1. Introduction

This report contains the results of the osteological analysis of the cremated bone recovered during an evaluation of a prehistoric site at Buttington Cross, Welshpool, Powys, Wales (Project Number P3021) by the Clwyd-Powys Archaeological Trust (Grant and Jones 2006). The latest stage of excavation has been undertaken by Worcestershire Historic Environment and Archaeology Service (Mann and Hurst 2009) as part of the final phase of site analysis, for which a report is under construction.

One deposit of cremated bone [119] was excavated from a pit [116] situated in the mound of a ring-ditch barrow. Neither any direct evidence of associated urns nor substantial evidence of pyre debris was recovered, although worked flints and a stone pendant were associated with the bone deposit. Dating of the associated finds indicate that the cremated bone was deposited during the Bronze Age period.

The osteological analysis aims to provide a detailed description of the nature of the cremated bone present, to quantify and differentiate, where possible, between animal and human cremated bone, to assess the age, sex and presence of pathological changes and to identify any evidence of pyre technology used during the cremation process.

2. Methods and Process

The cremated material was analysed according to the standards laid out in the guidelines recommended by the British Association of Biological Anthropologists and Osteologists in conjunction with the IFA (Guidelines to the Standards for Recording Human Remains, Brickley and McKinley (eds) 2004) as well as by English Heritage (Human Bones from Archaeological Sites: Guidelines for producing assessment documents and analytical reports, Centre for Archaeology Guidelines, 2002).

- The material was analysed macroscopically and where necessary with the aid of a magnifying glass for identification purposes.
- The material was sorted into three fractions of 10mm, 5mm and 2mm using UKAS accredited calibrated sieves.
- The material was weighed using calibrated digital scales to an accuracy of 0.1g.
- The material was analysed without prior knowledge of associated artefacts
- The material was recorded on sheets provided in Appendix A.

2.1. Reasons for the Analysis

Osteological analysis was carried out to ascertain:

- The type of deposit
- Total weight of the bone
- Identification and quantification of human bone
- Demographic data
- Pathology data
- Degree of fragmentation
- Efficiency of the cremation
- Presence and type of pyre goods
- Presence and type of pyre debris

3. Type of Deposit and Disturbance

3.1. Introduction

Recording of the type of deposit of cremated bone is necessary to make fair comparisons between different deposits from across a site, between one site and another and between cremated bone deposits from different historical contexts. Recording the type of deposit allows inferences to be made about the state of preservation of the material interred and how this may have affected bone content and fragmentation. This information is essential for accurate analysis of cremation processes due to diagnostic analytical techniques being based upon the weight and size of bone fragments present.

3.2. Observations

The nature of the deposit of the cremated bone was assessed during field excavation and recorded on the relevant context sheets. This information was subsequently classified according to the categories suggested by Brickley and McKinley (2004) and recorded on the sheets contained in Appendix A.

3.3. Results

The bone fragments under analysis were recovered from a single deposit that either formed the primary fill of pit [116]. The deposit formed a spread of approximately 0.70m across the base of the pit (Grant and Jones 2006) and no pottery fragments were recovered. A substantial quantity of bone was retrieved but by contrast only a very small amount of charcoal or other burnt material was present. The deposit, therefore, represents an intentional unurned burial of cremated bone material without the inclusion of pyre debris.

4. Identification and Quantification of Cremated Bone

4.1 Introduction

Cremated bone deposits have been found on frequent occasions to contain both human and animal bone remains. Often, particularly if the bone fragments are very small, it is not possible to identify whether bone is categorically human or animal. However, it is clear from the analysis of cremated bone deposits that the deposition of both types of bone together is intentional and, therefore, it is imperative to approach the assessment of the cremated bone present holistically, as well as to attempt to identify human and animal elements.

An assessment of the quantity of bone recovered may give an indication of the state of preservation of the associated feature in which the bone was interred or, if recovered from relatively undisturbed context, may provide valuable information regarding cremation processes. This may relate not only to the actual pyre technology itself but also to the collection and ritual deposition of bone after the process was complete. McKinley (1993) found that modern cremation processes resulted in the production of between 1227.4g and 3001.3g of bone. From this she inferred that the cremation of a whole body and deposition of the remains in an archaeological context would realistically produce between 1001.5g and 2422g of cremated human bone.

