

Excavation of a beaker cist burial with meadowsweet at Home Farm, Udney Green, Aberdeenshire

H K Murray* and Ian A G Shepherd†

with contributions by C Lamb, N W Kerr, Althea L Davies, M Jay, Richard Tipping, A J Mukherjee, R P Evershed and M P Richards

ABSTRACT

This paper summarizes the results of the rescue excavation of a short cist burial of a young male. Pollen and other analyses of residues in and immediately below the accompanying beaker suggest that it had contained a drink, possibly milk, flavoured with meadowsweet and possibly containing honey. Pollen analysis also revealed that the cist had been constructed within an open, farmed landscape, probably not far from a settlement; wheat and perhaps barley had probably been grown very near the cist. A radiocarbon date of 3795 ± 28 BP (2340–2130 cal BC) has been obtained from the skeleton. Isotopic analysis of the bones, undertaken as part of the Marischal Museum's current Beakers and Bodies Project, has revealed that the young man's diet was, like that of other recently analysed British Early Bronze Age skeletons, terrestrial.

INTRODUCTION

A short cist was found during ploughing at Home Farm, Udney Green, Aberdeenshire (NGR: NJ886265) in September 2001. The agricultural contractor had been aware of a large stone which had been exposed due to erosion of the plough soil, and the decision was made to move it. On doing so, it was initially thought that a stone drain had been uncovered and as a result there was some unfortunate disturbance of the cist contents. When this revealed human bone, the landowner, Mrs Williams, promptly informed the police and Ian Shepherd, Principal Archaeologist for Aberdeenshire Council, who inspected the site. Owing to the disturbed nature of the find and its proximity to the village, the principal author was asked to excavate the cist, as a matter of urgency, on behalf of Aberdeenshire

Council. The excavation, aided by J C Murray and M Wright, took place over three days (22–4 September 2001).

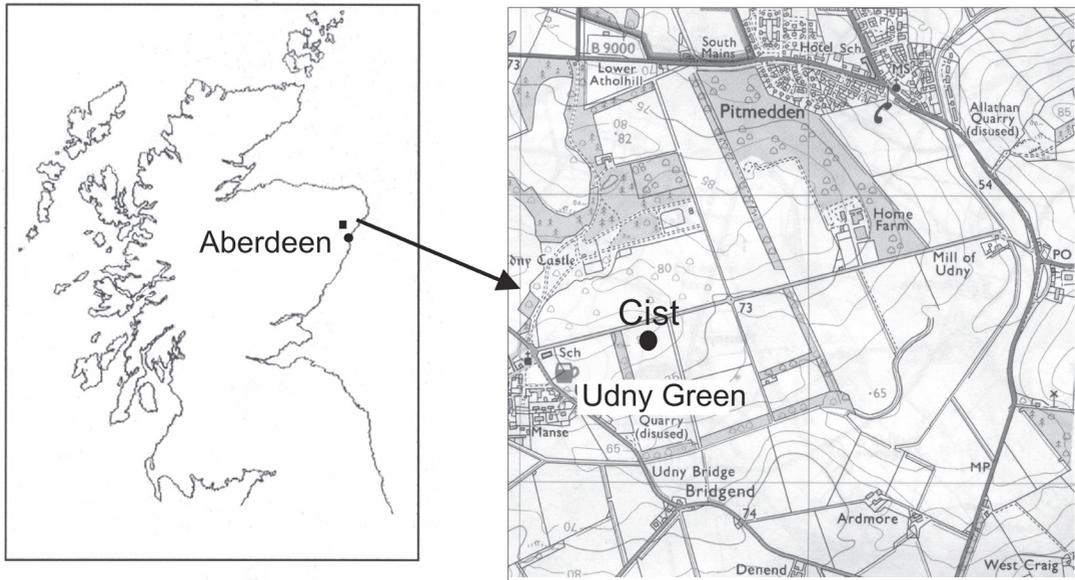
SITE DESCRIPTION

The cist lay just below the crown of a south-facing ridge at a height of *c* 75m OD. The land to the south slopes gently down to the Brony Burn, one of a number of small watercourses in the area which drain into the River Ythan.

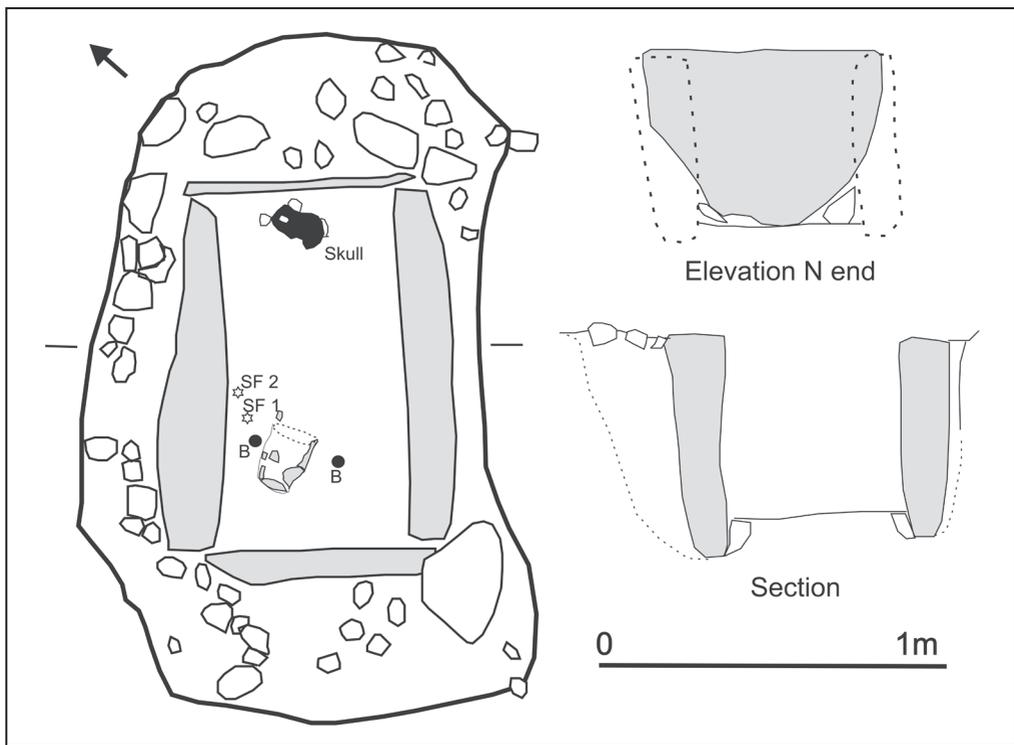
A number of stray finds of Bronze Age date have been recorded from the area around Udney Green (see Royal Commission on Ancient and Historical Monuments NMRS; Aberdeenshire Sites and Monuments Record). None of these finds appear to be directly related to the cist, or to any associated settlement; however, they do

* Murray Archaeological Services, Hill of Belnagoak, Methlick, Ellon, Aberdeenshire AB41 7JN

† Planning and Environmental Services, Aberdeenshire Council, Woodhill House, Aberdeen AB16 5GB



ILLUS 1 Location. Reproduced from OS 1:25,000 map with permission. Crown copyright. Licence No 0100020767 2008



ILLUS 2 Plan, elevation and section of cist. B = 2 bone fragments

indicate that the area – with its fertile, relatively light soils – was well populated and suitable for cultivation in the Bronze Age. The analysis of pollen from primary silts within the cist (see below) suggests that it was built in an open, cultivated landscape.

There are no visible remains of any mounds or other cists along the ridge, nor are any noted on either the 1870 Ordnance Survey or in the Statistical Accounts of 1791–9 and 1845. In fact, the present field pattern already existed at the time of the 1870 Ordnance Survey, which shows the Home Farm as a highly improved landscape. The same field system can be seen on Roy's military map of 1747–55 (Roy 1747) and the 1791 Statistical Survey (Sinclair 1791, 159) notes that the stone enclosure dykes had been built by the 'late proprietor'. It is unlikely that any mounds or other features associated with the cist would have been spared by his improving zeal.

