Knappach Toll, Balbridie: a late 3rd-millennium BC Beaker burial on Deeside, Aberdeenshire

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Knappach Toll, Balbridie: a late 3rd-millennium BC Beaker burial on Deeside, Aberdeenshire

Olivia Lelong
With contributions by Iraia Arabaolaza, Torben Ballin, Jane Evans, Richard P Evershed, Susanna Kirk, Angela Lamb, Dawn McLaren, Lucija Šoberl and Neil Wilkin

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1. ABSTRACT

A short cist discovered during ploughing at Knappach Toll on Balbridie Farm, Aberdeenshire held the remains of an adult accompanied by a Beaker, fragments of a copper awl and 11 struck flints. Little survived of the skeleton except for cranial fragments, but these indicate that the person had been placed with the head to the west, with the artefacts also at that end. While the sex of the person is indeterminate, with the single surviving sexual dimorphic trait suggesting a male, the position of the body and the presence of the awl are more usually indicative of a female. Radiocarbon dating shows that the person died between 3775±35 years BP (SUERC-30852) and 2330–2040 cal BC (95.4% probability). Stable isotope analysis indicates that he or she grew up on basalt geology, like that of the region, or on chalk. Residue analysis of the Beaker has established that it had held ruminant animal fat such as butter or milk, probably for some time, and some of the flint pieces had been lightly used. The composition and constituents of the burial suggest links between north-east Scotland and East Yorkshire. They also evoke the cultural practices that were spreading across eastern Britain in the later 3rd millennium BC through the mechanisms of cultural transmission and migration.
2. INTRODUCTION

In February 2009, a large slab was disturbed during ploughing of a field at Knappach Toll on Balbridie Farm, Aberdeenshire. The farmer dragged the slab to a corner of the field and, returning to the spot, observed a large, stone-lined hole where it had been. Thinking it was a field drain he stepped inside it, but on closer inspection he realised it contained pieces of pottery and was of some antiquity. He removed a slab that lay above the southern edge of the cist, laid it inside, collected the sherds of pottery and placed them on the slab. He then informed the Aberdeenshire Council assistant archaeologist, Moira Greig, who contacted Historic Environment Scotland (formerly Historic Scotland). The contents of the cist were excavated and its construction was investigated by a team from the former Glasgow University Archaeological Research Division over two days in dry conditions. The work was carried out under the Human Remains Call-off Contract issued by Historic Environment Scotland, who funded and monitored the fieldwork and post-excavation work.

2.1 Site location

The cist lies on a river terrace to the north of the B9077 road, about 2.5km to the east of Banchory (Illus 1). From the road, the ground rises slightly to a low ridge that runs along the field’s northern edge, reaching a height of 50m above OD. The cist lies c.5m south of the field’s northern boundary at approximately 49m above OD (NGR NO 7369 9595). To the north of this boundary, the ground drops steeply beneath mature conifers to a level expansae beside the River Dee. The first edition Ordnance Survey 6 inch to the mile map of the area shows that the field had been enclosed and improved by 1865. By 2012 it had been planted with conifer saplings, although the cist itself was excluded and protected under a low mound of ploughsoil.

The solid geology at the site consists of metamorphic bedrock formed between 1,000 and 542 million years ago (Queen’s Hill Formation – semipelite, psammite and pelite); these were originally sedimentary rocks that formed in shallow seas and were later altered by low-grade metamorphism. The superficial geology formed up to three million years ago in the Quaternary Period, when glaciers were scouring the land and meltwater was depositing moraines of till with outwash sand and gravel deposits (British Geological Survey [nd]).

2.2 Archaeological background

This part of the Dee valley was home to well-established communities in the 4th and 3rd millennia cal BC, with a ceremonial landscape flanking the river and dominated by large, communal monuments. Two substantial timber halls stood in the vicinity of Knappach Toll during the early Neolithic – one at Balbridie about 300m to the east and the other 1.5km to the north-east, across the river at Crathes (see Illus 1). Excavation of Balbridie timber hall in 1977–81 revealed that it had been built of prepared oak timbers; abundant carbonised grain was found inside it, along with sherds of Unstan Ware and worked flint (Canmore ID 36669; Ralston 1982). The similar but slightly smaller timber hall at Warren Field, Crathes was partially excavated in 2004. It was also built of dressed oak timbers, with relatively sparse pottery, flints and grain associated with it (Canmore ID 36670; Murray et al 2009). Both buildings stood during the early to mid-4th millennium BC and both were destroyed by fire.

By the mid-3rd millennium cal BC, the character of ceremonial activity in the landscape had shifted towards the construction and use of recumbent stone circles (Bradley 2005) and single burial in cists, often accompanied by Beakers, with some debate about whether the construction of these monuments preceded the common use of Beakers or whether these practices emerged concurrently (see Curtis & Wilkin 2012: 241–3). In the vicinity of Knappach Toll, a cluster of three cists was discovered during ploughing on a natural knoll in 1893, a kilometre to the SSE; they contained probable inhumations with Beakers and Beaker sherds (Shepherd 1986: 37) (see Illus 1). Other finds suggest the locations of settlement and other activity in the environs. Scatters of worked flint, including a barbed-and-tanged arrowhead, have been found along the south bank of the river within about a kilometre of the cist; a possible ring ditch has been identified through aerial photography to the east of Balbridie timber hall; and several extensive field systems which may incorporate burial cairns lie on higher ground to the SSW.
North-east Scotland contains one of the highest concentrations in northern Britain of inhumation burials accompanied by Beakers in short cists (Shepherd 1986). These point to shared belief systems and social practices across the region’s communities and their connections elsewhere along the eastern seaboard of the UK and to Continental Europe (Bradley 2005: 113; Shepherd 2012).
3. FIELDWORK METHODOLOGY

A trench measuring 2.5m NNE/SSW by 2m was excavated over the cist (Illus 2 & 3). After the loose, intrusive ploughsoil that covered the floor was removed, eight samples were taken on an east/west grid of the basal deposit to recover small fragments of bone or botanical material and allow testing for phosphate levels. Background samples were also taken from the ploughsoil, the upper subsoil and the lower subsoil. However, the decision was taken not to subject these samples to geochemical analysis, on the basis that the results were not likely to significantly inform interpretation.

As the landowner wished to leave the cist intact, no geological samples were taken of the slabs that formed it. The cist’s construction was investigated by excavating opposing quadrants of the cut outside the structure. This allowed the recording of two cross-sections across the cist and the examination of half of each exterior face for artificial markings. Following excavation, the capping slab was replaced and the pit that held the cist was backfilled; the estate manager then sealed it with a thick layer of ploughsoil.

Illus 2 Pre-excavation plan of the cist. © Northlight Heritage
Illus 3 The cist before excavation, from the east. © Northlight Heritage
4. RADIOCARBON DATE

Table 1 shows the radiocarbon determination from a left temporal bone recovered from the cist. When calibrated at two standard deviations (95.4% confidence), it returns a date range of 2330–2040 cal BC. This is consistent with radiocarbon dates associated with other Tall Short-Necked vessels from north-east Scotland (see 7.1 ‘Report on the Beaker’ below).

