Margarita Gleba, Elizabeth M. Foulds, Al Teasdale and Hannah Russ

First Identification of Club Moss Use in Roman Britain

Abstract
Archaeological works undertaken as part of Highways England's A1 road improvement scheme between Leeming Bar and Barton encountered a large rural Roman cemetery at Bainesse, near Catterick in North Yorkshire, United Kingdom. A copper-alloy bead was found to contain preserved string formed of two strands of an organic material twisted together in one of more than 200 burials. Scanning electron microscopy analysis suggests that the string was made of a club moss or a related species of fibre. This discovery further widens the repertoire of indigenous plant species used in Roman Britain for the production of textiles and emphasises the importance of fibre identification even of small organic remains.

Introduction
Archaeological works undertaken by Northern Archaeological Associates (NAA) as part of Highways England's A1 Road Improvement Scheme between Leeming Bar and Barton encountered human remains within the scheduled monument at Bainesse, near Catterick in North Yorkshire (fig. 1a-b). Excavations revealed over 200 burials, forming one of the largest rural Roman cemeteries known in Britain, which included sequences of intercutting inhumations and cremations (NAA 2015). The cemetery and contemporary settlement at Bainesse was located along a major north-south Roman roadway, known today as: Dere Street. Approximately 2.2 km to the north-west of Bainesse lay *Cataractonium*, a Roman fort and small town, which is of national importance due to its size and location in the north of Britain. The recent excavations by NAA have thrown new light on understanding not only the relationship between Bainesse and *Cataractonium*, but also on the character of Roman life in the frontier.
In total, 255 burials including cremations and inhumations were excavated at Bainesse, some of which contained grave goods including complete ceramic vessels and objects of personal adornment. Based on burial practices and grave goods, it is clear that the main period of use for the cemetery spanned the Roman period (AD 43-410), with continuation at least into the early post-Roman period as evidenced by two radiocarbon dates on human remains recovered from the site during previous excavations (Speed 2008, 7; Speed *pers. comm.* cal AD 428-618 (2σ; 1515±35 BP SUERC-20369) and cal AD 400-550 (2σ; 1585±35 BP SUERC-39626) calibrated with OxCal 4.2 using IntCal 13 (Reimer et al. 2013)). A full program of radiocarbon dating is pending in order to establish when the cemetery first came into use and for how long it served as a location for internment of the dead.

Context
During excavation of burial 203 (fig. 1c) an assemblage of three copper-alloy beads and a poorly preserved copper-alloy object (RF11325) later identified as a possible phallic pendant (Alex Croom *pers. comm.*, 2017) were recovered from a discrete deposit that had been placed on top of the grave, representing a separate, and possibly later, feature. One copper-alloy bead was found to contain a preserved 'string', which was formed of two z-twisted strands of an organic material loosely S-plied (fig. 2). The grave cut of burial 203 was small (L: >0.95 m, W: 0.65 m, D: 0.37 m), which suggests that it may have been a child's burial, although it contained no skeletal evidence. Across the site, there was a varying range of