EXCAVATION

A total area of 1.5 × 2.5m was excavated by hand to expose the edges of the cut into which the cist had been inserted. An area of plough soil, radiating some 10m from the cist, was also examined and some patches of disturbed soil, similar to the cist fill, were sieved to retrieve any associated bone and artefacts. The first aim of the excavation was to isolate and remove the modern disturbance in order to minimize any further contamination. Fortunately, it was fairly easy to identify the backfilled plough soil. All backfill material was also sieved.

No attempt was made to remove or lift the cist stones as the landowner expressed an intention to preserve the cist in situ. The capstone, which had been removed by the plough, was recorded and retained beside the cist.

THE CIST

The cist had been constructed in a pit c 1.12 × 0.97m cut into the natural boulder clay

to a depth of 0.55–0.65m. The lining slabs had been carefully selected, with straight, clean faces set towards the inside of the cist. The side slabs were stabilized by grooves, c 100mm deep, cut into the base of the pit. In contrast, the end stones were set directly on the floor of the pit and were held in position behind the ends of the side stones. Small, flat stones had been used to fill in gaps at the bottom of the north end slab (illus 2).

The space between the stones and the pit walls was backfilled with re-deposited boulder clay and some packing stones. The top of this backfilling was mixed with a little silt which had been washed into the slight hollow created as the fill compacted. The internal dimensions of the cist were 1.06 × 0.52m, with a general depth of 0.47–0.52m.

The capstone, which was removed during the investigation, measured 1.60 × 0.90m with a thickness of 0.17–0.2m. The side slabs of the cist had been placed so that the top edges were fairly level but several of the stones on the edge of the pit may have been used to level the capstone.

The cist was orientated north-east/south-west. The skeletal remains were fragmentary, partly due to disturbance during the initial discovery, but predominantly due to decomposition. However, a large part of the right side of the skull survived at the north end of the cist and appeared to have been facing east/south-east (from photographs, Margaret Bruce pers comm). The skull did not appear to have been disturbed, indicating that the body, identified as male, had lain on his left side. This is in accord with the gender-defined orientation of beaker burials, originally noted in Yorkshire and more recently discussed in relation to north-east Scotland (Shepherd 1989, 79–80). A number of small stones lay below the skull. It is possible that these were used to keep the head in position, as little stone was found in the fill. This may serve to emphasize the importance of the direction of the skeleton's line of site.

The remaining bone fragments were recovered from material disturbed from the cist. Two small fragments of skull, one including

teeth, had apparently been re-deposited during the initial discovery and were found at the south end of the cist (B on *illus 2*).

A beaker was found in the south end of the cist, lying on its side with the rim to the north. It had been disturbed during discovery and was partially crushed, with several small rim fragments found in the sieved topsoil. The beaker appeared to have fallen on its side in antiquity, as the inside of the pot was stained at an angle consistent with its position when found. The primary fill of the pot (context 15) appeared as a fine black residue. This was sealed by a thin layer of pea gravel (context 14) which was not observed in any other context within the cist. Analysis of the pot fill residue has yielded high percentages of meadowsweet pollen which Davies and Tipping (below) suggest is derived from a liquid.

This suggests that the beaker tipped over as a result of the vibrations inevitable in rolling the large capstone into position. This would be consistent with the small amount of silting below the pot (context 16) compared with the greater depth of silting (contexts 10, 11, 12) over the rest of the floor of the cist. The pollen analysis supports this as there appears to have been seepage of the pot contents into the soil directly below it; this could only occur if the pot had fallen before evaporation of the liquid content. Davies and Tipping also suggest that the better preservation of the pollen in the beaker suggests that it was on its side from an early point after deposition, creating a micro environment that protected the contents.

Two other grave offerings, a flint and a pebble (small find numbers 1 & 2), lay to the west of the beaker, near the suggested placement of the body's feet. An adjacent area of organic material proved to contain modern fly pupae and be derived from a small area of animal disturbance.

DATING

Owing to the disturbed nature of the cist, it was felt that the skull offered the best possibility for

radiocarbon dating. Unfortunately, the sample submitted to the Oxford Radiocarbon Accelerator Unit (ORAU) yielded insufficient collagen for dating. However, as part of the current Beakers and Bodies research project in Marischal Museum, funded by the Leverhulme Trust, a further sample (from collagen) was submitted to ORAU and produced the date of 3795±28 BP (OxA-V-2243-47, 2290–2150 cal BC at one sigma, 2340–2130 cal BC at two sigma).

THE SKELETAL REMAINS

C Lamb, with a note on the teeth by N W Kerr

The skeletal remains are from one individual, a young adult male, probably aged between 19 and 23 years. The skeletal elements consisted of fragments of the skull and long bones from the right side of the body. The remains show evidence of post-mortem damage due to the disturbance of the cist prior to excavation. A metopic suture is present on the skull.

AXIAL SKELETON

Only the skull was represented (right side only). It was not possible to record any standard measurements from the fragmented parts of the frontal, temporal, parietal, occipital and sphenoid bones present. The piece of frontal bone included a remnant of the frontal sinus. Many small skull fragments were present, which may be damaged sections of the delicate facial bones. Sections of two skull sutures were identified – the coronal suture and a metopic (frontal) suture. The coronal suture was not completely 'closed' suggesting the individual was adult but not of advanced age. The metopic suture usually closes completely by five years of age but is known to remain in about 10% of adult individuals (Brothwell 1965). Two 'male-type' features were noted: moderately developed supra-orbital and supra-temporal ridges.

A fragment of the right maxilla containing two teeth and part of the maxillary sinus was

present and sent for further analysis by N W Kerr. The teeth were the upper right 7th and 8th (2nd and 3rd molars). The wear pattern on tooth 7 indicated approximately eight years of wear if part of a functional dentition. Tooth 8 showed little or no wear. Therefore the age of the individual was estimated to lie between 19 and 23 years. No other dental remains were present.

No signs of disease were noted in any of the skull fragments.

APPENDICULAR SKELETON

The appendicular skeleton was represented only by parts of the femur and humerus from the right side of the body. Other, smaller long bone fragments were also present but were too small and heavily eroded to attribute to either side of the body.

Upper Limb

A fragment of the right distal humerus (7–8cm long) was present; other possibly mid-shaft humeral fragments were present but were highly eroded. No standard measurements were possible for the upper limb.

Lower Limb

Part of the proximal femur was present (215mm long), the neck and head of the femur were absent. There was no evidence of an epiphysis at the greater trochanter of the femur – suggesting that the individual was at least 18 years old (Gray 1967). The lateral surface of the femur

was highly eroded, especially below the level of the lesser trochanter. Other post-mortem damage was also evident, including a recent clean break on the femoral shaft, probably due to the pre-disturbance of the cist on discovery. The femur shows platymeric flattening (front to back), the platymeric index (PI) is as follows:

Antero-posterior diameter	26.4mm
Medio-lateral diameter	35.7mm
Platymeric index	73.95

Platymeric femora are defined as those with a PI of 84.9 or less (Bass 1987).

The general rugged appearance of the femur suggested that the individual was male.

STABLE ISOTOPIC ANALYSIS

Mandy Jay and Michael P Richards

Carbon and nitrogen stable isotope analysis of bone collagen from this individual was undertaken as part of the Beakers and Bodies Project instigated by the Marischal Museum, University of Aberdeen, and funded by the Leverhulme Trust. The analysis was undertaken at the Max Planck Institute for Evolutionary Anthropology in Leipzig. The data, obtained from collagen extracted from a sample of femur cortex, are listed in Table 1 below.

The data are averaged from two replicate analyses. The collagen extraction process includes the use of ultrafilters, involving the discard of molecules smaller than 30kD, so that the yield must be considered in the light of the

TABLE 1
Results of the stable isotope analysis

<i>S-EVA No / Marischal reference</i>	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	<i>C:N (atomic)</i>	%C	%N	<i>Collagen yield (%)</i>
4854 / ABDUA-56001	-21.2	10.3	3.3	42.3	15.2	4.2

fact that the more degraded molecules have been discarded.

The data are best considered in detail in the context of the overall data set for the project, so that interpretations can be made in relative terms, and this will be done as part of the project publication. However, it is possible to make some basic statements about these results in isolation. They are indicative of an individual with a relatively high level of animal protein in the diet and no sign of any significant level of protein from marine or other aquatic resources. This is despite the burial site being only approximately 12km from the coast at its current nearest point. The data are not unusual within the context of others for this time period and general location.

