcanea and the left talus, second and third cuneiform and navicular.

All bones recovered from skeleton (23) were badly eroded (phase 5) and fragmentary (IFA, 2004).

4.22.2 Determination of Sex

It was not possible to determine the sex of skeleton (23).

4.22.3 Estimation of Age

The distal epiphysis of the tibia were fully united and from this it can be concluded that skeleton (22) was an adult individual over 18 years of age (Schaefer et al, 2009) but without other diagnostic elements it is not possible to be more precise.

The recovered joint surface showed none of the degenerative changes associated with advanced years.

4.22.4 Stature

It was not possible to estimate the stature of skeleton (23).

4.22.5 Pathological analysis and Non-Metric Traits

No pathologies or non-metric traits were observed on skeleton (23).

4.23 Skeleton (24)

4.23.1 Description

Skeleton (24) was the partial articulated remains of an adult, located in grave cut [170]. The skeletal remains consisted of the skull and mandible, 1 cervical, 4 thoracic and one lumber vertebra, 4 right and 6 left ribs. The mandibular dentition was complete. The maxillary first incisors and left canine had been lost post-mortem, and the left first molar had been lost some time before death and the alveolus had resorbed. Both arms were also recovered, as were both scapulae and clavicles.

The skull was moderately eroded (phase 3) with patches of green discolouration due to copper alloy coffin fittings. The post-cranial skeletal elements were more eroded (phase 4) (IFA, 2004).

4.23.2 Determination of Sex

The sex of skeleton (24) has been assessed using the morphology of the skull and mandible.

The mastoid processes were moderately wide and robust and the muscle attachments of the occipital bone were moderately pronounced, as was the Ionian protuberance. The zygoma root extended above, but not beyond, the external auditory meatus. The temporal line and frontal bossing were of intermediate sex, but also somewhat eroded.

The mandible had a moderately flared gonial angle and the mental eminence (chin) was square and quite pronounced. The ascending ramus was moderately robust.

The morphology of the skull and mandible is indeterminate.

The vertical diameter of the humeral head (44.5mm) also falls into the 'Sex Indeterminate' category (Stewart, 1979:100).

It was not possible to reliably assign sex to skeleton (24).

4.23.3 Estimation of Age

The proximal epiphysis of the humeri were fully united and from this it can be concluded that skeleton (24) was an adult individual over 19 years of age (Schaefer et al, 2009) and the recovered joint surfaces showed none of the degenerative changes associated with advanced years.

All the third molars were fully mineralised indicating that skeleton (24) was probably at least over 21 years of age (Ubelaker, 1978).

Although the first molars were heavily worn with the dentine exposed all over the occlusal surfaces, there is very little wear on the second and third molars. This places skeleton (24) in the 25-35 years age category according to Brothwell (1965).

It must however be noted that populations do not have the same rates of dental wear. Dental wear varies between individuals within populations because of differences in diet and tooth structure, these factors limiting the accuracy of age estimation by this method (Bass, 2005:298).

4.23.4 Stature

It was not possible to estimate the stature of skeleton (24).

4.23.5 Pathological analysis and Non-Metric Traits

No pathologies were observed on skeleton (24).

4.24 Skeleton (25)

4.24.1 Description

Skeleton (25) was the partial articulated remains of an adult, located in grave cut [156]. The skeletal remains consisted of 3 thoracic and 3 lumber vertebrae and fragmented ribs. The right arm was recovered (minus the humeral head), as were fragmented femora, a somewhat fragmented pelvis, and a number of metacarpals and carpals.

The bone surfaces were moderately eroded (phase 2-3) (phase 4) (IFA, 2004).

4.24.2 Determination of Sex

The sex of skeleton (25) has been assessed using the morphology of the pelvis and the diameter of the femoral head.

The sciatic notch was narrow with no pre-auricular sulcus and the sacrum was curved and articulated into the 3rd sacral vertebrae. These are characteristics of the male pelvis.

The mean vertical diameter of the femoral head (51mm) is defined as male (>47.5) by Stewart (1979:120).

4.24.3 Estimation of Age

All the recovered epiphyses are fully fused and from this it can be concluded that skeleton (25) was an adult individual over 23 years of age. Observation of the auricular surface showed a dense irregular surface of rugged topography, moderate to marked retroauricular activity, moderate marginal irregularity and slight macroporosity. These characteristics indicate skeleton (25) was aged between 50-59 years (Lovejoy et al, 1985).

4.24.4 Stature

It was not possible to estimate the stature of skeleton (25).

4.24.5 Pathological analysis and Non-Metric Traits

No pathologies or non-metric traits were observed on skeleton (25).

4.25 Skeleton (26)

4.25.1 Description

Skeleton (26) was the partial articulated remains of an adult, located in grave cut [172]. The skeletal remains consisted of the left humerus, the scapula and 7 left ribs.

Bone surface erosion was light to moderate (phase 1-2) (IFA, 2004).

4.25.2 Determination of Sex

According to Bass (2005) the humerus is the second most effective skeletal element for the determination of sex. However due to a mid shaft break and erosion on the distal epicondyles it was only possible to measure the diameter of the humeral head, which, at 44mm, falls into the 'Sex Indeterminate' category (Stewart, 1979:100).

It was not possible to reliably determine the sex of skeleton (26).

4.25.3 Estimation of Age

The medial epicondyle of the humerus was fully united, indicating that skeleton (26) was over 19 years of age, however the proximal epiphysis was still in the process of

union and from this it can be concluded that skeleton (25) was an adult individual over 19 years but under 24 years of age (Bass, 2005:149).

Fig.7 Skeleton 26. Partial union of proximal humerus.

4.25.4 Stature

It was not possible to estimate the stature of (26).

4.25.5 Pathological analysis and Non-Metric Traits

No pathological or non-metric anomalies were observed on skeleton (26).

4.26 Skeleton (27)

4.26.1 Description

Skeleton (27) was the partial articulated remains of an adult, located in grave cut [163]. The skeletal remains consisted of the left and right tibiae and fibulae and the metatarsals and tarsals of both feet.

The bone surfaces of skeleton (27) were moderately/badly eroded (phase 3-4) (IFA, 2004).

4.26.2 Determination of Sex

It was not possible to determine the sex of skeleton (27), although the stature estimation (see below) may indicate that skeleton (27) was male.

4.26.3 Estimation of Age

The distal epiphysis of the tibiae and fibulae were fully united and from this it can be concluded that skeleton (27) was an adult individual over 18 years of age (Schaefer et al, 2009).

None of the age related degenerative changes associated with osteoarthritis were observed on the recovered joint surfaces.

4.26.4 Stature

Stature has been estimated for skeleton (27) from the mean maximum length of the tibiae (including the malleolus), using Trotter and Gleser's (1952) stature measurement formula:

2.42 (tibia) + 81.93 +-4.00

This indicates a mean height of 173.4cm, and a possible height range of 169.4cm – 177.4cm.

4.26.5 Pathological analysis and Non-Metric Traits

No pathological or non-metric anomalies were observed on skeleton (27).

4.27 Skeleton (28)

4.27.1 Description

Skeleton (28) was the partial articulated remains of a sub adult, located in grave cut [165]. The skeletal remains consisted of the distal epiphysis of the right femur, and fragmentary left and right tibiae and fibulae. The right patella, 6 metatarsals, 9 tarsals, and 5 foot phalanges were also recovered, as were 1 proximal and 1 distal metatarsal epiphysis and the unfused epiphysis of a calcaneus

The bone surfaces of skeleton (28) were moderately eroded (phase 2-3) (IFA, 2004).

4.27.2 Determination of Sex

It was not possible to determine the sex of skeleton (28) as it was sub adult.

4.27.3 Estimation of Age

As no teeth were recovered from skeleton (28) age has been estimated on the basis of the maximum length (including the epiphysis) of the tibia. The tibia measured 266.5mm, which falls into the age category of 8-9 years (Anderson et al, 1964).

4.27.4 Stature

It was not possible to estimate the stature of skeleton (28).

4.27.5 Pathological analysis and Non-Metric Traits

No pathologies were observed on skeleton (28).

4.28 Skeleton (29)

4.28.1 Description

Skeleton (29) was the partial articulated remains of an adult, located in grave cut [166]. The skeletal remains consisted of the right tibia and distal part of the fibula, and a number of metatarsals and tarsals.

The tibia and foot bones were moderately eroded (phase 2) the fibula had more surface damage (phase 4) (IFA, 2004).

4.28.2 Determination of Sex

It was not possible to determine the sex of skeleton (29).

4.28.3 Estimation of Age

The distal epiphysis of the tibia and fibula were fully united and from this it can be concluded that skeleton (29) was an adult individual over 18 years of age (Schaefer et al, 2009). However, without other diagnostic skeletal elements it was not possible to be more precise.

4.28.4 Stature

It was not possible to estimate the stature of skeleton (29).

4.28.5 Pathological analysis and Non-Metric Traits

An unusual hook-like bony growth was observed on the disto-lateral tibia. This may well be a calcified ligament, (Hassett, pers.comm) possibly the anterior inferior tibio-fibular ligament which connects the distal parts of the tibia and fibular. This problem can happen in response to trauma and is the result of calcium occurring at the site of previously damaged soft tissue, such as tendons and ligaments when it is laid down in scar tissue. This condition would have been painful, and probably resulted in walking difficulties.

Fig.8. Skeleton 29. Possible calcified anterior inferior tibio-fibular ligament.

4.29 Skeleton (30)

4.29.1 Description

Skeleton (30) was the partial articulated remains of an adult, located in grave cut [168]. The skeletal remains consisted of a number of long bone and rib fragments, a left 4th metacarpal and 1st metatarsal and the talus, second and third cuneiform and navicular and cuboid from the left foot.

The foot bones were moderately eroded (phase 2) (IFA, 2004), and the long bones and ribs were highly fragmentary and may well have been from the backfill of the grave cut.

4.29.2 Determination of Sex

It was not possible to determine the sex of skeleton (30).

4.29.3 Estimation of Age

The epiphyses of the metacarpal and metatarsal were fully united and from this it can be concluded that skeleton (30) was an adult individual over 18 years of age (Schaefer et al, 2009).

4.29.4 Stature

It was not possible to estimate the stature of skeleton (30).

4.29.5 Pathological analysis and Non-Metric Traits

No pathological or non-metric anomalies were observed on skeleton (30).

4.30 Skeleton (31)

4.30.1 Description

Skeleton (31) was the partial articulated remains of an adult, located in grave cut [178]. The skeletal remains consisted of a fragmentary skull. The right parietal, temporal and orbit and the left parietal and maxilla were recovered, as were the frontal bone and most of the occipital. The left maxillary dentition was also recovered.