<table>
<thead>
<tr>
<th>Site</th>
<th>Sample</th>
<th>Material</th>
<th>Area/Context</th>
<th>Description</th>
<th>Depositional context</th>
<th>Uncal</th>
<th>δ^13C</th>
<th>1σ (68.2%)</th>
<th>2σ (95.4%)</th>
</tr>
</thead>
</table>

Table 1 Radiocarbon date from the Knappach Toll burial, calibrated using OxCal 4.3.2 (Bronk Ramsey 2017); IntCal13 atmospheric curve (Reimer et al 2013)
5. THE BURIAL

The ploughsoil that sealed the cist and its environs consisted of friable, dark grey-brown gritty sandy and stony silt that varied from 0.1m to 0.23m thick.

5.1 Contents of the cist

The sub-rectangular interior of the cist was defined by four side slabs (Context 006) that pitched slightly together towards the top, so that it measured 0.88m east/west by 0.4m at the top but 1.10m east/west by 0.77m at the base. The base was formed of the natural sandy gravel subsoil (Context 012) (Illus 4 & 5).

A thin, irregular spread of compacted, dark grey-brown, gritty sandy silt (Context 011) lay about a centimetre thick across the base, beneath and around the human remains (Illus 4 & 5). It may have derived from the decay of organic materials, including the body. Similar, amorphous stains have been identified in other Early Bronze Age cist burials, for example at Doons Law in Berwickshire (Clarke & Hamilton 1999) and at Mains of Scotstown, Sandhole Quarry and Tavelty Farm, all in Aberdeenshire (Ralston 1996).

At the western end lay a concentration of skull fragments, including part of a temporal bone found directly on top of a mandible. Several other cranial fragments and teeth lay in the same area and across the western half of the cist. Two worked flints (SF022 and SF023) lay to the north-west. Two conjoining fragments of a copper awl (SF025) were also recovered from a bulk sample taken from the basal deposit (Context 011) in the north-west corner. Taken together, the evidence suggests that a body was laid in the cist with the head to the west and the artefacts were placed behind the head. This would be in keeping with Beaker burial practice (Tuckwell 1975: 109; Shepherd 2012, and see 10 ‘Discussion’ below).

Above was loose ploughsoil (Context 009) that had fallen in when the capping slab was dragged out of place by the plough. Human bone and teeth and pieces of worked flint, none apparently in situ, lay in it. A triangular slab (Context 014, not illustrated) sat in the north-west corner of the cist with the Beaker sherds lying on it, where the farmer had placed them. When he first observed the Beaker, it lay already broken in this corner of the cist (Ian Menzies, pers comm).

5.2 Construction of the cist

The cist had been constructed by first digging a large, sub-oval pit (Context 003) to contain the structure; it had been cut, 1.94m east/west by 1.7m and about 0.55m deep, into the yellow-orange coarse sand, pea grit and firmly set stones of the subsoil (Illus
Illus 5 The interior of the cist with skull fragments and basal deposit 011, from the north and above. © Northlight Heritage

Illus 6 Post-excavation plan of the cist. © Northlight Heritage
6 & 7). The upright slabs (Context 006) on the north and south were taller than the others and, to accommodate them, the builders had excavated near-vertical sides on the north and south, cutting away the lower subsoil in steps and setting the slabs hard against the edges of the cut. They dug the east and west sides to descend steeply to a gently sloping base in order to give the slabs on these sides greater height.

The eastern slab was of coarse-grained granite with an irregular surface. A small, pecked hollow measuring 2cm in diameter was observed in the centre of its inner face, about 0.33m from the base (Illus 8). The other slabs were of finer-grained, sedimentary rock and no markings were observed on their accessible faces.

The builders packed cobbles and small slabs (Context 008) behind the eastern slab and at the south-west and north-east corners, but relatively little packing material was observed elsewhere (Illus 7). Gaps at the lower corners were chocked with cobbles except on the south-east, and the north-east corner was also pinned with long, angular stones.

After the cist was constructed, light yellow gravelly sandy subsoil (Context 017) had been packed behind the base of the more steeply leaning southern slab. Then the rest of the pit outside the structure was backfilled with the coarse, dark orange-brown sand (Context 004) which had been dug out to make it. Roots had penetrated along the north face of the northern slab, leaving pockets of more humic, gritty loam (Context 019). On the north and south, the pit fill was sealed by a thin layer of light orange-brown sandy silt (Contexts 016 and 013), a remnant topsoil.

The builders set several slabs (Context 007) over the edge of the cist on the west and south to support the capping slab, which had an irregular underside. Over the western side they also set a large
Illus 8 The pecked hollow on the interior face of the eastern slab, from the west. © Northlight Heritage

Illus 9 The slab with a straight, serrated edge, set over west edge of the cist, from the east. © Northlight Heritage
slab with a serrated edge, which appeared to have been chipped to straighten it (Illus 2 & 9). Fine, pale yellow sand (Context 005) had been packed beneath the southern levelling slabs and partly over the western one before the capping slab was put in place (Illus 2 & 7).

The capping slab (Context 015, not illustrated) was an irregular triangle in plan, measuring 1.38m long by up to 0.68m wide and up to 0.10m thick. The surfaces were extremely irregular and weathered, and no artificial marks were observed on either face. When the capping slab was replaced, it became clear that a smaller slab (Context 020), found pitched at the cist’s south-east corner, had been set to fill a gap created by its irregular shape (Illus 2 & 3).
6. THE HUMAN REMAINS

6.1 Skeletal analysis
Iraia Arabaolaza

Only some fragments of skull and some teeth were recovered from the cist. The bone surface presented erosion which was graded 3 according to the standards in Brickley & McKinley (2004). The sex of the skeleton was assessed using standards outlined by Buikstra & Ubelaker (1994). Since no pelvic bones were preserved, only the sexual dimorphic traits of the skull were potentially available for observation, and three of them were not observable due to incompleteness or poor preservation. Consequently, only the posterior zygomatic process could be estimated, and this indicated a possible male (?M). However, because of the lack of more visual traits for observation and estimation, it is more appropriate to estimate the sex of the remains as indeterminate.

The degree of dental attrition observed led to an age estimation of 33–45 years (Brothwell 1981). However, since the different attrition stages do not follow a fixed and constant sequence, their accuracy is limited. As a result, a more general age category of ‘adult’ was estimated for the skeleton, based on the complete eruption of the third molars. No measurements were taken from the skeleton due to the poor preservation of the cranial bones. The non-metric traits, as their name indicates, are traits which are not measurable but are recorded as either present or absent (Table 2). Some of them relate to genetic causes, while others are thought to be linked to environment, occupation and lifestyle (Brickley et al 1999) and are used to identify and compare different genetic groups. Standard traits identified by Berry and Berry (1967) for the cranial bones were studied in this analysis.

The identification of different pathological conditions depends upon the completeness and preservation of the bone. Although this skeleton’s incomplete nature makes it difficult to identify evidence of pathology, several conditions were identified.