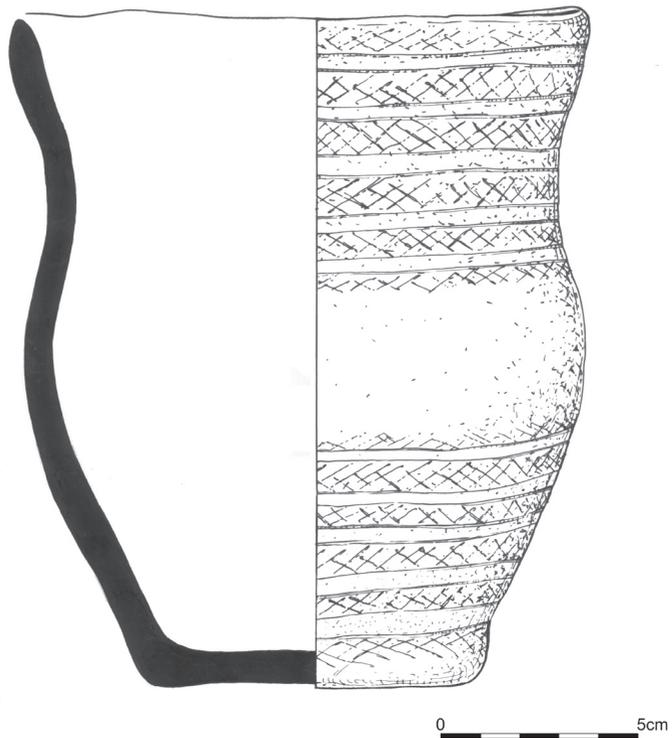
THE BEAKER

Ian Shepherd

Restored from many fragments to a now virtually complete S-profile beaker, 160mm tall on a slightly footed base, the pot measures 142mm in diameter around the belly and has an external rim diameter of 140mm. The fabric is 8mm thick and is well-fired with a brown-to-black core showing small crushed quartzitic grits. It has been covered in a red-brown to buff slip that was wet-hand-smoothed internally and burnished to a dull sheen externally before decoration. A small low omphalos is visible inside the base. The rim shows slight undulations from the finishing process which represent an attempt to square it off somewhat.

Decoration is in two broad zones covering the neck and waist and the belly. Both comprise six

bands of criss-cross impressions between single horizontal lines of toothcomb. The comb length on the horizontal lines is c 15mm; the same comb could have been used in a short, stabbing action to create the criss-cross decoration. The topmost set of impressions on the belly appears to have been done last of all, and hastily, perhaps in order to equalize the number of decorative elements. This band is thin and undulating, shows less control, and is almost half the width of the other



ILLUS 3 The Beaker

bands (4mm, compared with 8mm). The lowest set of impressions was also done hastily. There is a small patch of abrasion in the curve of the belly, where the pot had rested on its side on the cist floor.

This pot belongs in the Northern/North Rhine group of D L Clarke (1970) and to step 3 of the scheme of Lanting and van der Waals

(1972), adapted to the north-east of Scotland by the writer (Shepherd 1986). It is worth pointing out that there is a potential mismatch between the S-profile and the simple decorative scheme, in which the decoration has contracted into two broad zones; however, in Needham's review of British beaker typochronology (2005, 186), this would be one of his Tall Mid Carinated beakers. Similar beakers include those from Gordonstoun, Moray (Clarke 1970, no 1715), Sandhole, Fetterangus, Aberdeenshire (Shepherd 1986, illus 19; Ralston et al 1996; contra Needham 2005, 192, fig 8); Beverley, York (Clarke 1970, no 1238); and Whitestone, Skene, Aberdeenshire (Clarke 1970, no 1507; Shepherd 1986, illus 20).

The comparison with the Sandhole, Fetterangus beaker is instructive, given the new and early date for it reported through the current AHRC-funded Beaker People Project (Sheridan 2007). This is now 3845 ± 32 BP, (OxA-V-2172–23), 2430–2200 cal BC at one sigma, 2460–2200 cal BC at two, which, in conjunction with the Udney Green date itself (3795 ± 28 BP (OxA-V-2243–47), 2290–2150 cal BC at one sigma, 2340–2130 cal BC at two sigma) places the beaker clearly within Needham's (2005, 205) early, 'pre-fission' horizon for British beakers. This therefore emphasizes the relatively early typochronological position of this pot in the development of beakers in the north-east.

LIPID RESIDUE ANALYSIS OF SURFACE AND ABSORBED ORGANIC RESIDUES FROM THE BEAKER

Anna J Mukherjee and Richard P Evershed

The Udney Green beaker and its associated residues were analysed as part of a broader, Britain-wide project to determine the extent of the association between Grooved Ware and pig consumption and processing, through organic residue analysis (Mukherjee et al 2007; 2008). This research involved the systematic analysis of organic residues from 358 Neolithic and

Bronze Age potsherds. Archaeological sites were specifically selected to include domestic settlements and sites where 'ceremonial' activity may have taken place. Decorated and undecorated potsherds, different sub-styles of vessel and also pottery styles which were broadly contemporaneous with Grooved Ware (namely Peterborough, and Impressed Wares and beakers) were analysed along with some Unstan sherds. Ultimately the results from Udney will be compared and contrasted with Neolithic and Bronze Age pottery from sites throughout the Britain.

Initially, the selected sherds were screened using high-temperature gas chromatography (HTGC) in order to determine the presence or absence of organic residues. Where residues were detected, further analyses comprising HTGC and gas chromatography mass spectrometry (GC-MS) were performed. If degraded animal fats are observed, compound-specific stable carbon isotope measurements are made using gas chromatography-combustion-isotope ratio mass spectrometry to obtain $\delta^{13}\text{C}$ values of the major fatty acids ($\text{C}_{16:0}$ and $\text{C}_{18:0}$) and from these data a ruminant or non-ruminant origin can be assigned.

The full report (Mukherjee et al 2005) is available in the archive deposited in the NMRS at Edinburgh and in the Aberdeenshire SMR.

SAMPLES

Three samples from Udney were provided by the National Museums of Scotland, Edinburgh

TABLE 2
Beaker and residue samples from Udney Green

<i>Sample name</i>	<i>Description</i>
UDB1	Base of beaker
UDR1	Organic residue from beneath tilted beaker
UDR2	Residue from inside base of beaker

(Table 2); a portion of the base of the beaker (UDB1); the residue from the inside of the beaker (UDR2 – context 15); and some organic material which lay directly underneath the tilted pot (UDR1 – context 16). These were analysed and the samples are described in Table 3.

SUMMARY OF RESULTS

Lipid residue analysis and subsequent stable isotope analysis have identified the presence of degraded animal fat within the ceramic matrix of the beaker vessel (UDB1). The residue removed from inside the base of the beaker (UDR2), however, was found to contain a negligible quantity of lipid. This difference in the levels of preservation may be due to the exposure of the lipids within the surface residue to chemical and microbial attack compared with the absorbed lipid which was protected by the ceramic matrix of the pottery vessel. The organic material from beneath the beaker vessel (UDR1) was found to contain a mixture of degraded plant/beeswax and ruminant dairy fat. The dairy fat may derive from milk, butter or any other dairy product. If the dairy fat

originated from milk, this would be consistent with the interpretation that the vessel contained a liquid which was spilt shortly after burial. However, using this technique, different dairy products cannot be distinguished. The high levels of meadowsweet pollen present in the beaker and beneath it (see below), along with the possible beeswax identified in the residue, may derive from honey. If this is the case then perhaps the beaker was placed in the grave containing a dairy food/drink flavoured with honey. The results of lipid residue and stable isotope analysis are summarized in Table 3.

