Botanical Remains from Healaugh A, Swaledale

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With contributions by:
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The Site

This report presents the results of the analysis of 17 sediment samples collected during the 1988-1990 excavations at Healaugh A, Swaledale. The site is located at approximately SE 020 993, some 300m ENE of Healaugh, at an altitude of ca. 250m. It represents a small Romano-British settlement, consisting of a group of house platforms enclosed within a bank and wall, with an entrance on the south (downhill side), approached by a hollow-way. One of these house platforms was excavated by Dr. Andrew Fleming (then University of Sheffield) and Mr Tim Laurie (SWAAG). The site was never fully published, but three interim reports are available (Fleming and Laurie 1988, 1989, 1990), and the site is described in Fleming 1998 (pp 149-153). See also SWAAG ID 1000 on the Swaledale and Arkengarthdale Archaeology Group (SWAAG) website:
https://swaag.org/DB_VIEW_in_Pages.php?start=11&p_f=0

Three phases of construction were identified, with the earliest consisting of a timber-built round house, which was superseded by a stone-built circular house with a 6m internal diameter. It had a well-made stone wall and a paved floor, and an entrance on the east side. This was later converted into an oval shaped house (for illustrations, see publications given above). The finds were never published, but the interim reports mention the presence of some small amount of pottery from the two stone-built phases, mostly 2nd century AD, including a few scraps of Samian, and a handle and parts of an amphora (identified at the time by Prof. Keith Branigan, Sheffield University). The SWAAG website also mentions the presence of some native 'Brigantian' pottery from the 'pit' feature, a fragment of a D section opaque white glass bangle, a bronze split finger ring, several beehive querns and a saddle quern, the latter reused in the paving of one of the stone-built houses. To this can now be added two hobnails, recovered from one of the samples, see below. The timber-built roundhouse is thought to be pre-Roman, i.e. mid-late Iron Age, and the stone-built phases Romano-British in date.

No information is available about the contexts that were sampled and, consequently, it is not known whether the samples discussed here came from all three phases or from just the two stone-built phases of construction.

Personnel

Sorting of the samples was carried out by Ruth Pelling and Marijke Van der Veen; identification of the seeds by Marijke Van der Veen; identification of the charcoal by Lorne Elliott and Charlotte O'Brien; photography of amorphous charred fragments by Ruth Pelling; identification of animal bone fragments by Richard Thomas, and the hobnails and small fragments of 'industrial' waste by Jeremy Taylor.

Archive
The samples will be archived in the Dales Countryside Museum, Station Yard, Burtersett Road, Hawes, North Yorkshire DL8 3NT. Switchboard: 0300 456 0030. www.yorkshiredales.org.uk

Methods
The methods used in the various analyses are given below, in the relevant appendices.

Summary of Results
The samples produced a small assemblage of charred plant remains and fuel debris, probably representing domestic hearth waste sweepings. Two cereal crops were identified: spelt wheat and six-row hulled barley. Both grains and chaff fragments were recovered, and the assemblage suggests that the inhabitants of the settlement were engaged in cereal cultivation, probably just for their own use. Spelt wheat and barley are the typical crops of later Iron Age and Roman period sites in the north of England, and in England more widely. Charred hazelnut shells and two fragments of a possible sloe stone suggest that the residents of the site supplemented their diet with some gathered foods from the wild. The charcoal identifications indicate that a variety of local trees were exploited for construction and fuel, including birch, hazel, alder, the willow family and the subfamily of the Maloideae, which includes apple and hawthorn. In addition, the heavy residue of one context [342] was found to contain a complete hobnail and fragments of another. The flots contain numerous small amorphous charred fragments, sometimes referred to as semi-vitrified fuel waste (SVFW). The data are presented in Appendix 1 (context information), Appendix 2 (seeds), Appendix 3 (charcoal) and Appendix 4 (photos of semi-vitrified fuel waste).

Material for radiocarbon dating is available. The fragments of hazelnut shell are probably the best material for dating (esp. contexts [342], [373], [416], [428] and the context just labelled [soil at base of wall]). The cereal grains are poorly preserved and may not yield sufficient carbon. The suitability of the charcoal samples is ranked in Appendix 3.

Results – seeds
Four different food plants have been recovered: two cereals and two wild fruits/nuts. The total number of identifications of these, based on 17 samples, is as follows:

Spelt wheat, grains	5
Spelt wheat, glumebases	29
Spelt wheat, rachis segments	2
Wheat, not further identifiable, grains	8
Wheat, not further identifiable, glumebases	8
Wheat, not further identifiable, rachis segments	2
Six-row hulled barley, grains	28
Barley, probably six-row hulled, grains	3
Barley, prob. six-row hulled, rachis segments	3
Cereal grains, not further identifiable	52
Hazelnut, shell fragments	72
Sloe (probably), fruitstone fragments	6

The two cereals are spelt wheat (*Triticum spelta*) and six-row hulled barley (*Hordeum vulgare*). The wheat grains are poorly preserved and only a few could be identified to species; the others were identified as 'wheat' (*Triticum* sp.). But the presence of fragments of chaff (both glumebases and rachis segments) made clear we are dealing with spelt wheat, as the venation pattern on most of the glumes (one prominent vein and several strong secondary veins) is typical of spelt wheat. None of the glumebases could be identified as belonging to emmer wheat (*Triticum dicoccum*). Spelt wheat is a so-called hulled or glumewheat, meaning that the chaff surrounding the grains (the glumes) does not break off during threshing; the grains remain enclosed in their spikelets (unlike the bread wheat grown today, which is a so-called free-threshing wheat). This means that after threshing and winnowing the spikelets need to be pounded to release the grains from the chaff. The chaff (glumes, glumebases and rachis segments) is subsequently often used as a form of casual fuel or tinder, hence frequently being present, often in numbers, in any fuel waste, while the wheat grains, intended for human consumption, are recovered much less frequently.

The barley grains are also poorly preserved; in fact, most of the cereal grains could not be identified further than Cerealia indet., cereal grain. Some of the barley grains show evidence of ridges on the dorsal surface, a slightly angular cross-section and fragments of the hulls, all characteristic of hulled barley. And several grains are slightly twisted, suggesting they represent lateral grains, typical of six-row barley. These two features combined suggests that the grains belong to six-row hulled barley, *Hordeum vulgare*. In this case there are more grains than chaff fragments. Barley is a free-threshing grain, and the chaff (rachis segments) are removed during threshing and winnowing. Both these crop processing activities tend to take place away from domestic fires, and, consequently, the chaff of free-threshing cereals is usually under-represented in the fuel waste of the archaeological record.

