

[Supplementary material]

Thinking outside the cist: interpreting a unique artefact assemblage from an Early Bronze Age burial on the Isle of Man

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Further details on the Staarvey Farm cist

Staarvey Farm is located in the parish area of German. The cist was excavated in December 1947 by Basil Megaw on behalf of the Manx Museum after it was discovered during the course of ploughing. The slate cist was oriented north-northeast and consisted entirely of unmodified slate slabs with a slate floor (the predominant geology of the island); measurements are not precisely recorded but estimated to be approximately 0.61m wide, 0.91m long and 0.70m deep (Woodcock 1999: 89). A fractured slate slab lying to the south was interpreted by Woodcock as part of the capstone that had been displaced. Below this slate slab was a quartzite stone placed parallel to the southern end-slab of the cist, and below this was a further horizontal slate stone with a flat side that appeared to have been wedged against the cist as if to support it (Woodcock 1999: 89–90). The cist contained one intact inverted urn (IOMMM 7248) and a second highly eroded inverted urn (IOMMM 7247), both of which contained cremated bone. Cremated bone was also found elsewhere in the cist, beyond the south end slab of the cist (possibly spilling there when the cover slab was struck by the plough), and spread on the surface of the field nearby (likely associated with the discovery of the cist by the farmer) (Woodcock 1999).

Accession codes and dimensions for bone artefacts

All measurements are expressed as: length, width, thickness [where appropriate] and weight (in grams).

Pommel (Figure 4): Manx Museum 1983-0215/0005. $26.2 \times 7.9 \times 73$ mm. Internal dimensions of socket $15 \times 4.5 \times 5.8$ mm deep. Found among human remains in bag marked 'Bones from cist'.

Bone point (Figure 5): Manx Museum 1983-0215/0001a–c. The maximum length of the joining parts is 88.9mm with a maximum width of 5.7mm at the widest part. The point is perforated at the widest end with an oval hole (2.1×1.6 mm) set within a wider sub-rectangular depression (4mm deep \times 5.3mm). Found among human remains in bag marked 'Staarvey bones'.

Four bone oblongs (Figure 6): Manx Museum 1983-0215/0010a–d. Bone oblong A: $28.6 \times 8.8 \times 2.9$ mm; 1.18g. Bone oblong B: $30.4 \times 8.9 \times 3.6$ mm; 1.41g. Bone oblong C: $28.4 \times 9.1 \times 3.2$ mm; 1.27g. Bone oblong D: $29.1 \times 9.2 \times 3.8$ mm; 1.35g. All of the bone oblongs were found among human remains in bag marked 'Staarvey bones'.

Fourteen bone beads: Bone beads MM1983.0215.007a–c: 17.4×10.2 mm; 0.29g. Bone bead MM1983.0215.007b (Figure 5): 16.6×8.4 mm; 0.14g. Bone bead MM1983.0215.007c: 1.2×96 mm. Manx Museum 1983-0215/0011a–k: Bone toggle (Figure 5): MM1983-0215/0011a. 11×10.9 mm; 0.31g; perforation is 2.2mm in diameter. Bone bead MM1983-0215/0011b 13.5×12.4 mm; 0.58g. MM1983-0215/0011c. 1.3×10.4 mm; 0.46g. MM1983-0215/0011d–k are each smaller than 10×7.0 mm.

Potentially worked human bone fragments

It is not clear whether these have been worked into shapes or have fragmented in these shapes during the cremation process.

1. Burned 'bone disc' (previously recorded as unburned by Woodcock 1999: 95)
2. Sub-circular cranial fragment (adult) with sutures visible and partially fusing, ectocranial layer mostly missing, slightly curved endocranially, burned white with some cracking and blue staining ($28.0 \times 26.1 \times 3.3$ mm – from 'Staarvey bones')
3. Crescent-shaped fragment of cranium with smoothed edges ($24.0 \times 10.1 \times 3.0$ mm – from 'Bones from Cist').



Figure S1. Top left) #1 bone disc found by Woodcock (1999); top right) #2 bone disc found during sieving; bottom left) is #3 crescent shaped bone (photographs by M. Gamble, with permission of the Trustees of Manx National Heritage).

Osteological summary

A full osteological report prepared by Dr Michelle Gamble is lodged with Manx National Heritage; what follows summarises key details from that report and reflects further on the processes of cremation and commingling for the human remains from the cist at Staarvey Farm.

Context

All the skeletal material from Staarvey Farm, Isle of Man, was examined at the Manx Museum in October 2016 and is stored there in a purpose-built osteological storeroom (Accession Numbers: 1954-7248 and 1983-0215 from boxes 1935 and 1687).

The majority of the skeletal material derives from within the cist, according to the excavation records as interpreted by Woodcock (1999: 89–90). The excavators determined that the bones were not likely concentrated in any one part of the cist, but had naturally accumulated at the corners where there was the most space. There was also bone material described as spilled beyond a stone slab at the south end of the cist, but this was either not kept as a separate context and included within the main bulk of bones from within the cist, or it was not kept at all (Woodcock 1999: 89). The majority of the cremated bone is described as coming from in or around the intact inverted Collared Urn (IOMMM 7247). There was a second, less well-preserved inverted urn from in the north end of the cist which also contained burned bone (IOMMM 7248). Finally, Woodcock describes fragments of bone which were recovered from the surface of the field which were disturbed by ploughing and/or placed there by the finder of the cist and so also originally came from within the cist. This final group seems to have been mixed in with the larger collection of bones during recovery.