The skull was badly eroded (phase 5) and there was an area of green discolouration on the left parietal, probably due to copper alloy coffin fittings (IFA, 2004).

4.30.2 Determination of Sex

The inion protuberance and nuchal crest were badly eroded and the right mastoid process was damaged post-mortem.

The forehead however was sloping and the frontal bossing was pronounced, and from these characteristics skeleton (31) can tentatively be identified as male.

4.30.3 Estimation of Age

Without other diagnostic skeletal elements age estimation has been based on dental attrition.

All the recovered molars were worn with the dentine exposed on the occlusal surfaces.

Most noticeable however was the marked reduction in the molar crown height on the buccal side of the crown. This form of uneven wear tends to occur during the later stages of dental attrition and is defined by Brothwell (1965) as at least 45+ years of age.

4.30.4 Stature

It was not possible to estimate the stature of skeleton (31).

4.30.5 Pathological analysis and Non-Metric Traits

Skeleton (31) had carious lesions in the cervical area of the buccal surfaces of the molars.

4.31 Skeleton (32)

4.31.1 Description

Skeleton (32) was the partial articulated remains of an adult, located in grave cut [175]. The skeletal remains consisted of the left and right tibiae, the proximal joint surface of the right fibula and the shaft and distal joint surface of the left fibula. The left and right metatarsals and tarsals were also recovered.

The tibiae and foot bones were moderately eroded (phase 2) the fibulae had more surface damage (phase 4) (IFA, 2004).

4.31.2 Determination of Sex

It was not possible to determine the sex of skeleton (32).

4.31.3 Estimation of Age

The distal epiphysis of the tibia and fibula were fully united and from this it can be concluded that skeleton (32) was an adult individual over 18 years of age (Schaefer et al, 2009). However, there was slight marginal lipping around the joint surfaces of

some tarsals and metatarsals and spur like osteophytes on the posterior surface of the calcaneus and these may well be age related degenerative changes, indicating that skeleton (32) was an older individual.

4.31.4 Stature

Stature has been estimated for skeleton (32) from the mean maximum length of the tibiae (including the malleolus), using Trotter and Gleser's (1952) stature measurement formula:

2.42 (tibia) + 81.93 +-4.00

This indicates a mean height of 168.32cm, and a possible height range of 164.32cm – 172.32cm.

4.31.5 Pathological analysis and Non-Metric Traits

No pathological anomalies were observed on skeleton (32).

4.32 Skeleton (33)

4.32.1 Description

Skeleton (33) was the partial articulated remains of an adult, located in grave cut [174], beneath skeleton (26). The skeletal remains consisted of the left and right tibiae, and the shafts and distal joint surfaces of the left and right fibulae. The left and right metatarsals and tarsals were also recovered.

The bones were all moderately eroded (phase 2) (IFA, 2004).

4.32.2 Determination of Sex

It was not possible to determine the sex of skeleton (33).

4.32.3 Estimation of Age

The distal epiphysis of the tibiae and fibulae were fully united and from this it can be concluded that skeleton (33) was an adult individual over 18 years of age (Schaefer et al, 2009).

There were also profuse osteophytes on the posterior surface of the calcaneus and this may well be an age related degenerative change, indicating that skeleton (33) was an older individual.

4.32.4 Stature

It was not possible to estimate the stature of skeleton (33). The cnemic indices calculated for skeleton (33) were not significant.

4.32.5 Pathological analysis and Non-Metric Traits

No pathological anomalies were observed on skeleton (33).

4.33 Skeleton (34)

4.33.1 Description

Skeleton (34) was the partial articulated remains of an adult. No grave cut was visible for this burial. The skeletal remains consisted of the shafts and distal joint surfaces of the left and right tibiae and fibulae. The left and right metatarsals and tarsals were also recovered.

The bones were all badly fragmented and eroded (phase 4-5) (IFA, 2004).

4.33.2 Determination of Sex

It was not possible to determine the sex of skeleton (34).

4.33.3 Estimation of Age

The distal epiphysis of the tibiae and fibulae were fully united and from this it can be concluded that skeleton (33) was an adult individual over 18 years of age (Schaefer et al, 2009).

The bones were too badly eroded to detect age related degenerative changes

4.33.4 Stature

It was not possible to estimate the stature of skeleton (34).

4.33.5 Pathological analysis and Non-Metric Traits

No pathological or non-metric anomalies were observed on skeleton (34).

4.34 Skeleton (35)

4.34.1 Description

Skeleton (35) was the partial articulated remains of an adult. No grave cut was visible for this burial. The skeletal remains consisted solely of the left and right metatarsals and tarsals.

The bone surfaces were moderately eroded (phase 2) (IFA, 2004).

4.34.2 Determination of Sex

It was not possible to determine the sex of skeleton (35).

4.34.3 Estimation of Age

The epiphyses of the first metatarsal and calcaneus were fully united. This union begins about 12 years and is complete by 22 years (Brothwell, 1981) and from this it can be concluded that skeleton (35) was an adult, but without other diagnostic skeletal elements it is not possible to be more precise

4.34.4 Stature

It was not possible to estimate the stature of skeleton (35).

4.34.5 Pathological analysis and Non-Metric Traits

No pathological or non-metric anomalies were observed on skeleton (35).

4.35 Skeleton (36)

4.35.1 Description

Skeleton (36) was the partial articulated remains of an adult, located in grave cut [185]. The skeletal remains consisted of a fragmentary cranium. The left and right parietal and temporal were recovered, as was the occipital.

The skull was badly eroded and fragmentary (phase 5) (IFA, 2004).

4.35.2 Determination of Sex

The cranium was too badly eroded and fragmented for sexual diagnostic characteristics to be observed.

4.35.3 Estimation of Age

It was not possible to estimate the age of skeleton (36), although general observations indicated that it was an adult individual.

4.35.4 Stature

It was not possible to estimate the stature of skeleton (36).

4.35.5 Pathological analysis and Non-Metric Traits

No pathological or non-metric anomalies were observed on skeleton (36).

4.36 Skeleton (37)

4.36.1 Description

Skeleton (37) was the partial articulated remains of an adult, located in grave cut [183]. The skeletal remains consisted of the left and right tibiae and fibulae, a number of the left and right metatarsals and tarsals and foot phalanges.

The bone surfaces were moderately eroded (phase 3) (IFA, 2004).

4.36.2 Determination of Sex

It was not possible to determine the sex of skeleton (37), although the stature estimations (see below) may indicate this individual was male.

4.36.3 Estimation of Age

The epiphyses of the first metatarsal and calcanea were fully united. This union begins about 12 years and is complete by 22 years (Brothwell, 1981) and from this it can be concluded that skeleton (37) was an adult, but without other diagnostic skeletal elements it is not possible to be more precise.

None of the degenerative changes associated with advanced years were observed on the joint surfaces.

4.36.4 Stature

Stature has been estimated for skeleton (37) from the mean maximum length of the tibiae (including the malleolus) and fibulae, using Trotter and Gleser's (1952) stature measurement formula:

2.42 (tibia) + 81.93 +-4.00

This indicates a mean height of 176.55cm, and a possible height range of 172.55cm – 180.55cm.

2.60 (fibula) + 75.50 +-3.86

This indicates a mean height of 175.34cm, and a possible height range of 171.48cm – 179.20cm.

The cnemic indices calculated for skeleton (37) were not significant.

4.36.5 Pathological analysis and Non-Metric Traits

No pathological or non-metric anomalies were observed on skeleton (37).

4.37 Skeleton (38)

4.37.1 Description

Skeleton (38) was the partial articulated remains of an adult, located in grave cut [191]. The skeletal remains consisted of the cranium and mandible (the facial bones were missing), 6 right and 6 left ribs and a number of badly fragmented thoracic vertebral arches. The left and right humeri and fragmentary scapulae and clavicles were also recovered.

The skull and long bones were only moderately eroded (phase 1-2) although there was more damage to the other recovered elements (IFA, 2004).

4.37.2 Determination of Sex

Determination of sex for skeleton (38) has been based on the morphology of the skull and mandible and the diameter of the humeral head.

The mastoid processes were small and narrow and the inion protuberance and muscle attachments of the occipital bone were not pronounced. The forehead appeared rounded with no frontal bossing and the temporal area was small with a weak temporal line. The zygoma root was also located before the external auditory meatus (ear hole).

The mandible was generally gracile.

These are all characteristics of the female skull.

The maximum diameter of the humeral head was 420mm, which is also defined as female (Stewart, 1979:100).

4.37.3 Estimation of Age

There are several indications that skeleton (38) died in old age.

The entire mandibular dentition had been lost prior to death. The mandibular alveolae had totally resorbed and exhibited significant horizontal bone loss. This sort of tooth loss is usually the result of either caries or periodontal disease and increases with age, often resulting in malnutrition because of difficulties with chewing (Waldron, 2009). In this case the tooth loss has occurred several years before death and the jaw has completely remodelled and reduced in size.

The post-cranial skeleton also shows age related degenerative changes that are discussed below.

4.37.4 Stature

It was not possible to estimate the stature of skeleton (38).

4.37.5 Pathological analysis and Non-Metric Traits

The complete tooth loss observed in skeleton (38) is the result of either dental caries or periodontal disease but as no teeth remain, and the jaw has remodelled, it is difficult to decide which of these conditions is responsible.

Periodontal disease is the inflammation of the tissues that surround and support the teeth and is caused by bacteria. This results in the loosening, and eventual loss of teeth. This condition has also been linked to other, potentially fatal systemic diseases such cardiovascular and pulmonary disease and diabetes (Waldron, 2009:240).

Skeleton (38) also had osteoarthritis of the left elbow. This was observed as areas of eburnation on the left capitulum. It was not possible to assess the right elbow as the distal joint surface was missing. Osteoarthritis of the elbow is rare but studies have shown that it can occur more frequently in some specific occupational groups (see skeleton 03) and have a higher prevalence in some skeletal assemblages (Waldron, 2009:36).

Fig.9 Skeleton 38. Eburnation on the left capitulum.

4.38 Skeleton (39)

4.38.1 Description

Skeleton (39) was the partial articulated remains of an adult, located in grave cut [193]. The skeletal remains consisted of the left and right parietal and temporal and the frontal bone, the left humerus and scapula and a number of fragmentary ribs.

The skull was badly eroded (phase 4) but the postcranial elements were better preserved (phase 2) (IFA, 2004).