Identification of particular elements of the human body serves to confirm the presence of human material and also may give an insight into any particular areas of the body which may have been purposefully collected following cremation. The absence of elements, especially those that are smaller, may be due to the lack of their survival as a result of fragmentation during the cremation, post-depositional preservation conditions or may be due to their loss during the cremation itself.

4.2 Observations

The total amount of bone present in each context was weighed and subsequently analysed for identifiable fragments. These fragments were then weighed and recorded separately according the area of the body they originated from. Full quantification of bone is given in the recording sheets in Appendix A.

4.3 Results

The table below summarises the results of the quantification analysis:

Context	**119**
Total Weight of Cremated Materials (g)	2523.2
Total Weight of Identifiable Human Fragments (g)	436.3
Minimum Number of Individuals	2

The content of the bone was well above the amount that would be expected had the cremated bone of a single complete body been deposited. McKinley has observed that on average 1000g is recovered from undisturbed primary urned burials dating to the Bronze Age (McKinley 2001). Therefore, the quantity of the bone alone suggests that more than one individual was represented by the material recovered. Animal bone, identified through either morphology or cortical denseness, was also present (see Section 9: Presence and Type of Pyre Goods) but in very small quantities and it was thought that the majority of the material present was human.

The identifiable human skeletal material present indicated that all parts of the body were represented, including cranium (35.9%), torso (55.3%), upper limb (2%) and lower limb (6.8%). Very small bones were present, such as distal toe and hand phalanges. Although the comparative percentage of the representation of the upper limbs appears low, it is likely that this is due to a lack of specifically identifiable fragments rather than being absent or under-represented in actuality. A zoned approach to the analysis, whereby the body is divided into a head zone (skull, expected to represent approximately 20% of a skeleton), central zone (axial ~ 40%), peripheral zone (long bones of arms or legs ~ 30%) and extremities zone (hands and feet ~ 10%) indicates that approximately 32.2% of the bone collected could be categorised using this method as 'long bone of arms or legs'. Therefore, the upper limb was not under-represented.

Context [119] contained repeated bone elements that were clearly of different stages of development and thus it could be inferred that the cremated bone represented the remains of at least two individuals. This was most clearly exemplified by the presence of one very small and one much bigger mastoid process (See Plate 1 below). Evidence of differential skeletal development could also be seen in elements such as the rib, skull and dentition fragments as well as by combined the presence of larger unfused epiphyses and small primary and secondary ossification centres (undeveloped bones).

To summarise, the cremated material was found to contain the remains of at least two human individuals as well as a small quantity animal remains.

Plate 1: *Two mastoid process elements present in context [119], the one on the left belonging to a much younger individual than that on the right.*

5. Demographic Data

5.1 Introduction

Demographic data recorded from human cremated bone gives an indication as to the age and sex of the individual. This information is derived from the macroscopic examination and metric assessment sexually dimorphic elements (e.g. Gejvall 1981, Van Vark (1975) and Whal (1982) as well as analysis of dental and bone development recommended by Buikstra and Ubelaker (1994). A large sample of well-preserved cremated bone deposits can provide a valuable insight into the demographic structure of the archaeological population and also into any ethnocentric funerary practices associated with the age and sex of the individual cremated.

5.2 Observations

Observations of material present and any indicators of age and sex were noted on the recording sheets contained in Appendix A. No fragments present were large enough to allow metric assessments to be undertaken so any observations were based upon morphological features.

5.3 Results

Age

Context [119], as discussed above, contained the remains of at least two individuals. The age of these individuals could be broadly assessed through observations made of epiphyseal fusion and dental development. The material present contained a large quantity of fragments of unfused epiphyses, including long bones, phalanges, metacarpals, metatarsals, medial clavicle, vertebrae, iliac crest and rib heads. The collection of unfused epiphyses and diaphyses could

be further divided according to size since there was a marked disparity between the size of unfused elements present. This, therefore, indicated that the remains of an older and younger subadult were present.