OTHER ARTEFACTS

Ian Shepherd

FLINT KNIFE

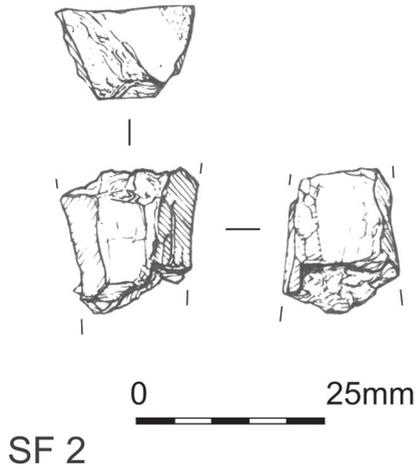
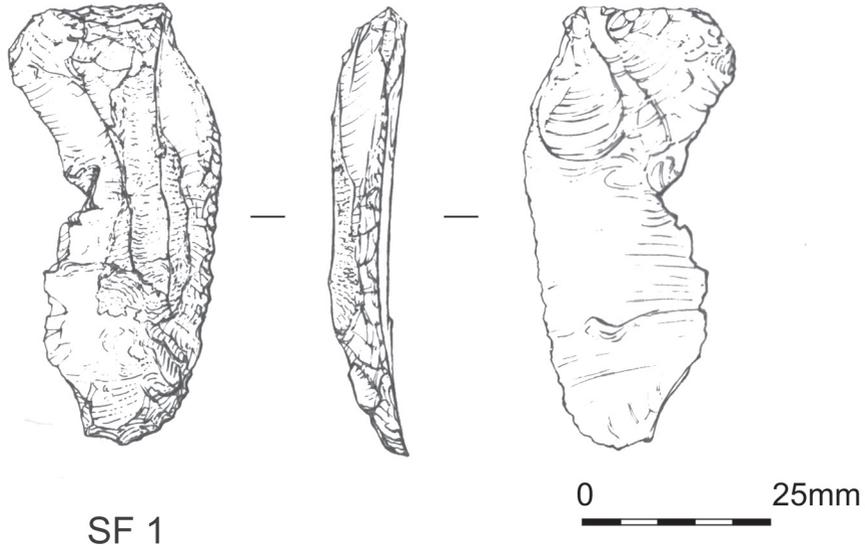
A secondary flake of fairly poor quality flint, mottled light grey-brown in colour and 60mm long, 12mm wide and c5mm tall with a flaw on the right hand side. The bulb of percussion on the ventral surface has been removed in order to reduce its thickness. The upper/dorsal

TABLE 3

The lipid assignments for the Udney Green beaker and its surface residues from Udney as suggested from the TLE, TAG distribution, $\delta^{13}\text{C}$ values and $\Delta^{13}\text{C}$ value

<i>Sample name</i>	<i>Lipid origin suggested from:</i>				<i>Interpretation</i>
	TLE	TAG distribution	$\delta^{13}\text{C}$ values	$\Delta^{13}\text{C}$ values	
UDB1	Animal fat	–	–	–	Animal fat
UDR1	Animal fat and beeswax	Rum* dairy	Rum* dairy	Rum* dairy	Rum* dairy fat and plant/beeswax
UDR2	–	–	–	–	–

*ruminant



ILLUS 4 Small finds

surface is markedly keeled and has some sandy matter adhering to it (possibly from the beaker's contents). The left-hand edge and parts of the right hand edge near the distal end have been retouched (illus 4, SF 1).

PEGMATITE

An almost prismatic fragment of a rod of pegmatite heavily encrusted with biotite mica with quartz and feldspar; maximum dimension 20mm. Pegmatite forms small intrusions scattered

throughout north-east Scotland (N Trewin pers comm). The rod is 20mm long, 18mm wide and 13mm tall. The very shiny, glittering appearance of the pegmatite and its position beside the other grave goods suggest that it may have been a deliberate deposition (main plan *illus 2*).

COMPARANDA

While the occurrence of a small flint knife with a beaker is almost a British commonplace, seen from Newmill (Watkins & Shepherd 1980) to Kirkcaldy (Childe 1944), the pegmatite is an altogether rarer and more intriguing discovery. It can be most closely compared with the topaz crystal found in a cist at Clinterty, near Blackburn, Aberdeenshire (Reid 1924, 38–40). Now in Marischal Museum, registration no 14800, this is *c* 25mm long, 8mm tall and *c* 6mm wide; it is very much a rod with a diamond-shaped profile and is translucent. Topaz occurs in cavities in the Cairngorm Granite and also in pegmatite; there is no need to look outside north-east Scotland for a source (N Trewin pers comm).

It was found with an adult male skeleton (*c* 60 years old) accompanied by a tall, necked N3/step 5 beaker (Clarke 1970, no 1443, fig 661). It should be noted that the unusually large number of finds recorded from this cist may represent the addition, by purchase at a later date, of farm surface finds to the original cist assemblage (N Wilkin pers comm). Certainly, inspection of the material shows that three of the seven flints are rounded primary flakes with much greater wear than is visible on the other flints; there must also be some doubt whether the schist axe was ever part of the grave assemblage.

THE POLLEN

Althea L Davies and Richard Tipping

(Note: the report on pollen was written in 2002 before the lipid results were available.)

INTRODUCTION

Eight samples were received from several contexts within the cist. The context number

TABLE 4

Context number and inferred origin of samples assessed for pollen content

<i>Context</i>	<i>Description and interpretation</i>
5	Mid-brown silt and redeposited yellow boulder clay. Backfill of cist cut outside chamber.
8	Fine, crumbly, yellow/brown silt. Secondary silt, upper silt fill, disturbed by rodents, surrounding pot.
9	Fine sandy green/grey silt, deepest at edges. Secondary silt, upper cist fill, surrounding pot.
11	Discrete green/grey deposit within primary silt infill (Context 10) adjacent to skull.
12	Fine, gritty mid-brown silt between Context 10 and hard-packed natural. Primary silt, cist fill.
12C	As above: primary silt, central cist fill.
15	Fine black residue from inside the base of the tilted beaker; stain at an angle on base sherd on lower side, below upper pot fill of pebbles (Context 14).
16	As Context 12, silt with bone/charcoal, but from below lower side of pot. Primary silts underlying the tilted beaker.

TABLE 5

Pollen and spore types recorded in initial assessment and predominant preservation state. Note: these are not quantified and therefore can not be used for palaeoenvironmental reconstruction; provided for information only

<i>Context</i>	<i>Pollen and spore types present</i>	<i>Dominant preservation state</i>
5	<i>Cichorium intybus</i> -type (eg dandelions), Poaceae (grasses), <i>Polypodium</i> (polypody, a fern) Fungal spores, charcoal fragments	Very crumpled and corroded, with broken fragments and degraded (amorphous) grains
8	<i>Alnus glutinosa</i> (alder), <i>Betula</i> (birch), Brassicaceae (eg shepherd's purse, mustard, kale), <i>Calluna vulgaris</i> (heather), Caryophyllaceae (campions), cereal type (including <i>Hordeum</i> group – barley, aquatic and maritime grasses), <i>Cichorium intybus</i> -type, Chenopodiaceae (eg goosefoot), <i>Corylus avellana</i> (hazel), <i>Erica</i> (heath), <i>Pinus sylvestris</i> (Scots pine), Poaceae, <i>Polypodium</i> , <i>Pteropsida</i> (fern spores), <i>Sphagnum</i> (bog moss)	Crumpled, corroded
9	<i>Alnus</i> , <i>Betula</i> , Brassicaceae, Caryophyllaceae, cereal type (including <i>Hordeum</i> group), <i>Corylus</i> , Ericaceae (heaths), <i>Plantago lanceolata</i> (ribwort plantain), Poaceae, <i>Polypodium</i> , <i>Pteropsida</i> , <i>Solidago virgaurea</i> -type (eg daisies), <i>Sphagnum</i> Charcoal fragments, fungal spores	Crumpled, corroded, broken fragments
11	<i>Alnus</i> , <i>Betula</i> , Brassicaceae, <i>Cichorium intybus</i> -type, <i>Corylus</i> , <i>Erica</i> , Ericaceae, Poaceae, <i>Polypodium</i> , <i>Pteridium aquilinum</i> (bracken), <i>Pteropsida</i> , <i>Rumex</i> (dock/sorrel), <i>Solidago virgaurea</i> -type Fungal spores, charcoal fragments	Crumpled, corroded with broken and degraded grains
12	<i>Betula</i> , cereal-type, <i>Corylus</i> , Ericaceae, Poaceae, <i>Polypodium</i> , <i>Pteropsida</i> Fungal spores	Crumpled, corroded; very low numbers
12C	<i>Alnus</i> , Brassicaceae, <i>Cichorium intybus</i> -type, <i>Corylus</i> , Poaceae, <i>Polypodium</i> , <i>Pteropsida</i> Fungal spores, charcoal fragments	Crumpled, corroded, degraded
15	<i>Alnus</i> , Apiaceae (eg hogweed, cow parsley), <i>Betula</i> , Asteraceae (daisy/dandelion family), Brassicaceae, cereal-type, <i>Calluna</i> , <i>Cichorium intybus</i> -type, <i>Corylus</i> , Ericaceae, abundant <i>Filipendula</i> (meadowsweet/dropwort), <i>Plantago lanceolata</i> , Poaceae, <i>Polypodium</i> , <i>Ranunculus acris</i> -type (eg buttercups), <i>Sphagnum</i> , <i>Tilia</i> (lime) Charcoal fragments	Crumpled, corroded; highest pollen concentration of all samples
16	<i>Alnus</i> , <i>Betula</i> , <i>Calluna</i> , <i>Corylus</i> , <i>Filipendula</i> , <i>Plantago lanceolata</i> , Poaceae, <i>Pteropsida</i> , <i>Sphagnum</i> Fungal spores, charcoal fragments	Crumpled; low pollen concentrations, even of deteriorated pollen