Caries or tooth decay, caused by bacteria found in dental plaque (Hillson 1996), was recorded on the second and third maxillary left molars. On both teeth the cemento-enamel junction was affected by the caries, distally on the second molar and mesially on the third molar. Calculus or tartar, a hard deposit of mineralised plaque, was recorded on all left molars as well as on the maxillary left second premolar and mandibular left first premolar (Hillson 1996). In archaeological remains, calculus indicates poor oral hygiene, although its presence and severity can be influenced by age, diet, ethnicity and systemic diseases (White 1997). Finally, a dental anomaly, dental pearl enamel, was also identified on the distal aspect of the second maxillary left molar (Illus 10).

<table>
<thead>
<tr>
<th>Trait</th>
<th>Right</th>
<th>Left</th>
<th>Number</th>
</tr>
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<tbody>
<tr>
<td>Cranial</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zygomaticofacial foramen</td>
<td>X</td>
<td>P</td>
<td>1 foramen</td>
</tr>
<tr>
<td>Tympanic dehiscence</td>
<td>X</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>Auditory exostosis</td>
<td>X</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Mastoid foramen exsutural</td>
<td>X</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>Mental foramen number</td>
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<td>A</td>
<td></td>
</tr>
<tr>
<td>Mandibular torus</td>
<td>X</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Mylohyoid bridge</td>
<td>X</td>
<td>N/O</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 Non-metric traits identified on the skeleton from Knappach Toll
6.2 Strontium, oxygen, carbon and nitrogen isotope analysis

Jane Evans & Angela Lamb

6.2.1 Method

Samples were submitted for analysis of strontium and oxygen isotopes on tooth enamel, and for analysis of carbon, nitrogen and sulphur isotopes on bone, in order to illuminate the diet and geographical origins of the person buried in the cist.

The tooth enamel samples were prepared by abrading the available enamel surface to a depth of >100 microns, cutting thin slices and cleaning all surfaces. Strontium was collected using Dowex resin columns and loaded onto a single Re Filament with TaF following the method of Birck (1986); the isotope composition and concentrations were determined by Thermal Ionisation Mass spectroscopy (TIMS) using a Thermo Triton multi-collector mass spectrometer. Oxygen isotopes were collected by treating small fragments of clean enamel (15–20mg) to extract PO₄ radicals and precipitated as silver phosphate, using the method of O’Neil et al (1994). Oxygen isotope measurements on each sample were analysed in triplicate by thermal conversion continuous flow isotope ratio mass spectrometry (TC/EA-CFIRMS). Results were converted to SMOW values using a value of 21.7‰ for silver phosphate precipitated from NBS120C (Florida phosphate rock), calibrated against certified reference material NBS127 (assuming δ¹⁸O of NBS127 = +20.3‰ versus V-SMOW) at NIGL using fluorination (see Chenery et al 2010: appendix). The 1σ reproducibility for mass spectrometry controls in this batch of analysis were δ¹⁸O = ±0.20‰ (1δ, n=14) and the mean repeatability of triplicate analyses was δ¹⁸O = ±0.10‰ (1δ, n=12). Drinking water values were calculated using the calibration of Daux et al (2008: equation 4).

The samples for carbon and nitrogen analysis were prepared following a modified Longin method (Brown et al 1988). The collagen samples used for carbon and nitrogen analysis were redissolved in milliQ water and ultra-filtered to remove the <30 kDa component for sulphur isotope analysis. The residue from the filters was freeze-dried and ~12–14mg was weighed into tin capsules. Sulphur, carbon and nitrogen isotope analysis was by continuous flow isotope ratio mass spectrometry (CFIRMS).

6.2.2 Results

The strontium isotope composition is below the value predicted for this part of Scotland (Evans et al 2010), although data from this area are sparse and
the geology is complex. The drinking water value is within the expected range for the eastern side of Scotland (Darling et al 2003). Data are presented in Table 3.

The low strontium isotope ratio is indicative of someone raised either on chalk or basaltic terrain and most likely basalt, given the combination of the signature with an elevated S concentration of 212 ppm and by comparison with the very few examples we have of such origins (Culduthel man (J Montgomery, pers comm) and individual Cnip-D (Montgomery et al 2003)). A basaltic origin would be more likely in the Scottish context and, although such rocks are not recorded on the \(^{87}\text{Sr}/^{86}\text{Sr}\) isotope biosphere map of Britain (Evans et al 2010) due to their limited outcrop, such rocks are found locally in the Knappach Toll area. The oxygen isotope composition (−8.3) is also consistent with an eastern Scottish origin. There is thus no evidence that this individual was not local; the data could also be consistent with an origin in Antrim, Ireland, where large areas of basalt exist. Origins on chalk terrain (such as occurs in eastern and southern England and in parts of the Continent) are also possible, especially given other kinds of evidence for close links between north-east Scotland and East Yorkshire (see 7.1 ‘Report on the Beaker’ below; Curtis & Wilkin 2012; Shepherd 2012) and the eventual mass displacement by Beaker-using people of steppe ancestry via the Netherlands (Olalde et al 2018) (see 10 ‘Discussion’ below). The Knappach Toll individual plots on the lower margin of the enamel strontium dataset for individuals analysed across Britain in the Beaker People Project (Parker Pearson et al 2016: fig 6).

The carbon and nitrogen isotope composition for the individual from Knappach Toll suggests that he or she had a diet high in animal protein, but with no evidence of a marine component. The data have been compared with reference data from the Norse-period Scottish sites of Cnip and Galson in the Outer Hebrides (Richards et al 2001), Newark Bay, an Iron Age site on Orkney (Richards et al 2006), and Wetwang, an Iron Age chariot burial in Yorkshire (Jay & Richards 2006). The Scottish data define an array of values that result from a mixed diet of marine and non-marine protein components; the higher nitrogen values typify a marine component. The Wetwang dataset provides a reference set for a

| Sample                  | ppm | \(^{87}\text{Sr}/^{86}\text{Sr}\) | Mean \(^{18}\text{O}\) at C/N | Am% N at C/N | Am% C at C/N | C/N       | Amt% N | Amt% C | \(^{15}\text{N}\) AIR | \(^{13}\text{C}\) P 1 SD | \(^{13}\text{C}\) AIR | \(^{15}\text{N}\) AIR | \(^{13}\text{C}\) P 1 SD | \(^{13}\text{C}\) AIR | \(^{15}\text{N}\) AIR | \(^{13}\text{C}\) P 1 SD | \(^{13}\text{C}\) AIR | \(^{15}\text{N}\) AIR | \(^{13}\text{C}\) P 1 SD | \(^{13}\text{C}\) AIR | \(^{15}\text{N}\) AIR |
|-------------------------|-----|-------------------------------|-----------------------------|--------------|--------------|-----------|---------|---------|---------------------|------------------|------------|------------------|------------------|--------|------------------|------------------|--------|------------------|------------------|--------|
| KT-09-SK1-e             | 212.1 | 0.707949                      | 16.72                       | 3            | 14.9         | 43.6      | 3.4     | 10.14   | -8.3                | 16.72            | 3          | -8.3             | 16.72            | 3       | -8.3             | 16.72            | 3       | -8.3             | 16.72            | 3       |

Table 3 Strontium isotope data for the Knappach Toll individual (*A ±0.2 (1σ) blanket error, derived from the reproducibility of the NBS 120 C standard, is considered the best estimate of error for the \(^{18}\text{O}\) SMOW values and this results in ±0.4 (1σ) error on the calculated drinking water values*)
diet high in animal protein, with no evidence for any significant marine food input (Jay & Richards 2006). The Knappach Toll individual plots on the margin of the Wetwang dataset. In comparison with the Beaker People Project dataset, the Knappach Toll individual’s values are slightly higher for carbon isotope ratio than the average range of −21.0±0.4‰ and slightly lower for nitrogen than the average of 10.3±0.7‰ for dentine (Parker Pearson et al 2016).

