

Portkil Coffins, Roseneath Peninsula, Argyle and Bute: Cremation Report

Kathleen McSweeney, PhD, MA (Hons), FSA (Scot)
April 2023

*5 Stanley Street
Edinburgh
EH15 1JJ*

1. Background and Methods

1.1 *The material*

Bone from four cremation deposits from the Portkil Coffins site was received in nine variously sized sample bags, some of which contained multiple smaller bags, all contained within a cardboard box.

Bag descriptions were as follows:

Cremation No.	No. Bags	Bag Contents	Context
1	2	Bag 1: Bone fragments 325 g. + residue (not weighed) Bag 2: c. 184 g. Contained 39 smaller bags marked 'Upper' and 18 smaller bags marked 'Lower'.	Truncated cremation urn buried upright in a pit.
2	3	Bag 1: Burnt bone 234 g. Bag 2: 0-3 Flot, Pit Fill, nearly all bone and micro bone. Bag 3: Bone, Tooth, Charcoal.	Cist No. 1
3	3	Bag 1: Single bone from Food Vessel Bag 2: 1 of 2 bags Bag 3: 2 of 2 bags	Rectangular stone setting.
4	1	Bag 1: 220 g.	Deposit of bone from below kerb stone.

The cremated bone had been very carefully prepared, having previously been sieved, weighed and many larger bone fragments separately bagged. No further preparatory work was carried out. It was not deemed necessary to wash the material. The original bone weights assigned by the archaeologists have been used in this report.

1.2 *Cremation technology*

The remains from the four cremation deposits will be compared with various studies conducted on the degree of distortion, colour, weight and fragment size from modern and experimental cremations in order to reconstruct cremation technology at Portkil.

1.3 *The analysis*

Every fragment, however small, was examined to establish anatomical identification. It should be understood, however, that identification of the remains

depends very much on fragment size. In many cases, the anatomical origin of very small pieces of bone cannot be identified, and even where some pieces can be assigned to general locations such as limb bones or cranium, a precise location may not be possible.

All identified fragments were assessed to establish biological profile. General osteological methods employed are those outlined in Buikstra and Ubelaker (1994), Brickley et al. (2004), Schaefer et al. (2009) and White and Folkens (2005). Identification of, and assessment of age from, the dental remains is based on van Beek (1983). It should be appreciated that the accuracy of the estimations of age and sex will be less than that based on inhumed remains. It is also very rare that estimations of stature can be made because this is normally based on measurements taken from complete long bones, and it has not been possible with the Portkil cremations. Also, while some pathological lesions may be visible, the assessment of the impact of identified conditions may be limited because such an assessment usually relies on complete and intact skeletal remains.

An inventory and full description of the identified fragments can be found in the spreadsheet that forms an appendix to this report. The exception to this is with Cremation 4, which was very a very small deposit and had very few identified bones. These have simply been listed directly in the report.

2. Cremation 1

2.1 Description of the Remains

These remains were found in an upright urn that had been truncated by ploughing. The surviving part of the urn was 155 mm high. A total of 591 grams of bone was found (Ward 2019). This weight excludes the residue that incorporates minute bone fragments; this residue was not examined for the purpose of this report as no identification or diagnostic information would be able to be extracted. There were several large fragments, the longest being a section of femoral shaft that was 104 mm. Many of the larger fragments of bone had been separately bagged.

The cremated bone was received already separated between arbitrary upper and lower levels of the pot, as well as fragments from the soil in the pot. In the analysis of the remains, this separation has been maintained to establish whether there was any evidence of stratigraphic significance in the distribution of the remains. The identified remains have been recorded on the spreadsheet that accompanies this report and each location has been colour-coded to show where each identified bone was located. It is apparent that most of the identified remains were found in the upper part of the urn (107 identified fragments, highlighted in yellow in the spreadsheet); 32 identified fragments were found in the lower section of the pot (highlighted in blue); and 59 identified fragments were found in the fill of the pot (highlighted in green). It is apparent that the remains from the lower part of the pot tended to be smaller in size than those from the upper part.

This is to be expected as smaller fragments tend to filter down through voids. Similarly, the fragments from the fill of the pot also tended to be smaller. Interestingly there were some complete or virtually complete hand and foot bones.

2.2 Number of individuals

The remains of three individuals were present: an adult, an infant and a foetus but there was no evidence of any significance to the stratigraphy of remains within the pot. Bone fragments from all three were found in all sub-contexts. It must be assumed therefore that they were all deposited in the urn at the same time.

Individual 1 (adult): remains from all parts of the skeleton were identified, although all anatomical areas were under-represented.