Both spelt wheat and six-row hulled barley are commonly found in late Iron Age, Romano-British and Roman sites in northern England, such as at Hagg Farm and West Hagg Site 103, both in Swaledale, at various sites in Nidderdale, and more widely in the northeast (Archaeological Services 2013, 2014, 2017, 2018, 2020, 2022; Hall and Huntley 2007; Van der Veen 1992).

Two other food plants are halzelnut (*Corylus avellana*) and sloe (*Prunus* cf. *spinosa*), though this latter identification is tentative only. Both fruits could have been gathered in the vicinity of the settlement. Note that the tables give the number of fragments found; these do not amount to more than one hazelnut or sloe in each sample.

A small number of seeds of wild plants are present, including fat hen, goosefoots, grasses (incl. brome grass), docks, orache, sheep's sorrel, scentless mayweed, and ragged robin. These are most likely ruderal plants and weeds of the cereal crops that were accidentally harvested with the crops, and were discarded into domestic fires, possibly at the same time as the cereal chaff. While sheep's sorrel tends to prefer rather acid soils, and ragged robin damp soils, the goosefoots, orache and scentless mayweed are usually found on well-drained soils, rich in nitrogen. There are too few seeds to carry out any detailed ecological analyses.

The assemblage is very small, just 308 identifications from 17 samples (though two samples contained no seeds). The density of plant remains in the samples is very low, on average just 1.4 fragments per litre of sieved sediment, with just one context, [395], having 9 items per litre. This suggests that little domestic refuse entered the contexts that were sampled. This may be because few pits or postholes were sampled, the material in several cases deriving from sediments found in between the paving stones, i.e. not in contexts usually regarded receptacles for quantities of domestic waste (pits, postholes, ditches). Additionally, only one house platform was excavated, and cereal processing and food preparation might have been carried out in a different building or in different part of the settlement. The density of plant remains deposited can sometimes be used to

assess the scale of arable production (Van der Veen and Jones 2007). If the samples available for analysis can be assumed to be typical for the wider settlement – and we do not know this for certain – then the residents probably produced cereals for their own consumption only. Other sites in the region have shown similar low deposition rates. There can, however, be little doubt that the people living at Healaugh A were growing their own cereal crops.

Results – Charcoal

Pieces of charcoal were found in most samples. The larger fragments (>4mm) from seven samples were selected for identification, see details in the report by Lorne Elliott and Charlotte O'Brien in Appendix 3. Eight different tree species could be identified, plus one fragment of heather and one piece of bark. Birch and hazel are the most frequently represented, followed by alder and members of the Salicaceae family. This family includes willow, poplar and aspen, but the fragments found here are probably willow based on the predominance of heterogeneous rays. The Maloideae is a subfamily of the rose family. The pieces found here might represent hawthorn, and one piece might be apple. Ash and oak are rare, while the *Prunus* sp. piece may possibly be from bird cherry (*Prunus* cf. *padus*).

All these trees could have grown in the vicinity of the site and may have been used in the construction of houses, barns, and fences, as well as for fuel. A similar range of taxa was found at West Hagg Site 103 and Hagg Farm, both in Swaledale, and at several Nidderdale sites (Archaeological services 2013, 2014, 2017, 2018, 2019, 2020, 2022). The assemblage is typical for domestic fuel waste. The charcoal evidence suggests that a diverse range of trees and shrubs was still growing in the vicinity of the settlement during the later Iron Age and early/mid Roman period.

Context	342	373	395	416	423	428	base wall	**Total**
Birch (*Betula* sp.)	.	15	2	5	1	2	10	**35**
Hazel (*Corylus avellana*)	.	3	13	.	.	4	8	**28**
Alder (*Alnus glutinosa*)	15	.	.	.	2	.	.	**17**
Salicaceae (willow, poplar)	.	.	9	.	.	1	.	**10**
Maloideae (hawthorn, apple)	.	.	1	1	2	.	1	**5**
Ash (*Fraxinus excelsior*)	1	.	2	.	.	.	1	**4**
Oak (*Quercus* sp.)	.	.	1	.	.	1	.	**2**
Prunus sp. (cf. bird cherry)	.	.	.	.	1	.	.	**1**
Heather (*Calluna vulgaris*)	.	.	1	.	.	.	.	**1**
Bark	.	.	.	.	.	.	1	**1**
TOTAL	**16**	**18**	**29**	**6**	**6**	**8**	**21**	**104**

Results – Semi-vitrified fuel waste

The samples contain many very small pieces of amorphous charred material, which may represent some amalgamated fuel waste. Some of the fragments appear to show evidence of stem fragments or fibres and some appear to be semi-vitrified. Such fragments have also been found at other sites in northern England (Jacqui Huntley and Charlotte O'Brien, pers. comm.). It has, to date, not been possible to identify the exact origin of this material. It would appear to include organic material, and possibly some resinous wood or green wood fuel, amongst other things, but other possibilities cannot be ruled out at this stage. In the tables these fragments are labelled SVFW, semi-vitrified fuel waste. Photos of some of the fragments are given in Appendix 4.

Results – Animal bone

Some animal bone is present, and these identifications are courtesy of Richard Thomas. Four contexts ([406], [416], [423], and [base of wall]) contain a few incisors and molars of a vole (possibly cf. *Arvicula terrestris*). These are very likely intrusive and not part of the archaeological assemblage; voles tend to burrow. Context [423] has a fragment of a deciduous incisor of sheep/goat, and context (373) contains an adult molar of sheep/goat, probably from a young individual. Finally, tiny fragments of calcined and/or burnt bone were found in the following contexts: [217], [342], [346], [373], [395], [405], [406], [416], [423], [424], [428, and [base of wall]. Bones are frequently present in manure heaps and rubbish heaps and burning of these would result in these calcined fragments.

Results – Industrial waste

A tiny piece of copper alloy was present in [424]. Several contexts contain tiny fragments of 'industrial' waste, such as hammer scale in [395], and slag in [342], [346], [373], [424], [406] and [428]. Very small and abraded pieces of pottery were found in [373] and [416]; none of these were diagnostic.