4.38.2 Determination of Sex

The skull was too badly eroded to observe sexually dimorphic characteristics. However, measurements of the humerus have been successfully used to assign sex to fragmentary skeletal remains (Dwight, 1905, Krogman, 1962, Thieme, 1957, & Stewart, 1979).

The epicondylar width, maximum length and maximum diameter of the head were measured for skeleton (39) and all measurements fell well within the female size ranges defined in the studies mentioned above.

4.38.3 Estimation of Age

The humeral epiphyses were all fully united and from this it can be concluded that skeleton (39) was adult. However, without other diagnostic skeletal elements it was not possible to be more precise.

4.38.4 Stature

It was not possible to estimate the stature of skeleton (39).

4.38.5 Pathological analysis and Non-Metric Traits

No pathological or non-metric anomalies were observed on skeleton (39).

4.39 Skeleton (40)

4.39.1 Description

Skeleton (40) was the partial articulated remains of an adult, located in grave cut [200]. The skeletal remains consisted of the left and right tibiae and fibulae, although there was post-mortem damage to the joint surfaces, and a number of the left and right metatarsals and tarsus.

The bone surfaces were generally moderately eroded (phase 3) (IFA, 2004).

4.39.2 Determination of Sex

It was not possible to determine the sex of skeleton (40), although the gracile appearance of the long bones may indicate that it was female.

4.39.3 Estimation of Age

The recovered epiphyses were all fully united, and from this it can be concluded that skeleton (40) was an adult. However, without other diagnostic skeletal elements it is not possible to be more precise.

None of the degenerative changes associated with advanced years were observed on the joint surfaces.

4.39.4 Stature

It was not possible to estimate the stature of skeleton (40) due to the damaged joint surfaces of the long bones.

The cnemic indices calculated for skeleton (40) were not significant.

4.39.5 Pathological analysis and Non-Metric Traits

No pathological or non-metric anomalies were observed on skeleton (40).

4.40 Skeleton (41)

4.40.1 Description

Skeleton (41) was the partial articulated remains of an adult, located in grave cut [195]. The skeletal remains consisted of the right femur and the left and right tibiae.

The bone surfaces were badly eroded (phase 4-5) (IFA, 2004).

4.40.2 Determination of Sex

Without other sexually diagnostic skeletal elements, the sex of skeleton (41) has been based solely on the circumference of the femoral shaft. However, studies have used this measurement with success (Bass, 2005:230). The femoral shaft circumference of skeleton (41) measured 100mm, and this is well within the 'male' category (> 81mm), defined by Black (1978).

From this it has been tentatively concluded that skeleton (41) was male.

4.40.3 Estimation of Age

The recovered epiphyses were all fully united, and from this it can be concluded that skeleton (41) was adult. However, without other diagnostic skeletal elements it is not possible to be more precise.

None of the degenerative changes associated with advanced years were observed on the joint surfaces.

4.40.4 Stature

It was not possible to estimate the stature of skeleton (41).

4.40.5 Pathological analysis and Non-Metric Traits

No pathological or non-metric anomalies were observed on skeleton (41).

4.41 Skeleton (42)

4.41.1 Description

Skeleton (42) was the partial articulated remains of an adult, located in grave cut [212]. The skeletal remains consisted solely of the 3rd, 4th and 5th right metatarsals, and the right cuboid.

The bone surfaces were moderately eroded (phase 2) (IFA, 2004).

4.41.2 Determination of Sex

It was not possible to determine the sex of skeleton (42).

4.41.3 Estimation of Age

The recovered epiphyses were all fully united, and from this it can be concluded that skeleton) was an adult. However, without other diagnostic skeletal elements it is not possible to be more precise.

None of the degenerative changes associated with advanced years were observed on the joint surfaces.

4.41.4 Stature

It was not possible to estimate the stature of skeleton (42).

4.41.5 Pathological analysis and Non-Metric Traits

No pathological or non-metric anomalies were observed on skeleton (42).

4.42 Skeleton (43)

4.42.1 Description

Skeleton (43) was the partial articulated remains of an adult, located in grave cut [206]. The skeletal remains consisted of the shafts and distal joint surfaces of radii and the left ulna, both femora, the left and right tibiae minus the distal joint surfaces and the right patella and fibula shaft. The right pelvis was almost intact and the ilium and ischium were recovered from the left side. The sacrum, left and right metacarpals and a number of carpal bones were also recovered.

The bone surfaces were moderately badly eroded (phase 3-4) with some areas of black discolouration (IFA, 2004).

4.42.2 Determination of Sex

Determination of the sex of skeleton (43) has been based on the morphology of the pelvis and diameter of the femoral head.

The sciatic notch was very narrow and there was no pre-auricular sulcus. The pubic symphysis was short with a narrow sub-pubic angle. The sacrum was curved and articulated into the 3rd sacral vertebrae.

These are all characteristics of the male pelvis.

The femoral head measured 50mm. This is defined as male (>47.5mm) by Stewart (1979).

From this it can be concluded that skeleton (43) was male.

4.42.3 Estimation of Age

The recovered epiphyses were all fully united, and from this it can be concluded that skeleton (43) was an adult.

The auricular surface had become dense, without striae, billows, or transverse organisation. There was moderate apical and retroauricular activity and some marginal lipping. These characteristics of the auricular surface suggest skeleton (43) was aged 45-49 (Lovejoy et al, 1985).

None of the degenerative changes associated with advanced years were observed on the joint surfaces of skeleton (43).

4.42.4 Stature

Stature has been estimated for skeleton (43) from the maximum length of the femur using Trotter and Gleser's (1952) stature measurement formula:

2.32 (femur) + 65.53 +-3.94

This indicates a mean height of 161.81cm and a possible height range of 157.87cm – 165.75cm.

4.42.5 Pathological analysis and Non-Metric Traits

No pathological anomalies were observed on skeleton (43).

4.43 Skeleton (44)

4.43.1 Description

Skeleton (44) was the partial articulated remains of an adult, located in grave cut [208]. The skeletal remains consisted of the left and right tibiae and fibulae (although the proximal joint surface of the left fibula was missing), and a number of the right metatarsals and left and right tarsals.

The bone surfaces were badly eroded (phase 4-5) (IFA, 2004).

4.43.2 Determination of Sex

It was not possible to determine the sex of skeleton (44), although the gracile appearance of the long bones may suggest that it was female.

4.43.3 Estimation of Age

The recovered epiphyses were all fully united, and from this it can be concluded that skeleton (44) was an adult. However, without other diagnostic skeletal elements it is not possible to be more precise.

None of the degenerative changes associated with advanced years were observed on the joint surfaces.

4.43.4 Stature

It was not possible to estimate the stature of skeleton (44) due to the damaged joint surfaces of the long bones.

The cnemic indices calculated for skeleton (44) were not significant.

4.43.5 Pathological analysis and Non-Metric Traits

No pathological anomalies were observed on skeleton (44).

4.44 Skeleton (45)

4.44.1 Description

Skeleton (45) was the articulated remains of an adult orientated east west and located in grave cut [233]. The skeletal remains consisted of a complete skull and mandible, all the cervical and 1st-5th thoracic vertebrae, and 7 right and 5 left ribs. The clavicles, the right scapula and humerus, and the proximal joint surface of the right ulna were also recovered.

The skull and mandible had minimal surface erosion (phase 1-2), but the post-cranial elements were less well preserved (phase 4) (IFA, 2004).

4.44.2 Determination of Sex

Sex determination for skeleton (45) has been based on the morphology of the skull and mandible and the diameter of the humeral head.

The skull was generally gracile, with small mastoid processes and temporal areas and a weak temporal line. The zygoma root was located before the external auditory meatus and the nuchal crest and inion protuberance were not pronounced. The forehead was upright and displayed minimal frontal bossing and the supraorbital ridges were not prominent.

The ascending ramus of the mandible was small and there was very little flaring at the gonial angle. The mental eminence (chin) was rounded, and slightly pointed at midline.

These are all characteristics of female crania.

Many metric studies have been conducted on sexual dimorphism of the humerus, and it is considered by some to be "the second best bone for sex estimation" (Bass, 2005:151). One method of assigning sex to the humerus uses the diameter of the humeral head.

The vertical diameter of the humeral head of skeleton (45) measured 41mm, which falls into the 'female' (<43mm) category as defined by Stewart (1979:100).

4.44.3 Estimation of Age

There are several indications that skeleton (45) died in old age.

The entire dentition had been lost prior to death. Both the maxillary and mandibular alveoli were totally resorbed and exhibited significant horizontal bone loss. This sort of tooth loss is usually the result of either caries or periodontal disease and increases with age, often resulting in malnutrition because of difficulties with chewing (Waldron, 2009). In this case the tooth loss has occurred several years before death and the jaw has completely remodelled and reduced in size.

The post-cranial skeleton also shows age related degenerative changes.

The vertebrae have been affected by intervertebral disc disease. This condition is particularly associated with ageing and is rare below the age of 40 years and very common above the age of 70 years (Waldron, 2009:43).

Skeleton (45) also suffered from osteoarthritis. Although this condition alone should not be used as an indication of age, it is uncommon in individuals under 40 years and increases considerably in prevalence thereafter (Waldron, 2009:31).

4.44.4 Stature

No attempt was made to estimate the stature of skeleton (45).

4.44.5 Pathological Analysis and Non-Metric Traits.

The complete tooth loss observed in skeleton (45) is the result of either dental caries or periodontal disease but as no teeth remain and the jaw has been remodelled, it is difficult to decide which of these conditions is responsible.

Periodontal disease is the inflammation of the tissues that surround and support the teeth and is caused by bacteria. This results in the loosening, and eventual loss of teeth. This condition has also been linked to other, potentially fatal systemic diseases such cardiovascular and pulmonary disease and diabetes (Waldron, 2009:240).

Skeleton (45) suffered from intervertebral disc disease throughout the vertebral column. This is caused by the collapse of the intervertebral discs resulting in the vertebral bodies becoming pitted on the superior and inferior surface and the formation of marginal osteophytes. This is an age related condition and is very common in skeletal assemblages.

Skeleton (45) had eburnation on the superior articular facets of the fourth cervical vertebra and the right facet has remodelled, becoming much larger than the left. The cervical vertebrae are commonly affected by osteoarthritis (Waldron, 2009:35).

Fig.10 Skeleton 45. Resorbed mandibular alveoli.

Fig.11 Skeleton 45. Eburnation and intervertebral disc disease in the cervical vertebra.