The application of sulphur isotope analysis to archaeological material is relatively new. A few studies have begun to assess the utility of δ³⁴S both as an indicator of palaeodiet and as an indicator of residency/mobility (Richards et al 2001; 2003; Privat et al 2007). Sulphur is a vital nutrient for animals, and an animal’s sulphur composition derives from its food intake. At the base of the food chain, vegetation will inherit sulphur from the substrate and its δ³⁴S composition will vary with geology, giving rise to a large variety of terrestrial δ³⁴S sources (−19 to +30‰). This variety can enable residency/mobility studies as it can identify ‘migrants’ to an area based on non-local δ³⁴S signatures. Plant δ³⁴S will also be affected by soil processes and, near the coast, by sea spray, which can deposit marine sulphur and potentially blur the terrestrial/marine δ³⁴S distinction. Marine sulphate has a δ³⁴S value of about +21‰ and primary oceanic producers have +17–21‰, whereas freshwater producers can have a very wide range of δ³⁴S (−22 to +22‰), reflecting the oxidation state of sulphates. As there is minimal fractionation between trophic levels, this can usefully be applied to compare terrestrial, freshwater and marine consumers. Away from areas affected by sea spray, δ³⁴S can distinguish between marine and terrestrially based diets. For example, a study of modern fauna from the Canadian Arctic used δ³⁴S to distinguish between terrestrial mammals (<+10‰) and mammals living close to the coast and consuming marine fauna, such as polar bears (+16–18‰) (Krouse & Herbert 1988). The limitation of δ³⁴S for archaeological palaeodiet studies is that it may not be able to distinguish between truly marine diets and terrestrial diets in coastal locations due to the issue of sea spray. If it is used in combination with other palaeodietary isotopes (C, N) this may aid interpretations. For example, high δ¹³C values (> −17‰) can also suggest a marine protein diet in C₃-plant environments.

Theoretically, modern bone has a sulphur content of 0.18%. Privat et al (2007) suggest caution if the percentage of sulphur in collagen is greater than 0.6%, which suggests the presence of contaminants. This sample has a percentage of sulphur close to 0.18% and thus appears well preserved. Although still not fully established, it has been suggested that atomic N/S ratios can be used to assess sulphur in collagen quality in the same way C/N ratios

<table>
<thead>
<tr>
<th>Identifier</th>
<th>δ³⁴S</th>
<th>VCDT</th>
<th>1 SD</th>
<th>n</th>
<th>% S</th>
<th>Amt% S</th>
<th>Amt% N</th>
<th>Amt% C</th>
<th>% C</th>
<th>Amt% at C/N</th>
<th>Amt% at C/S</th>
<th>Amt% at N/S</th>
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<tbody>
<tr>
<td>KT09-SK1</td>
<td>16.7</td>
<td>0.13</td>
<td>2</td>
<td>0.21</td>
<td>2</td>
<td>0.13</td>
<td>14.9</td>
<td>43.6</td>
<td>3.4</td>
<td>0.21</td>
<td>0.21</td>
<td>0.21</td>
</tr>
<tr>
<td>KT09-SK2</td>
<td>16.7</td>
<td>0.13</td>
<td>2</td>
<td>0.21</td>
<td>2</td>
<td>0.13</td>
<td>14.9</td>
<td>43.6</td>
<td>3.4</td>
<td>0.21</td>
<td>0.21</td>
<td>0.21</td>
</tr>
</tbody>
</table>

Table 4: Sulphur data for the Knappach Toll individual
are used for C and N analysis. If the atomic N/S ratio is outside the range of modern bone, caution should also be used (modern bone N/S ranges from 61–211 (Privat et al 2007)). The N/S ratio of this sample is 165 and thus well within modern range (Table 4).

The Knappach Toll individual has a relatively high $\delta^{34}$S value (16.7‰), intermediate between UK coastal and inland archaeological values when compared to data presented in Richards et al (2001) (Illus 11). The $\delta^{13}$C value ($-21.6\pm0.15$‰) and $\delta^{15}$N value (10.1±0.1) suggest a largely terrestrially based protein diet with possibly some freshwater fish input.

**Illus 11** Sulphur data for the Knappach Toll individual (KT09) compared to other UK archaeological data (Richards et al 2001). © Northlight Heritage
7.1 Report on the Beaker

Neil Wilkin

The Beaker (SF002, Illus 12) was analysed according to the Guidelines of the Prehistoric Ceramics Research Group (PCRG 1997), with full details recorded in the archived report (held at the National Record of the Historic Environment maintained by Historic Environment Scotland). A catalogue of the sherds is also included with the project archive. The vessel is approximately 80–85% complete, including c 90% of the neck and rim and >90% of the upper body. These sherds are in relatively fresh condition. However, the lower body (c 3cm above base) is complete and abraded to only c 20–25%. The base is also incomplete, abraded and complete to only c 50%. The dimensions of the vessel are as follows: height c 190–200mm; rim diameter c 155mm; base diameter c 95mm; wall thickness c 7mm.

7.1.1 Detailed vessel description

The colour of the exterior surface is brown to dark brown (Munsell 5YR 5/6) while the interior is a yellow-buff to brown. Quartzatic inclusions are frequently distributed, with maximum size of 3–4mm, and with some showing on the surface of the vessel. Also evident on the surface are black mica platelets. Both inclusions of quartzatic grits and mica platelets are a common feature of Beakers from the north-east of Scotland, occurring in a high proportion of funerary vessels in the collection of the Marischal Museum, University of Aberdeen (author’s personal dataset). Indeed, of the 11 Beakers excavated to modern standards (that is, from c 1970/80), and for which data are available, at least five have quartzatic grits.

The fabric has a cross-section comprising an oxidised exterior; a black, unoxidised core, and an oxidised interior, indicative of the open-air firing and incomplete burning of the carbonaceous matter
that is broken by the difference in the scale of the opposed isosceles triangles. The overall design is therefore centred upon opposed, filled and unfilled triangles – a relatively popular Beaker scheme (see 7.1.2 'The Beaker: traits and comparanda' below).