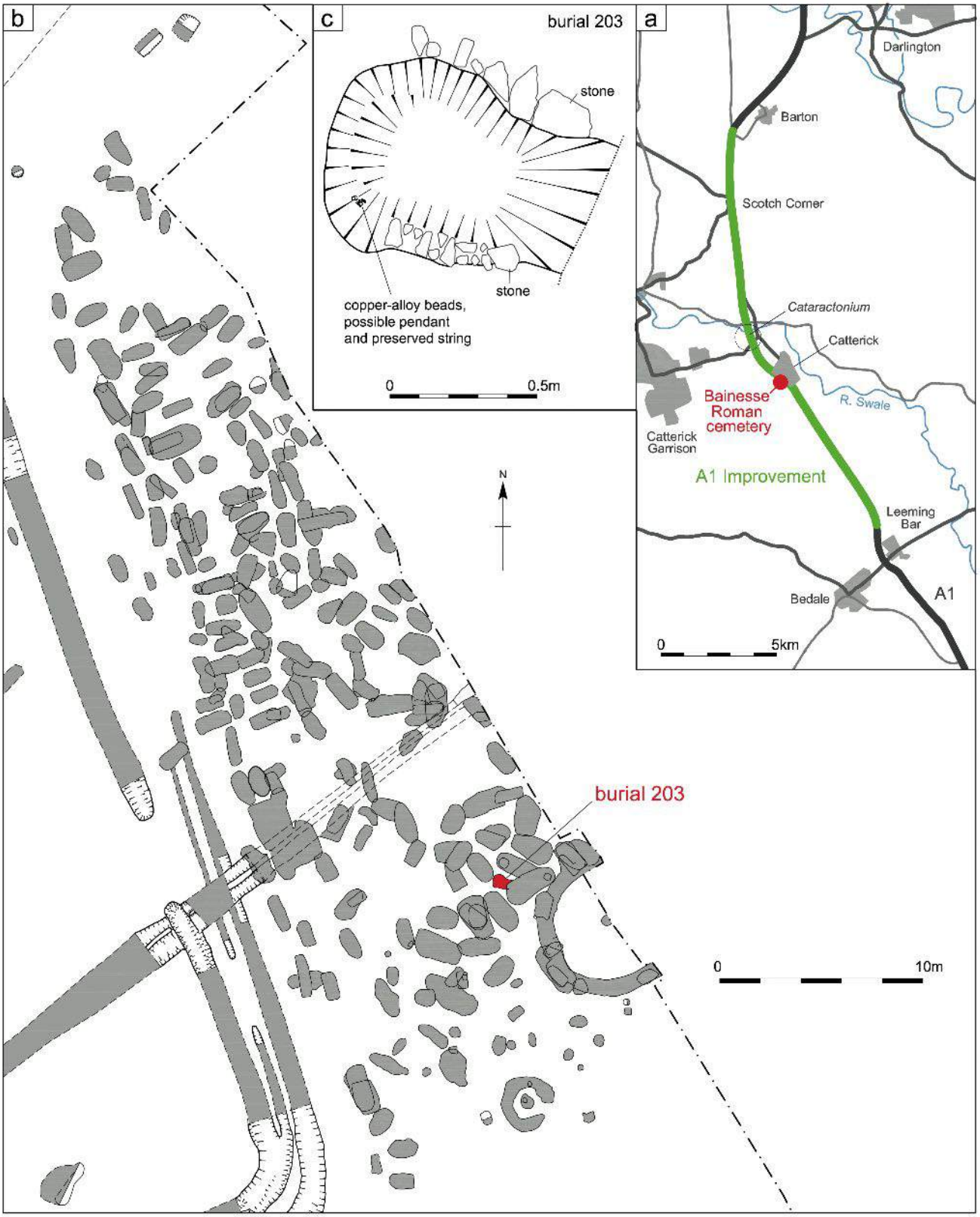

Fig. 1. a) Location of Bainesse Roman cemetery on the A1 improvement scheme. b) Plan of of the cemetery, with burial 203 location indicated. c) Plan of burial 203 (Image: © Northern Archaeological Associates).

Fig. 2. a) Three copper-alloy beads and a copper-alloy pendant in situ. b) Preserved string in situ with copper-alloy bead. c) Copper-alloy bead after conservation. d) Preserved string after conservation (Images: © Northern Archaeological Associates).

preservation from no skeletal remains to complete skeletons in very good condition. Although burial 203 cannot be dated directly, human remains from burial 202, which cut into burial 203, produced a radiocarbon date of cal AD 85-234 (2σ; 1852±29 BP SUERC-73007). This suggests that burial 203 could be as late as the early 3rd century AD, although it is not entirely clear how the copper-alloy assemblage with the organic string related to the inhumation. It is possible that they were added later.

The 'string'

A sub-sample of the string was submitted for identification and analysis using a scanning electron microscope (SEM) at the McDonald Institute for Archaeological Research, University of Cambridge, to determine the morphological characteristics of the fibre and to acquire more detailed surface information for fibre identification. The fibres were examined longitudinally for morphological features, which were compared with the author's (MG) reference collection

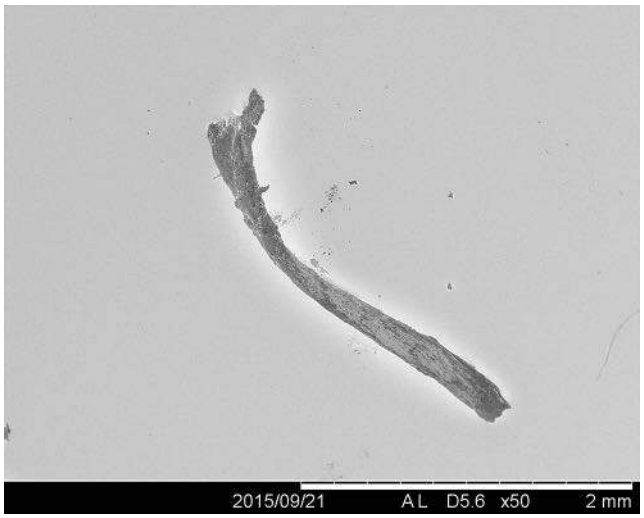

Fig. 3. SEMicrograph of the sample showing the stem (Image: Margarita Gleba).