Results – Hobnails

A remarkable find is that of one complete and one fragmented hobnail in the heavy residue of context [342] (Fig. 1). Hobnails were and are used in the soles of shoes to reinforce them. They are usually associated with the sandals and boots of Roman soldiers (*caligae* and *calcei*), but they have also been found on civilian sites, especially in burial contexts from the mid-Roman period onwards (Jeremy Taylor, pers. comm.).

Fig. 1. Hobnails. One complete and one fragmented hobnail, recovered from context [342]. (Photos: Toby Savage).

Discussion

This assemblage of botanical remains from Healaugh A offers information about life in Swaledale during the later Iron Age and early/mid Roman period. The inhabitants of the settlement were engaged in the cultivation of spelt wheat and six-row hulled barley, the two crops found widely in the region during this time. Spelt wheat would have been intended for human consumption, while barley could have been used for both human and animal consumption. Animal husbandry may have formed an important part of the rural economy at the settlement, but no bone assemblage was recovered, probably due to the poor preservation of bones in the sediments, though tiny fragments of sheep teeth and bone were recovered from the samples.

The limited size of the charred plant assemblage, derived from just 17 samples of one house platform, makes it difficult to go beyond a basic description of the data, but as assemblages from nearby sites in Swaledale and Nidderdale have similar data sets, we may assume that the material is representative for the wider settlement. Little is known about the exact contexts from which the samples derived, but several are thought to be from the sediments found in between the floor slabs of the stone-built house, hence the small size of the samples (40-60 litres would normally be the recommended sample size; English Heritage 2011). Few deep features with rubbish accumulations were available within the excavated area.

Pollen evidence for northern England has highlighted that an expansion of agricultural activities and the consequent clearance of woodland took place during the Iron Age and continued well into the Roman period (Huntley 2010). Fleming (1998) mention that pollen analysis was conducted on a 6 feet section of peat in a glacial overflow channel on Ellerton Moor, beside the Grinton-Leyburn Road, by Elizabeth Livett. Unfortunately, it has not been possible to trace the publication of this work, but Fleming (1998, 138) mentions a sharp fall in tree pollen, especially of birch and, to a lesser extent, of hazel, oak and alder, associated with an increase in pollen of plants of open vegetation (grasses, plantain) during the second half of the 1st millennium BC. This is indicative of major woodland clearance during the mid-late Iron Age. After this clearance episode the diagram shows a short-lived recovery of birch, hazel, oak and alder, possibly around the time of the Roman conquest in the first century AD, followed by further clearance of woodland during the mid-late Roman period. What the charcoal evidence from Healaugh A highlights is that locally diverse woodland, comprising birch, hazel, alder, willow, hawthorn, apple, oak, ash and possibly blackthorn, was still present.

The recovery of two hobnails in the samples came as a surprise as these are usually associated with the footwear of Roman soldiers, though, as mentioned above, these have also been found in mid-late Roman civilian contexts, especially in burials. Together with the presence of fragments of an amphora, a glass bangle and a bronze split finger ring, these items suggest that the inhabitants had access to a variety of artefacts that might reflect a certain level of wealth.

Acknowledgments
I am grateful to the Yorkshire Dales National Park for a grant that facilitated this research. The images of the semi-vitrified fuel waste were taken by Ruth Pelling at Fort Cumberland Laboratories, Historic England, using an AHRC funded Keyence VHX7000 3-D digital microscope (AHRC Award AH/V011758/1). The images of the hobnails were taken by Toby Savage, and modified by Seán Goddard.

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Appendix 1 – Context Information

Very little information is available about the contexts sampled, but where the sample labels had any text, this is given below. The sample volumes are given in Appendix 2.

Year Excav.	Context	Text on label
1989	216	
?	148	
?	217	label no longer legible, but something like: 'from paving of hut'; C 2450 E 1150 N
?	262	
?	342	drain gully, silt layer 2050/1625 2200/1625
1989	346	
1990	373	
1990	395	
1990	405	drain section 1, black lens from behind drain slab
1990	406	
1990	416	
1990	423	
1990	424	
1990	428	
89/90	425	
89/90	360	
?	Base wall	no context number but label says: from lowest black material at base of hut circle wall

Appendix 2 – Seeds

The samples were processed using flotation over a 500µm mesh. The residues were also sieved over a 500µm mesh. The flots were sorted under a Wild M5A stereomicroscope at 12-25x magnification; the residues were examined for charcoal, fruit stones, small bones, small finds, etc.. Identification of the seeds and fruits, using up to x50 magnification, was undertaken by comparison with modern reference material held by the author and in the School of Archaeology & Ancient History, University of Leicester, and by using various seed identification manuals (Berggren 1981; Neef *et al*. 2012).

The seeds and flots should be retained as part of the physical archive of the site. The residues were discarded following examination.

The identifications are given in the table below.