4.45 Skeleton (46)

4.45.1 Description

Skeleton (46) was the partial articulated remains of an adult. No grave cut was visible for this burial. The skeletal remains consisted of the 5^{th}-7^{th} cervical, all the thoracic and the 1^{st}-4^{th} lumbar vertebrae, 12 left and 12 right ribs, the left and right humeri, the proximal parts of the left and right ulnae and the proximal portion of the left radius. The right scapula and clavicle, a fragment of the left clavicle, the sternum and a piece of mineralised costal cartilage were also recovered.

The recovered bone had minimal surface erosion (phase 1-2) (IFA, 2004).

4.45.2 Determination of Sex

Without other diagnostic skeletal elements determination of the sex of skeleton (46) has been based on the diameter of the humeral head.

The maximum diameter of the humeral head measured 48.5mm and this was within the 'male' category (>47mm) as defined by Stewart (1979).

From this skeleton can be tentatively identified as male.

4.45.3 Estimation of Age

The recovered epiphyses were all fully united, and from this it can be concluded that skeleton (46) was an adult.

The mineralisation of costal cartilage is very uncommon below 20 years of age and moderate mineralisation (skeleton (46) for example) is rare below the age of 40 years. This may indicate that skeleton (46) was at least middle aged at time of death.

Although there was slight pitting on some of the vertebral bodies, none of the other degenerative changes associated with advanced years were observed on the joint surfaces of skeleton (46).

4.45.4 Stature

It was not possible to estimate the stature of skeleton (46).

4.45.5 Pathological analysis and Non-Metric Traits

There was sight pitting some vertebral bodies, but no marginal lipping, and this may reflect the early stages of intervertebral disc disease.

4.46 Skeleton (47)

4.46.1 Description

Skeleton (47) was the articulated remains of an adult, located in grave cut [221]. The skeletal remains consisted of the left parietal and temporal, the occipital bone and fragments of the sphenoid, the mandible (including the right 2nd incisor and 1st and 2nd premolars), the 1st-7th thoracic vertebrae and 6 right and 7 left ribs. Both clavicles and scapulae and the proximal shafts and joint surfaces of the humeri were also recovered.

The bone surfaces were moderately eroded (phase 2-3) (IFA, 2004).

4.46.2 Determination of Sex

Sex determination for skeleton (47) has been based on the morphology of the mandible.

The ascending ramus of the mandible was robust but there was only slight flaring at the gonial angle and the mental eminence (chin) was intermediate.

These characteristics are inconclusive, and sex cannot be reliably assigned to skeleton (47).

4.46.3 Estimation of Age

There are indications that skeleton (47) died in old age.

The majority of the mandibular dentition had been lost prior to death. The molar alveoli were totally resorbed and the anterior alveoli are in the process of resorbsion, suggesting that the anterior teeth were lost shortly before death. The dentine is exposed on the occlusal surfaces of the remaining anterior teeth.

This sort of tooth loss is usually the result of either caries or periodontal disease and increases with age, often resulting in malnutrition because of difficulties with chewing (Waldron, 2009).

The post-cranial skeleton also shows age related degenerative changes.

The vertebrae have been affected by intervertebral disc disease. This condition is particularly associated with ageing and is rare below the age of 40 years and very common above the age of 70 years (Waldron, 2009:43).

4.46.4 Stature

It was not possible to estimate the stature of skeleton (47).

4.46.5 Pathological Analysis and Non-Metric Traits.

Skeleton (47) suffered from intervertebral disc disease throughout the vertebral column and this was particularly bad in the 1st thoracic vertebrae. This condition is caused by the collapse of the intervertebral discs and results in the vertebral bodies becoming pitted on the superior and inferior surface and the formation of marginal osteophytes. This is an age related condition and is very common in skeletal assemblages.

Fig.12 Skeleton 47. Intervertebral disc disease.

4.47 Skeleton (48)

4.47.1 Description

Skeleton (48) was the partial articulated remains of an adult, located in grave cut [223]. The skeletal remains consisted solely of the left and right metatarsals, and the right talus, calcaneus, 1st cuneiform and navicular.

The bones were badly eroded (phase 5) and fragmentary (IFA, 2004).

4.47.2 Determination of Sex

It was not possible to determine the sex of skeleton (48).

4.47.3 Estimation of Age

The recovered epiphyses were all fully united, and from this it can be concluded that skeleton (48) was an adult. However, without other diagnostic skeletal elements it is not possible to be more precise.

None of the degenerative changes associated with advanced years were observed on the joint surfaces.

4.47.4 Stature

It was not possible to estimate the stature of skeleton (48).

4.47.5 Pathological analysis and Non-Metric Traits

No pathological anomalies were observed on skeleton (48).

4.48 Skeleton (49)

4.48.1 Description

Skeleton (49) was the articulated remains of an adult, located in grave cut [225]. The skeletal remains consisted of the left and right parietal, temporal, maxilla and mandible, the left zygomatic and orbit, a fragmentary frontal bone, sphenoid and atlas (1st cervical vertebrae). The maxillary and mandibular anterior teeth were also recovered.

The bone surfaces were moderately eroded (phase 3) (IFA, 2004).

4.48.2 Determination of Sex

Sex determination for skeleton (49) has been based on the morphology of the mandible.

The ascending ramus and the mental eminence (chin) was intermediate.

These morphological characteristics are inconclusive and sex cannot be reliably assigned to skeleton (49)

4.48.3 Estimation of Age

The maxillary and mandibular molars had all been lost prior to death. The remaining anterior teeth were all extremely worn. The dentine and pulp cavities were exposed on all the teeth and some cases the tooth crown was totally eroded with only the root remaining.

Dental attrition ageing criteria tends to be based on the occlusal surface of the molars rather than the anterior teeth (Brothwell, 1965). However, the levels of wear seen in skeleton (49) suggest that this individual was at least middle aged, and may well have been elderly when they died.

4.48.4 Stature

It was not possible to estimate the stature of skeleton (49).

4.48.5 Pathological Analysis and Non-Metric Traits.

No pathological or non-metric anomalies were observed on skeleton (49).

4.49 Skeleton (250)

4.49.1 Description

Skeleton (250) was the articulated remains of an adult, located in grave cut [244]. Most of the upper body was recovered and the skeletal remains consisted of a complete skull (including the hyoid bone) and mandible, the entire vertebral column and 7 ribs from the right side, 11 from the left and the sternum. The left humerus and scapula were recovered as were both clavicles and the left and right radii and ulnae. The left and right ilium and ischium were well preserved although neither pubis survived. A number of metacarpals and carpals were also recovered.

Skeleton (250) possessed an almost complete set of teeth, with only the left 1st incisor lost ante mortem.

Skeleton (250) was generally well preserved, with moderate (phase 2) surface erosion.

4.49.2 Determination of Sex

Sex determination for skeleton (250) has been based on the morphology of the skull, mandible and pelvis, and the diameter of the humeral head.

The mastoid processes were quite wide and robust although the temporal areas and temporal line were intermediate. The zygoma root was located beyond the external auditory meatus and the nuchal crest and inion protuberance were moderately pronounced. The forehead was sloping with moderately strong frontal bossing and the supraorbital ridges were prominent.

The ascending ramus of the mandible was robust with flaring at the gonial angle. The mental eminence (chin) was square.

The sciatic notch was narrow and there was no preauricular sulcus. The sacrum was curved and articulated in to the third sacral vertebrae.

Many metric studies have been conducted on sexual dimorphism of the humerus, and it is considered by some to be "the second best bone for sex estimation" (Bass, 2005:151). One method of assigning sex to the humerus uses the diameter of the humeral head. The vertical diameter of the humeral head of skeleton (250) measured 51mm, which fell within the male category (>47mm) as defined by Stewart (1979).

Although some elements of the skull morphology were inconclusive, the other sexing criteria indicate that skeleton (250) was male.

4.49.3 Estimation of Age

There are several indications that skeleton (250) died in old age.

The molars were heavily worn with the dentine fully exposed and an exposed pulp cavity on the lower right 1st molar. The dentine of the anterior teeth was also exposed.

The post-cranial skeleton also shows age related degenerative changes.

The auricular surface had a very irregular rugged appearance and the margins were almost totally destroyed. There were also profuse osteophytes and macroporosity. This stage of degenerative change is defined 60+ years (Lovejoy et al, 1985).

The vertebrae have been affected by intervertebral disc disease. This condition is particularly associated with ageing and is rare below the age of 40 years and very common above the age of 70 years (Waldron, 2009:43).

Skeleton (250) also suffered from osteoarthritis. Although this condition alone should not be used as an indication of age, it is uncommon in individual under 40 years and increases considerably in prevalence thereafter (Waldron, 2009:31).

4.49.4 Stature

It was not possible to estimate the stature of skeleton (250).

4.49.5 Pathological Analysis and Non-Metric Traits.

Skeleton (250) suffered from dental caries. The crown of the lower left 2nd molar had totally rotted, leaving only the root. There were also root caries on the lower left 3rd molar and caries on the crown of the upper right 2nd molar. All the teeth had calculus deposits, indicating poor dental hygiene.

Skeleton (250) suffered from intervertebral disc disease with moderate marginal lipping, pitting and ostephytes throughout the vertebral column. This is caused by the collapse of the intervertebral discs and results in the vertebral bodies becoming pitted on the superior and inferior surfaces, and the formation of marginal osteophytes. This is an age related condition and is very common in skeletal assemblages.

Skeleton (250) had osteoarthritis (OA) of the left wrist with eburnation on the distal joint surface of the radius near the styloid process. This location is the most common site of OA in the wrist (Waldron, 2009:36).

There was an unusually large osteophyte on the body of the 3rd lumbar vertebrae and the 5th lumbar vertebra was also partially sacralised. The 5th lumbar and 1st sacral junction is an unstable joint, and it is not uncommon for the lower lumbar transverse process to be fused to the sacrum on one or both sides (Waldron, 2009: 219). Although this condition has no clinical significance, studies have suggested that it is congenital, and can therefore be inherited (Brothwell, 1995:110).

Fig.13. Skeleton 250. Partial sacralisation of the 5th lumbar vertebra.

4.50 Skeleton (251)

4.50.1 Description

Skeleton (251) was the articulated remains of an adult, located in grave cut [235]. The skeletal remains consisted of the left and right maxillae and mandible, a fragmentary sphenoid and 2 left ribs. The 7 cervical vertebrae were recovered intact but all other vertebrae were badly fragmented. The shaft of the right humerus and clavicle were also recovered.

The dentition was complete apart from the incisors, which had been lost post-mortem.

The bone surfaces were moderately eroded (phase 2-3) (IFA, 2004).