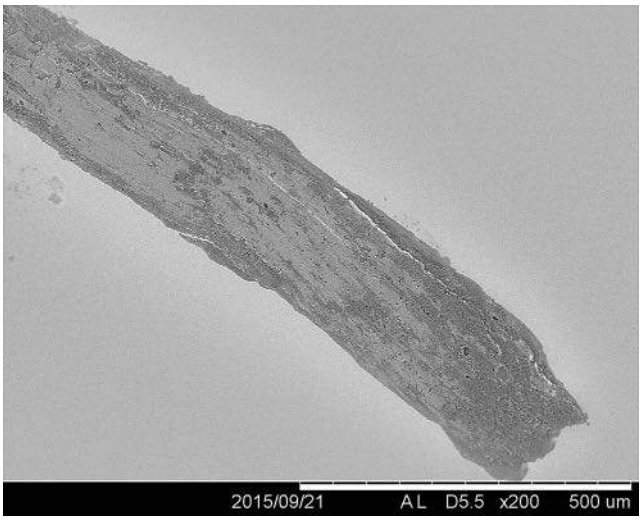

Fig. 4. SEMicrograph of a stem with a woody appearance, longitudinal splits and thickenings where leaves may have attached (Image: Margarita Gleba).

of plant, animal, and synthetic fibres. The reference collection includes processed and unprocessed fibres from plants and animals expected for the prehistoric (flax, nettle, various types of tree bast, sheep wool, goat hair, horse hair) and later periods (cotton, hemp, silk, ramie, camel hair, yak hair), as well as hair moss (*Polytrichum commune*), running or stagshorn club moss (*Lycopodium clavatum*), and cotton grass (*Eriophorum angustifolium*).

The sample fragments did not show the characteristic knee-joint dislocations of plant bast fibres, such as flax, hemp, or nettle (Catling & Grayson 1982). Instead, they had a woody appearance and occasional slight thickenings and splittings along the surface of the stem (figs. 3-4). The surface showed parallel grooves (fig. 5). In one area, a feature resembling a stoma was present (fig. 6). The diameters of these fibres were between 100-200 microns, which is significantly greater than any typical bast fibre (mostly well under 50 microns). The closest parallel in the reference collection in terms of all these characteristics is the stripped stem of running or stagshorn club moss (*Lycopodium clavatum*), which has a woody stem, grooves on the surface, splitting and frequent thickenings along the stem where the leaves were attached before their removal, and frequent stomata on the stem (figs. 7-8). The fibre analysis thus indicated that the sample may have derived from a type of club moss or similar plant species.

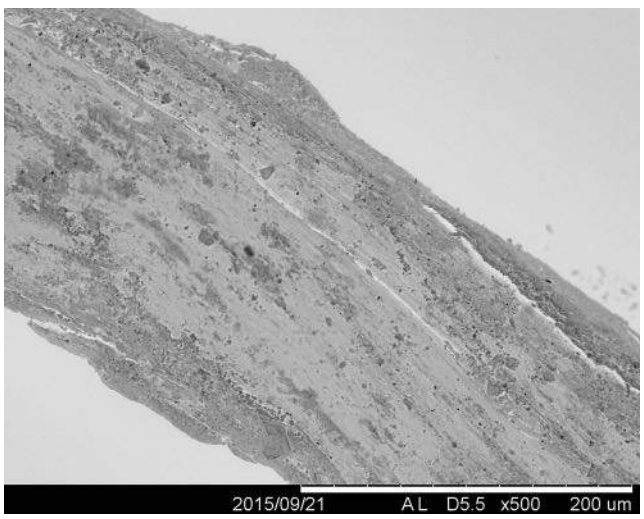

Fig. 5. SEMicrograph showing the thickenings and splits along the stem (Image: Margarita Gleba).

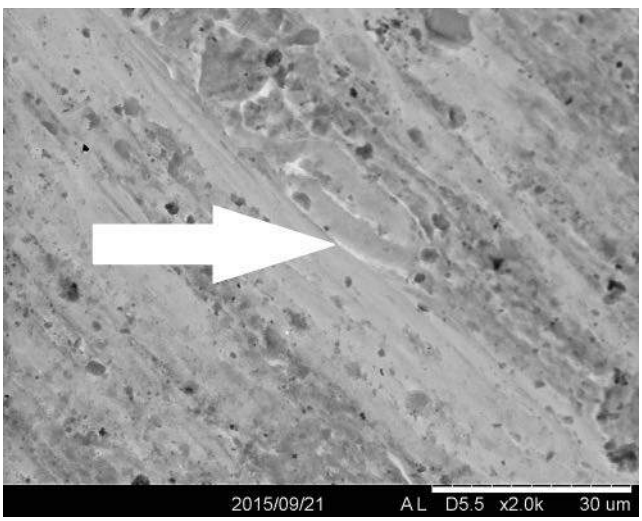

Fig. 6. SEMicrograph of a stoma-like feature (Image: Margarita Gleba).