It was hoped that perhaps the bones could be separated into excavation contexts based on how they were bagged and labelled. The majority of the skeletal material was placed in five large bags, three of which were labelled ‘Staarvey’ and two of which were labelled ‘Bones from Cist’ (Figure S2). There is no further documentation to guide an assessment of what the two labels indicate about the locations in which the bones were found. While the bones were bagged and stored with two different labels, there were bone fragments with breaks that joined together across these bags, and thus there is a high degree of commingling. The mixing of skeletal material across these two labels and the lack of excavation notes regarding the labels on the bags means that there is no way to re-associate any group of bones with any particular location within the burial feature, barring the skeletal material which was recovered mixed with the pottery sherds from the second urn (IOMMM 7248). The three possible contexts of bones within this cist were kept separate for the analyses, but all the remains from this burial can be considered as a single context, as there was clearly mixing of material, and no conclusive method of determining which collection of skeletal material came from which part of the burial, if indeed they were separate at all.



Figure S2. Bags containing all the skeletal material from 'Staarvey' and 'Bones from Cist', as they were found in Box 1687. Note some possible sorting by size of bone fragment (photograph by M. Gamble, with permission of the Trustees of Manx National Heritage).

Methods

The methods of observation and analysis of the human remains in this report are in agreement with the recommendations from Buikstra and Ubelaker (1994) and McKinley (2004).

Observations were recorded for cremated skeletal material from a single context in a detailed inventory (see Table S1 below for abbreviated version).

Standard age and sex assessment scales were used where the fragmentation and preservation of the particular skeletal elements permitted (i.e. Moorrees *et al.* 1963; Ubelaker 1989; Buikstra & Ubelaker 1994; White & Folkens 2000; Schaefer *et al.* 2009). In particular, the preservation of particular skeletal fragments such as the mandible or maxilla (with alveoli present) can be indicative of more accurate age ranges.

Burning of skeletal material can cause a number of observable changes to the morphology and structure of the bones and teeth. As noted above, the bone can change colour based on the temperature and length of exposure to the heat source. Bones which are black have been exposed to a lower temperature or high heat for a short period of time, and bones which are white or blue-grey have been subject to high heat, or lower heat for a long period of time. The loss of water in the bone can cause it to shrink and warp, which may also cause changes to

the bone surface, including longitudinal and transverse checking and curved cracks. Long bones will tend to split apart in a longitudinal manner (as if twisted apart into fragments) and the enamel on teeth will shatter. This last action, severely limits the amount and nature of information which can be derived from the teeth of cremated skeletons (i.e. with no crowns it is impossible to identify the tooth, discuss pathology or age assessments). In regards to deliberate fragmenting to the burned skeletal material, there are still some debates. It would seem that even the action of collecting the cremated bone can cause high levels of fragmentation and perhaps in archaeological cases where the bone is highly fragmentary the intention of the action cannot be determined. It can simply be noted that the levels of fragmentation are quite high and possibly reflect movement of the material to cause significant levels of damage to the bone structure.

In regards to burning of skeletal material, there have been a number of studies which are summarised by Ubelaker (2009) (and further discussed in the more recent publication by Thompson (2015)) indicating that there are a number of variables which can affect the appearance of burned bone. Colour change and structural changes such as warping, shrinkage, longitudinal splitting and transverse cracking all are used as indicators for aspects of the burning such as the temperature of fire, whether the bones were dry or fleshed and the length of thermal application. Experiments seem to indicate that dry bones tend to display less variation in fracture pattern and more transverse checking while fleshed bones tend to display more warping, more variation in longitudinal splitting and transverse fractures frequently in a curvilinear pattern (Ubelaker 2009: 3).

In general, for the cremated skeletal material, an inventory was compiled to assess the number of individuals present and suggest the proportion of the skeleton present. This was achieved through weighing the skeletal material and determining if there are duplicate elements present.

The skeletal material all required some sieving and sorting to separate it from some of the excavation soil. It did look as though a preliminary separation of bigger elements has occurred, though whether this was just an artefact of excavation collection (or later re-bagging at the museum) or a true representation of the original deposition of the bones is impossible to tell. The cleaning of the skeletal material was accomplished using dry brushes and wooden tools. The skeletal material was separated into larger portions which could be identified and sided, fragments which could be determined to be a 'long bone' and indeterminate bone which included fragments which were too small or too warped to identify.

There is a portion of small bone fragments which could not be separated from the general soil detritus.

Results

1983-0215 'Bones from Cist' (Box 1935)

The 'Bones from Cist' (1983-0215) are very white-cream with a mix of sizes from quite large fragments to tiny ones, there is a group of bones within this sample that are very water-worn which could either reflect a deposit which was in there for a longer period of time and exposed to water action or is in a portion of the cist which was affected by water movement.