The decoration was executed using three techniques. The main technique was comb impression, with at least two combs utilised, one with teeth of 0.7mm diameter (for example, for the upper chevrons) and the other with teeth of 1–2mm diameter (for example, for the encircling lines). The fringes, dashes and the fill of the lower chevron pattern have been incised, possibly using the edge of a comb. Finally, the encircling lines on the inside of the neck were grooved using a blunt instrument (c4–5mm) with irregular edges.

7.1.2 The Beaker: traits and comparanda

The Knappach Toll vessel sits comfortably within the overall decorative and morphological palette of Beaker pottery in Deeside and north-east Scotland, but also presents some unique features and evidence for inter-regional connections (see Illus 13). The closest parallels for the overall decorative design and form are the angular-necked vessels from Cookston, Angus (Coutts 1971: 48, fig 82a); Thurston Mains, East Lothian (Clarke 1970: no. 1648, fig 648: ‘Skateraw’), and Goodmanham 99, Burial 5, East Yorkshire (Clarke 1970: no. 1309, fig 675). However, several individual features are rare and require further attention in relation to privileged connections within the wider Beaker network of eastern Britain. For instance, the double-bevelled rim, shaped to a blunt point, is a modest but relatively rare feature, although internal bevels alone are more common. Limited parallels include the vessel from Cookston, Angus (Coutts 1971: 48, fig 82a) and the unusual squat bowl from Urquhart, Moray (Clarke 1970: no. 1721, fig 723).

Opposed filled isosceles triangles (frequently associated with horizontal herringbone/fringing) are a recurrent decorative feature of funerary Beakers in north-east Scotland, frequently globular vessels from the Buchan region (Shepherd 1986: illus 20; Shepherd 2012: illus 17.6). However, the Beaker from Knappach Toll belongs to a more dispersed group with longer, angular necks and more ovoid bodies that stretch the opposed...
The single cordon or ‘rib’ positioned at the base of the neck of the Knappach Toll Beaker relates to the practice of placing up to six cordons on the neck of angular-necked Beakers. It is likely to be related to (or have its origins in) the single or double cordons placed immediately below the rim of non-funerary and typologically early Beakers (for example, Clarke’s Northern British/North Rhine grouping, 1970, vol 1: 36–7). Shepherd (1986: 145) associated this feature with ‘high-status’ burials associated with ‘archery’ equipment, for instance at Tavelty, Aberdeenshire.

The single corded motif across neck and body. This is also true of the vessels from Juniper Green, Midlothian (Clarke 1970: no. 1710, fig 710); Inveramsay, Aberdeenshire (Clarke 1970: no. 1457, fig 682); Ballymeanoch henge, Argyll and Bute (Clarke 1970: no. 1530, fig 711), and Glenforsa, Mull, Argyll & Bute (Clarke 1970: no. 1531, fig 676). Most closely comparable, however, is the design of the vessel from Goodmanham 99, Burial 5, East Yorkshire (Clarke 1970: no. 1309, fig 675; Kinnes & Longworth 1985: 85).

**Illus 13** Map showing connections between the key and related decorative and morphological features of the Knappach Toll Beaker and similar vessels from Northern Britain. The Beakers that share most in common with the Knappach Toll vessel (from Cookston, Thurston Mains, and Goodmanham 99) are shown as line drawings (vessels not to scale). Illustration by Craig Williams. © Northlight Heritage
on non-funerary Beakers, although it is still rare (eg Gibson 1982 vol 1: 119, 142; 2006: fig 3.6.3; MacGregor & Stuart 2008: 88–91).

Humphrey Case connected the use of internal rilling to the Late Neolithic Grooved Ware tradition (2001: 369; cf Manby 1999: 61, table 6.2; Brindley 1999), a claim that is noteworthy given the chronological overlap between Grooved Ware and Beaker deposition (Garwood 1999), and the socio-cultural relationships between communities using these respective ceramic traditions (eg Needham 2007). Thus internal rilling is more easily paralleled among the non-funerary Beaker assemblage, a claim that also applies to the use of external cordons and, indeed, Grooved Ware pottery. In typological terms, the Beaker can be assigned to Clarke’s (1970) Late Northern (N3) grouping due to its decorative motifs (Motif Group 3, no. 21 and Motif Group 4, no. 29–30) and shape (Variation IV). Clarke observed that bevelled rims were more common in this group than any other (ibid: vol 1, 176), although the inner and outer bevel of the Knappach Toll vessel is rare. Within Shepherd’s scheme for north-east Scotland (Shepherd 1986; following Lanting & Van der Waals 1972), the vessel belongs to Step 4 due to the relatively sharp angle between neck and body and the emphasis placed upon the neck by the use of internal rilling and cordon. In Needham’s most recent, national Beaker scheme (Needham 2005), the vessel belongs to the wide-ranging Short-Necked group (ibid: 191–5), due to the presence of a neck depth of less than 35% of the overall height. However, the Knappach Toll vessel may not satisfy this requirement by very much, with its neck depth of c 33–34% based on the assumed total height of c 190–200mm. In Curtis & Wilkin’s (2019) north-east Scottish scheme, it belongs to the Tall Short-Necked group.

Previous radiocarbon dates have suggested an overall currency of c 2350–1900 cal bc for Beakers from short-cist burials in north-east Scotland (Curtis et al 2008; Wilkin 2010). A notable number of Beakers with features (decoration, rim form, cordon and profile) similar to Knappach Toll are associated with relatively early dates (ie with ranges extending earlier than c 2200 cal bc at 95.4% probability). Indeed, the radiocarbon date obtained from the human remains, of 2330–2040 cal bc (95.4% probability; SUERC-30852; 3775±35 BP),
is consistent with this view and spans both sides of the critical interface between the Chalcolithic and Early Bronze Age in our chronologies (cf Needham’s (2005) ‘fission’ horizon at c 2200 cal BC and the adoption of both tin-bronze and the more widespread adoption of Beakers after this date). This date is consistent with other Tall Short-Necked vessels from north-east Scotland (Curtis & Wilkin 2019).

7.2 Organic residue analysis of the Beaker
Lucija Šoberl & Richard P Evershed

Lipid residues of cooking and the processing of other organic commodities have been found to survive in archaeological pottery vessels for several thousand years as components of surface and absorbed residues. The components of the lipid extracts of such residues can be identified and quantified through solvent extraction and using a combination of analytical techniques capable of achieving molecular level resolution, such as high-temperature gas chromatography (HTGC), GC/mass spectrometry (GC/MS; Evershed et al 1990) and GC-combustion-isotope ratio MS (GC-C-IRMS; Evershed et al 1994). Characterising lipid extracts to commodity type is only possible through detailed knowledge of diagnostic compounds and their associated degradation products formed during vessel use or burial. For example, triacylglycerols (TAGs) are found in abundance in fresh animal fats; however, they are degraded to diacylglycerols (DAGs), monoacylglycerols (MAGs) and free fatty acids during vessel use and burial, such that in archaeological pottery the free fatty acids tend to predominate. This has been observed in numerous pottery vessels (Evershed et al 2002) and verified through laboratory degradation experiments (eg Charters et al 1997; Dudd & Evershed 1998; Evershed 2008a; Evershed 2008b). An increasing range of commodities is being detected in pottery vessels, including animal products (for example, Evershed et al 1992; Copley et al 2003), leafy vegetables (Evershed et al 1991; Evershed et al 1994), specific plant oils (Copley et al 2005a) and beeswax (Evershed et al 1997b).