Whilst individual epiphyses are observed to fuse to the diaphyses at different times, overall epiphyses throughout the body start to fuse after the commencement of puberty. Given the observation that the sizes of some of the unfused elements were of adult-like proportions, one of the subadults is likely to be adolescent (13-17 years of age). In addition, some of the tooth roots recovered were permanent molar dentition, some of the latest teeth to develop. It should be emphasised that due to the fragmentation of the material, it was not possible to observe the developmental status of all elements and that the presence of additional adult remains cannot be completely ruled out. However, given the quantity of material present it is unlikely that the remains of a complete adult as well as an adolescent are present.

The second set of remains observed was much smaller and less well developed. One deciduous tooth (possibly a 1st maxillary incisor) was present, although broken post-mortem, along with several other small tooth roots. Unfortunately, the post-mortem breakage of the many of the tooth roots meant that in most cases it was not possible to differentiate broken upper molar (double) tooth roots from single roots. In addition, it should be emphasised that subadults, of course, present with a mixed permanent and deciduous dentition from the ages of approximately 6 to 12 years of age so the presence of deciduous teeth in itself can not be used to categorically distinguish between older and younger subadults, especially in such a fragmented state. Nonetheless, the presence of the possible 1st deciduous incisor, one of the first teeth to develop and to be shed, combined with the presence of the small immature skeletal elements, confirms that a second subadult is contained within the remains and is likely to be a younger child, possibly aged between 2 and 4 years old from dentition development.

Sex

No elements were present in context [119] that could be assessed for indications of the sex of this individual by metrics. One fragment of ilium did survive, however, containing part of the sciatic notch, a feature used in sexing from skeletal morphology. The notch in this case appeared to be very broad (Grade 2 or 1), possibly indicating that a female adult/adolescent was present amongst the cremated remains. Unfortunately, this is a very tentative observation, since the sciatic notch is not complete and it is not generally possible to assign a sex to sub-adults due to sexually dimorphic features appearing after puberty. Only an aDNA test could confirm the sex of the material present.

6. Pathology Data

6.1 Introduction

Palaeopathology is the study of diseases of past peoples and can be used to infer the health status of groups of individuals within a population as well as indicate the overall success of the adaptation of a population to its surrounding environment. Pathologies are categorised according to their aetiologies; e.g. congenital, metabolic, infectious, traumatic, neoplastic etc. Any pathological modifications to the bone are described. The size and location of any lesion is also noted. Pathology data is usually restricted, however, by intrinsic nature of cremated bone, although if fragment size is large enough, pathological changes may be observed.

6.2 Observations

Observations were recorded on the sheets provided in Appendix A.

6.3 Results

No pathological changes were observed in any of fragments contained in context 119. This is mainly due to the small size of the fragments recovered from the deposit and also quite likely relates to the age of the individuals present.

7. Bone Fragmentation

7.1 Introduction

The observation and quantification of bone fragmentation is essential in assessing its impact on the quality of the overall data retrieved from the analysis of cremated bone. It may also be an indicator of practices carried out during the cremation process and give and insight into pyre technology. Fragmentation of bone is assessed by sorting all bone fragments into three sieve fractions (10mm, 5mm and 2mm) and comparing the proportion of bone in each fraction (McKinley 2004). Measurement of the maximum bone fragment length is also recorded.

The fragmentation of bone can occur for several reasons, i.e. from the raking of the remains during the cremation process, the collection and the subsequent interment of the remains, making it difficult to assess whether bone was deliberately fragmented as part of the cremation ritual (McKinley 1994b, 2001). It is, however, generally believed that both the excavation and post-excavation processes can lead to the largest amount of damage caused to the remains (Lange *et al* 1997, McKinley 1994b).

7.2 Observations

Observations of the weight of bone present in each sieve fraction and the percentage of each fraction of the total weight of bone were recorded on the sheets provided in Appendix A.