4.50.2 Determination of Sex

Sex determination for skeleton (251) has been based on the morphology of the mandible. The ascending ramus and mental eminence were robust and square, and from these morphological characteristics it was concluded that skeleton (251) was male.

4.50.3 Estimation of Age

Without other diagnostic elements age estimation has been based solely on molar dental attrition. As discussed above, this technique has limitations and is ideally used in conjunction with other ageing techniques and, as this was not possible in this case age estimation for skeleton (251) is tentative.

The dentine was only slightly exposed ('dots') on the first and second molars, and the third molars were "polished' with no exposed dentine. This stage of dental wear is classified as 25 – 35 years (Brothwell, 1965).

4.50.4 Stature

It was not possible to estimate the stature of skeleton (251).

Fig.14. Skeleton 251. Pipe stem facet and periodontal disease.

4.50.5 Pathological Analysis and Non-Metric Traits.

Skeleton (251) had a well-defined clay pipe wear facet between the maxillary and mandibular right canines and first premolars that was caused by the prolonged gripping of the stem of a clay pipe.

Although this is not a strictly clinical pathology excessive tobacco smoking usually causes clinical complications and this can be seen in the resulting periodontal disease that has caused horizontal bone loss in the alveoli of both the maxilla and mandible. This would have eventually resulted in tooth loss.

There were also interproximal carious lesions on the mesial surface of the mandibular right 1st molar and distal surface of the 2nd premolar.

4.51 Skeleton (252)

4.51.1 Description

Skeleton (252) was the articulated remains of an adult, located in grave cut [237]. The skeletal remains consisted of the left and right parietal and temporal, part of the left mandible, the orbits, the frontal and occipital bone, a fragmentary sphenoid and 5 left ribs. The 7 cervical vertebrae were recovered intact but all other vertebrae were badly fragmented. The scapulae were also fragmentary as was the left clavicle. The left humerus and ulna, a somewhat fragmented innominate and the proximal parts of both femora were also recovered as were the right 3rd metacarpal and 2 proximal hand phalanges.

The mandible was fragmentary and only 4 teeth remained in the dental arcade: the left premolars and the 2nd and 3rd molars.

The bone surfaces were moderately eroded (phase 2-3) (IFA, 2004).

4.51.2 Determination of Sex

Sex determination for skeleton (252) has been based on the morphology of the skull and pelvis.

The mastoid processes were wide and robust and the inion protuberance was moderately pronounced with a strong nuchal crest. The upper orbit margins were square and the frontal bossing was moderately pronounced. The forehead was intermediate and the zygoma root was above the external auditory meatus.

The sciatic notch was narrow and there was no preauricular sulcus.

Although some of the skull morphology was intermediate the morphological characteristics overall indicate that skeleton (252) was male.

4.51.3 Estimation of Age

The molars were only moderately worn with patches of exposed dentine, but the premolar crowns had worn to the root.

The auricular surface showed some macroporosity and moderate subchondral destruction and retroauricular activity. The stage of degenerative change was not clear and characteristics of both phase 7 (50-59 years) and 8 (60+ years) were observed (Lovejoy et al, 1985).

There was however advanced intervertebral disc disease in the cervical and lumbar regions. This condition is particularly associated with ageing and is rare below the age of 40 years and very common above the age of 70 years (Waldron, 2009:43). Skeleton (252) also suffered from osteoarthritis. Although this condition alone should not be used as an indication of age, it is uncommon in individuals under 40 years and increases considerably in prevalence thereafter (Waldron, 2009:31).

4.51.4 Stature

It was not possible to estimate the stature of skeleton (252).

4.51.5 Pathological Analysis and Non-Metric Traits.

Skeleton (252) had root caries in the cervical area of the lower left 2nd and 3rd molars and moderate calculus deposits, indicating poor dental hygiene.

Skeleton (252) also suffered from intervertebral disc disease with moderate marginal lipping, pitting and ostephytes in the cervical and lumbar regions. This is caused by the collapse of the intervertebral discs and results in the vertebral bodies becoming pitted on the superior and inferior surface, and the formation of marginal osteophytes. This is an age related condition and is very common in skeletal assemblages.

Skeleton (252) had osteoarthritis (OA) in the spine, a common site of for this condition (Waldron, 2009:35) with eburnation on the articular facets of 3 cervical vertebrae. The right articular facets of the 4th and 5th cervical vertebrae have also totally remodelled and become enlarged.

Fig.15 Skeleton 252. Root caries.

Fig.16 Skeleton 252. Eburnation and enlargement of articular facets.

4.52 Skeleton (253)

4.52.1 Description

Skeleton (253) was the articulated remains of an adult, located in grave cut [239]. The skeletal remains consisted of a complete skull (although missing the ethmoid and hyoid bones) and mandible, most of the vertebral column (the lower lumber vertebrae were missing) and 12 ribs from each side. The humeri, scapulae and clavicles were also recovered.

The dentition was almost complete, with only the maxillary right 2nd molar lost antemortem and the mandibular right 1st premolar lost post mortem.

Skeleton (253) was generally well preserved, with minimal (phase 1-2) surface erosion and some green discoloration on the cranium due to copper alloy coffin fittings.

4.52.2 Determination of Sex

Sex determination for skeleton (253) has been based on the morphology of the skull mandible and the diameter of the humeral head.

The skull was large and generally robust, with all the sexing criteria indicating a male individual except the zygoma root which was above the external auditory meatus (intermediate) and the temporal line and areas which were also intermediate.

The ascending ramus of the mandible was robust, the gonial angle moderately flared and the mental eminence (chin) was square.

Many metric studies have been conducted on sexual dimorphism of the humerus, and it is considered by some to be "the second best bone for sex estimation" (Bass, 2005:151). One method of assigning sex to the humerus uses the diameter of the humeral head. The vertical diameter of the humeral head of skeleton (253) measured 49mm, which falls within the male category (>47mm) as defined by Stewart (1979). The muscle attachments of the humeri were also very robust.

Although some elements of the skull morphology were inconclusive, the other sexing criteria indicate that skeleton (253) was male.

4.52.3 Estimation of Age

The molars were moderately worn with patches of exposed dentine. The wear pattern correlated most closely to 35-45 years as defined by Brothwell (1965)

The post-cranial skeleton also showed moderate age related degenerative changes.

There was some modification of the proximal humeri and both ends of the clavicles in the form of osteophytes, and there was also the early onset of intervertebral disc disease in the vertebral bodies. This condition is particularly associated with ageing and is rare below the age of 40 years and very common above the age of 70 years (Waldron, 2009:43).

Bearing in mind the limitations of dental attrition as a method of age estimation, it can be concluded that skeleton (253) died in middle age.

4.52.4 Stature

No attempt was made to estimate the stature of skeleton (253).

4.52.5 Pathological Analysis and Non-Metric Traits.

Skeleton (253) displayed the early stages of intervertebral disc disease with moderate ostephytes throughout the vertebral column. This is caused by the collapse of the intervertebral discs resulting in the vertebral bodies becoming pitted on the superior and inferior surface and the formation of marginal osteophytes. This is an age related condition and is very common in skeletal assemblages.

4.53 Skeleton (254)

4.53.1 Description

Skeleton (254) was not excavated. The burial was located in cut [215] adjacent to east end of the church and was contained within a stone lined vault. The coffin was made of wood and lined with copper alloy and the coffin plate was still legible identifying the occupant as Robert Jackson, who died in 1827 aged 76 years.

Fig.17. Skeleton 254. Stone lined vault and wood and copper alloy coffin.

Fig.18. Skeleton 254. Coffin plate.

4.54 Skeleton (255)

4.54.1 Description

Skeleton (255) was the articulated remains of an adult, located in grave cut [246]. The skeletal remains consisted of the shaft of the right humerus, the proximal joint surface and shaft of the right ulna, the femora, tibiae and ilia and a fragmentary sacrum.

The bone surfaces were badly eroded (phase 4-5+) (IFA, 2004) and fissured in places.

4.54.2 Determination of Sex

Sex determination for skeleton (255) has been based on the morphology of the pelvis and the circumference of the femoral shaft.

The sciatic notch was wide and the sacro-illiac articulation was elevated with a preauricular sulcus. These are characteristics of the female pelvis.

The mid-shaft femoral circumference has been used with success in osteological studies. The femoral circumference of skeleton (255) measured 80mm, which falls into the female category (<81mm) as defined by Black, 1978).

4.54.3 Estimation of Age

The auricular surface showed some macroporosity and moderate subchondral destruction and retroauricular activity. However, the stage of degenerative change was not clear and characteristics of both phase 7 (50-59 years) and 8 (60+ years) were observed (Lovejoy et al, 1985).

There was also intervertebral disc disease in the cervical and lumbar regions. This condition is particularly associated with ageing and is unusual below the age of 40 years but very common above the age of 70 years (Waldron, 2009:43). Skeleton (255) also suffered from osteoarthritis. Although this condition alone should not be used as an indication of age, it is uncommon in individuals under 40 years and increases considerably in prevalence thereafter (Waldron, 2009:31).

4.54.4 Stature

It was not possible to estimate the stature of skeleton (255) due to the eroded condition of the bones.

4.54.5 Pathological Analysis and Non-Metric Traits.

Skeleton (255) also suffered from intervertebral disc disease with moderate marginal lipping, pitting and ostephytes in the cervical and lumbar regions. This is caused by the collapse of the intervertebral discs resulting in the vertebral bodies becoming pitted on the superior and inferior surface and the formation of marginal osteophytes. This is an age related condition and is very common in skeletal assemblages.

Skeleton (255) had osteoarthritis (OA) in the lumber spine, a common site of for this condition (Waldron, 2009:35) with eburnation on the inferior articular facets of the lumber vertrbrae.

Fig.19 Skeleton 255. Eburnation on the lumbar inferior articular facets.

4.55 Skeleton (256)

4.55.1 Description

Skeleton (256) was the articulated remains of an adult, located in grave cut [270]. The skeletal remains consisted of the right humerus (minus the proximal joint

surface), radius and ulna. The right metacarpals and a number of carpals and hand phalanges were also recovered.

The bone surfaces had minimal erosion (phase 1) (IFA, 2004).

4.55.2 Determination of Sex

It was not possible to determine the sex of skeleton (256).

4.55.3 Estimation of Age

The recovered epiphyses were all fully united, and from this it can be concluded that skeleton (48) was an adult. However, without other diagnostic skeletal elements it is not possible to be more precise.

None of the degenerative changes associated with advanced years were observed on the joint surfaces.

4.55.4 Stature

It was not possible to estimate the stature of skeleton (256).

4.55.5 Pathological Analysis and Non-Metric Traits.

No pathological anomalies were observed on skeleton (256).