Animal fats are by far the most common class of residue identified from archaeological pottery, with compound-specific stable carbon isotope analysis allowing detailed characterisation of their source. GC-C-IRMS allows the carbon stable isotope ($\delta^{13}C$) values of individual compounds to be determined within a mixture. The $\delta^{13}C$ values for the principal fatty acids ($C_{16:0}$ and $C_{18:0}$) can be used to distinguish between different animal fats, such as ruminant and non-ruminant adipose fats and dairy fats (Evershed et al 1997a; Dudd & Evershed 1998), as well as to identify the mixing of commodities (Evershed et al 1999; Copley et al 2001). Research has demonstrated that dairy products were important commodities in prehistoric Britain, as illustrated through the persistence of dairy fats in prehistoric pottery (Copley et al 2003; 2005b). For an overview of the use of compound-specific stable isotopes in archaeology, see Evershed et al (1999) and Evershed (2008b).

7.2.1 Methods

A single sherd, weighing 1.680g, from the body of the Knappach Toll Beaker was received for lipid analysis. Lipid analyses were performed using established protocols which are described in detail elsewhere (Evershed et al 1990; Charters et al 1993). The identification of individual compounds was based upon eluting order, comparison of retention times to standards and comparison of mass spectra with known fragmentation patterns and the NIST spectra library. A detailed description of the methods is included in the archive report.

7.2.2 Results

Table 5 lists the concentration of lipids detected in the Knappach Toll sherd together with the analysed visible residue, and the assignments of the broad commodity group based on the molecular data retrieved.

The Knappach Toll Beaker displayed a very good preservation with high lipid concentration of 276.5µg g$^{-1}$ sherd. The preservation of lipids in pottery is heavily influenced by degradative alterations that may occur during vessel use or due to post-burial conditions in the soil (Evershed et al 1999).

Illus 14 shows a partial gas chromatogram for the total lipid extract (TLE) of the absorbed residue, indicating the compounds detected, namely free
fatty acids, with high abundances of saturated C_{16:0} and C_{18:0} components. The presence of mono-, di- and triacylglycerols indicates a relatively good level of preservation, most likely due to the favourable post-burial conditions in the soil.

The Knappach Toll Beaker extract yielded an appreciable amount of lipids and was further submitted for stable carbon isotope ratio measurements. $\delta^{13}C$ values obtained for the C_{16:0} and C_{18:0} components are plotted in Illus 15. The values of modern reference fats are represented by confidence ellipses (1 standard deviation). All $\delta^{13}C$ values obtained for modern reference animal fats have been adjusted by the addition of 1.2‰ for the post-Industrial Revolution effects of fossil fuel burning (known as the Suess Effect; Tans et al 1979). Lines connecting the ellipses represent theoretical $\delta^{13}C$ values obtained through the mixing of these fats. The C_{16:0} and C_{18:0} $\delta^{13}C$ values of the Knappach Toll Beaker extract plot adjacent to the ruminant dairy fat reference confidence ellipse, thus indicating the likely lipid origin.

The animals that supplied the modern fats used to construct the reference isotope plot were reared on strict C_{3} diets of forages/fodders and cereals. The slight displacement of $\delta^{13}C$ isotopic values for the Knappach Toll Beaker outside the ruminant dairy confidence ellipse may be due to the fact that the animals in prehistory were reared on diets which varied in $\delta^{13}C$ values compared to today’s values. The $\delta^{13}C$ value, where the $\delta^{13}C$ values of most abundant fatty acids are subtracted from one another ($\delta^{13}C_{16:0} - \delta^{13}C_{18:0}$), reflect only the differences in metabolisms of animals, and are therefore a useful indicator of lipid origin when such variations in isotope values occur. Illus 16 displays the $\delta^{13}C$ value plotted against $\delta^{13}C_{16:0}$ value for the Knappach Toll Beaker. The ranges on the left side of the plot belong to the modern reference fats. $\delta^{13}C$ values obtained for the analysed Beaker extract confirm the presence of ruminant dairy lipids.

7.2.3 Conclusions

Lipid residue analysis of the Beaker revealed the excellent preservation of lipids absorbed within the vessel walls. Gas chromatograms of the lipid extract show the presence of compounds, indicative of partially degraded animal fat with free fatty acids.
Illus 14 Partial HTGC profile of the trimethylsilylated total lipid extract from the Beaker illustrating the distribution of compounds characteristic of degraded animal fat. © Northlight Heritage

Illus 15 Scatter plot showing the $\delta^{13}$C values of $C_{16:0}$ and $C_{18:0}$ fatty acids prepared from the total lipid extract of the Knappach Toll Beaker. © Northlight Heritage
Illus 16 Plot showing the difference between $\delta^{13}C$ values ($\delta^{13}C_{16:0} - \delta^{13}C_{18:0}$) and $\delta^{13}C$ values obtained from the $C_{16:0}$ fatty acids extracted from the Beaker potsherd. The ranges for the modern reference fats are plotted to the left of the diagram with indicated standard deviation. © Northlight Heritage

(palmitic and stearic acid predominantly), and mono-, di- and triglycerides. The sherd extract also displayed the presence of odd-carbon-number fatty acids with their branched homologues indicating the presence of ruminant animal fat, which was also confirmed by the preserved TAG distributions.

The measurement of $\delta^{13}C$ values of most abundant free fatty acids provided an additional confirmation that the lipids preserved in the walls of the Beaker can be assigned to a ruminant dairy source. These results, together with the absence of mid-chain ketones, which are formed during exposure to high temperatures, suggest that the vessel was used for the consumption of dairy products. Despite frequently referenced ethnographic reports of milk being used as a sealant for porous ceramic matrix (Rice 1987; Palmer 2002), modern degradation experiments have shown that such lipid concentrations, commonly found preserved in archaeological pottery, can only be the result of long-term vessel use to hold commodities with high dairy fat concentrations (Copley et al 2005b). A study from 2011 (Šoberl 2011) inferred that while most British Beaker vessels analysed were not used as cooking pots, the predominant presence of dairy fats and lipids originating from plants would suggest a specialised function. In conclusion, while historically Beakers have been associated with ritual feasting and the consumption of alcoholic beverages (Sherratt 1987; Guerra-Doce 2006; Rojo-Guerra et al 2006), organic residue analysis can provide further insight into the nature and type of these drinks.
8. THE AWL

Dawn McLaren (with scientific analysis by Susanna Kirk)

- **SF025** (Illus 17): Two heavily corroded, joining fragments of a small double-ended copper awl, sub-square in section, tapering gently at both ends. The tips of both ends have been lost and the overall length cannot be extrapolated. Non-destructive XRF and SEM-EDX surface analysis (by Susanna Kirk, NMS) shows that the fragments are copper with silver-rich inclusions. Remaining L: 11.5mm; central expansion: W: 2mm Th: 2mm; remaining ends W: 1.4mm Th: 1.2mm. Mass 0.1g. Sample 1, Context 011 (basal deposit in cist).