The pre-sieved weight of the 2 bags was: $467.01\text{g} + 375.43\text{g} = 842.44\text{g}$.

The MNI of this sample is 3 based on the left petrous portion. There is at least one infant/child likely based on the size of some of the material. The MNI is supported by two right adult mandibular condyles and two right mandibular body fragments, as well as two dens fragments from the second cervical vertebrae. There is no diagnostic subadult material, but given the size of the long bone fragments, it is likely a neonate–3y (on the older end of that range, approximately 1–3 years old at death). The overall weight of the cremation is 735.1g. One unsided metacarpal displays a rough surface which may reflect a healed trauma, but the burning process has made it difficult to be certain.

1983-0215 'Staarvey' (Box 1935)

The 'Staarvey' (1983-0215) bones are slightly more white-grey, there are some larger bone fragments and two large bags of small fragments. The three bags have a pre-cleaning weight of: $1790.3\text{g} + 952.3\text{g} + 825.1\text{g} = 3567.7\text{g}$. Once again with this collection there are a small group of bones which are water-worn and eroded.

The MNI of this sample is three based on variations in cranial thickness, three left mandibular condyles and unfused long bone epiphyses. There is one adult male based on the right frontal rim, which may also be associated with the thicker cranial vault material with substantial amount of shearing off of the two layers of cortical bone from the diploe. Based on the general size and unfused long bone epiphyses (left proximal humerus and unsided proximal radius), there is one adolescent present aged 10–15 years at death. The overall weight of the cremation is 2461.8g. Again, the cremation process makes pathological assessment difficult, but several calvarial fragments displayed possible microporosity on the ectocranial surface which may reflect a general mineral or nutritional deficiency; and the distal epiphyses of an unsided intermediate foot phalanx is remodeled to be angled laterally, likely due to use.

1954-7248 (Box 1687)

Approximately >5 per cent of a cremated adult skeleton, for whom age and sex could not be assessed. The total weight of the burial was 71.50g. There were no pathological changes observed on any of the skeletal material.

Combined results

Overall, there were 165 data entries of osteological material from Staarvey, 152 of which were identifiable portions of the human skeleton (the rest constituted of unidentifiable fragments, typically by weight). The heavy fragmentation and the significant warping and cracking has made discussion of pathological changes difficult. The remains consist of a minimum of four cremated individuals. There are at least two adults, one of which is a male based on a supra-orbital rim fragment and general robusticity of several cranial fragments; one adolescent aged 10–15 years at death and an infant/child, aged between 1 and 3 years at death. There is limited material from this infant/child and no duplication of bones that it makes it difficult to be certain. In general, the mandible and the petrous proved best for assessing the MNI. Note that all the diagnostic fragments of bone were compared across the two groups to ensure no double counting for MNI. Portions of all parts of the body were recovered suggesting that the individuals buried here were burned as complete skeletons, particularly given the number of hand and foot phalanges recovered. The majority of the tiny bone fragments are within the ‘Staarvey’ sample.

All the skeletal material was calcined white, with slight variations towards creamy-white or grey-white, which could be due to different burning events or more likely due to soil conditions within the cist (Figure S3). All the material showed significant warping, cracking, transverse checking and longitudinal fracturing. It was highly fragmented with relatively few large pieces and minimal diagnostic material for the minimum of four individuals present.



Figure S3. Fragments of femora. The collection on the top is from the 'Staarvey' sample and the collection on the bottom is from the 'Bones from Cist' sample. Note the slight differences in colour and the differences in size of the two femoral necks (photograph by M. Gamble, with permission of the Trustees of Manx National Heritage).

Discussion

As the minimum number of individuals across the burial is four, and a total cleaned osteological weight of 3268.4g, it is possible that the majority of the skeletal material of the individuals interred here are present. The average weight of a modern adult cremation is 876–3784g, with males all over 2750g and all females under 1887g (Warren & Maples 1997). Therefore, with a bone weight of 3268.4g for four individuals, it is unlikely that 100 per cent of the skeleton of each individual is present. McKinley (2016: 33) presents a comprehensive discussion on burial weights and notes that cremation weight is variable and that most archaeological adult cremations fall between 500–800g. Gonçalves *et al.* (2015) discuss the use of average weights of cremated material as a potential method for bioarchaeological analysis, it is clear that it is not straight forward. Forensic analysis of modern cremations has determined standard weights for adult individuals, which are impacted by sex and body mass (see, for example, McKinley 1993, 1994; Bass & Jantz 2004; van Deest *et al.* 2011; Gonçalves *et al.* 2013). While higher weights may indicate that there is more of an individual

present, or perhaps even more than one individual, lower weights do not necessarily reflect less individuals as the destructive nature of cremation and the taphonomic activities will affect the results. Given that one individual is an infant and the other an adolescent, and there are questions regarding the survivability of infant remains (i.e. Jaeger & Johansen 2013), the recovered weight, coupled with the presence of small fragments of teeth and phalanges, suggests fairly good recovery of the remains both from the pyre to the cist, and from the excavation. It is difficult to determine the percentage of each individual present as separating the majority of the skeletal material into individuals is not possible.