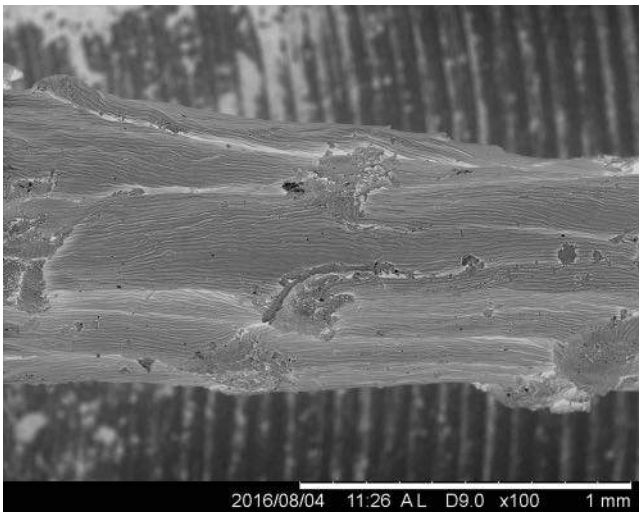

Fig. 7. SEMicrograph of a stripped stem of running or stagshorn club moss (*Lycopodium clavatum*) (Image: Margarita Gleba).

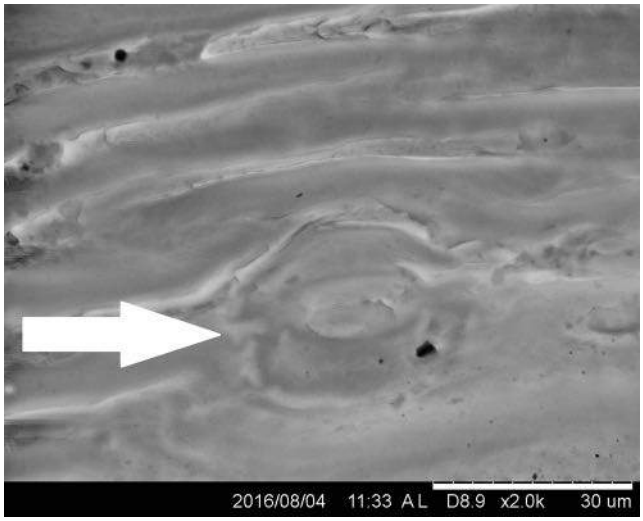

Fig. 8. SEMicrograph of stoma present on club moss (*Lycopodium clavatum*) stem (Image: Margarita Gleba).

Club mosses can have very long stems (runners), which are strong and relatively flexible. There are three species of *Lycopodium* that are native to Britain (*L. clavatum*, *L. annotinum,* and *L. lagopus*), as well as several others in related genera (http://www.ferns.rogergolding.co.uk/ferngenus/lycopodium.html). The club moss fibre reference samples have diameters (stem without leaves) of 450-850 microns. The smaller diameter of the sample may, however, be explained by the following: 1) a younger plant with smaller diameter may have been used; 2) diameter of a single club moss stem is uneven along its length and the sample may come from a section closer to the 'tip' where it is generally thinner; 3) shrinkage due to preservation conditions; 4) a different species of club moss with similar characteristics, but thinner stem, was used.

Although club moss has not, to our knowledge, been identified in archaeological contexts before, its use for medicinal purposes, in dyeing, and as a decorative item is well known from ethnography and modern use. *Lycopodium clavatum* is, for example, still used to decorate traditional Easter egg baskets in Lithuania. Its long and flexible runners, once defoliated, can easily be used as ready-made 'string' for a variety of purposes – as in the case of our Roman beads and possible pendant. The use of a wide variety of indigenous plant fibres in everyday life should not surprise us, as in addition to the more common species (e. g. flax, nettle, and hemp), hair moss string and basketry items have been identified in several prehistoric and Roman contexts in the British Isles (Harris & Gleba 2015).

The beads

The three copper-alloy beads (RF 11319, RF 11320, RF 11321) were barrel shaped and measured approximately 13 mm in diameter, 11 mm in height, and had a perforation about 9 mm in diameter (fig. 2). One of the beads (RF 11320), which was found with the fibre fragment still threaded through the perforation, was slightly flattened and broken. Given the good state of the other two beads, it seemed likely that the damage occurred in antiquity.