4.56 Skeleton (257)

4.56.1 Description

Skeleton (257) was the articulated remains of an adult, located in grave cut [248]. The skeletal remains consisted of the shaft of the left radius and ulna, the femora and fragmented innominates. A number of metacarpals and carpals were also recovered.

The bone surfaces were moderately eroded (phase 2-3) (IFA, 2004).

4.56.2 Determination of Sex

The sciatic notch was too badly damaged to be used to determine the sex of skeleton (257), but there was a slight preauricular sulcus.

The femoral head measured 44mm, which puts skeleton (257) in the 'sex indeterminate' category as defined by Stewart (1979:120).

It was not possible to reliably assign sex to skeleton (257).

4.56.3 Estimation of Age

The age of skeleton (257) has been based on observations of the auricular surface.

There was marked marginal irregularity and lipping with profuse osteophytes in the retroauricular area and macroporosity on the surface.

This stage of degenerative change shows morphological characteristics of 'Phase 8', defined by Lovejoy (et al, 1985) as 60+ years.

Skeleton (257) suffered from osteoarthritis. Although this condition alone should not be used as an indication of age, it is uncommon in individuals under 40 years and increases considerably in prevalence thereafter (Waldron, 2009:31).

4.56.4 Stature

It was not possible to estimate the stature of skeleton (257) due to damage on the distal joint surfaces of the femora.

Fig. 20. Skeleton 257. Osteoarthritis of the femoral head.

4.56.5 Pathological Analysis and Non-Metric Traits.

Severe osteoarthritis was observed in right hip joint. There was eburnation, new bone formation and pitting on the femoral head, and it had remodelled becoming

wider and flatter. The acetabulum had also remodelled and widened to accommodate the shape of the femoral head. Osteoarthritis of the hip commonly affects females rather than males, although any link with obesity remains weak, suggesting that stress is not a major cause of this condition (Waldron, 2009:38).

Fig.21. Skeleton 257. Osteoarthritis of the acetabulum.

4.57 Skeleton (258)

4.57.1 Description

Skeleton (258) was the articulated remains of an adult, located in grave cut [274]. The skeletal remains consisted of the entire vertebral column, 10 right and 3 left ribs and a fragmented pelvis. The left scapula and sacrum, both fragmented, and a number of carpals were also recovered.

The bone recovered bone surfaces had minimal erosion (phase 1) (IFA, 2004).

4.57.2 Determination of Sex

The sciatic notch appeared intermediate but there was a marked preauricular sulcus and subpubic angle. The curve of the sacrum was intermediate and it was articulated into the 3rd sacral vertebrae.

Skeleton (258) was tentatively identified as female.

4.57.3 Estimation of Age

The age of skeleton (258) has been based on observations of the auricular surface.

There was moderate activity in the retroauricular area and the surface appeared dense with moderate marginal lipping.

This stage of degenerative change shows morphological characteristics of 'Phase 6', defined by Lovejoy (et al, 1985) as 45-49 years.

4.57.4 Stature

It was not possible to estimate the stature of skeleton (258).

4.57.5 Pathological Analysis and Non-Metric Traits.

There were moderate marginal osteophytes and slight pitting on the cervical and lumbar vertebrae, which may have been the early onset of intervertebral disc disease.

4.58 Skeleton (259)

4.58.1 Description

Skeleton (259) was the articulated remains of a sub adult, located in grave cut [272]. The skeletal remains consisted of a fragment of mandible, 12 thoracic and 3 lumbar vertebrae, 7 right and 3 left ribs, the left and right diaphyses of the humeri and ulnae and the proximal epiphyses of the left humerus and ulna and both femora. The right innominate was almost complete while only the ilium and ischium were recovered from the left side. Both scapulae and the right clavicle were also recovered, as were 5 metacarpals and 1 hand phalange.

A first and second permanent molar and canine were also recovered, but were not in the dental arcade (due to the broken mandible). It is possible that these teeth belonged to another individual.

The recovered bone surfaces had minimal erosion (phase 1) (IFA, 2004).

4.58.2 Determination of Sex

It was not possible to determine the sex of skeleton (259) as it was a sub adult individual.

4.58.3 Estimation of Age

The age of skeleton (259) has been based on observations of the length and stage of fusion of the humerus.

The diaphyses of the humerui measured 224mm (mean), which falls in the age range of 8-9 years as defined by Maresh (1970).

The proximal epiphyses had fused to form a 'later compound epiphysis', which occurs around 8 years of age (Schaefer et al, 2009).

It is also worth noting that although the recovered teeth were loose the development stage was 8 years (+-24 mths.) for the molars and 9 years (+-24 mths.) for the canine (Ubelaker, 1978), indicating that they may well have belonged to this individual.

4.58.4 Stature

It was not possible to estimate the stature of skeleton (259).

4.58.5 Pathological Analysis and Non-Metric Traits

No pathological anomalies were observed on skeleton (259).

4.59 Skeleton (260)

4.59.1 Description

Skeleton (260) was the articulated remains of an adult. No grave cut was visible for this burial. The skeletal remains consisted of the lower part of the vertebral column and a fragmented sacrum and left ilium and ischium, and 2 right ribs. The left humerus shaft and the proximal and distal joint surfaces of the left femur were also recovered.

The bone preservation was poor and badly eroded (phase 4-5) with areas of black discolouration (IFA, 2004).

4.59.2 Determination of Sex

The sciatic notch was narrow, but this was the only sexually diagnostic skeletal element recovered. Skeleton (260) has been tentatively identified as male.

4.59.3 Estimation of Age

There were osteophytes in the retroauricular area suggesting that skeleton (260) was at least 40 years old (Lovejoy et al, 1985), but the auricular surface itself was too badly eroded to be used to estimate age.

There was also slight marginal lipping and pitting and the vertebral bodies which also suggests this individual was at least middle aged as these degenerative changes are rare below 40 years of age (Waldron, 2009:43).

4.59.4 Stature

It was not possible to estimate the stature of skeleton (260).

4.59.5 Pathological Analysis and Non-Metric Traits.

There were slight marginal osteophytes and pitting on the lumbar vertebral bodies, which may have been the early onset of intervertebral disc disease.

4.60 Skeleton (261)

4.60.1 Description

Skeleton (261) was the articulated remains of an adult, located in grave cut [242]. Almost the entire skeleton was recovered and the skeletal remains consisted of the cranium and mandible, entire vertebral column, sternum and sacrum, 6 right and 3 left ribs, the left and right ilia and ischia, the left clavicle, parts of both scapulae, and all the long bones. The left patella and most of the bones from the hands and feet were also recovered.

The molars had all been lost ante mortem, and the anterior teeth post mortem

The recovered bone surfaces were in generally good condition (phase 1-2) (IFA, 2004) although there was slightly more erosion on the skull.

Fig.22. Skeleton 261.

4.60.2 Determination of Sex

Determination of sex has been based on the morphology of the skull, mandible, pelvis and femora.

The sciatic notch was moderately narrow and there was only a very slight preauricular sulcus. The sacrum was curved and articulated into the 3rd sacral vertebrae. These are characteristics of the male pelvis.

The supraorbital ridges were moderately prominent and the mastoid processes were moderately wide and robust, although somewhat eroded. The occipital muscle attachments were strong and the forehead was sloping, although the zygoma root and temporal area were intermediate. Other areas of the skull were too badly eroded to be used for sex determination.

The gonions were only moderately flared and the ramus was intermediate, but the mental eminence was strong and square.

The diameter of the femoral head measured 44.5mm which falls into the 'sex intermediate' as defined by Stewart (1979), but the mid shaft circumference of the femora measured 93.5 mm (mean) and this was well within the 'male' category (>81mm) as defined by Black (1978).

Although some elements were intermediate, it was concluded that skeleton (261) was male.

4.60.3 Estimation of Age

The age of skeleton (261) has been based on observations of the auricular surface.

The inferior face was lipped at the inferior terminus and the margins were becoming irregular. There was some macroporosity and moderate activity in the retroauricular area.

This stage of degenerative change shows morphological characteristics of 'Phase 7', defined by Lovejoy (et al, 1985) as 50-59 years.

4.60.4 Stature

Stature has been estimated for skeleton (261) from the maximum length of the femur and tibia (including the malleolus) and, using Trotter and Gleser's (1952) stature measurement formula:

2.42 (tibia) + 81.93 +-4.00

This indicates a mean height of 170.86cm, and a possible height range of 166.86cm – 174.86cm.

2.32 (femur) + 65.53 +-3.94

This indicates a mean height of 168.77cm and a possible height range of 164.83cm – 172.71cm.

Indices were also calculated for skeleton (261). The meric index is calculated form the diameters of the femur at the proximal end of the shaft, and expresses the degree of antero-posterial flattening of the bone shaft (platymeria), and has been attributed to a variety of biomechanical and developmental factors (Brothwell, 1981). The femora of skeleton (261) did not show significant levels of platymeria.

However, the cnemic index calculated from the left tibiae diameters do show platycnemia, or mediolateral flattening of the tibia shaft. This has been interpreted as both a response to suboptimal nutrition and a reflection of greater mechanical stress in the lower limbs (Lovejoy et al, 1976). Although studies of platycnemia have usually dealt with prehistoric populations, bad diet and hard work are equally relevant factors when considering post-medieval societies.

4.60.5 Pathological Analysis and Non-Metric Traits.

There were moderate marginal osteophytes and slight pitting on the cervical and lumbar vertebrae, which may have been the early stage of intervertebral disc disease.

There were also two fused thoracic vertebrae (see below), which may be diffuse idiopathic skeletal hyperostosis or DISH. This condition causes gradual fusion of the right side of the spine, particularly in the thoracic region, although the integrity of the vertebral body surfaces and joints are retained. The osteophytes produced by this condition are large and appear to flow down the right side of the spine like 'candlewax' (Roberts and Manchester, 1995:120). Although, technically, four contiguous vertebrae are necessary for a diagnosis, right-sided ossification in the thoracic region is pathognomonic of DISH, and in cases such as this one where less than four are fused it can be diagnosed as early DISH (Waldron, 2009: 77). DISH is more common in men than women, and is found in association with obesity and type II diabetes. A high incidence of this condition has been observed in archaeological

assemblages from medieval monasteries, and is almost certainly related to the high status diet enjoyed by monks in this period (Waldron, 2009:76). Pain, aching and stiffness are some of the symptoms of this disease.

Fig. 23 Skeleton 23. Fused thoracic vertebrae.