It is relatively unusual for Early Bronze Age cremation deposits containing the remains of more than one individual to be identified, but the practice might have been more common than a simple review of site reports would suggest (McKinley 1997: 130, 142–43; Fowler 2013: 166–67; Brück 2019: 36). McKinley (1997: 130) estimated at least 5 per cent of cremations were of multiple individuals, though this was based on ‘multi-period’ data (130 of her approximately 4000 cases were dated to the Early Bronze Age). Fowler’s review of 159 recorded cases of Early Bronze Age burials of cremated remains in Northeast England identified 21 reports of more than one individual, of which 11 were the remains of multiple individuals buried in the same vessel — but stressed that this is likely to under-represent the proportion of multiple cremation deposits given that the records stretch back to the early nineteenth century and earlier records seldom include detailed osteological assessments (Fowler 2013: 166–67). The vast majority of the sources for Early Bronze Age north-east England reporting multiple individuals record two MNI, but there is one example of 4 MNI buried in the same Collared Urn at Kirkhill, Northumberland (Miket 1974). The vessel was inverted in an oval pit, oriented north-south. Here the four sets of bones were heavily intermixed within the vessel, and came from three adults and one older child or adolescent. The only artefacts were two flint flakes and the bones and soil within the urn were described as free from charcoal. There are six other known cases of Early Bronze Age burials on the Isle of Man containing cremated remains of more than one MNI.

Across Britain, combinations of adult and child predominate in Early Bronze Age cremation deposits but this may be due to a detection bias in that differences in the size of bones is likely to have been a key indicator of multiple individuals, or have stimulated closer inspection of remains, prior to the development of contemporary osteological techniques (Petersen *et al.* 1974: 49). Bone was reported as present in both vessels at Staarvey Farm but since it is not known which bones came from which vessel it is impossible to identify the MNI present in each vessel. If each vessel had contained two individuals this might or might

not have been particularly unusual; if each vessel contained parts of three or four MNI that might be more unusual. It is worth noting that four other burials with class 3 pommels across Britain also contained the cremated remains of multiple individuals (see Table 1). This is a relatively high proportion of the overall number of burials with class 3 pommels with detailed reports on the cremated bone — indeed, of all the burials with cremated remains only Merddyn Gwyn conclusively reports a MNI of one.

Table S1. Bone elements from Staarvey Farm

Table description: bone element, side (L = left, R = right, A = axial, U = un-sided), the segment of the skeletal element present (Buikstra & Ubelaker’s (1994) abbreviations are employed to record the segment present (PE = proximal epiphysis, P1/3 = proximal third of the diaphysis, M1/3 = middle third of the diaphysis, D1/3 = distal third of the diaphysis, DE = distal epiphysis, Pend = un-fused proximal end, Dend= un-fused distal end)), the number of fragments or the weight, the completeness score (‘Comp’ – the percentage of a bone element present using the scores from Buikstra & Ubelaker 1994: where 1 = <25%, 2 = 25–50% , 3 =51–75%, 4= >75% and 5 = 100%). . The nature of the surface texture as affected by burning process is recorded (L= Longitudinally Split; T= Longitudinal and Transverse Checking; C= Cracking and W= Warping) and the colour (T = Tan; B= Black and W= White/Blue–Grey). The age category (Age Cat.) refers to the age group which the bones appear to derive from (General subadult = 9; General adult = 8; Senior Adult (50+) = 7; Adult (36–50) = 6; Young Adult (21–35) = 5; Adolescent (13–20) = 4; Child (4–12) = 3; Infant (neonate – 3 yr) = 2; Prenatal (foetus) = 1).

Bag	Accession	Bone	Side	Segment	No Frags/ weight	Comp	Crem	Col	Age Cat.
from cist'	1983-0215	Calvarium	A		115.15g	2	W, C, T	W	
	1983-0215	Calvarium	A		290.72g	2	W, C, L, T	W, G, B	
cordoned	1954-7248	Cranium	A		30	1	W, C, T	W	

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
	1983-0215	Endocranial bone	A	sphenoid	19	1	W, C, T	W	
from cist'	1983-0215	Frontal	A	R + L rims	2	2	W, C, T	W	9
from cist'	1983-0215	Frontal	A	squama	4	1	W, C, T	W	8
	1983-0215	Frontal	A	R rim and ridge	1	1	W, C, T	W, G	8
	1983-0215	Frontal	A	squama	4	1	W, C, T	W, G	
	1983-0215	Hyoid	A	body	1	3	W, C	W	8
from cist'	1983-0215	Mandible	A	body	9	1	W, C, L, T	W	
	1983-0215	Mandible	A	body	12	1	W, C, T	W	
	1983-0215	Mandible	L	condyle with neck	1	1	W, C, T	W	8
	1983-0215	Mandible	L	condyle with neck	1	1	W, C, T	W	8
	1983-0215	Mandible	L	condyle	1	1	W, C, T	W	9
from cist'	1983-0215	Mandible	R	condyle, coronoid, gonial	2	2	W, C, L, T	W	
from cist'	1983-0215	Mandible	R	condyle, body with alveoli	2	1	W, C, L, T	W	
from cist'	1983-0215	Mandible	R	body with alveoli	2	1	W, C, L, T	W	