It is unclear how copper-alloy beads were used in Roman Britain. They are generally considered rare finds at Roman sites. Previous excavations at Catterick unearthed a number of copper-alloy beads, which Cool (2002, 27) noted as being 'remarkable' when compared to the numbers found at other sites. These beads were a mixture of the long facetted tubular type, as well as examples that were globular and barrel shaped, which are similar to the three from burial 203. However, none of these were found in burial contexts, but instead came primarily from later phases at Sites 433, 434, and non-inhumation contexts at Site 46 (Wilson 2002, 52, 109). Of particular note was cat. no. 90 (Wilson 2002, fig. 246), which recorded three globular copper-alloy beads of a similar size to the Bainesse examples, and one contained a fragment of leather thong.

Association between the beads and possible pendant (RF 11323) is interesting, as it is not only rare to find so many copper-alloy beads deposited together, but it is also rare to find beads associated with a pendant. If it is in-fact a phallic amulet, then association with beads is even more unusual. It is not clear how such amulets were worn, or how they were suspended. Greep

(1983, 139) remarked that fist and phallus amulets would have been worn individually and they were not a component of more complex necklaces; however, Parker's (2015) re-assessment of a group of five phallic pendants from a burial at Catterick suggested that this may not always be the case. There were several types of Roman phallic pendants and they are generally thought to have been worn for amuletic, apotropaic, general good luck/protection purposes, and sometimes associated with child burials and/or sites with military activity (Crummy 2010, 51). Although no skeletal material was recovered from burial 203, it is possible that the small grave cut represented a child's inhumation and that the amulet was a later addition.
Alternatively, if the pendant was not of a phallic nature, it remains unlikely that the beads were used on necklaces, which are often associated with female Roman dress (cf. jet necklace at Catterick (Cool 2002, 28; Isaac & Thompson 2002, 177, Plate 100)). These necklaces were composed primarily of glass and sometimes mixed with jet beads, although other exotic materials were used, including semi-precious stones, coral, or amber. In contrast, the association of copper-alloy beads with military sites has been highlighted and discussed (Mould 1991, 194). The inclusion of the possible pendant with the beads in burial 203, suggests that they may have been used together as decoration on military equipment.

Discussion

It is not common for organic fibres to be preserved in non-waterlogged archaeological contexts. However, organic materials are known to survive for long periods as a result of their proximity to metal artefacts and their corrosion products (e. g. Janaway & Scott 1989). Archaeological examples from the region include the flax or hemp textiles preserved due to proximity to copper-alloy brooches in the female Viking burial at Aldwick-le-Street, South Yorkshire (Speed & Walton Rogers 2004), and wool twill preserved in association with copper-alloy brooches and buckles in Anglo-Saxon graves at Scorton in North Yorkshire (ASUD 2002; Jones 2004; Walton Rogers 2004). This also appears to be the case for the string recovered from burial 203 at Bainesse Roman cemetery. Here, the corrosion product from one of the copper-alloy beads facilitated the survival of the organic string, from which, presumably, the bead(s) and the possible pendant once hung. This find also highlights the necessity for examining fibre samples under high powered magnification (e.g. SEM), as such techniques permit a more robust method for identification.
The survival of this short piece of string informs us further about the use of natural plant resources during the Roman period and about string technology in Roman Britain. While many examples of preserved textiles have been recovered from Roman deposits elsewhere in the Roman Empire, string and textiles produced using club moss have not been recovered outside of Britain, despite it being likely that the plant grew on the European continent during the Roman period, and thus was an available resource. Nonetheless, archaeological finds from Britain suggest that various types of moss were a utilised resource in the prehistoric periods. A rope made of hair moss (*Polytrichum commune*) was found on North Ferriby Boat No. 3 (Wright & Churchill 1965, 5). Other types of moss wadding (*Neckera complanata*, *Eurhynchium striata*) were used as caulking on this same boat. There is evidence for the continued use of moss in the Roman period from two moss caps (*Polytrichum commune*), both found in northern Britain. The cap from *Vindolanda* Roman fort was dated to AD 97-103, while the Newstead Roman fort example was dated to *c.* AD 86. Although these examples are different species of moss compared to the Bainesse string, it perhaps suggests that the use of different types of moss as a resource more generally had its origins in local prehistoric tradition, one that continued into the Roman period in Britain, rather than being an idea or items brought to Britain.
The post-excavation works on remains recovered during archaeological excavations at the cemetery are still in progress, with publication expected in 2018.

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Corresponding author:
ef@naaheritage.com