7.3 Results

The tables below summarises the results of the quanitification of cremated bone present by sieve fraction weight and percentage of total weight:

Context	119
>10mm Weight (g)	1111.3
>10mm Percentage of Total	*44.1%*
>5mm Weight (g)	1015.0
>5mm Percentage of Total	*40.2%*
>2mm Weight (g)	366.8
>2mm Percentage of Total	*14.5%*
Assessment of Bone Content Percentage <2mm residue	100%

These results indicate that the majority of the fragments were larger 10mm in size. The maximum bone fragment size was 52.3mm and the average 25mm. McKinley (2001) has found that on average fragments from archaeological deposits are between 20 and 40mm in size. Therefore, overall, the size of the bone fragments was average for archaeological cremated material. There was evidence of post-depositional fragmentation of one piece of bone, as a few pieces were identified as originally having been one piece, highlighting the fragility of the bone. The majority of the bone also was observed to have reasonably sharp edges from breaks occurring post-mortem. This may have been the result of the cremation processes employed but it is also likely that a high degree of post-depositional breakage has occurred to the structurally weakened fragments. It is, overall, very difficult to assess and differentiate between the impact of post-depositional disturbance on the fragmentation of bone *in-situ* and cremation practices.

8. Efficiency of the Cremation

8.1 Introduction

Effective cremation of a human body requires basically two elements: burning at high temperatures and a sufficient length of time of the application of this heat. Differences in temperature and length of time of exposure will result in variation in how the bone is burned. Complete burning will result in complete oxidation of the organic element of bone, leaving the mineral portion remaining (McKinley 1994a, Lange *et al* 1987).

Holden *et al.* (1995a and 1995b) reports that generally, the range of colours seen in burnt bone relates to the temperature to which the bone was exposed:

Brown/Orange = Unburnt

Black = Charred (*c.*300°)

Blue/Grey = Incompletey Oxidised (*c.*600°)

White = Completely Oxidised (>600°)

The colour may vary from bone to bone as different elements of the body may be exposed to different temperatures for different lengths of time. It is, therefore, essential to record any differences in colouration according to skeletal elements affected and to the aspect of the element (i.e. interior, exterior) affected. The extent of the burning or oxidation of the bone represents the relative success of the cremation processed applied and contemporary knowledge of pyre technology.

Observations of dehydration of the bone should also be recorded. Shrinkage of bone due to dehydration can amount to a 25-30% decrease in cross-section width and accordingly approximately a 5% decrease in length (Lange *et al* 1987). Evidence of dehydration presents itself on the bone fragments in the form of fissuring, transverse, concentric and parabolic cracking, especially on articular surfaces of long bones and cranial vault fragments (Lange *et al* 1987, McKinley 1994a). These are generally interpreted as occurring due to the result of cremating the bone when soft tissue was still present on the bone.

8.2 Observations

Observations were noted on the recording sheets contained in Appendix A. Generally, the bone was observed to be white in colour but the fragments appear to have undergone considerable staining from the surrounding soil matrix giving them a yellow-brown hue. The faunal remains were recorded as being grey/white but these also contained some blue-grey colouration in the centre of the cortices, exhibited as a result of being incompletely oxidised during the cremation process. Observations regarding dehydration of the bone were also noted.

8.3 Results

The results of the analysis of colour variation in the fragments of bone indicate that most of the bone likely to be human contained within the deposit had been exposed to heat and that the temperature was at a sufficient temperature (i.e. above 600°) for a sustained amount of time in order to for it to have been completely oxidised. Although on initial inspection the majority of the bone does appear unburned from the analysis of the colour alone i.e. it is of a yellow-brown hue (i.e. appearing as unburnt bone), a chalky white texture to the surface of the bone was present throughout and no charring of the bone was observed. It was thought likely that the fragments had undergone staining from the surrounding soil matrix (a yellow-brown silty clay) and therefore, the bone has been classified as ‘white’. The presence of blue/grey bone and white unstained bone was noted for only a very small amount of elements (at most 2% of the context). This was generally present along the external areas of the cortices of ribs and bone with thinner cortices such as scapula border, metacarpal/tarsals and child cranial vault

bones. No colour change was observed in the cancellous bone. Overall, the findings indicate that the bone was exposed to high enough temperatures long enough to the majority of the human bone fragments and external surfaces of most of the more robust faunal remains elements to oxidise (Murray *et al.* 1993).