4.61 Skeleton (262)

4.61.1 Description

Skeleton (262) was the articulated remains of an adult. No grave cut was visible for this burial. The skeletal remains consisted of the distal joint surfaces of the femora, the proximal joint surfaces and shafts of the tibiae, shaft fragments of the fibulae and the left patella.

The bone preservation was poor and the surfaces badly eroded (phase 4-5) (IFA, 2004).

4.61.2 Determination of Sex

It was not possible to determine the sex of skeleton (262).

4.61.3 Estimation of Age

All the recovered epiphyses were fully united and from it can be concluded that skeleton (262) was an adult, but it was not possible to be more precise without other diagnostic skeletal elements.

4.61.4 Stature

It was not possible to estimate the stature of skeleton (262).

4.61.5 Pathological Analysis and Non-Metric Traits.

No pathological anomalies were observed on skeleton (262).

4.62 Skeleton (263)

4.62.1 Description

Skeleton (263) was the articulated remains of an adult. No grave cut was visible for this burial. The skeletal remains consisted of the shaft and distal joint surface of the right tibia and the distal joint surface of the left tibia. A fragment of fibula shaft and a number of metatarsals and tarsals were also recovered.

The bone preservation was poor and the surfaces badly eroded (phase 5) (IFA, 2004).

4.62.2 Determination of Sex

It was not possible to determine the sex of skeleton (263).

4.62.3 Estimation of Age

All the recovered epiphyses were fully united and from it can be concluded that skeleton (263) was an adult, but it was not possible to be more precise without other diagnostic skeletal elements.

4.62.4 Stature

It was not possible to estimate the stature of skeleton (263).

4.62.5 Pathological Analysis and Non-Metric Traits.

No pathological anomalies were observed on skeleton (263).

4.63 Skeleton (264)

4.63.1 Description

Skeleton (264) was the articulated remains of an adult. No grave cut was visible for this burial. The skeletal remains consisted of most of the thoracic and 5 lumbar vertebrae, a fragmentary sacrum, the shaft of the right humerus and the right femur. A small part of the right innominate and some metacarpals and proximal hand phalanges were also recovered.

The bone preservation was generally poor and the surfaces badly eroded (phase 5) (IFA, 2004).

4.63.2 Determination of Sex

It was not possible to determine the sex of skeleton (264).

4.63.3 Estimation of Age

All the recovered epiphyses were fully united and from it can be concluded that skeleton (264) was an adult.

There was intervertebral disc disease in the thoracic vertebrae. This condition is particularly associated with ageing and is rare below the age of 40 years and very common above the age of 70 years (Waldron, 2009:43), and this may indicate that skeleton (264) was an older individual.

4.63.4 Stature

It was not possible to estimate the stature of skeleton (264).

4.63.5 Pathological Analysis and Non-Metric Traits.

Skeleton (264) suffered from intervertebral disc disease with marked marginal lipping, pitting and ostephytes in the thoracic vertebrae. This is caused by the collapse of the intervertebral discs resulting in the vertebral bodies becoming pitted on the superior and inferior surface and the formation of marginal osteophytes. This is an age related condition and is very common in skeletal assemblages (Waldron, 2009:43).

Fig. 24 Skeleton 264. Intervertebral disc disease.

4.64 Skeleton (265)

4.64.1 Description

Skeleton (265) was the articulated remains of an adult, located in grave cut [285]. The skeletal remains consisted of parietal, temporal and occipital bones, a fragmentary sphenoid, 4 right and 3 left ribs, the proximal joint surfaces and fragmented shafts of all the long bones from the right side and parts of the right ilium, scapula and clavicle. A number of right metatarsals and tarsals were also recovered.

The bone preservation was generally poor and the surfaces badly eroded (phase 4-5) (IFA, 2004).

4.64.2 Determination of Sex

There did not appear to be a preauricular sulcus, but this area was quite badly eroded, and the sciatic notch was not well enough preserved to assign sex to the skeleton.

Sex could not be reliably assigned to skeleton (265).

4.64.3 Estimation of Age

All the recovered epiphyses were fully united and from it can be concluded that skeleton (265) was an adult.

The auricular surface was fairly rugged and irregular in appearance with some porosity and marginal irregularity. The retroauricular area was not recovered.

Although incomplete, the degenerative changes showed morphological characteristics of 'Phase 7', defined by Lovejoy (et al, 1985) as 50-59 years.

There are also osteoarithric changes visible on the acetabulum. Although OA alone should not be used as a skeletal ageing criterion it is uncommon below 40 years of age and increases in prevalence thereafter (Waldron, 2009:31).

4.64.4 Stature

It was not possible to estimate the stature of skeleton (265).

4.64.5 Pathological Analysis and Non-Metric Traits.

There was evidence of osteoarthritis was observed in the right acetabulum in the form of new bone formation and pitting on the joint surface.

Osteoarthritis of the hip commonly affects females rather than males. Although the link with obesity is weak, strongly suggesting that stress is not a major cause of this condition (Waldron, 2009:38).

4.65 Skeleton (266)

4.65.1 Description

Skeleton (266) was the articulated remains of at least 1 adult. No grave cut was visible for this burial. The context was also not secure and this may well not be the remains of a single individual. The skeletal remains consisted of the left and right temporal bones, the right parietal, maxilla and mandible, the 1st-4th cervical vertebra, and fragments of 2 lumber vertebrae, the proximal joint surface and shaft of the right ulna and fragments of the right scapula and sternum. Some tarsals, 4 loose anterior teeth and 1 loose upper 2nd molar were also recovered.

The bone surfaces were moderately eroded (phase 3) (IFA, 2004).

4.65.2 Determination of Sex

The sex of the skull recovered from this burial appeared to be female, with very small mastoid processes and an upright forehead.

4.65.3 Estimation of Age

All the recovered epiphyses were fully united and from it can be concluded that all the remains were adult.

There was intervertebral disc disease in the lumbar vertebrae recovered. This condition is particularly associated with ageing and is rare below the age of 40 years and very common above the age of 70 years (Waldron, 2009:43)

4.65.4 Stature

It was not possible to estimate the stature of these remains.

4.65.5 Pathological Analysis and Non-Metric Traits.

The lumbar vertebrae recovered had intervertebral disc disease with profuse marginal osteophytes and pitting on the vertebral bodies. This is caused by the collapse of the intervertebral discs resulting in the vertebral bodies becoming pitted on the superior and inferior surface and the formation of marginal osteophytes. This is an age related condition and is very common in skeletal assemblages (Waldron, 2009:43).

4.66 Skeleton (267)

4.66.1 Description

Skeleton (267) was the articulated remains of an adult, located in grave cut [121], lying above skeleton (268). The skeletal remains consisted solely of the right metatarsals, 2 left metatarsals and the calcaneus and first cuneiform from the right foot. 6 proximal and 2 distal foot phalanges were also recovered.

The bone preservation was poor and the surfaces badly eroded (phase 5) (IFA, 2004).

4.66.2 Determination of Sex

It was not possible to determine the sex of skeleton (267).

4.66.3 Estimation of Age

All the recovered epiphyses were fully united and from it can be concluded that skeleton (267) was an adult, but it was not possible to be more precise without other diagnostic skeletal elements.

4.66.4 Stature

It was not possible to estimate the stature of skeleton (267).

4.66.5 Pathological Analysis and Non-Metric Traits.

No pathological anomalies were observed on skeleton (267).

4.67 Skeleton (268)

4.67.1 Description

Skeleton (268) was the articulated remains of an adult, located in grave cut [121], but lying beneath skeleton (267). The skeletal remains consisted solely of the left and right metatarsals, and the calcaneus, first and third cuneiform and the cuboid from the left foot.

The bone preservation was good with minimal surface erosion (phase 1) (IFA, 2004).

4.67.2 Determination of Sex

It was not possible to determine the sex of skeleton (268).

4.67.3 Estimation of Age

All the recovered epiphyses were fully united and from it can be concluded that skeleton (268) was an adult, but it was not possible to be more precise without other diagnostic skeletal elements.

4.67.4 Stature

It was not possible to estimate the stature of skeleton (268).

4.67.5 Pathological Analysis and Non-Metric Traits.

No pathological anomalies were observed on skeleton (268).

4.68 Charnel

4.68.1 Topsoil/Graveyard Soil

A large quantity of disarticulated bone was recovered from topsoil and graveyard soils. This is quantified in Appendix 1, Table 2.

4.68.2 Grave Backfills

Disarticulated bone was also recovered from a number of backfills from the articulated burials. This is a common feature of crowded post-medieval cemeteries as old graves were often truncated to make way for new burials and the remains of the previous occupant were used to backfill the new grave. This disarticulated bone has been quantified and the minimum number of individuals in each context has been estimated. These results can be seen in Appendix1, Table 3.

4.68.3 The Church Interior

A small quantity of charnel was recovered from make-up layers beneath the church floor and this is quantified in Appendix 1, Table 4.

5 Discussion

5.1 General Assemblage Condition.

In general, the condition of the excavated bone was good, with, in most cases only moderate surface erosion (IFA, 2004). It was possible to recover the small bones of the hands and feet from many of the graves, and, as the graveyard had been well tended and kept clear of vegetation bioturbation was minimal.

However, the width of the utility trench (0.60m approx) meant that the majority of the skeletons recovered were partial (lower legs and feet in many cases), and this has limited the interpretation of the assemblage.

5.2 Assemblage Demography.

In total the articulated remains of 67 individuals were recovered from the excavation at St Andrews Church. When considering this assemblage, it is worth noting that the surrounding headstones were quite elaborate which probably indicates the presence of relatively wealthy individuals, and the area of the churchyard itself (south side, near the east end of the church) was traditionally the more desirable, and therefore more expensive, part of the churchyard in which to be buried.

5.2.1 Sub Adults

There were 10 sub-adults in the assemblage, and only 1 of these was a neonate (0-3 months). In most late post medieval cemetery assemblages a higher proportion of very young children can be expected as 19th century rates of infant mortality were high, with around 25% (and more in urban communities) of babies dying within the first year of life. It is quite possible that this is the result of sampling bias, and that more young children would have been encountered if a larger area of the cemetery had been excavated. However, this could also be a reflection of relatively high standards of hygiene, sanitation and nutrition for at least some of the children born in Thursby during this period.

5.2.2 Adults

It was not possible to assign sex to 29 of the adult individuals due to the incomplete nature of the remains. Of the remainder, 9 were positively identified as male and 7 as female. There were 10 individuals who were possibly male, and 2 who were

possibly female. As always, with incomplete archaeological remains the potential to assign sex depends on preservation and recovery, and there is a recognised bias of around 12% in favour of the identification of males (Weiss, 1972), which may well account for the higher number of males than females identified in this assemblage.