and the excavator's interpretation of each are provided in Table 4. The samples were processed and examined to establish whether they contained pollen in sufficient quantities to

warrant further palaeoenvironmental analysis. This assessment indicated that seven contexts did contain pollen in sufficient quantities, including the beaker residue which appeared to contain

a large quantity of *Filipendula* (meadowsweet or dropwort) pollen. The results are presented below.

ASSESSMENT

One millilitre of each sample was processed using standard pollen analysis techniques (Moore et al 1991).

Results of the assessment

The results of the assessment are presented in Table 5 and details are given in the archive report.

Analysis of selected contexts

Four samples were selected for quantitative pollen analysis. All derive from contexts in or immediately around the beaker, interpreted as primary fill sediments. They were selected on the basis that they would provide pollen assemblages contemporary with the construction, use and initial infilling of the cist and establish whether the pollen content of the beaker residue is distinct from that of the primary fill sediments.

Methods

The pollen and microscopic charcoal content of each context was examined at $\times 400$ and $\times 1000$ magnification. A minimum of 300 land pollen grains (excluding spores) (total land pollen or TLP) were counted from each sample, providing a statistically acceptable indication of the pollen content. Pollen and spore types were identified using the key in Moore et al (1991) and the reference collection at the University of Stirling. Nomenclature follows Bennett (1994). The extent and type of damage were recorded for each pollen grain. The indeterminate class 'concealed' was used where minerogenic or organic matter prevented a pollen grain from being identified. Pollen values are expressed as a percentage of the TLP sum, or TLP plus group for spores and indeterminate pollen grains. The pollen

frequencies from Context 15 are also presented as a percentage of TLP minus *Filipendula*, called 15.2, to allow this assemblage to be compared with the other analyses by removing the high *Filipendula* values which decrease the other values when they are expressed as percentages. For this reason, a total of 300 land pollen grains (TLP) minus *Filipendula* were counted in Context 15 (see illus 6).

Charcoal fragments were counted on pollen slides as a measure of the extent of burning associated with the burial and/or the environment. They were identified as black, opaque and angular (Patterson et al 1987). Charcoal fragments were recorded in four size classes: 10–25 μm , 26–50 μm , 51–75 μm , and fragments larger than 75 μm , which were measured individually (cf Tipping et al 1993). Charcoal data are expressed as a percentage of TLP. A ratio of charcoal to pollen concentrations is also presented as this can help overcome the problem of spurious differences in the number of charcoal fragments caused by variations in pollen concentration.

Results of the analysis of selected contexts

The results of quantitative pollen and charcoal analysis of selected samples are presented in Table 6 and illus 5. The extent of deterioration is shown in Table 7 and illus 6.

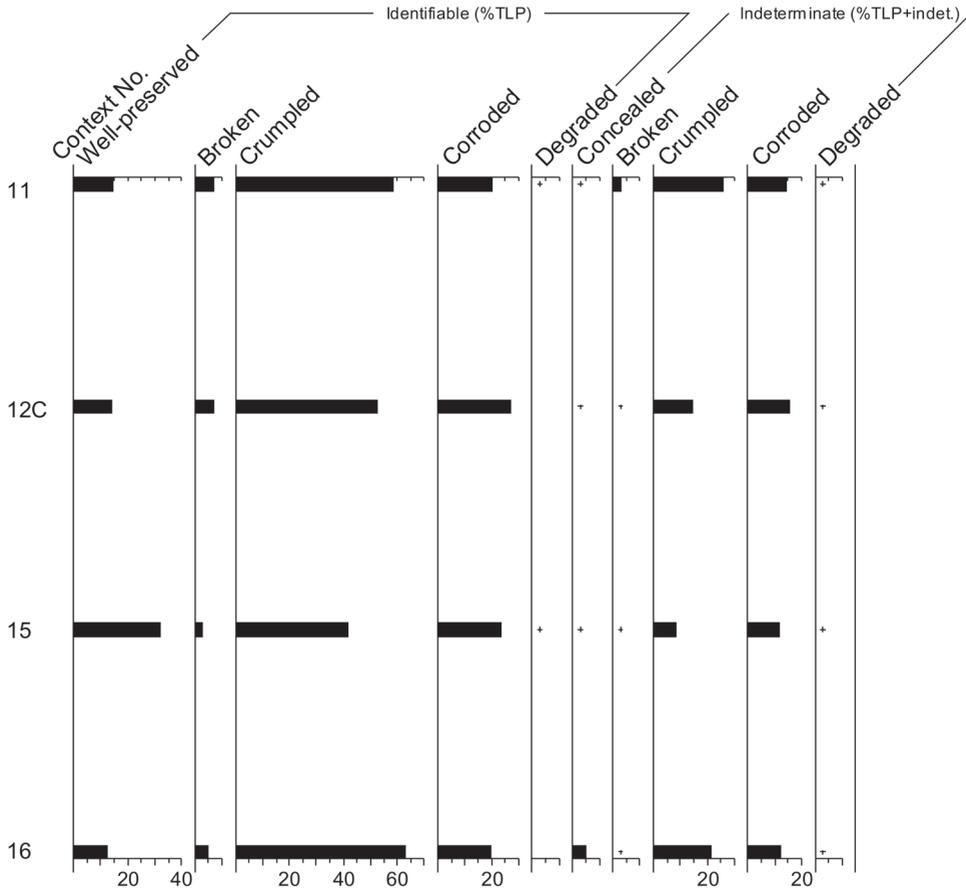
1. Post-depositional biasing

Before the pollen assemblages can be accepted as indicators of the past environment, the extent of post-depositional biasing must be assessed. This is because pollen and spores resist decay well in waterlogged and anaerobic environments, but in minerogenic sediments, such as Udney Green, they have been exposed to conditions which can selectively destroy less robust grains (Havinga 1984), thus potentially skewing the original assemblage.

A series of tests have been developed to assess the severity of post-depositional biasing in pollen assemblages from soils and

Udny Green, Aberdeenshire

Pollen preservation data
 (+ indicates <2%)



Analyst: A.L.Davies

Breakage and crumpling are caused by mechanical abrasion or compression, often associated with minerogenic sediments or reworking (Cushing 1964; Lowe 1982; Tipping 1995). Corrosion can result from chemical and microbial (fungal or bacterial) attack on the pollen wall and is often associated with aerobic conditions (Cushing 1964, 1967; Havinga 1964, 1984). Degradation is thought to be the result of long-term deterioration, oxidation, physical abrasion or compression (Cushing 1964; Lowe 1982). Degraded grains may also indicate the presence of residual soil pollen: aerobic and biologically active soils are unfavourable for pollen preservation so soil pollen assemblages may contain only the damaged, most robust remnants of the original pollen assemblage (Tipping et al 1994; Tipping 1995).