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
	1983-0215	Mandible	R	coronoid	1	1	W, C, T	W, G	8
	1983-0215	Mandible	R	condyle and extramolar sulcus	2	1	W, C, T	W, G	8
	1983-0215	Maxilla	A	alveoli	7	1	W, C, T	W	
from cist'	1983-0215	Maxilla	L	frontal proc	1	1	W, C, T	W	9
from cist'	1983-0215	Maxilla	R	frontal proc	1	1	W, C, T	W	8
from cist'	1983-0215	Maxilla	U		5	1	W, C, T	W	
from cist'	1983-0215	Occipital	A	squama	3	1	W, C, T	W	8
	1983-0215	Occipital	A	cruciform and protuberanc e	4	1	W, C, T	W, G	8
from cist'	1983-0215	Temporal	L	petrous	1	1	W, C, T	W	
from cist'	1983-0215	Temporal	L	petrous	1	1	W, C, T	W	
from cist'	1983-0215	Temporal	L	petrous	1	1	W, C, T	W	
	1983-0215	Temporal	L	petrous	1	1	W, C, T	W	
from cist'	1983-0215	Temporal	R	articular eminence	1	1	W, C, T	W	8

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
from cist'	1983-0215	Temporal	R	articular eminence	1	1	W, C, T	W	9
	1983-0215	Temporal	R	petrous	1	1	W, C, T	W	
	1983-0215	Temporal	R	petrous	1	1	W, C, T	W	
from cist'	1983-0215	Temporal	U	body, matsoid and zyg proc	18	1	W, C, T	W	
	1983-0215	Temporal	U	ext aud meatus, petrous, zyg proc, mastoid	24	2	W, C, T,	W, G	
from cist'	1983-0215	Zygomatic	L	frontal process	1	3	W, C, T	W	8
	1983-0215	Zygomatic	L	frontal process	1	2	W, C, T	W	
	1983-0215	Zygomatic	L	frontal process	2	1	W, C, T	W	
cordoned	1954-7248	Man I	U	root	1	2			
from cist'	1983-0215	Root	U	root	6	2			
	1983-0215	Root	U	multi-roots	11	2			
	1983-0215	Root	U	single root	17	2			
from cist'	1983-0215	C1	A	art facet with C2	1	1	W, C, T	W	
	1983-0215	C1	A	L sup and inf art facet	1	1	W, C, T	W	
	1983-0215	C1	A	inf art facet and pedicle	2	2	W, C, T	W	

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
cordoned	1954-7248	C2	A	L sup facet	1	1	W, C, T	W	
from cist'	1983-0215	C2	A	dens and art facet	2	2	W, C, T	W	
from cist'	1983-0215	C2	A	dens and body	1	2	W, C, T	W	
from cist'	1983-0215	Cervical vert	A	body	2	2	W, C, T	W	
cordoned	1954-7248	Vertebrae	A	sp, body and facets	8	1	W, C, T	W	
from cist'	1983-0215	Vertebrae	A	bodies, laminae, pedicles, facets	41	1	W, C, T	W	
	1983-0215	Vertebrae	A	facets, laminae, pedicles, 1 body	98	1	W, C, T	W	
from cist'	1983-0215	Clavicle	U	shaft	5	1	W, C, L, T	W	
	1983-0215	Clavicle	U	M1/3	8	1	W, C, T	W, B	
	1983-0215	Humerus	L	PE	1	1	W, C, T	G	4
cordoned	1954-7248	Humerus	U	diaphysis	12	1	W, C, L, T	W	
from cist'	1983-0215	Humerus	U	diaphysis	63.08g	1	W, C, L, T	W	
	1983-0215	Humerus	U	diaphysis	31	1	W, C, L, T	W, G	

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
	1983-0215	Humerus	U	DE	1	1	W, C, L, T	G	
from cist'	1983-0215	Radius	U	PE, P1/3, diaphysis	3	2	W, C, L, T	W	8
	1983-0215	Radius	U	PE	1	1	W, C, L, T	W, G	4
	1983-0215	Radius	U	diaphysis	9	1	W, C, L, T	W, G	
from cist'	1983-0215	Scapula	L	glenoid	1	1	W, C, T	W	8
	1983-0215	Scapula	L	neck	1	1	W, C, T	W, G	8
from cist'	1983-0215	Scapula	U	neck	2	1	W, C, L, T	W	
	1983-0215	Scapula	U	neck, spine	5	1	W, C, T	W, G	
	1983-0215	Ulna	R	PE	1	1	W, C, L, T	T, W	
from cist'	1983-0215	Ulna	U	diaphysis	3	1	W, C, L, T	W	
from cist'	1983-0215	Ulna	U	Dend	1	1	W, C, T	W	9
	1983-0215	Ulna	U	D1/3, diaphysis	11	1	W, C, L, T	W, G	
cordoned	1954-7248	Ulna/Radius	U	diaphysis	9	1	W, C, L, T	W	
from cist'	1983-0215	Ulna/Radius	U	diaphysis	53	1	W, C, L, T	W	
	1983-0215	Ulna/Radius	U	diaphysis	50	1	W, C, L, T	W, G	