Fissuring and transverse cracking was present on the vast majority of the elements contained in this context. This indicates that soft tissue was present on the bone when it was cremated. The presence of both transverse, concentric and parabolic fissuring as well as severe warping of child cranial skull fragments confirms that the bone has been cremated long enough for substantial amount of dehydration of the bone to occur.

9. Presence and Type of Pyre Goods

9.1 Introduction

Pyre goods are those items that were placed on the pyre and have been deliberately included for interment along with the cremated human bone. These can consist of objects manufactured from glass, ivory or metal, for example, which may have formed items of personal adornment. Metal items may only leave a trace of their presence in the form of staining on the bone, especially those manufactured from copper alloys.

It is most common for animal bone to be included with deposits of human bone (e.g. Wells, C 1960). It is generally perceived that these represent animal sacrifice or food offerings to the dead (McKinley 1994b, Bond 1994,). Williams (2005) has suggested, furthermore, that the deliberate admixture of animal and human cremated remains is deeply significant and may be associated with shamanistic rituals often observed ethnographically whereby not only can animals symbolically represent totemic ancestor lineages and but also both human and animal beings are seen to dynamically and mutually co-exist: “Animals were more than symbols of identity but agents of transformation, enabling the dead to be reconstituted into a new social status in death." (Williams 2005).

9.2 Observations

Observations regarding the identification, quantification and percentage of identifiable animal bone present were recorded on sheets contained in Appendix A. Context [119] contained a very small quantity of animal bone.

9.3 Results

The animal remains recovered consisted of a group appearing to represent a neonate/juvenile small/medium mammal as well as fragments that could be reconstructed into a worked fragment of possible mandible from a medium sized mammal (See Plate 2). This appears to represent animal remains being used as both offerings within the cremation ritual as well as being used for personal adornment. The worked bone exhibits a drilled perforation which would have allowed the item to be suspended as a pendant. The inferior end of the bone may also have been worked as there appears to be rounded off and a slit cut upwards into the

fragment (See Plate 3 below); it is however, it is unclear the role warping and fissuring may have had in producing this shape. During the excavation, a further item of adornment in the form of a stone hone pendant as well as other funerary goods including worked flint were recovered, appearing to mirror contemporary barrow burials.

Plate 2: *Reconstructed fragments of worked animal bone (possible mandible ramus) with drilled perforation*

Plate 3: *Inferior end of worked animal bone fragment*

The deliberate inclusion of animal remains is documented in Ibn Fadlan's contemporary account of Viking cremations (Broendsted 1965), for example, reveals that the dead were often cremated with their pets and that pieces of meat from sheep, goats or pigs were placed by the head as a food offering. Animal remains appear to have been equally important in the role they played in cremation rituals during the Bronze Age; approximately 16% of burials of cremated bone contain faunal remains and typically include sheep or pigs and birds (McKinley 2001). The lack of grave goods found during the Bronze Age compared with the presence of pyre goods indicates that their presence is strongly linked to the funerary rituals carried out through the cremation (McKinley 2001).

10. Presence and Type of Pyre Debris

10.1 Introduction

The presence and type of pyre debris is analysed in order to ascertain the nature of pyre technology and can be used to provide an insight into the type of deposit. Recent experimental reconstructions of pyre sites have determined that distinct features and types of debris can be left by former pyre sites and in particular that the use of different materials alters the type and form of deposit (Marshall 2005).

10.2 Observations

Observations regarding presence, quantity and type of pyre debris were made and recorded on sheets contained in Appendix A.

10.3 Results

No pyre debris was observed to be present, the context consisting entirely of bone fragments. Only a very small quantity of charcoal was observed to be present amongst the flot sample. This, unfortunately, prevents any inferences to be made regarding pyre technology employed at this site. However, the completeness of the remains and the inclusion of very small bones in the deposit without a substantial deposit of pyre debris may indicate that the material was meticulously collected after the cremation and that the pyre technology employed was well sophisticated. Alternatively, given that the bone on the whole was unburnt, it may have been the case that parts of the body were still covered with some soft tissue when removed and hence smaller bones were retained and little charcoal was collected.