Individual 2 (infant): This individual was represented by only two rib fragments, two pieces of clavicle, and a proximal hand phalanx.

Individual 3 (foetus): The identified fragments from this individual were as follows: two fragments of vertebrae, nine of ribs, two of clavicle, three of humerus, one first metatarsal, and five small fragments of long bone shafts.

It should be remembered that some of the remains of all the above individuals will be among the unidentified fragments.

2.3 Age at death

Individual 1: This individual was an adult of at least 21 years of age. This is confirmed by fused epiphyses in the spine and pelvis and the full development of a third molar. However, all cranial sutures present were unfused and as these tend to fuse and gradually obliterate with age, it suggests that adulthood was not advanced.

Individual 2: The dimensions of some clavicle remains, rib shafts and a complete proximal hand phalanx suggest an infant of about 6 months.

Individual 3: There were several foetal remains that varied by age assessment of between 6, 7 and 8 months. Taken on average, it is likely that this individual was about 7 months in utero.

2.4 Sex

Individual 1: There was only one sexual indicator among the adult remains, a very deep and wide preauricular sulcus in a fragment of pelvis. This is groove that houses the sacroiliac ligament and its presence is characteristic of female sex. While this can be present in a small percentage of males, in this case the sulcus was very marked and may well indicate that Individual 1 was female.

Individuals 2 and 3: It is very difficult to assess sex in subadult remains, and especially so in cremations, and has not been attempted here.

2.5 Pathology

No pathological lesions were noted.

2.6 Interpretation of the remains found in Cremation 1.

Individual 1: Cremation 1 contained remains from all parts of the skeleton of a young adult who was probably female. However, as will be discussed below, the weight and extent of the burned remains do not represent a full cremation. There are two possibilities: a) some of the remains may have become lost post-deposition by plough damage, very likely as the urn was not complete, or b) the cooled remains were not thoroughly collected from the pyre site, or a combination of both.

Individual 2: Only a few bones from this infant were identified. Had this been a freshly cremated child that had been placed in the urn then more bone fragments would be expected, especially from the long bones or cranium, which tend to survive the cremation process well. It is possible that these remains were a few that were accidentally collected from a habitually used pyre site.

Individual 3: There are two possibilities for the presence of foetal remains. An unborn child of 7 months gestation would, if born, have been unlikely to survive, and so it may have been still born or died shortly after birth. On the other hand, it is possible that this is an unborn child and that Individual 1 was the mother who died while still pregnant. This hypothesis is somewhat supported by the suggestion of female sex. Unfortunately, it is not possible to differentiate between born and unborn children from their skeletal remains.

3 Cremation 2

3.1 Description of the Remains

This deposit consisted of three bags. One was marked '0-3 Flot, Pit Fill, Nearly all grit + micro bone' and was not examined. A second bag was marked 'Bone, Tooth, Charcoal. Within this bag were four smaller bags, one containing a tooth, one marked, 'Un-Burnt bone', one marked 'Bone Un-burned and Burnt' and the fourth containing charcoal. The third bag was marked 'Burnt Bone 234 grams'.

Tooth: This is an unerupted lower first premolar. The roots had not yet started to develop, and the crown was about half formed. The crown of this tooth is usually fully formed by about aged 5-6 years and so the individual was probably aged about 3-4 years.

Bag marked 'Un-burnt bone': This consists of three rather eroded fragments, two of which are parts of a parietal bone and the third is probably also from the

cranium, although cannot be assigned a specific location. These fragments are fairly thick – 7-8 mm, suggesting that they belonged to an adult.

Bag marked 'Un-burned + Burnt bone': This was a small quantity of tiny bone fragments, none of which were identifiable.

The main deposit of burnt bone: The total weight of the remainder of the main deposit of burnt bone was 185 grams and the largest fragment size, as also indicated in the excavation report (Ward 2019), was 35 mm long. Because of the small fragment size most of the fragments were unidentified (129 grams).

A total of 52 fragments were identified, although most of these were non-diagnostic and non-specific cranial vault or limb bone shaft fragments. Specific identifications related to part of the zygomatic (cheek) bone, a small part of the mandible, two tooth root fragments, part of the proximal end of an ulna, and the vertebral end of a rib. Details of the identified fragments can be seen in the spreadsheet that accompanies this report.

Non-bone: A quartz flake and a further three small fragments of quartz were found among the bone fragments.

The weight of the remains clearly indicated that this was not a full cremation. There was a comment in the excavation report that the remains were 'in the final stage of decay'. This is unlikely. Despite the fracturing and distortion that occurs during the cremation process, cremated bone actually survives better than inhumed bone. It is more likely that either some bone fragments were lost during post-depositional disturbance or that the remains were not thoroughly collected from the pyre, or both.