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
	1983-0215	1st Distal hand phalanx	U	PE-DE	1	4	W, C, L, T	W	
	1983-0215	1st Distal hand phalanx	U	PE-DE	1	4	W, C, L, T	W	
	1983-0215	1st proximal hand phalanx	U	M1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Carpal	U		1	2	W, C, L, T	W	
cordoned	1954-7248	Distal hand phalanx	U	PE-DE	1	4	C	T, W	
cordoned	1954-7248	Distal hand phalanx	U	PE-DE	2	4	C	T, W	
	1983-0215	Distal hand phalanx	U	PE-DE	1	4	W, C, L, T	W	
	1983-0215	Distal hand phalanx	U	PE-DE	1	4	W, C, L, T	W	
	1983-0215	Distal hand phalanx	U	PE-D1/3	1	3	W, C, L, T	W	
	1983-0215	Distal hand phalanx	U	PE-M1/3	1	2	W, C, L, T	W	
	1983-0215	Distal hand phalanx	U	DE	1	2	W, C, L, T	W	
	1983-0215	Hand Phalanx	U	P1/3-DE	1	3	W, C, L, T	W	
	1983-0215	Hand Phalanx	U	M1/3-DE	1	2	W, C, L, T	W	

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
	1983-0215	Hand Phalanx	U	M1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Hand Phalanx	U	M1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Hand Phalanx	U	M1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Hand Phalanx	U	M1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Hand Phalanx	U	M1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Hand Phalanx	U	M1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Hand Phalanx	U	M1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Hand Phalanx	U	M1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Hand Phalanx	U	Pend-D1/3	1	3	W, C, T	W	4
	1983-0215	Hand Phalanx	U	Pend-D1/3	1	3	W, C, T	W	4
	1983-0215	Hand Phalanx	U	Pend-D1/3	1	3	W, C, T	W	4
cordoned	1954-7248	Indet carpal	U		1	2	C	T, W	
from cist'	1983-0215	Indet MC	U	M1/3-D1/3	1	3	W, C, L, T	W	8
from cist'	1983-0215	Indet MC	U	M1/3	1	1	W, C, L, T	W	8
from cist'	1983-0215	Intermediat e hand phalanx	U	PE-DE	1	4	W, C, T	W	8

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
from cist'	1983-0215	Intermediate hand phalanx	U	PE-DE	2	3	W, C, T	W	8
from cist'	1983-0215	Intermediate hand phalanx	U	Pend-DE	1	4	W, C, T	W	9
	1983-0215	Intermediate hand phalanx	U	PE-DE	1	4	W, C, L, T	W	
	1983-0215	Intermediate hand phalanx	U	PE-DE	1	4	W, C, L, T	W	
	1983-0215	Intermediate hand phalanx	U	PE-DE	1	2	W, C, L, T	W	
from cist'	1983-0215	Lunate	U		1	3	W, C, T	W, G	9
	1983-0215	MC1	U	PE, DE	2	1	W, C, L, T	W	
from cist'	1983-0215	Proximal hand phalanx	U	D1/3-DE	1	2	W, C, L, T	W	8
from cist'	1983-0215	Proximal hand phalanx	U	D1/3-DE	1	2	W, C, L, T	W	8
from cist'	1983-0215	Proximal hand phalanx	U	D1/3-DE	1	2	W, C, L, T	W	8

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
from cist'	1983-0215	Proximal hand phalanx	U	M1/3	1	2	W, C, L, T	W	8
	1983-0215	Proximal hand phalanx	U	P1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Proximal hand phalanx	U	M1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Proximal hand phalanx	U	DE	1	1	W, C, L, T	W	
from cist'	1983-0215	2nd Rib	R	shaft	1	3	W, C, L, T	W	
cordoned	1954-7248	Ribs 3-10	U	shafts	2	1	C	T, W	
from cist'	1983-0215	Ribs 3-10	U	shafts	35	1	W, C, L, T	W	
from cist'	1983-0215	Ribs 3-10	U	shaft	1	1	W, C, T	W	9
	1983-0215	Ribs 3-10	U	shafts	56	1	W, C, T	W	
from cist'	1983-0215	Os Coxa	L	sciatic notch	1	1	W, C, L, T	W	
from cist'	1983-0215	Os Coxa	R	sciatic notch	1	1	W, C, L, T	W	
cordoned	1954-7248	Os Coxa	U	ramus, iliac crest	3	1	C, T	W	
from cist'	1983-0215	Os Coxa	U	ilium, ischium	29	1	W, C, L, T	W	