ILLUS 6 Pollen preservation data

TABLE 6

Pollen, spore and charcoal content of selected samples from Udney Green cist. The calculation sum for Context 15.2 is based on %TLP-Filipendula for comparison with values from other contexts

	Context 11	Context 12C	Context 15	Context 15.2	Context 16
Trees and shrubs subtotal (%TLP):	25.5	26.1	10.9	21.8	30.9
<i>Alnus glutinosa</i> (alder)	8.8	15.9	5.7	11.4	14.1
<i>Betula</i> (birch)	8.2	5.1	2.5	5.1	6.3
<i>Corylus avellana</i> -type (cf hazel)	7.4	3.8	2.7	5.3	9.2
<i>Fraxinus excelsior</i> (ash)	0.0	0.3	0.0	0.0	0.0
<i>Pinus sylvestris</i> (Scots pine)	0.5	1.0	0.0	0.0	1.0
<i>Salix</i> (willow)	0.3	0.0	0.0	0.0	0.0
<i>Tilia</i> (lime)	0.3	0.0	0.0	0.0	0.0
<i>Ulmus</i> (elm)	0.0	0.0	0.0	0.0	0.3
Heaths subtotal (%TLP):	7.4	6.4	3.8	7.6	8.9
<i>Calluna vulgaris</i> (heather)	7.2	3.8	2.9	5.8	7.2
<i>Empetrum nigrum</i> (crowberry)	0.3	1.0	0.1	0.3	0.0
Ericales (other heaths)	0.0	1.6	0.8	1.5	1.6
Herbs subtotal (%TLP):	67.0	67.5	85.3	70.6	60.2
Poaceae (wild grasses)	42.3	46.8	24.4	48.6	30.9
<i>Avena/Triticum</i> group (oats/wheat)	0.3	0.0	0.0	0.0	0.7
<i>Hordeum</i> group (includes barley)	1.9	0.6	0.9	1.8	1.0
Poaceae anl-D>8 µm (cereal-type)	2.4	0.6	1.6	3.3	0.3
Apiaceae (eg hogweed, cow parsley)	0.3	0.0	0.0	0.0	0.0
cf Apiaceae	0.3	0.0	0.0	0.0	0.0
<i>Astragalus danicus</i> -type (eg vetch)	0.0	0.6	0.0	0.0	0.0
Brassicaceae (eg shepherd's purse, kale)	1.3	2.5	1.1	2.3	0.7
Caryophyllaceae (eg ragged robin)	0.3	0.0	0.1	0.3	0.3
<i>Cichorium intybus</i> -type (eg dandelions)	3.2	1.9	1.0	2.0	1.0
<i>Cirsium</i> -type (thistles)	0.3	0.0	0.0	0.0	0.0
Cyperaceae (sedges)	0.0	0.0	0.1	0.3	0.7
Fabaceae (eg clovers, pea family)	1.1	0.6	0.5	1.0	0.0
<i>Filipendula</i> (meadowsweet, dropwort)	0.5	1.3	49.4	49.6	13.2
cf <i>Filipendula</i>	0.0	0.0	0.1	0.1	0.0
cf Gentianaceae (gentian family)	0.0	0.0	0.0	0.0	0.3
cf Lamiaceae (mint family)	1.1	0.0	0.0	0.0	0.0
cf <i>Papaver rhoeas</i> -type (poppies)	0.3	0.0	0.3	0.5	0.3
<i>Plantago coronopus</i> (buck's-horn plantain)	0.0	0.3	0.1	0.3	0.0
<i>Plantago lanceolata</i> (ribwort plantain)	5.3	7.3	3.6	7.1	8.6
<i>Potentilla</i> -type (eg tormentil)	0.0	0.0	0.0	0.0	0.3
<i>Ranunculus acris</i> -type (eg buttercups)	0.3	1.0	3.0	3.0	0.3
Rosaceae (rose family)	0.5	0.3	0.3	0.5	0.0
Rubiaceae (bedstraw family)	0.5	0.0	0.3	0.5	0.0
<i>Rumex acetosella</i> (sheeps' sorrel)	0.3	0.6	0.0	0.0	0.0
<i>Rumex</i> undiff. (dock, sorrel)	0.3	1.6	0.4	0.8	0.3
<i>Solidago virgaurea</i> -type (eg daisies)	4.3	1.0	0.5	1.0	1.3
<i>Stachys</i> -type (eg woundwort)	0.3	0.0	0.0	0.0	0.0
<i>Succisa pratensis</i> (devil's-bit scabious)	0.0	0.3	0.1	0.3	0.0
<i>Urtica</i> (nettles)	0.0	0.0	0.1	0.3	0.0

TABLE 6 (cont)

Pollen, spore and charcoal content of selected samples from Udney Green cist. The calculation sum for Context 15.2 is based on %TLP-*Filipendula* for comparison with values from other contexts

	Context 11	Context 12C	Context 15	Context 15.2	Context 16
Ferns and mosses (%TLP+ferns/mosses):	7.9	20.3	4.3	8.3	26.9
<i>Polypodium</i> (polypody)	1.3	1.3	0.4	0.7	1.7
<i>Pteridium aquilinum</i> (bracken)	0.8	0.8	0.5	0.9	0.3
Pteropsida (monolete) indet. (fern spores)	3.0	14.1	2.9	5.6	13.4
<i>Sphagnum</i> (bog moss)	2.8	4.0	0.5	1.0	11.6
<i>Charcoal: pollen concentration ratio</i>	2.79	15.71	1.74	1.74	8.60
<i>Charcoal fragments (%TLP):</i>	279.3	1571.3	174.1	348.4	860.2
10–25 μm	218.4	1076.1	117.1	233.7	506.3
26–50 μm	52.9	392.0	41.0	81.8	262.5
51–75 μm	6.9	84.1	14.5	28.9	62.5
>75 μm	1.1	19.1	2.0	4.1	28.9

archaeological sediments (Tipping et al 1994; Bunting & Tipping 2000; Tipping 2000a). These have been applied to the Udney Green data and the results are shown in Table 8, indicating that three of the four assemblages fail the same test; they all have relatively high frequencies of indeterminate pollen. This is due mainly to crumpling and corrosion, which also affect most of the identifiable grains (Table 7, illus 5 & 6). This reflects burial conditions in mineral sediments, exposed to the air.

The samples show no other indication of severe biasing and are therefore considered to be a reliable source of evidence for the pollen assemblage that was present around the time of cist construction and initial infilling at Udney Green. It is, however, noted that pollen concentrations in Context 15 are far higher than the other samples (see below).

2. Characteristics of the pollen assemblages

All contexts contain mostly herb pollen (>60%), with trees and shrubs contributing 10–31% and heaths 4–9% (Table 6, illus 5). Context 15 is

distinguished from the other three samples by a high frequency of *Filipendula* pollen grains (50% TLP), compared with <2% in Contexts 11 and 12C and 13% in Context 16, underlying the tilted pot. Context 15 also contains 8–25 times as much pollen as the other samples (Table 6), not only of *Filipendula*, but also of other herbs, trees, shrubs and heaths; overall, the pollen is better preserved, with fewer indeterminate grains. These features indicate a different type of preservation environment and/or pollen source. Context 15 is thus interpreted separately from the fill samples and possible reasons for this large difference in pollen concentration discussed.

INTERPRETATION

Context, pollen sources and preservation

Before examining the results, brief discussion is necessary to establish what the pollen assemblage in each context represents, that is, how they formed and the origin of sediment, since this has implications for the source and age of the pollen. The analysed samples are from

primary fill contexts, but a clear understanding of taphonomic factors is essential to establish exactly how the pollen data relate to the Bronze Age landscape.

Pollen grains may have been incorporated into primary fills on the floor of the cist when it was open, through aerial transport: this would provide pollen assemblages precisely contemporaneous with the burial. However, if the primary fill material was derived from Holocene soil being thrown or washed in when the cist was open, or if Holocene soil filtered between the cist slabs during and after capstone emplacement to form a fill, it may have contained pollen grains (residual soil pollen) pre-dating the Bronze Age. In this case, the pollen assemblage would be of mixed age and potentially uninterpretable as a coherent assemblage. In addition, it is possible for pollen grains to have been introduced after the cist was sealed through animal or insect burrowing (cf Dickson & Dickson 2000). Such taphonomic complexities emphasize the need for careful sampling strategies to establish secure relationships between archaeological contexts and palaeoenvironmental evidence (cf Long et al 1999).