3.2 Number of Individuals

There were at least three individuals present in this deposit.

- Individual 1: The single tooth was from a 3–4-year-old child. There were no other fragments that clearly belonged to a child and certainly not one of this age. This tooth would have been unerupted and so must therefore have originated from a deceased child and could not have been an exfoliated deciduous tooth.
- Individual 2: The fragments of parietal said to be unburnt were of a thickness that indicated an adult. There was a clear morphological difference from the cranial vault fragments found in the main deposit of burnt bone.
- Individual 3: The bulk of the cremated remains could easily be differentiated from the child's tooth and the unburnt cranial fragments, indicating a third individual. There were no variations in morphology among these remains to suggest a fourth individual.

3.3 Age at Death

Individual 1: As indicated above this individual was aged 3-4 years.

Individual 2: Again, as indicated above, this individual was adult.

Individual 3: Unfortunately, there were no specific ageing indicators. The presence of a molar root with a closed apex suggested that at least 9 years had been reached. However, this individual could have been an older child, adolescent, or adult. However, cranial thickness at 4.4 mm is rather thin, indicating at tenuous estimate that this individual was not an adult.

3.4 Sex

No sexual indicators were noted.

3.5 Pathology

No pathological lesions were identified.

4. Cremation 3

4.1 Description of the Remains

This cremation deposit consisted of a single bone from a Food Vessel and two bags containing remains weighing, according to the excavation report (Ward 2019), 215 grams.

Bone from Food Vessel

The excavation report (Ward 2019) indicated that a single piece of bone was found in the Food Vessel. On examination there were in fact three fragments of bone in the bag marked 'Single Bone from Food Vessel', two of about 18 mm and a further tiny fragment. The bone fragments had originated from a larger bone part and was extremely fragile, consisting of very, powdery, spongy bone, and may have become subsequently fragmented. Although difficult to identify, it appears that the fragments were from part of the acromion of a scapula.

Bone from the Stone Setting

This bone was said to be found in an abundant concentration at the North and East sides of the sub-rectangular pit, with some occasional fragments in the pit fill.

While this was clearly not a full cremation judging by the weight (215 grams), there was some good preservation of spongy (cancellous) bone, which often does not survive the cremation process. There were also some large pieces surviving: a section of long bone shaft c. 66 cm and some substantially complete vertebrae.

A total of 81 fragments were identified. These consisted of some skull fragments, parts of the spine, mostly from lower lumbar vertebrae and the sacrum, a few fragments of upper and lower limbs, a single fragment of pelvis and hand and foot bones. The best preserved remains were the lumbar vertebrae, sacrum, and foot bones.

However, all these body parts were greatly underrepresented and there were no ribs, shoulder bones or tooth fragments. The lack of dental remains is surprising. Other than a small piece of mandible with traces of tooth placements there was none. While tooth crowns are only rarely found among cremated remains, tooth roots are almost always present. It is unlikely that bone fragments were missed during excavation as all the contents of the pit were wet-sieved. It also seems unlikely that poor preservation was responsible for the lack of remains as much spongy bone had survived. There are two possible other explanations for the lack of remains: either there had been considerable post-depositional disturbance, or only a sample of remains were recovered from the pyre site. Perhaps the latter is most likely.

The identified fragments are listed in the Spreadsheet that accompanies this report.

4.2 Number of Individuals

There were no duplicated bones, no clear morphological differences, or variations in age markers to indicate that more than one individual was present.

4.3 Age at Death

It is likely that this individual was adolescent. Fused hand bone epiphyses indicate an age of at least 14 years had been reached, while epiphyses in the lumbar vertebrae were still in the process of fusing, which occurs between puberty to early 20s.

4.4 Sex

There is no indication of the sex of the individual.

4.5 Pathology

Some healed pitting in the only surviving eye orbit is suggestive of a condition known as cribra orbitalia. Such pitting is thought to be related to iron deficiency anaemia, although this need not necessarily be related to diet (Larsen 2015). However, the evidence in this case is very slight and such a diagnosis can only be tenuous.

5. Cremation 4

5.1 Description of the Remains

This is a small cremation deposit of 220 grams found below a kerb stone, and according to the interim excavation report (Ward 2019) may have been the result of disturbance by ploughing.

Fragment size was extremely small; the largest fragments were only about 25 mm, and the vast majority were much smaller. Very few fragments could be identified to anatomical location. Some tooth roots and a possible fragment of rib

with a linear indentation had been bagged separately by the archaeologists. Other identified fragments were largely pieces of cranium and long bone. As there were so few identified fragments, they have been listed below rather than on the spreadsheet that accompanied this report.