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
	1983-0215	Os Coxa	U	ilium, ischium	50	1	W, C, L, T	W, G	
	1983-0215	Femur	L	P/13	1	1	W, C, L, T	W, G	4
cordoned	1954-7248	Femur	U	diaphysis	5	1	W, C, L, T	W	
from cist'	1983-0215	Femur	U	P1/3, diaphysis, DE	39	1	W, C, L, T	W	
	1983-0215	Femur	U	diaphysis	27	1	W, C, L, T	W, G	
cordoned	1954-7248	Fibula	U	diaphysis	2	1	W, C, L, T	W	
from cist'	1983-0215	Fibula	U	diaphysis	18	1	W, C, L, T	W	
	1983-0215	Fibula	U	diaphysis	24	1	W, C, L, T	W, G	
	1983-0215	Patella	U	sup and ant	2	1	W, C, T	W, G	
cordoned	1954-7248	Tibia	U	PE, diaphysis	3	1	W, C, L, T	W	
from cist'	1983-0215	Tibia	U	diaphysis	29	1	W, C, L, T	W	8
	1983-0215	Tibia	U	PE, DE, diaphysis	39	1	W, C, L, T	W, G	
	1983-0215	1st proximal foot phalanx	U	D1/3	2	1	W, C, L, T	W	

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
from cist'	1983-0215	Indet MT	U	P1/3-D1/3	1	3	W, C, L, T	W	8
from cist'	1983-0215	Indet MT	U	DE	1	1	W, C, L, T	W	8
	1983-0215	Indet MT	U	DE	1	1	W, C, T	W	
	1983-0215	Indet MT	U	DE	1	1	W, C, T	W	
	1983-0215	Indet MT	U	DE	1	1	W, C, T	W	
	1983-0215	Indet MT	U	DE	1	1	W, C, T	W	
	1983-0215	Indet MT	U	DE	1	1	W, C, T	W	
	1983-0215	Indet MT	U	DE	1	1	W, C, T	W	4
	1983-0215	Indet MT	U	D1/3	1	1	W, C, T	W	
	1983-0215	Intermediate foot phalanx	U	PE-DE	1	4	W, C	W	8
	1983-0215	MT1	L	M1/3-DE	1	2	W, C, L, T	W	8
cordoned	1954-7248	Proximal foot phalanx	U	P1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Proximal foot phalanx	U	D1/3-DE	1	2	W, C, L, T	W	

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
	1983-0215	Proximal foot phalanx	U	D1/3-DE	1	2	W, C, L, T	W	
	1983-0215	Proximal foot phalanx	U	D1/3-DE	1	2	W, C, L, T	W	
cordoned	1954-7248	Indet bone	U		70	1	W, C, L, T	W	
from cist'	1983-0215	Indet bone	U		106.85g	1	W, C, L, T	W	
	1983-0215	Indet bone	U		785.3g	1	W, C, L, T	W, G, B	
	1983-0215	Indet epiphyses	U		3	1	W, C, L, T	W, G	9
from cist'	1983-0215	Indet epiphyses /tarsal	U	articular surfaces	12	1	W, C, L, T	W	
	1983-0215	Indet epiphyses /tarsal	U		56	1	W, C, T	W, G	
cordoned	1954-7248	Indet MC or MT	U	diaphysis	5	1	C, L	T, W	
from cist'	1983-0215	Indet MC or MT	U	diaphysis	8	1	W, C, L, T	W	
	1983-0215	Indet MC or MT	U	diaphysis	18	1	W, C, L, T	W	
from cist'	1983-0215	Long bone	U	diaphysis	13	1	W, C, L, T	W	9
from cist'	1983-0215	Long bone	U	diaphysis	54.61g	1	W, C, L, T	W	

Bag	Accession	Bone	Side	Segment	No Frag/ weight	Comp	Crem	Col	Age Cat.
	1983-0215	Long bone	U	Pend or Dend	2	1	W, C, L, T	W, G, B	9
	1983-0215	Long bone	U	diaphysis	418.62g	1	W, C, L, T	W, G	
	1983-0215	Sesamoid	U		1	4	W, C	W	

Table S2. Burials with Class 3 bone pommels (expanded version). Sites from central Britain and the Isle of Man highlighted grey, entries in bold are most similar to Staarvey. All dates are cal BC to (95.4%) probability using OxCal v3.4.2 with IntCal 13 (Bronk Ramsey 2009; Reimer *et al.* 2013). MNI = Minimum number of individuals; CU = Collared Urn; EFVU = Enlarged Food Vessel Urn.