The pollen in Context 15 derives from a residue within the tilted pot, thus giving some measure of protection from later sediment and pollen input, especially after it fell over. Therefore, of all the samples analysed, this is most likely to be specific to the burial context, reflecting the contents of the pot with a component from the contemporaneous Bronze Age landscape.

Contexts 11, 12C and 16 represent the earliest stages of infilling. The cist was cut into glacially-deposited till and it is possible to suggest that this was non-polleniferous due to its age (>15,000 years before present) and the unfavourable environment it provides for pollen preservation (cf Tipping 2000). However, the primary fill may also have included topsoil formed on this till and containing pollen older than the cist. Although not analysed, the presence of pollen in Context 5, the fill of the cist cut (Table 5), suggests that polleniferous topsoil was present, potentially introducing older pollen into primary fill contexts. Later disturbance by rodents could also have introduced younger pollen, although the analysed contexts are thought to be undisturbed.

TABLE 7

Pollen preservation data: extent of deterioration and frequency of indeterminate grains

	<i>Context 11</i>	<i>Context 12C</i>	<i>Context 15</i>	<i>Context 16</i>
Deterioration (%TLP):				
Well-preserved	14.4	13.7	31.3	12.5
Broken	6.6	7.0	1.8	4.9
Crumpled	58.2	25.5	45.1	62.8
Corroded	20.5	26.8	21.5	19.7
Degraded	0.3	0.0	0.3	0.0
Indeterminate grains (%TLP+indet.):				
Concealed	0.1	0.6	0.6	5.2
Broken	3.1	1.3	0.4	1.6
Crumpled	25.8	14.3	8.3	21.3
Corroded	14.4	15.2	11.8	12.0
Degraded	0.7	0.6	0.4	1.0

The presence of silt below the tilted beaker (Context 16) implies that the cist received some sediment infill before the pot fell. As discussed below, comparison of the pollen in Contexts 16 and 15 suggests that the pot tilted relatively soon after burial, perhaps caused by disturbance when the capstone was put into place, as the excavator suggests. Context 16 was thinner than other areas of primary fill (Context 10), again suggesting that this context was deposited over a shorter timescale than other primary silts, before being sealed by the tilted pot. Context 16 is thus unlikely to contain pollen much younger than the time of burial, although older soil pollen may still have been present, as indicated above.

Previous analyses of pollen assemblages in soils sealed by burial cairns and in cists suggest that soil and cist environments have different effects on pollen preservation, and this assists interpretation at Udney Green. Work on Biggar Common in the Scottish Borders suggests that older pollen assemblages in soil horizons beneath Bronze Age cairns are much depleted and are present in very reduced concentrations due to differential pollen destruction in soils (Tipping et al 1994). However, the uppermost spectra contained better preserved pollen present at much higher concentrations, and these are thought to have been deposited in the short period between turf stripping and burial, 'swamping' the residual soil pollen. Similar processes may have occurred at Udney Green. This could account for the limited range of pollen grains, consisting mainly of robust pollen or spore types, and very poor state of preservation recorded in Context 5 (Table 5). This may indicate that only a very low proportion of the original soil pollen assemblage was retained in the soils that became the primary fill of the cist. These low amounts of residual soil pollen may have been swamped by pollen grains arriving by air when the cist was open.

Within the cist, however, deterioration appears to have continued after burial: pollen concentrations are so much higher in the beaker (8–25 times high than in other contexts) that pollen has probably been lost from Contexts

11, 12C and 16 through post-depositional deterioration. This was not detected in the tests of post-depositional biasing (Table 8) and as a result they are not thought to be distorted by differential destruction. The similarities between the beaker assemblage minus *Filipendula* (labelled Context 15.2) and the other contexts suggest that this conclusion is justified (Table 6 and illus 5). This suggests that the assemblages within the sealed cist may uniformly 'fade away' over time, while conditions in the beaker provide a more favourable preservation environment.

Consequently, we infer that little pre-Bronze Age pollen remains in the primary fill sediments, that much of the pollen is contemporaneous with the construction, use and closure of the cist, and that, while some of this assemblage has been lost after the cist was sealed, the remaining pollen does reflect the burial environment.

Bronze Age environment: Contexts 11, 12C and 16

The pollen in the cist samples may derive from a variety of sources: from the deliberate deposition of plant material, for example as food, drink, floral tribute or lining (eg Tipping 1994a; Bunting et al 2001), and/or from airborne pollen. As indicated above, the Udney Green primary fill assemblages are interpreted as a contemporaneous landscape signal deriving from airborne sources.

From these data, the Bronze Age landscape appears to have been predominantly open, dominated by grasses and herbs which suggest grazing and cereal cultivation around the cist. The most common herb pollen types are *Plantago lanceolata* (ribwort plantain), *Solidago virgaurea*-type (eg, daisies), *Cichorium intybus*-type (eg dandelion, hawkweed) and Brassicaceae, a family which includes weeds (eg shepherd's purse) and cultivated vegetable crops (eg kale, cabbage, mustard). These and the other herb taxa recorded occur in grassland, particularly grazed or meadow communities (Behre 1981; 1986), notably *Rumex* (dock, sorrel), *Ranunculus*

TABLE 8

Assessment of the extent of post-depositional biasing (after Bunting & Tipping 2000). Sum = %TLP/TLP+group

<i>Test</i>	<i>Failure threshold</i>	<i>Context 11</i>	<i>Context 12C</i>	<i>Context 15</i>	<i>Context 16</i>
TLP sum	<300	376	314	788	304
Total pollen concentration (grains/cm ³)	<3000	29, 286	10, 573	336, 142	13, 292
Number of main sum taxa	<10	30	24	26	23
% degraded identifiable grains	>35%	0.3	0.0	0.3	0.0
% indeterminable	>30%	44.2	32.0	22.1	41.1
% resistant taxa	>6%	5.1	4.5	2.3	2.0
% Pteropsida (monolete) indet	>40%	3.0	14.1	2.9	13.4
Spore:pollen concentration ratio	>0.66	0.05	0.19	0.05	0.18
Spore:pollen taxa ratio	>0.66	0.13	0.17	0.015	0.17
No of tests failed		1	1	0	1

acris-type (eg buttercups), *Succisa* (scabious) and *Fabaceae* (eg clover, vetch but also peas, beans).

Cereal-type pollen is present in all samples. This includes *Hordeum* group in all analysed contexts with *Avena/Triticum* (oats/wheat) in two contexts (11 and 16). *Hordeum* group includes barley but also aquatic and maritime grasses, thus requiring caution in interpretation in relation to cereal cultivation. Cereal-type pollen is identical in shape to wild grass pollen: a spherical body with a single pore, and is distinguished only by its larger size, so measurements of grain dimensions and pore size are essential. However, the majority of large grass pollen could not be identified further due to the extent of crumpling, although pore measurements suggest *Hordeum* group. Most cereals have closed flowers, suited to self-pollination, and produce relatively large pollen grains, which do not travel far from the parent plants (Vuorela 1973; Hall 1989). This suggests that some cereals were grown in close proximity to the burial site. Macrofossil evidence indicates that oats were not grown as a crop until the Iron Age (Boyd 1988), indicating the cultivation of wheat and perhaps barley at Udney Green.

Several other pollen types may have occurred as weeds in these fields, including (for example) *Papaver rhoeas*-type (cf poppies). Brassicaceae and Fabaceae pollen could also derive from vegetables, but this cannot be confirmed.

Tree and shrub pollen types contribute a smaller part of the assemblages, indicating that little woodland cover was present near Udney Green around the time that the cist was constructed. Low frequencies of *Alnus* (alder), *Betula* (birch) and *Corylus avellana*-type (cf hazel) are recorded. All are shorter-lived, quick growing pioneer species, often associated with secondary woodland or scrub. This suggests small copses or scattered trees within the agricultural landscape, remnants of or regrowth after the loss of earlier Holocene woodland (Durno 1957). Heaths were also present, either in small numbers within the grassland or perhaps forming more distant heathland communities. The cist was thus constructed within an open agricultural landscape, not distant from the community to which the deceased individual presumably belonged.