Approximately one third (18 of 57) of the adult sample appeared to have been at least 50+ years, if not considerably more, when they died. Average life expectancy in 1837 was in the late 30's and the 1841 census records averages of 40.2 years for men and 42.2 years for women. These statistics had only increased to approximately 48 years by 1901 so many of the individuals from Thursby appear to have had relative longevity in comparison with the national averages. This could either be due to the fact that the assemblage consists of the wealthier individuals from this community, or reflect a generally higher standard of living in a rural community compared to the chronic poverty, overcrowding and insanitary conditions that were prevalent in urban areas at this time.

5.3 Stature.

It was only possible to estimate the stature of 11 individuals from the Thursby assemblage. The mean heights ranged from 5'2" to 5' 11.5", and the most common height was 5'8". All these stature estimations have 4cm (+-) standard deviation.

5.4 Pathology.

The majority of the pathologies observed in the St Andrews Church assemblage were age related degenerative changes. Intervertebral disc disease was observed in eleven individuals, and varying degrees of osteoarthritis was also common.

There were two instances of osteoarthritis in the elbow, which may indicate that these individuals were engaged in heavy manual labour.

There was no evidence of infectious disease in the assemblage, but some indicators of systemic disease as there is a clear link between periodontal disease and systemic diseases such as cardiovascular and pulmonary disease and diabetes (Waldron, 2009:240).

It is also possible that the pit type enamel hypoplasia observed in skeleton (02) was the result of a systemic disease. Although birth trauma, low birth weight, infection and genetic factors could also have been responsible for these enamel defects

(Waldron, 2009: 244) the fact that skeleton (02) died at approximately 6 years of age may suggest that this child suffered from a systemic condition.

The only pathology that was likely to have been the result of trauma was the probable ossified ligament observed on skeleton (29).

The periosteal bone growth seen in the distal fibulae of skeleton (17) may have been the result of stress or trauma in these areas, but may equally have been age related.

There was little evidence of obesity in the assemblage, with only 2 individuals (18) and (261) showing signs of this condition.

The dental health of the sample was generally poor, but this is not at all unusual for assemblages from this period. The prevalence of dental disease in English post-medieval populations can be seen in the Spitalfields Collection where 87% of 968 individuals had dental caries, and a common cause of death recorded in the 18th century London Bills of Mortality was 'teeth' (Waldron, 2009, 240).

The maxillary horizontal bone loss observed in skeleton (251) was very likely to have been the result of excessive tobacco smoking as a clay pipe stem had eroded a circular facet in the anterior teeth. The pattern of dental wear observed in this individual suggests they died at a relatively young age (25-35 years), and it is possible that tobacco smoking contributed to this untimely demise. It was unfortunately not possible to observe the ribs for lesions as this may have indicated a pulmonary related condition.

Appendix 1

Table 1. Summary of Osteological Analysis.

Skeleton No.	Male or Female	Age Estimation	Stature Estimation	Pathologies
01	?	Adult	N/A	None visible
02	?	6 years	N/A	Pit type enamel hypoplasia.
03	F	60+	N/A	Periodontal disease, Intervertebral disc disease, OA elbows, wrist & cervical vertebrae.
04	Poss. M	Adult	N/A	None visible
06	?	Adult	1.60m (1.56-1.64)	None visible
07	Poss. M	Adult	N/A	None visible
08	?	Neonate (0-3 mths)	N/A	None visible
09	M	50-59 years	1.77m (1.73-180)	None visible
10	?	5-6 years	N/A	None visible
11	Poss. M	Adult	N/A	None visible
12	?	Adult	N/A	None visible
13	?	4-5 years	N/A	None visible
14	Poss. M	Adult	N/A	None visible
15	?	7-9years	N/A	None visible
16	?	Adult	N/A	None visible
17	Poss. M	Adult	1.81m (1.77-185)	Periosteal bone growth on disto-lateral tibiae.
18	?	Adult (50+)	1.65m (1.61-1.69)	OA in patella & tarsometatarsal joint.
19	?	Adult	1.68m (1.65-1.73)	None visible.
20	?	Poss. Adolescent	N/A	None visible.
21	?	7-10 years	N/A	None visible.
22	?	Adult	N/A	None visible
23	?	Adult	N/A	None visible
24	?	25-35 years	N/A	None visible
25	M	50-59 years	N/A	None visible
26	?	19-24 years	N/A	None visible
27	Poss. M	Adult	1.73 (1.69-1.77)	None visible
28	?	8-9 years	N/A	None visible
29	?	Adult	N/A	Ossified anterior inferior tibio-fibular ligament.
30	?	Adult	N/A	None visible
31	Poss. M	45+	N/A	Root caries in molars
32	?	50+	1.68m (1.64-1.72)	None visible
33	?	50+	N/A	None visible
34	?	Adult	N/A	None visible
35	?	Adult	N/A	None visible

Skeleton No.	Male or Female	Age Estimation	Stature Estimation	Pathologies
36	?	Adult	N/A	None visible
37	?	Adult	1.75m (1.71-1.79)	None visible
38	F	50+	N/A	OA of elbow
39	F	Adult	N/A	None visible
40	Poss. F	Adult	N/A	None visible
41	Poss. M	Adult	N/A	None visible
42	?	Adult	N/A	None visible
43	M	45-49 years	1.61m (1.57-1.65)	None visible
44	Poss. F	Adult	N/A	None visible
45	F	60+	N/A	Intervertebral disc disease & OA in cervical vertebrae
46	Poss. M	40-50 years	N/A	Early stages of intervertebral disc disease
47	?	60+	N/A	Periodontal disease & Intervertebral disc disease.
48	?	Adult	N/A	None visible
49	?	60+	N/A	None visible
250	M	60+	N/A	Dental Caries
251	M	25-35 years	N/A	Interproximal caries, horizontal bone loss (maxillary & mandibular) & pipe stem facet.
252	M	60+	N/A	Intervertebral disc disease & vertebral OA.
253	M	Adult	N/A	Early stages of intervertebral disc disease.
254	M	76 years	N/A	None visible
255	F	60+	N/A	Intervertebral disc disease and OA.
256	?	Adult	N/A	None visible
257	?	60+	N/A	Severe OA of femoral head and acetabulum.
258	F	35-45 years	N/A	Intervertebral disc disease.
259	?	8-9- years	N/A	None visible
260	M	35-45 years	N/A	Intervertebral disc disease
261	M	50-59 years	1.68m (1.64-1.72)	Early diffuse Idiopathic skeletal hyperostosis (eDISH)
262	?	Adult	N/A	None visible
263	?	Adult	N/A	None visible
264	?	60+	N/A	Intervertebral disc disease
265	?	50-59 years	N/A	OA of acetabulum
266	F	60+	N/A	Intervertebral disc disease
267	?		N/A	None visible
268	?		N/A	None visible

Table 2. Quantity and weight of charnal recovered from topsoil and graveyard soil contexts.

Context No.	Context Type	Quantity of Skeletal Elements	Weight (kgs).
57	Topsoil	101	0.95
58	Topsoil	214	2.75
59	Topsoil	394	4.3
60	Topsoil	216	317
61	Topsoil	173	1.4
62	Topsoil	41	1.0
63	Topsoil	77	1.8
64	Topsoil	73	1.1
65	Topsoil	-	-
66	Topsoil	10	0.4
67	Topsoil	29	0.65
68	Topsoil	13	0.4
69	Topsoil	-	-
105	Topsoil	33	0.22
106	Topsoil	57	0.9
107	Topsoil	202	2.3
277	Topsoil	7	0.075
70	Graveyard Soil	97	0.7
71	Graveyard Soil	132	1.1
72	Graveyard Soil	25	0.1
73	Graveyard Soil	269	4.9
74	Graveyard Soil	68	0.3
75	Graveyard Soil	281	3.05
76	Graveyard Soil	38	0.65
77	Graveyard Soil	55	0.9
78	Graveyard Soil	53	0.75
79	Graveyard Soil	56	1.95
80	Graveyard Soil	17	0.1
81	Graveyard Soil	31	2.6
82	Graveyard Soil	4	0.3
110	Graveyard Soil	120	2.05
111	Graveyard Soil	433	3.37
112	Graveyard Soil	233	2.5
113	Graveyard Soil	-	-
114	Graveyard Soil	-	-
240	Graveyard Soil	143	2.3
117	Graveyard Soil	64	2.85
155	Graveyard Soil	46	0.65
278	Graveyard Soil	11	0.2
279	Graveyard Soil	9	0.3
282	Graveyard Soil	9	0.1

Table 3. Quantity, weight and minimum number of individuals recovered from grave backfill context

Context No.	Skeleton No.	Fill of Cut No.	Quantity of Skeletal Elements	Weight (Kgs)	Minimum No. Of individuals
94		95	67	1.8	1 Adult
97	03	98	6	0.1	1 Adult
101	16	-	3	0.2	1 Adult
122	267	121	17	0.05	1 Adult
124	13	125	23	0.3	1 Adult
126	17	127	23	0.4	1 Adult
161	19	139	1	0.02	1 Adult
162	27	163	47	0.40	1 Adult
164	28	165	47	0.8	1 Adult 1 Juvenile
167	29	166	3	<0.01	1 Adult
176	32	175	61	0.5	1 Adult 1 Juvenile
177	31	178	48	1.0	2 Adults
179	Un-ex	180	24	0.6	1 Adult
182	37	183	7	0.1	1 Adult
190	38	191	32	1.4	3 Adult 1 Juvenile
199	40	200	29	0.7	2 Adult 1 Juvenile
207	44	208	11	0.2	1 Adult 1 Infant
216	254 (Un-ex)	Stone Vault	23	0.55	1 Adult 1 Juvenile
243	250	244	128	2.85	2 Adults 1 Juvenile 1 Neonate
282	-	281 (Modern cut)	19	0.3	2 Adults
283	-	284 (Church Foundation cut)	7	0.045	1 Adult

Table 4. Quantity, weight and minimum number of individuals recovered from church interior contexts

Context No.	Context Type & Location	No. of Skeletal Elements	Weight (Kgs)	Minimum No. Of Individuals
05	Make-up layer Beneath Nave floor	1	0.05	1 Adult
52	Make-up layer Beneath Nave floor	10	0.075	2 Adults
86	Make-up layer Beneath Nave floor	3	0.025	1 Adult
313	Make-up layer Beneath Nave floor	7	0.1	2 Adults
314	Make-up layer Beneath Nave floor	29	0.75	2 Adults 1 Neonate