Context	216	346	360	425	373	395	405	406	416	423	424	428	148	217	342	base wall	262	**TOTAL**
Volume in litres	19.5	18.0	5.0	-	20.5	8.0	8.2	13.5	10.0	9.5	12.5	8.0	12.5	25.0	16.5	18.0	20	224.7
Cereal grain																		
Triticum cf. spelta, spelt wheat	.	1	.	.	.	2	.	.	.	.	1	1	.	.	.	.	.	5
Triticum sp., wheat	.	1	.	.	.	2	.	.	1	.	.	2	1	.	.	.	.	7
Hordeum vulgare, 6-row hulled barley	.	.	.	1	9	6	.	1	.	.	.	5	6	.	.	.	.	28
cf. Hordeum sp., probably barley	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	3
Cerealia indet, indeterminate cereal grain	.	3	.		6	16	1	1	1		1	10	2	1	2	5	3	52
Cereal chaff																		
Triticum spelta, spelt glumebases	.	.	.	.	.	8	3	.	.	.	.	3	12	1	.	.	2	29
Triticum spelta, spelt rachis segment	.	.	.	.	1	.	.	.	1	.	.	.	.	.	.	.	.	2
Triticum sp., wheat glumebases	.	1	.	.	1	3	.	.	.	.	.	.	3	.	.	.	.	8
Triticum sp., wheat rachis segment	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	2
Hordeum vulgare, barley rachis segments	.	.	.	.	.	3	.	.	.	.	.	.	.	.		.	.	3
Culm node cereals	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1
Nuts/Fruits																		
Corylus avellana, hazelnut, shell fragm.	.	.	.	.	14	1	.	.	19	1	1	4	10	.	14	8	.	72
Prunus spinosa, sloe fragm.	.	.	.	.	2	.	4	.	.	.	.	.	.	.	.	.	.	6
Weeds/Wild Plants																		
Chenopodium album, fat hen	.	.	.	.	2	4	.	1	4	.	.	.	.	.	.	.	.	11
Chenopodium sp., goosefoot	.	.	.	.	2	8	.	.	.	1	.	1	.	.	.	1		13
Atriplex sp., orache	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	5
Chenopodiaceae indet.	.	.	.	.	.	.	2	.	.	.	.	.		.	.	.	.	2
Rumex acetosella, sheep's sorrel	.	.	.	.	1	.	1	.	.	.	.	.	2	.	.	.	.	4
Rumex sp., dock	.	.	.	.	1	.	.	.	.	1	.	.	3	.	3	1	.	9
Vicia sp., vetch	.	.	.	.	2	1	.	.	.	.	.	.	1	.	.	.	.	4
Bromus mollis/secalinus, bromegrass	.	.	.	.	3	6	1	1	.	.	.	.	5		.	5	.	21
Poaceae, grass, Avena/Bromus size	.	.	.	.	.	.	.	.	1	.	.	.	.	1	.	1	.	3
Poaceae indet, (Poa annua size), grass	.	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	4
Tripleurospermum inodorum, scentless mayweed		.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	2
Lychnis flos-cuculi, ragged robin	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	1
cf. Galeopsis, hemp nettle	.	.	.	.	.	.	1	.	.	.	1	.	.	.	.	.	.	2
Rhizome fragm.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	1
indet.	.	1	.	.	2	.	.	.	.	.	.	1	2	.	2	.	.	8
Other																		
Charcoal	.	x	.	xx	xx	xx	xx	xx	xx	x	x	x	x	x	xx	xx	x	x
SVFW	.	x	.	x	xx	x	x	xx	xx	xx	xx	x	x	x	xx	x	x	x
modern roots	xxx	xx	.	.	.	.	.	.	.	.	.	x	xx	x	.	.	.	x
TOTAL	**0**	**9**	**0**	**1**	**48**	**72**	**13**	**4**	**27**	**3**	**4**	**27**	**48**	**3**	**22**	**22**	**5**	**308**

Appendix 3. Charcoal

ARCHAEOLOGICAL SERVICES DURHAM UNIVERSITY

Healaugh A
North Yorkshire

charcoal identification
report 5966

on behalf of
Prof. Marijke van der Veen

1. The Project

1.1 This report presents charcoal identifications from 7 samples taken during archaeological works at Healaugh A, Swaledale, North Yorkshire.

1.2 The works were commissioned by Prof. Marijke van der Veen and conducted by Archaeological Services Durham University.

2. Personnel

2.1 Charcoal identification was by Dr Charlotte O'Brien and Lorne Elliott.

3. Archive

3.1 The charcoal samples will be archived at the Dales Countryside Museum, Hawes.

4. Methods

4.1 The transverse, radial and tangential sections were examined at up to x500 magnification using Leica DMLM and Nikon Eclipse microscopes. Identifications were assisted by the descriptions of Gale & Cutler (2000), Hather (2000) and Schweingruber (1990), and modern reference material held in the Palaeoenvironmental Laboratory at Archaeological Services Durham University.

4.2 Where comparable anatomical properties prevented secure identification, charcoal remains were recorded to genus level or assigned to family groups. Apple and hawthorn are represented by the subfamily Maloideae. Willows and poplars are grouped as Salicaceae (willow family).

5. Results

5.1 Results are listed in Appendix 3a-g.

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Dr Charlotte O'Brien, Palaeoenvironmental Manager, 25th May 2023.
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Appendix 3a: Data from charcoal identification [373]

Context	Fragment No.	Species	C14 Ranking	Notes
373	1	Birch	***	Largest fragment (longest axis 21mm). Relatively good condition (few mineral inclusions). Five wide evenly spaced growth rings with moderate ring curvature (large branchwood or stemwood).
373	2	Birch	**	Large fragment (longest axis 17mm). Moderate condition (some mineral inclusions). More than seven growth rings moderate ring curvature. Very diffuse porous (stemwood?).
373	3	Birch	**	Large fragment (longest axis 18mm). Moderate condition (few mineral inclusions). More than five growth rings with moderate ring curvature (large branchwood or stemwood).
373	4	Birch	**	Large fragment (longest axis 12mm). Moderate condition (some mineral inclusions). More than fifteen variable-sized growth rings with weak ring curvature (stemwood).
373	5	Birch	**	Large fragment (longest axis 11mm). Moderate condition (some mineral inclusions). Slight vitrification. More than five growth rings with weak ring curvature (stemwood).
373	6	Birch	**	Moderate condition. More than five growth rings. Narrow radially fractured fragment (stemwood).
373	7	Birch	**	Moderate condition. Five growth rings with weak ring curvature (stemwood).
373	8	Hazel	***	Fairly good condition. Strong ring curvature (branchwood). Four wide evenly-spaced growth rings. Has possible insect tunnels.
373	9	Birch	**	Moderate condition. Four wide growth rings with weak ring curvature (stemwood).
373	10	Hazel	***	Fairly good condition. Strong ring curvature with six variable rings and asymmetrical growth (branchwood). Has possible insect tunnels.
373	11	Birch	**	Moderate condition. Five growth rings with moderate ring curvature (large branchwood or stemwood).
373	12	Birch	**	Moderate condition. More than six rings with moderate ring curvature but indistinct ring boundaries (large branchwood or stemwood).
373	13	Birch	**	Moderate condition. Five wide evenly spaced rings with weak ring curvature (stemwood).
373	14	Hazel	***	Fairly good condition. Strong ring curvature with two wide growth rings (branchwood). Has possible insect tunnels. Pith present.
373	15	Birch	**	Moderate condition. Three wide evenly spaced rings with weak ring curvature (stemwood).
373	16	Birch	**	Moderate condition. Eight variable-sized rings with weak ring curvature (stemwood).
373	17	Birch	**	Moderate condition. Two wide evenly spaced rings with weak ring curvature (stemwood).
373	18	Birch	**	Moderate condition. Three wide evenly spaced rings with weak ring curvature (stemwood).
373	19	-	-	Not charcoal - semi-vitrified fuel waste (slightly magnetic).
373	20	-	-	Not charcoal - semi-vitrified fuel waste (slightly magnetic).
373	21	-	-	Not charcoal - cinder.