Identified fragments:

- Apex of the buccal roots of an upper right second permanent molar.
- Apex of a root; shape and size suggest that it is from an upper molar, although it is not clear which one.
- Two small undiagnostic fragments of tooth root.
- Small fragment of right zygomatic process of the frontal bone.
- 10 small fragments of cranial vault. All of these were very thin, approximately 2.1 mm, suggesting that they were from a juvenile. Two of the fragments had traces of sutural edges that suggested they were unfused.
- One incomplete Wormian bone (a small accessory bone sometimes found within the cranial sutures).
- Small fragment (13.56 mm) possibly from a rib shaft. This was selected by the archaeologist as having a 'mark' (Pl. 35 Ward 2019). There is certainly a linear indentation on the external surface of the fragment. However, this appears to be natural, possibly a blood vessel indentation.
- 3 undiagnostic fragments of rib shaft?
- There were 28 fragments of various long bone shafts that could not be more specifically identified.
- In addition, based on size, four long bone shaft fragments suggest that they probably originated from a femur, two others appeared to come from a humerus, and one was part of the upper shaft of a left ulna.
- There was one fragment of head of a humerus or femur, too small to establish whether epiphyseal fusion had taken place.

5.2 Age at Death

There was very little indication of age at death. Some tooth root fragments originated from an upper second molar. As the apices of these roots had closed, age was probably in excess of 14-16 years. Cranial fragments suggested that the cranial wall was thinner than would be expected in an adult, and so may be from an adolescent.

5.3 Sex

There was no indication of the sex of the individual.

5.4 Pathology

No pathological lesions were identified.

6. Cremation Technology

6.1 Fracturing

The bones from all four cremations had been subjected to a marked degree of cracking, twisting, and curved lateral splintering. In addition, many cranial fragments had warped, causing the inner and outer tables to separate. Ubelaker (1978, 35) suggests that curved lateral splintering and marked warping can be indicative of the body being burnt while still 'fresh', i.e., soon after death. Mays proposed that fragmentation and distortion are most likely to be the result of rapid water loss during the cremation process (1998, 207). This would suggest that the Portkil Coffins individuals had been burned soon after death.

6.2 Colour

There was little variation in the colour of the Portkil Coffins remains, which was a uniform beige/gray. It is accepted that the colour of bone changes with increasing temperature (e.g., Ubelaker 1978, 34; Mays, 2010, 322-325). Colours of burnt bone can range from shades of red, brown, black, blue, grey, yellow, or white. Although there are some slight differences in the reported results, in the main, the higher the temperature, the lighter the colour. Light grey or white colouring occurs with temperatures more than 645°C (Mays, 2010, 322-325). Shipman *et al* found that white or light grey colouring occurred with temperatures of 645 to 940°C, while Mays' experiments showed no change in colour over 645°C. Wells found that black colouring occurs with temperatures of less than 800°C, while temperatures above 800°C produced calcined bone, which ranged in colour from bluish grey to white. As a point of reference, furnaces in modern crematoria were said to operate at between 820°C and 980°C (Wells 1960, 35), or according to McKinley, between 700 °C and 1000 °C (2001, 283). Colour change is thought to relate to decomposition of the organic component (Shipman *et al*, 1984, 322.). The length of time bones are exposed to heat may also be a factor in colour change (Correia, 1997). Just as the colour of cremated remains can signify the temperatures reached during the burning process, variations in the colour of bone fragments can give an indication of uneven burning of the body.

The light-ish colour of the remains from the Portkil Coffins site indicates burning at high temperatures, in excess of 645°C, while the uniformity of the colour suggests that this temperature was well-controlled, the burning process was conducted efficiently and cremation technology was well understood.

6.3 Fragment size

McKinley in an analysis of modern cremations (1993, 284), found skull fragments of up to 95 mm and long bone fragments of up to 195 mm. Since cremated bone is very fragile and further pre- and post-depositional disintegration is very likely to have occurred with ancient cremations, a smaller fragment size than that originating from new cremations is to be expected. Mays (1998, 209) reports that, in his experience, fragments of up to 100 mm are only occasionally found. However, personal experience of working with prehistoric Scottish cremated material is that fragments of around 100 mm or more are frequently found, especially if the remains had the protection provided by a vessel or cist.

Fragment size in the Portkil cremation varied. There were several large fragments from Cremation 1, one more than 100 mm. In general, however, fragment size in the other three cremation deposits was small. In Cremation 2 the largest was 35 mm, in Cremation 3 the largest fragment was c. 66 mm and there was some good preservation of vertebral remains. However, Cremation 4 was very poorly preserved with the largest fragments only about 25 mm. A factor in the Portkil remains appears to be post-depositional disturbance as none of the cremation deposits were intact.