The copper awl fragments were recovered during processing of a bulk sample taken of the basal deposit in the north-west corner of the cist. Although its exact original position is uncertain, the soil sample was taken from the area 5–20cm to the north of the surviving skeletal remains, the same part of the cist in which the Beaker sherds and struck lithics were found.

Although uncommon and easy to overlook during excavation due to their small size, several examples of copper and bronze awls are known from Early and Middle Bronze Age graves in Scotland (summarised in Sheridan 1999). Two main forms of awl have been recognised (Thomas 1968; Henshall & McInnes 1968; Sheridan 1999): a double-ended form with central expansion which is seen as an earlier, long-lived type, and a later type with flattened tang and no central swelling. Despite the fragmentary, corroded condition of the Knappach Toll awl, it appears to be of the double-ended variety.

Very few Bronze Age awls have been analysed scientifically, but at least one other copper (as opposed to bronze) example is known from Scotland, at Doon’s Law, Berwickshire (Sheridan 1999). Here, the awl accompanied the crouched inhumation burial of a young adult female, associated with a complete Northern British/Northern Rhine Beaker and a group of flints (Clarke & Hamilton 1999). Other examples from Beaker-associated burials are known from Kirkcaldy, Fife (Childe 1944: 11, pl viii) and Springwood, Kelso (Henshall & McInnes 1968), although awls are also found in association with Food Vessels, urns, accessory vessels and burials with no ceramic associations (Sheridan 1999: 197).

Bronze and copper awls in Scotland, as elsewhere in Britain, are typically found with female burials, but this is not exclusively so (Sheridan 1999: 198). The sex of the associated individual here could not be determined. The function of these tools is not clear, but their use for tattooing, piercing leather and decorating jet or jet-like material has been suggested (Hunter 2000: 147; Hunter & Woodward 2015).
9. CHIPPED STONE ARTEFACTS

Torben Ballin

9.1 Description of the chipped stone assemblage

The lithic assemblage was retrieved from the intrusive ploughsoil within the cist, where the artefacts had been disturbed during its discovery. This report refers to the artefacts by their number in the catalogue (CAT no.). Eleven flint artefacts were recovered (Illus 18). Apart from one core (CAT 1), the assemblage comprises debitage, the waste resulting from the manufacture of stone tools. The pieces comprise five primary flakes, four secondary flakes (including one blade), one tertiary flake and one bipolar core. The finds were characterised according to standard typologies (eg Ballin 1999; 2000).

The abraded character of the pieces’ cortex suggests that nodules were procured from local beach deposits, such as the shores of the North Sea. It was not possible to conjoin any artefacts, and the different raw material colours (grey, light brown

Illus 18 Chipped flint artefacts. © Northlight Heritage
and dark brown), size differences and differential patterning (small-dotted and marbled) suggest that the finds represent a minimum of five or six nodules.

One piece (CAT 5) is a blade (50 × 22 × 10mm), whereas all other pieces of debitage are elongated flakes (average dimensions of intact specimens: 44 × 30 × 10mm; L/W ratio 1.5:1). At first glance, the objects appear larger than one would expect to find along the east coast of Scotland, and they are considerably larger than flakes from the contemporary assemblage from the Kingfisher Estate in Aberdeen (average dimensions: 29 × 23 × 9mm; Ballin 2009; 2012), although flint nodules from that site are considerably larger (average dimensions: 42 × 31 × 22mm). Based on this comparison, the Knappach Toll blanks were probably selected for their large size.

All pieces of debitage were detached by the application of bipolar technique, with 50% being primary flakes, 40% secondary flakes and 10% tertiary flakes. The fact that half of the flakes and blades are primary blanks suggests that nodules were brought to the locale intact, although common practice in prehistoric times would have been to decorticate them at the source to avoid having to carry unnecessary weight back to the camp or settlement. The fact that this did not happen at Knappach Toll may reflect the proximity of the raw material source, but it most probably also reflects the character of the industry, which appears to have focused on the splitting of pebbles for blanks, and where oval primary flakes may have been preferred for the production of certain tools such as scrapers (cf the Kingfisher Estate assemblage; Ballin 2009).

Only one core was retrieved (CAT 1). It is a large and relatively slender bipolar core (52 × 27 × 12mm); the remaining cortex at either terminal shows that the length of the surviving core (52mm) corresponds to the length of the original nodule.

Although no formal tools were found at Knappach Toll, four pieces have faint use-wear along one lateral edge, most probably from their use as knives. The grave goods of the deceased include used (and still usable) informal (unmodified) tools, as well as unused tool blanks. The assemblage supports evidence from other, recently excavated assemblages of a technological shift in the region – from sophisticated platform techniques in the Neolithic to bipolar approaches in the Early Bronze Age period (Ballin forthcoming).

9.2 Lithics catalogue
Context 009:
- CAT 1 Secondary bipolar core, grey flint (52 × 27 × 12mm). One lateral edge may have been used for cutting. SF022.
- CAT 2 Secondary bipolar flake, grey flint (34 × 23 × 11mm). SF023.

Context 010:
- CAT 4 Primary bipolar flake, grey flint (34 × 27 × 12mm). SF003.
- CAT 5 Secondary bipolar blade, grey flint (50 × 22 × 10mm). The right lateral edge may have been used for cutting. SF004.
- CAT 7 Primary bipolar flake, light brown flint (45 × 27 × 8mm). SF006.
- CAT 8 Fragmented tertiary bipolar flake, grey flint (49 × 39 × 8mm). A small part of the distal end has broken off, as well as a segment of the right lateral side (frost-induced). The left lateral edge may have been used for cutting. SF007.
- CAT 9 Primary bipolar flake, black and grey flint (50 × 38 × 12mm). SF008.
- CAT 10 Primary bipolar flake, light brown flint (32 × 30 × 10mm). It is uncertain whether modification of the distal edge is expedient retouch, use-wear or natural damage. SF009.
- CAT 11 Primary bipolar flake, grey flint (59 × 33 × 8mm). SF010.

Context 011:
- CAT 3 Proximal-medial fragment of secondary bipolar flake, light brown flint (26 × 19 × 6mm). Sample 1.
10. DISCUSSION

The evidence from the cist at Knappach Toll may appear at first glance to evoke a straightforward sequence of acts. At some point between 2330–2040 cal BC (95.4% probability) and probably 2280–2140 cal BC (68.2% probability) (SUERC-30852), a community in north-east Scotland conducted some rites on a low ridge south of the River Dee. They dug a large hole and brought slabs from two different geological sources to build a stone box or cist inside it. In the cist they laid the flexed body of an adult, placed so that the head lay to the west. Beside the body, probably behind the head, they set a copper awl, a Beaker and some lightly used flint tools. Then they dragged a large slab over the cist, sealing the contents.

Behind the apparent simplicity of this sequence, however, lay a complex and highly prescribed set of practices. These in turn related to social connections and belief systems that were spreading across eastern Britain during the later 3rd millennium BC, having already developed in Continental Europe.