[Rank: *: low; **: medium; ***: good potential for radiocarbon dating; Large fragment = greater than 10mm, small fragment less than 4mm]

Appendix 3b: Data from charcoal identification [395]

Context	Fragment No.	Species	C14 Ranking	Notes
395	1	Maloideae	***	Largest fragment (longest axis 15mm). Moderate condition (some mineral inclusions). Three wide growth rings and moderate ring curvature. Growth ring boundaries are almost indistinct. Branchwood. No spiral thickening (cf. apple).
395	2	Oak	**	Sapwood longshoot with 2 wide growth rings. Narrow radially fractured fragment. Moderate condition with some mineral inclusions.
395	3	Hazel	***	Moderate condition (slightly mineral encrusted). Strong ring curvature (small branchwood). Eight growth rings of variable widths.
395	4	Hazel	***	Moderate condition (slightly mineral encrusted). Strong ring curvature (branchwood). Seven growth rings of variable widths.
395	5	Hazel	**	Moderate condition (some mineral inclusions). Strong ring curvature (branchwood with enlarged vessels). More than 12 short growth rings.
395	6	Hazel	**	Moderate condition (some mineral inclusions). Strong growth ring curvature (branchwood). Three evenly spaced growth rings.
395	7	Salicaceae	**	Moderate condition (some mineral inclusions). Radially fractured fragment. Four growth rings. (cf. willow).
395	8	Heather	**	Moderate condition (slightly better condition than most fragments - less encrusting). Twig – whole roundwood with indistinct growth rings curled growth (Ø = 6mm).
395	9	Salicaceae	**	Moderate condition (few mineral inclusions). Moderate ring curvature (stemwood). Six evenly spaced growth rings. (cf. willow).
395	10	Salicaceae	**	Moderate condition (some mineral inclusions). Moderate ring curvature (larger branchwood). More than six growth rings. (cf. willow).
395	11	Salicaceae	**	Moderate condition (some mineral inclusions). Moderate ring curvature (larger branchwood). More than five growth rings. (cf. willow).
395	12	Salicaceae	**	Moderate condition (few mineral inclusions). Moderate ring curvature (stemwood). Five growth rings. (cf. willow).
395	13	cf. Hazel	*	Poor condition some encrusting. Curled growth and poor cleaving. More than two growth rings – small calibre branchwood - reaction wood.
395	14	Hazel	***	Relatively good condition (few mineral inclusions). Strong ring curvature (small branchwood). Five average-sized growth rings.
395	15	Hazel	*	Poor condition some encrusting. Narrow radially fractured fragment. Six growth rings. Has possible insect tunnels.
395	16	Hazel	**	Fair condition some encrusting. Ten short rings moderate ring curvature (larger branchwood).
395	17	Hazel	**	Fair condition. Ten variable growth rings moderate ring curvature (larger branchwood).
395	18	Salicaceae	*	Moderate condition (mineral encrusted). >3 growth rings. Not possible to tell ring curvature.
395	19	Salicaceae	**	Moderate condition (slightly encrusted). More than four variably sized growth rings. Strong ring curvature (small branchwood).
395	20	Ash	**	Moderate condition (some encrusting). Fifteen narrow growth rings – restricted growth. Moderate ring curvature (large branchwood?).
395	21	Salicaceae	**	Moderate condition (slightly encrusted). Five growth rings. Moderate ring curvature (larger branchwood). (cf. willow).
395	22	Hazel	*	Moderate condition (some encrusting). More than two growth rings - curled growth – reaction wood/branchwood.
395	23	Hazel	*	Moderate condition (some encrusting). More than three growth rings - curled growth – reaction wood/branchwood.
395	24	Birch	**	Moderate condition (some encrusting). Seven short growth rings – small calibre branchwood (whole roundwood pith to bark) (Ø = 4.5mm).
395	25	Birch	**	Moderate condition (some encrusting). Seven short growth rings – small calibre branchwood (whole roundwood pith to bark) (Ø = 4mm).
395	26	Hazel	*	Poor condition mineral inclusions curled growth sparse vessels – reaction wood/branchwood. Strong ring curvature.
395	27	Hazel	**	Moderate condition fewer mineral inclusions. Strong ring curvature with eleven growth rings continually decreasing in size (branchwood).
395	28	Ash	**	Moderate condition (some encrusting). Twelve narrow growth rings – restricted growth. Moderate ring curvature (large branchwood?). This fragment is very similar to fragment no. 20 in [342].
395	29	Salicaceae	**	Moderate condition (few mineral inclusions). Seven evenly spaced growth rings. Moderate ring curvature (larger branchwood).

[Rank: *: low; **: medium; ***: good potential for radiocarbon dating; Large fragment = greater than 10mm, small fragment less than 4mm]

Appendix 3c: Data from charcoal identification [416]

Context	Fragment No.	Species	C14 Ranking	Notes
416	1	Birch	**	Largest fragment (longest axis 11mm). Fairly good condition. Weak ring curvature (stemwood). >5 average-sized growth rings.
416	2	Birch	**	Fairly good condition. Weak ring curvature four average-sized growth rings (stemwood).
416	3	Birch	**	Fairly good condition. Weak ring curvature (stemwood). >6 average-sized growth rings.
416	4	Maloideae	***	Fairly good condition (solid fragment with less encrusting). Moderate curvature (branchwood) Eight average-sized ring widths. Trace of spiral thickening (cf. hawthorn).
416	5	Birch	**	Fairly good condition. Moderate ring curvature (stemwood). Six average-sized growth rings.
416	6	Birch	*	Moderate condition (mineral inclusions). More than four growth rings - moderate curvature - sparse vessels (reaction wood/branchwood).