11. Conclusion

The table below summarises the findings of the osteological analysis of cremated bone deposit [119]: -

	[119]
Type of deposit	Unurned Burial
Total weight of cremated materials	2523.2g
Quantification of bone	2517.1g Probable Human; 6.1g animal
Minimum Number of Individuals	2
Demographic data: Age	Adolescent + ?Young Child
Demographic data: Sex	Unobservable
Pathology data	Unobservable
Maximum Fragment Size	52.3mm
Degree of fragmentation – average fragment size	25mm
Efficiency of the cremation	Overall colour: White Blue Grey/White (2%)
Presence and type of pyre goods	Pyre Goods: 6.1g. Unidentified mammal bones 1 neonate/juvenile, 1 medium mammal worked bone fragment.
Presence and type of pyre debris	None.

The osteoarchaeological analysis of the cremated bone recovered from context [119] revealed that the deposit contained the remains of at least two individuals. Both individuals were subadults. One individual was assessed as being approximately 13-17 years of age at death and was classified as adolescent. The second individual was thought to be a young child, possibly aged between 2-4 years at death. Funerary goods were recovered with the human remains and included a worked bone pendant, animal remains and additionally flints and a second pendant that were recovered at the excavation stage. The burial was placed beneath a barrow mound.

The bone identified as probably human has been fully oxidised and, therefore, appears to have been burnt to a high temperature for a sustained period of time. All the cremated bone present demonstrated evidence of cracking and fissuring, indicating that the bone was covered by soft tissue when it was burnt.

Cremation was practised as a funerary rite throughout the Bronze Age, though predominantly in the early and middle Bronze Age periods (McKinley 2001). Evidence from this period suggests that large timbers, usually oak, were used to construct the frame of the pyre with brushwood infills of cherry, sloe and alder. In some cases during this period, mounds were constructed over the collapsed pyre containing the human remains, whereas in others remains were collected and interred. Redeposited pyre debris that has been recovered from ring-ditch fills, such as at Twyford Down, Winchester, where the line of tipping indicated that the interior area of the ring may have been used as a pyre site (McKinley 2001). Pyre debris has also been noted to have been deliberately deposited in small pits as well as in the backfill of cremation burials. Mound burial was also common during the Bronze Age and was an important means of creating monuments to the dead for the living in the surrounding landscape. Their substance, form and location would have important symbolic significance and would have formed part of the structured understanding of the environment and people's place in it (Tilley 1994). Thus, the construction of a barrow would have represented a significant social investment by a population.

It has been observed that many Bronze Age funerary landscapes would have been relatively open pasture lands (Parker-Pearson 1999) and that colours and undoubtedly other properties of purposefully selected materials may have played an important role in the construction of barrows and their contextual 'viewscape', such as that at Upton Pyne 284b in East Devon (Owoc 2006.) Here a Bronze Age mound containing the remains of at least 3 infants had been capped with an orange clay subsoil, possibly relating to the general observation that infants were treated differently in death during this period.

The osteological analysis of the cremated bone deposit has proven to be beneficial and provided data that not only confirms previous conclusions drawn about the nature of the site but also provides new and unique information, raising many questions regarding the nature of these deposits and funerary rites in the Welsh borders:

- *The deposit is now known to contain significant quantities of human cremated remains: what is the significance of the lack of pyre material? Where was the original pyre site?*
- *Has there been any special treatment of these individuals given their young age at death?*
- *What is the significance of the animal bone placed in with the human material?*
- *How do the finds and mound structure from Buttington Cross compare with other cremated bone deposits in the area?*
- *Does the context of this deposit reveal any spatial or temporal patterning in the ritual landscape during the Bronze Age?*

The evidence presented by this analysis suggests that highly developed funerary rituals of deep symbolic significance had taken place at Buttington Cross. It is clear that further research and the recovery of more comparable material would allow a deeper understanding and greater insight into burial practices in the Welsh borders of this nature to be reached.

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THE ARCHIVE

Type	No	Type	No
Basic Context & Weights Recording Form	1	CD-Rom Database	1
Bone Fragment Analysis Recording Form	1		
Pyre Technology Recording Form	1		

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Appendix A

Recording Sheets for Context [119]