Charcoal fragments are present in all samples, with very high values recorded in Context 12C and high frequencies in Context 16. Macroscopic

charcoal was noted in Contexts 16 and 17 and it is possible that microscopic fragments may have been scattered across the floor of the cist. The charcoal in Context 16 cannot derive from the overlying beaker because the beaker produced lower values. This indicates that the charcoal must have been present in the fill material, perhaps associated with the inhumation. It is not possible to determine the extent of charcoal burning in the surrounding landscape, as there are no data from this period around the cist.

Beaker contents: Context 15

The pollen assemblage in the beaker derives from a black residue which rested at an angle on the base of the tilted pot. It is distinguished from the three primary cist fill contexts by several features: most obviously, high values for *Filipendula*, but also high pollen concentrations and better preservation (higher values for well-preserved pollen, lower percentages of indeterminate pollen). This is also emphasized by differences in preservation quality: 55% of *Filipendula* grains are well preserved compared with only 9.3% of other pollen grains in this sample. This suggests that the *Filipendula* pollen is most likely to derive from a different source from the 'background' pollen signal in the pot, as inferred from similar results in cist floor deposits at Sketewan (Tipping 1997). These characteristics suggest the deliberate inclusion of pollen-bearing material, either as flowers or a product containing floral extracts, which produced values above what would be expected from aerial pollen rain alone.

The location and angle of the residue on the basal pot sherd suggest that it may be the remains of a liquid, in which *Filipendula* flowers formed a major component. The results from Context 16, underlying the beaker, also suggest that the pot held a liquid. It contains 13% *Filipendula* pollen, compared with values <2% in Contexts 11 and 12C, therefore possibly indicating that some of the contents of the pot leaked out onto underlying sediments as it tilted in antiquity.

DISCUSSION

The concentration of pollen in the beaker residue suggests that it contained *Filipendula* flowers or a concentrated floral extract. This contributes to a growing body of evidence for the use of this herb in burial contexts in Bronze Age Scotland (Tipping 1994a; Dickson & Dickson 2000; Tipping 2000b). The pollen can derive from meadowsweet (*Filipendula ulmaria*) or dropwort (*Filipendula vulgaris*) but most authors assume a preference for the former, which has taller heads of creamy, scented flowers and is presently more widespread than dropwort, which is restricted to calcareous grasslands. This is supported by recent analyses from a Food Vessel Urn at Sand Fiold, Orkney, where the contents included *Filipendula* pollen and the fungus *Triphragium ulmariae*, an obligate parasite of meadowsweet (Wiltshire in Dalland 1999).

The aerial parts (leaves and flowers) of meadowsweet have known practical qualities. They contain chemicals with medicinal properties similar to aspirin, still used by modern herbalists. They have also been used as general tonic and a fragrant strewing herb. Meadowsweet is known as a source of flavouring in mead and can act as a preservative in ale (Dineley & Dineley 2000). Dropwort was used for medicinal purposes in the 17th century AD, according to herbalist Nicholas Culpeper, but this required the root, not the flowers.

Several interpretations have been put forward for such Bronze Age finds, including floral tributes, cist lining, a drink such as mead with honey, ale or porridge flavoured with meadowsweet (Tipping 1994a; Dickson & Dickson 2000). In each case, interpretation is based on the whole pollen assemblage, any macroscopic remains present and the context of the sample within the burial. Each of these suggestions is now examined in relation to the evidence from Udney Green.

Much recent Bronze Age burial evidence favours the inclusion of flowers as a floral tribute or vegetation mat, in which *Filipendula* was a

frequent component (Whittington 1993; Tipping 1994a; Tipping 1997; Clark 1999; Tipping 2000b; Tipping in Dalland 1999). These examples derive mainly from cist floor sediments, often around the presumed position of the body or around skeletal remains, although this does not discount the possibility that flowers may have been placed in a beaker. The presence of normal and possibly immature *Filipendula* pollen grains has been suggested to indicate flowering heads containing both open flowers and unopened buds (Bohncke 1983; Tipping 1994a). However, no immature *Filipendula* pollen was found in the Udney Green beaker. This evidence, the position of the residue on the basal potsherd and the pollen content of Context 16 (above) all suggest that the residue is the remnant of a liquid product rather than flowers.

The beaker residue from Udney Green is similar in palynological characteristics to that from North Mains, near Perth, which also had high frequencies of *Filipendula* and low values for cereal-type pollen, a combination interpreted as evidence of a fermented cereal-based ale or food (Bohncke 1983). However, at Udney Green the other analysed contexts contain similar cereal-type pollen values to the pot residue (Table 6, illus 6). This suggests that cereal-based products may not necessarily have been added, although it is unclear whether cleaned and processed grain would contain much cereal pollen.

Honey is another potential liquid floral product containing pollen, which could have been present either alone or as a flavouring, in mead for example (or in milk as suggested by the lipid analysis). There is some debate as to whether *Filipendula* is a common constituent of honey (compare Tipping 1994a; Dickson & Dickson 2000). Whether or not this is or was the case, pollen from insect-pollinated species often found in honey (eg Fabaceae, Lamiaceae) are no more frequent in the Udney Green pot than in surrounding contexts. This contrasts with the beaker from Ashgrove, in Fife, where *Tilia* (lime) pollen was abundant (Dickson 1978), and there is similar evidence

for honey from bronze vessels at an Iron Age site in Germany (Rosch 1999). As there is no evidence for elevated pollen values associated with other ingredients in the Udney Green beaker, it is possible that there were no other components, although this inference is based on an absence of evidence. It should be noted that a trace of possible beeswax was identified in the lipid analysis of Context 16 which might indicate the presence of honey.

In conclusion, the beaker contains no evidence for enhanced pollen values associated with any plant other than *Filipendula*. The position of the residue and presence of *Filipendula* pollen in the primary fill below the pot suggest the remnant of a liquid product based on or flavoured with mature, open *Filipendula* flowers, rather than a posy of flowers which could be expected to contain both mature and immature pollen.

It is important to recognize that the Udney Green cist appears to have been constructed within a farmed landscape, not on less productive areas, such as heathland, distant from the living community. In regional terms, the Bronze Age was a period of agricultural expansion, as evident at the nearest dated pollen sites in the Grampian foothills (Edwards & Rowntree 1980). Grazing, arable activity and burial at Udney Green can thus be seen as part of a wider agricultural landscape in which, locally at least, little of the original birch, hazel and oak woodland cover (Tipping 1994b) remained. This is not an isolated occurrence, as there is similar evidence for the placement of Bronze Age burials on open, productive agricultural ground at Linga Field, Mainland Orkney (Bunting et al 2001) and on Biggar Common, Scottish Borders (Tipping et al 1994), for example.

FINAL DISCUSSION

The Udney Green cist is notable both for extending the known use of meadowsweet in Early Bronze Age graves north from Perthshire and Fife and

for presenting a distinctly earlier context for its use than has been seen before (at least in terms of pottery typology). The debate as to whether honey or a flavoured drink had been present in the beaker remains open (Dickson & Dickson 2000, 78–84). The absence at Udney of any macrofossil evidence of the strewing of scented flowers in the grave (as seen at Ashgrove, Fife; *ibid*) concentrates attention on the contents of the beaker. The lipids report contradicts the (absence of) evidence for honey from the pollen data (A Davies & Richard Tipping pers comm), although there is none of the intrusive or exotic lime pollen that permitted honey to be identified at Ashgrove, nor is there any elevated amount of pollen of insect-pollinated plants.

Case (1995, 63) has considered the various uses to which beakers could have been put to use as containers and concluded that shape is not a definitive indicator. However, the radiocarbon date and the typological similarity of the Udney Green beaker to that from Sandhole, Fetterangus (itself with a date of 3845 ± 32 BP; 2430–2200 cal BC at one sigma; 2460–2200 cal BC at two sigma) (Sheridan 2007) is significant in permitting the view that this burial took place in the early stages of beaker settlement in the north-east. However, this does not advance the general debate on the origins of beaker pottery (eg Case 2004).

LOCATION OF FINDS

The finds and skeletal material were allocated, through the Treasure Trove system, to Marischal Museum, University of Aberdeen (registration numbers: ABDUA 56000 – beaker; ABDUA 56001 – skeletal remains; ABDUA 56002 – flint knife; ABDUA 56003 – pegmatite).

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