[Rank: *: low; **: medium; ***: good potential for radiocarbon dating; Large fragment = greater than 10mm, small fragment less than 4mm]

Appendix 3d: Data from charcoal identification [423]

Context	Fragment No.	Species	C14 Ranking	Notes
423	1	Maloideae	***	Largest fragment (longest axis 15mm). Moderate condition. Six narrow outer rings plus attached bark (branchwood). (cf. hawthorn).
423	2	Birch	**	Moderate condition. Three wide rings and weak ring curvature (stemwood).
423	3	Alder	**	Moderate condition. Five growth rings with moderate curvature (large branchwood or stemwood). Has possible insect tunnels.
423	4	Alder	**	Moderate condition (relatively more mineral inclusions). Three growth rings with weak ring curvature. Very diffuse porous (stemwood).
423	5	Maloideae	**	Moderate condition (some mineral inclusions). Four narrow growth rings (branchwood). (cf. hawthorn).
423	6	*Prunus* sp.	**	Moderate condition. One ring with moderate ring curvature (stemwood). (cf. bird cherry – *Prunus padus*).
423	7	-	-	Not charcoal - semi-vitrified fuel waste (slightly magnetic).
423	8	-	-	Not charcoal - semi-vitrified fuel waste (slightly magnetic).
423	9	-	-	Not charcoal - semi-vitrified fuel waste (slightly magnetic).
423	10	-	-	Not charcoal - semi-vitrified fuel waste (slightly magnetic).

[Rank: *: low; **: medium; ***: good potential for radiocarbon dating; Large fragment = greater than 10mm, small fragment less than 4mm]

Appendix 3e: Data from charcoal identification [428]

Context	Fragment No.	Species	C14 Ranking	Notes
428	1	Oak	**	Largest fragment (longest axis 17mm). Reasonable condition. Sapwood longshoot - wide growth rings. Narrow radially fractured fragment.
428	2	Hazel	***	Large fragment good condition (few mineral inclusions). Moderate ring curvature (larger branchwood) more than eight average-sized rings.
428	3	Birch	**	Relatively good condition. Weak ring curvature (stemwood). Three average-sized growth rings.
428	4	Hazel	**	Fairly good condition (some encrusting). Strong ring curvature (branchwood). Six average-sized ring widths.
428	5	Salicaceae	**	Fairly good condition (some encrusting). Moderate ring curvature (larger branchwood). Six evenly spaced growth rings. (cf. willow).
428	6	Hazel	**	Fairly good condition (slight encrusting). Moderate ring curvature (stemwood – very diffuse porous). Four above average-sized growth rings.
428	7	Birch	**	Small fragment. Fairly good condition (some encrusting). Moderate ring curvature (stemwood?). More the two growth rings.
428	8	Hazel	**	Fairly good condition (some encrusting). Strong ring curvature (branchwood). Six variable-sized growth rings.
428	9	-	-	Not charcoal - semi-vitrified fuel waste (slightly magnetic).

[Rank: *: low; **: medium; ***: good potential for radiocarbon dating; Large fragment = greater than 10mm, small fragment less than 4mm]

Appendix 3f: Data from charcoal identification [342]

Context	Fragment No.	Species	C14 Ranking	Notes
342	1	Alder	***	Largest fragment (longest axis 20mm). Has probable insect tunnels, but otherwise in fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). Approx. 11 wide, evenly spaced growth rings.
342	2	Alder	***	Large fragment (longest axis 18mm). Has probable insect tunnels, but otherwise in fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). More than 6 variable sized growth rings. Appears to be from worked (one side is cut obliquely against the grain).
342	3	Alder	***	Large fragment. Fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). Six wide, evenly spaced growth rings. Potentially from worked wood.
342	4	Alder	***	Large fragment. Fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). Five wide, evenly spaced growth rings. Has probable insect tunnels. Distinctive shaping probably from worked wood.
342	5	Alder	***	Large fragment. Fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). Seven, evenly spaced growth rings. Has probable insect tunnels. Probably from worked wood.
342	6	Alder	***	Large fragment. Fairly good condition (few mineral inclusions). Has probable insect tunnels. Moderate ring curvature (stemwood). Five, evenly spaced growth rings. Probably from worked wood.
342	7	Alder	***	Large fragment. Fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). Five, moderate to wide growth rings. Has probable insect tunnels.
342	8	Alder	***	Large fragment. Fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). Six variably spaced growth rings. Probably from worked wood.
342	9	Alder	***	Large fragment. Fairly good condition (few mineral inclusions). Has probable insect tunnels. Moderate ring curvature (stemwood). More than seven, evenly spaced growth rings. Probably from worked wood.
342	10	Alder	***	Fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). Three wide, evenly spaced growth rings. Probably from worked wood.
342	11	Alder	***	Large fragment. Fairly good condition (few mineral inclusions). Has probable insect tunnels. Moderate ring curvature (stemwood). Three wide, evenly spaced growth rings.
342	12	Alder	***	Fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). Four wide, evenly spaced growth rings. Probably from worked wood – obliquely cut against the grain. Has possible insect tunnels.
342	13	Alder	***	Large fragment (longest axis 13mm). Fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). More than three wide, evenly spaced growth rings. Probably from worked wood. Has possible insect tunnels.
342	14	Alder	***	Fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). Four wide, evenly spaced growth rings. Potentially from worked wood. Has possible insect tunnels.
342	15	Alder	***	Fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). Five evenly spaced growth rings. Potentially from worked wood. Has possible insect tunnels.
342	16	Ash	**	Fairly good condition (few mineral inclusions). Moderate ring curvature (stemwood). >10 narrow growth rings.