In its form, location and constituents, the burial at Knappach Toll sits firmly within prevailing contemporary traditions in north-east Scotland. This region, out of three studied by the Beakers and Bodies Project (with the Moray Firth area and East Central Scotland), contains the highest concentration of Beaker burials and accompanying evidence for significant cultural change during the Early Bronze Age (Curtis & Wilkin 2012). The choice of location, along the valley of a major river, is consistent with most other Beaker burials in the North-East (ibid: 244). Like this cist, many were placed at the top of natural gravel terraces or knolls and often in small groups (Shepherd 1986: 12–13); the immediate environs of the Knappach Toll burial, which had been planted with well-spaced conifers at the time of writing, could thus contain other, as yet undiscovered cists.

Nearly all of the recorded Beaker burials in north-east Scotland were flat graves like this one, with no evidence for a covering mound (Curtis & Wilkin 2012: 244). The slabs used to form it came from two different geological sources. Most were of fine-grained sedimentary rock, the solid geology beneath the site. The slab that formed the eastern side of the cist, at the feet of the individual, was of granite with a small, pecked hollow facing inward at its centre. Although its source is unknown, igneous rock forms the solid geology across extensive areas on the opposite side of the Dee, under uplands to the south of the site and upriver around Ballater. This slab may have been taken from a previous context of use, one which had some bearing on its re-use here.

The use of chocking stones in the cist’s construction has parallels elsewhere in the region, for example at Borrowstone to the north of the Dee, where at least one of a cluster of six cists was built with elaborate chocking stones beneath the capstone (Shepherd 1986: 13). Other, similar inhumation burials in short cists, which also included Beakers and flint implements, were being created along the River Dee around the same time – for example at Balbridie, 1km to the SSE (Canmore ID 36692), and at Park Quarry, 9km downstream (Canmore IDs 74325, 87288). Calibrated radiocarbon dates for human remains from Park Quarry are statistically identical to that from Knappach Toll, at 2280–2130 cal BC (3769±32; OxA-V-2172-14; Sheridan et al 2006) and 2290–2040 cal BC (3768±31; OxA-V-2243-45; Curtis et al 2008), both at 95.4% probability.

Analysis of Beaker burials across north-east Scotland by the Beakers and Bodies Project confirms that they were highly formalised, displaying a remarkable degree of consistency (Curtis & Wilkin 2012: 244–6). The communities that created them employed a uniform symbolic vocabulary, structured by strict grammatical rules that governed how the body was positioned, the objects that were placed with it and the choice of topographic location. Detailed analysis by Shepherd (2012) of 26 Beaker burials in the region also identified clear patterns in body position that correspond to gender. In north-east Scotland, bodies were most often laid in cists on a strict or approximate east/west orientation with lines of sight to the south. Males were consistently placed on their left side with head to the east and facing south (MLES), while females were usually placed on their right side with head to the west, also facing south (FRWS), albeit with some deviation from cardinal points within quadrants (ibid: 263).

In the Knappach Toll burial, the skull fragments were found at the western end of the cist, and the Beaker and the worked flints and copper awl fragments were found in the cist’s north-west corner, suggesting
copper awl may have evoked specific associations with decorating the body – for example, with tattoos, clothing or ornaments – as part of Beaker-complex rites (see Hunter & Woodward 2015).

The finely made, elaborately decorated Beaker may have been made especially for this person, perhaps for special use during life and ultimately to accompany her body after death. That Beakers were made specifically and exclusively for burial contexts has been argued both on the basis of ethnohistoric parallels and on the taphonomic grounds that they are regularly found whole and would have easily fractured along their coil-joints under the stress of everyday use (Boast 1995; Shepherd 2012: 276). However, the findings of organic residue analysis suggest that this vessel had held ruminant dairy products over an extended period of time, rather than that the porous fabric was simply sealed with milk (7.2 ‘Organic residue analysis of the Beaker’ above). These findings are consistent with those of a wider study of organic residues in Early Bronze Age pottery, including over 200 Beakers, which identified predominantly ruminant dairy fats in Beakers from various contexts across Britain and concluded that in many cases ‘vessels with long-term use-lives were deposited in burials’ (Šoberl 2011: 217–18).

These arguments are not necessarily mutually exclusive. The Knappach Toll Beaker may have been made for a particular purpose or person, with complex cultural meanings encoded in its decoration and form, and used over a long period on a regular basis for ceremonies and other special occasions – perhaps for serving and drinking fermented milk (rather than for cooking or boiling, which would have caused damage and fracture) (Šoberl 2011: 91). Such drinks have been (and still are) part of everyday life as well as special occasions around the world, including more locally on the Scottish Isles during the post-medieval period (Fenton 1978; Abdelgadir et al 1998). Finally, this long-used, heavily symbolic, carefully curated pot was placed behind the head of the person for whom it was made, signifying her cultural identity and that of the burial community.

Recent research is changing narratives about the geographical and genetic origins of the communities who made and used Beakers as part of a suite of cultural practices and belief systems. The Beaker People Project (Parker Pearson et al 2016) combined...
Among the three closest parallels to the Knappach Toll Beaker, one of the vessels was placed with the burial of a woman laid on her right side and facing south (Shepherd’s (2012) FRWS) at Goodmanham 99, East Yorkshire (see 7.1 ‘Report on the Beaker’ above). The strontium and oxygen isotopes in the Knappach Toll individual’s tooth enamel could indicate she grew up on the basalt-derived soils of north-east Scotland; however, they could also point to her having spent her childhood on chalk geology, like the soils of East Yorkshire (see 6.2 ‘Strontium, oxygen, carbon and nitrogen isotope analysis’ above). Her food was drawn mainly from terrestrial sources, with a high proportion of animal protein and little marine input (ibid). This accords with the findings of the Beaker People Project as a whole, indicating they were farmers rather than fishers (Parker Pearson et al 2016).

Whether the person whose body was placed in the cist was locally bred, had moved to the Dee from eastern England, was descended from Dutch migrants or had some other history, she and her burial community identified with a set of beliefs and practices that differed markedly from the ones that had held sway for earlier generations. Knappach Toll lay in an ancient ceremonial landscape that, up to 2,000 years before, had been dominated by large communal monuments – the timber halls that stood on opposite sides of the river in the late 5th to early 4th millennia cal BC (Ralston 1982; Murray et al 2009). In the late 3rd millennium, the footprints of these halls may have still been discernible on the ground and in the shared memory of local communities, as monumental expressions of social practices and belief systems that valued and demanded communal contributions and participation.

The Beaker-complex burial practices and the value systems that lay behind them seem to have placed more emphasis on the individual body and experience. That a burial community chose to create the cist at Knappach Toll a few hundred metres from the site of one Neolithic timber hall and within view of the site of another seems significant. The placing of the burial in this ancient ceremonial context suggests the community was aware of an earlier belief system and responded to its gravitational pull – perhaps either contesting it or grafting onto it – as happened at other Neolithic monuments in East Yorkshire and at Stonehenge (Parker Pearson et al 2007).
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