Site (no. on Fig 9)	Region (NGR)	Material	Condition	Radiocarbon dates	Feature /site	Associated vessels	Other associated artefacts	MNI: age, sex, cremation/ inhumation	Site report/ osteological data
Ballymoney, Ireland (2)	Antrim, NW1184	Horn?	Intact	-	bog	-	-	-	Burgess & Gerloff (1981: 137), Woodward <i>et al.</i> (2015)
Bedd Branwen (burial B), Anglesey (4)	Anglesey, SH36158498	Bone	Burnt	3257±80 BP [BM-455]; 1742–1322 cal BC	Pit, edge of ring cairn	EFVU, inverted	Hone	1: adult male (osteoarthr), C	Lynch (1971)
Bedd Branwen (burial H), Anglesey (4)	Anglesey, SH36158498	Bone	Burnt, axial fracture	3520±30 BP [GrA-19652]; 1929–1753 cal BC	Cist	Collared Urn, inverted	Bone bead , 6 amber beads, 4 jet beads	2: young male adult + indet. Subadult, C	Lynch (1971)
Beech Hill House (1)	Perthshire, NO22014040	Bone	Burnt	3665±45 BP [GrA-19426]; 2196–1921 cal BC	Cist , 2m S of kerbed cairn	None	Bone toggle , quartz ball	2: young male adult + indet. Subadult, C	Stevenson <i>et al.</i> (1995)
Bwlch y Rhiw / Rhiuw-with-Llanfaelrhys (10)	Caernarvonshire, SH2227	Bone	Burnt	-	Cist	Collared Urn, inverted	Awl	?, C	Savory (1980)
Galley Low (9)	Derbys., SK21805649	Bone (cattle or horse)	Mostly intact	2030–1880 cal BC	Grave pit within barrow	Food Vessel	flint flake, antler rod, ironstone	1: adult male (middle adult), I	Bateman (1848); Parker Pearson <i>et al.</i> (2019: 143, 146)
Manton barrow, (Preschute G1a) (13)	Wiltshire, SU16496912	Amber	Basal slot damaged, mostly intact	-	Grave pit within barrow	Collared Urn, ? “9 feet” from burial	Bronze knife-dagger blade; 'Grape cup', gold-bound amber disc, perforated cup, 3 awls, beads, halberd pendant with haft set in sheet gold, ceramic lip plug	1: adult, female, I	Cunnington (1907)
Marian Bach (6)	Flintshire, SJ0777	Bone or horn	Mostly intact	-	Pit, round cairn	Collared Urn	-	?, C	Savory (1980)
Merddyn Gwyn (5)	Anglesey, SH5278	Bone	Burnt?, axial fracture	-	Barrow perimeter	Collared Urn/EFVU, inverted	-	1: adult, female, C	Hughes (1908)
Radwell barrow I (12)	Bedfordsh. TI0157	Bone	Socket fractured		Pit, in ring ditch	Collared Urn, inverted	Awl, jet spacer plate, 94 jet disc beads, 13 jet barrel beads, amber spacer plate bead, 9 amber barrel beads, v-perforated amber button	2: adult ?male + adult ?female, C	Hall & Woodward (1977)
Raunds barrow 1, f30017,	Northants.SP962371 26	Antler	Burnt	3520±40 BP [GrA-22378]; 1951–1703 cal BC	Pit within barrow (S of primary burial)	Collared Urn, upright	Bronze dagger blade (unburnt; no fit with pommel), bone pin (burnt)	2: adult ?male, 20–40 + 13–14 indet, C	Harding & Healy (2007)

Irthlingborough (11)									
Ringlemere (14)	Kent, TR29385698	Amber	Probably dep. intact	-	Barrow	(not in situ)	(not in situ – gold cup, amber pendant with gold trim)	-	Needham (2006)
River Thames (16)	Thames	Bronze	Intact	-	river	-	-	-	Woodward <i>et al.</i> (2015)
Shaw cairn (8)	Greater Manchester, SJ98678724	Bone	Burnt, socket fractured	-	Kerbed round cairn	?	?	?	http://www.mellorarchaeology.org.uk/shaw-cairn.html
Staarvey Farm (3)	Isle of Man, SC280843	Bone (cattle or horse)	Burnt, socket fractured	3515+45 BP [GrA-29940]; 1956–1696 cal BC	Cist	Collared Urn, inverted (+2nd vessel)	Plano-convex flint knife, flint end scraper, bone beads, bone point, bone oblongs	4: 1 child, 1 adolesc., 2 adult (1 male), C	Woodcock (1999); this article
Wilmslow (7)	Cheshire, SJ8480	Bone	?	-	?	Collared Urn, inverted	?	?, C	Evans (1881: 228)
Winterbourne Stoke G4 (15)	Wiltshire, SU0741	Antler or cetacean bone	Mostly intact	-	Pit, barrow	-	'Elm chest with bronze straps', Camerton-Snowhill knife-dagger, bone 'tweezers', bone pin	?, C	Colt Hoare (1810)
Winterbourne Stoke G9 (15)	Wiltshire, SU0741	Amber	Mostly intact	-	Pit, barrow	?	?	?, C	Colt Hoare (1810)
Winterbourne Stoke G66 (15)	Wiltshire, SU0741	Cetacean bone; damage to basal slot	Basal slot reworked, otherwise mostly intact		Pit under barrow	Collared Urn, upright	bronze knife-dagger blade, 'black' beads	?, C	Colt Hoare (1810)

NB: A further pommel was found at Oviden, Halifax, with cremated human remains in an inverted Collared Urn in a cist (Longworth 1984: 279). The pommel has been lost. A pommel found at Narrowdale Hill, Alstonfield, Staffordshire, has a pronounced lipped socket, like class 3 pommels, but is less oval in shape: it was also found in cremated remains in a cist within an urn. The vessel is listed by Hardaker (1974: Appendix table) as a Cordoned Urn, but the urn is reported as lost by Barnatt & Collis (1996: 219). It is possible that the association of class 3 pommels with cremated remains, inverted urns (largely Collared Urns) and cists was better represented in the West Pennines than Table 1 illustrates.

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