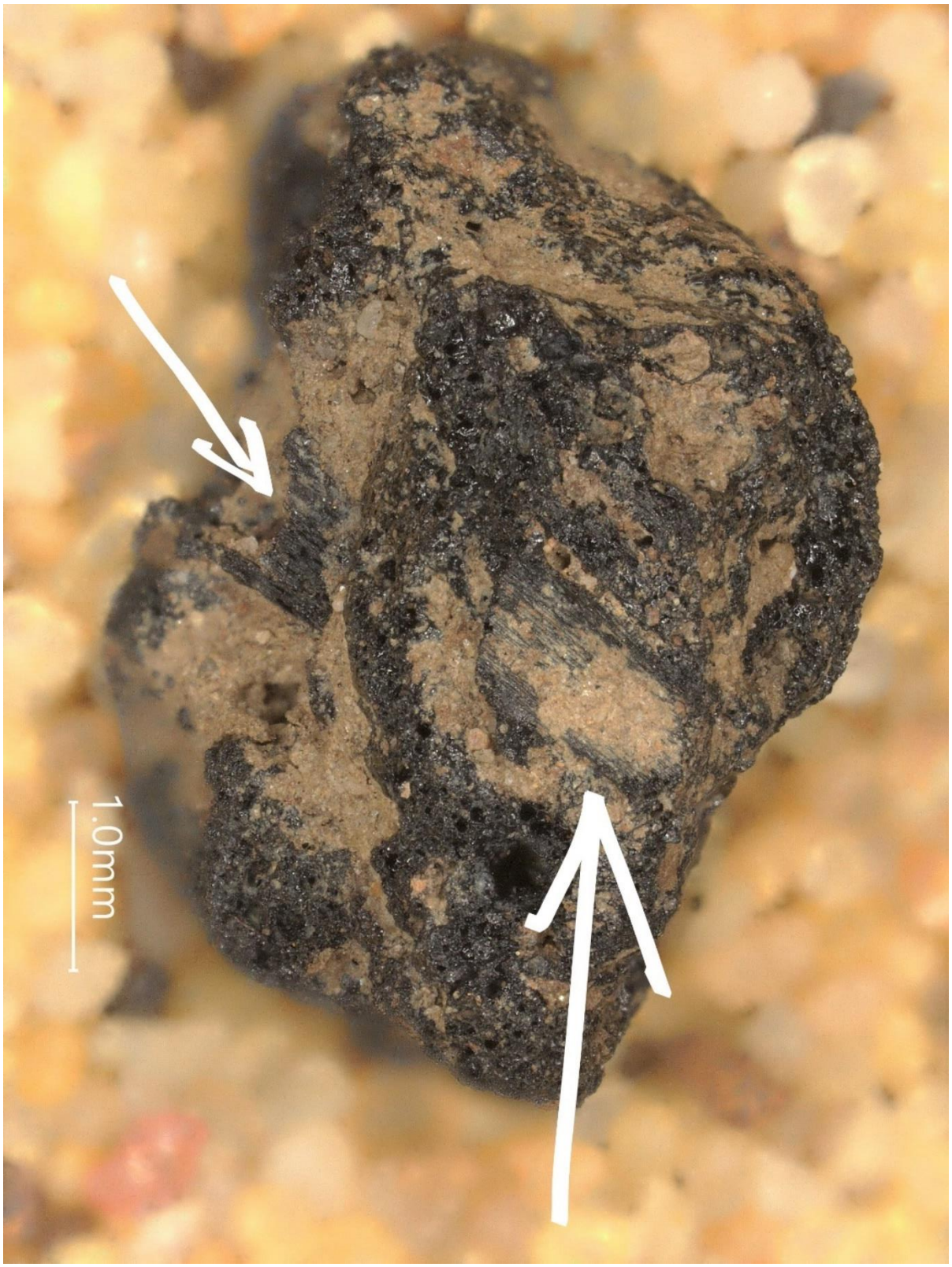
[Rank: *: low; **: medium; ***: good potential for radiocarbon dating; Large fragment = greater than 10mm, small fragment less than 4mm]

Appendix 3g: Data from charcoal identification [soil at base of wall of hut circle]

Context	Fragment No.	Species	C14 Ranking	Notes
-	1	Birch	**	Largest fragment (longest axis 22mm). Moderate condition (mineral inclusions). Moderate ring curvature (large branchwood or stemwood).
-	2	Hazel	**	Fair condition - mineral inclusions. Moderate ring curvature with three growth rings. Very diffuse porous (stemwood) possible insect tunnels.
-	3	Hazel	**	Moderate condition. Moderate ring curvature with three wide growth rings (large branchwood or stemwood).
-	4	Birch	**	Large fragment (longest axis 13mm). Moderate condition (Some mineral inclusions). Three wide rings with weak ring curvature (stemwood).
-	5	Birch	**	Fairly good condition. Seven growth rings with weak ring curvature (stemwood).
-	6	Birch	**	Fairly good condition (slight encrusting). Four evenly spaced growth rings with weak ring curvature (stemwood).
-	7	Birch	**	Large fragment (longest axis 11mm). Moderate condition (Some mineral inclusions). Three wide rings with weak ring curvature (stemwood).
-	8	Birch	**	Fairly good condition (slight encrusting). Two growth rings with moderate ring curvature (large branchwood or stemwood).
-	9	Ash	*	Moderate condition (slight encrusting). Weak ring curvature – eleven narrow growth rings – some tyloses (stemwood heartwood).
-	10	Hazel	**	Reasonable condition (slight encrusting). Moderate ring curvature – four growth rings (small stemwood or relatively large branchwood).
-	11	Hazel	***	Moderate condition (slight encrusting). Four even-spaced rings with moderate/strong ring curvature (small stemwood or large branchwood).
-	12	Birch	**	Moderate condition (slight encrusting). Four wide rings - weak ring curvature (stemwood).
-	13	Birch	**	Large fragment (longest axis 11mm). Moderate condition. Four growth rings with moderate ring curvature (large branchwood or stemwood).
-	14	Birch	**	Moderate condition. Two wide growth rings - weak ring curvature (stemwood).
-	15	Hazel	**	Moderate condition. Four growth rings – moderate ring curvature (small stemwood or relatively large branchwood).
-	16	Hazel	***	Moderate condition. Four growth rings with moderate/strong ring curvature (small stemwood or large branchwood).
-	17	Hazel	***	Relatively good condition. Twig – complete roundwood with pith and bark. Four rings (wood cut early in 4th year) 3mm diameter.
-	18	Hazel	**	Moderate condition. Three growth rings with moderate/strong ring curvature (small stemwood or large branchwood).
-	19	Birch	**	Moderate condition. Four growth rings - weak ring curvature (stemwood).
-	20	Maloideae	**	Moderate condition (some inclusions). Moderate ring curvature – six growth rings (branchwood).
-	21	Bark	*	Indeterminate species – with vitrification. Narrow tangentially fractured fragment.
-	22	-	-	Not charcoal - semi-vitrified fuel waste (slightly magnetic).
-	23	-	-	Not charcoal - semi-vitrified fuel waste (slightly magnetic).