6.4 Weight

A study of skeletal ash weight following the burning of dry bones in an incinerator by Trotter and Hixon (1954) indicated that mean total skeletal ash weight for >3- to 13-year-olds was 1032.5 grams, and for adolescents of >13 was 3364.4 grams. Adult ash weights were found to range from 2130.0 to 5415.2 grams. These ash weights (an average of the results for white males and females) were produced by controlled incineration in a laboratory. McKinley analysed the remains of 15 recently deceased individuals following cremation in a modern crematorium (1993, 284). She found that full weights ranged from 1227.4 grams for an 83-year-old female, to 3001.3 grams for a 90-year-old male. These results are much lower than those from the Trotter and Hixon study. However, a later study by Bass and Jantz (2004) found that adult ash weight reduces with age. This could explain some discrepancies in the results of the various studies; although an additional factor could be the nature of burning; the remains studied by McKinley were burned in large modern efficient cremators and the others in a small laboratory incinerator.

Another factor to consider is the collection of the remains. In modern cremations and in laboratory experiments the residue from the burning will have been carefully collected from a contained receptacle, whereas with ancient cremations the cooled remains would have been left in the open air until they were cool enough to handle and then collected from the pyre residue. McKinley estimated that, in an archaeological setting, a realistic range would be 1001.5 grams to 2422 grams (1993, 284). All the Portkil cremations weighed much less than the above - mentioned experiments and less than McKinley's estimate. While poor collection of the remains from the pyre site may have been a factor, post-depositional disturbance, may have been the main reason here.

7. Summary

At least eight individuals were identified, although some by very scant remains, and one represented by only a single tooth.

In total there were two adults, one foetus, an infant, a young child and three adolescents. The adult from Cremation 1 was probably female and may have been pregnant with the foetus at the time of death. Only one pathological lesion was noted, and this was cribra orbitalia in an eye orbit from the adolescent in Cremation 3 that may be indicative of healed anaemia.

It appears that all four cremations had been evenly burned, that the individuals had been cremated soon after death and that cremation technology was well understood. While none of the four cremation deposits from Portkil were full, all appeared to have suffered from post-depositional damage. This may have been responsible for the low weight of the remains, although it is possible that not all of the remains had been fully collected from the pyre site.

8. References

- Bass, W.M. and R.L. Jantz, 2004. Cremation weights in East Tennessee. *Journal of Forensic Science*, September 2004, Vol. 49, No. 5, 1-4.
- Brickley, M and J.I. McKinley, 2004. *Guidelines to the Standards for Recording Human Remains*. IFA Paper No. 7. British Association for Biological Anthropology and Osteoarchaeology and Institute of Field Archaeologists. Southampton and Reading.
- Buikstra J. E. and D.H. Ubelaker, 1994. *Standards for Data Collection from Human Skeletal Remains*. Arkansas Archaeological Survey Research Series No. 44. Fayetteville, Arkansas
- Correia, P.M.M., 1997. Fire modification of bone: a review of the literature. In, W.D. Haglund and M.H. Sorg (eds.), *Forensic Taphonomy: The Postmortem Fate of Human Remains*, 275-293. CRC Press. Boca Raton.
- Larsen, C.S. 2015. *Bioarchaeology: Interpreting Behavior from the Human Skeleton*. Cambridge University Press.
- McKinley, J. I., 1993. Bone fragment size and weights of bone from modern British cremations and the implications for the interpretation of archaeological cremations. *International Journal of Osteoarchaeology*. Vol. 3, p.283-287.
- Mays, S. 2010. *The Archaeology of Human Bones*. Second Edition. Routledge. London and New York.
- Schaefer, M, Black, S., and Scheuer, L. 2009. *Juvenile Osteology: A laboratory and Field Manual*. Elsevier.
- Shipman, P., G. Foster and M. Schoeninger. 1984. Burnt bones and Teeth: An Experimental Study of Color, Morphology, Crystal Structure and Shrinkage. *Journal of Archaeological Science*. 11. 307-325.
- Ubelaker, D. H., 1978. *Human skeletal remains*. Washington.
- van Beek, G.C., 1983. *Dental Morphology an Illustrated Guide*. Wright. Edinburgh.
- Ward, T. 2019. *The investigation of 'stone coffins', an 'urn', a crop mark and other sites, and a lime burning kiln on the southern tip of Roseneath Peninsula, Argyle and Bute. Interim Report*. North Clyde Archaeological Society. Unpublished report.