[Rank: *: low; **: medium; ***: good potential for radiocarbon dating; Large fragment = greater than 10mm, small fragment less than 4mm]

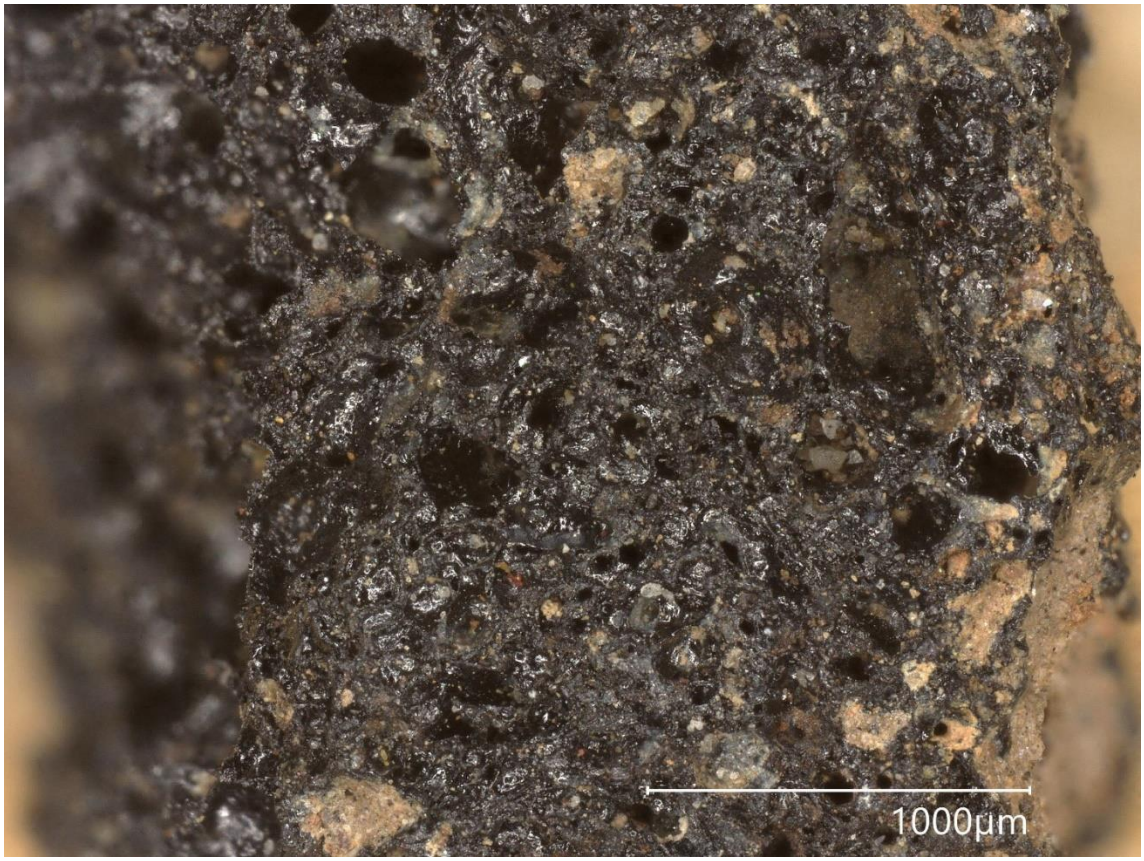
Appendix 4 – Photos of some SVFW fragments



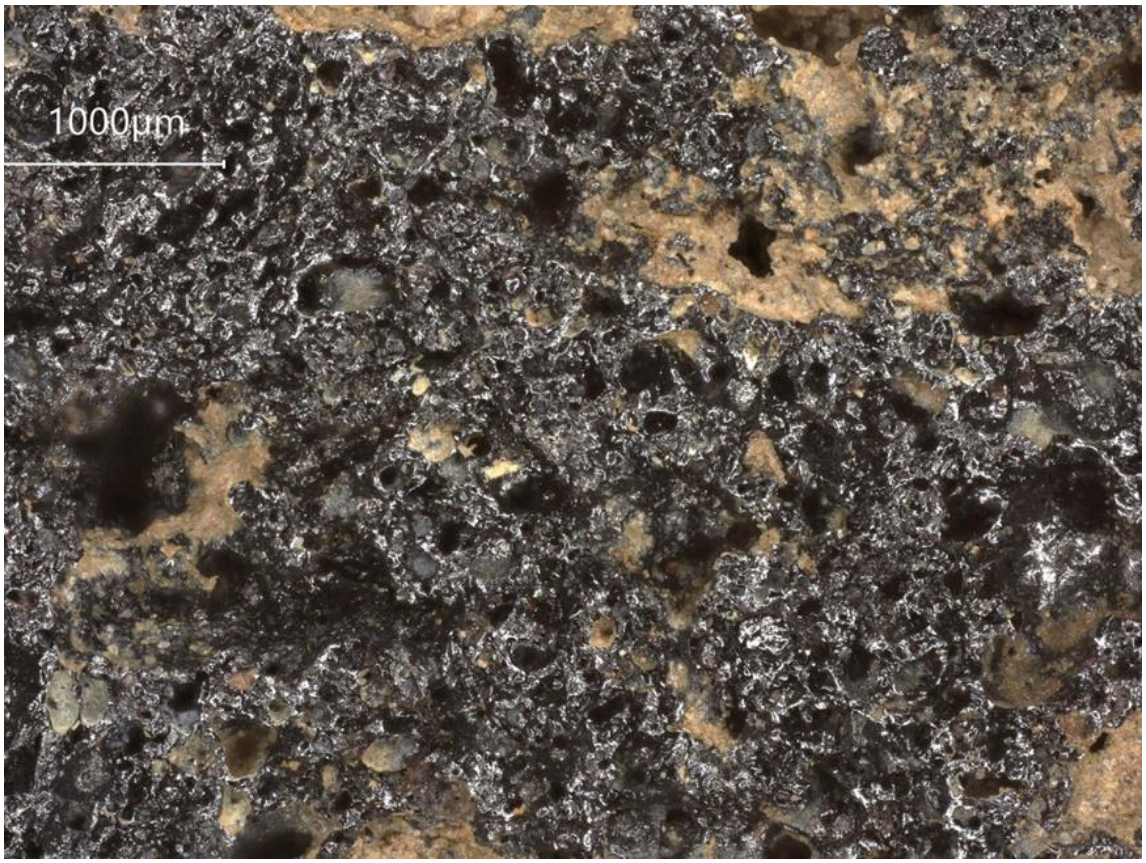
SVFW fragment, showing location of stem fragments within an amorphous matrix, context [424] fragment 1 x40.

Context [406], fragment 1 x40

Context [406], fragment 1 x200

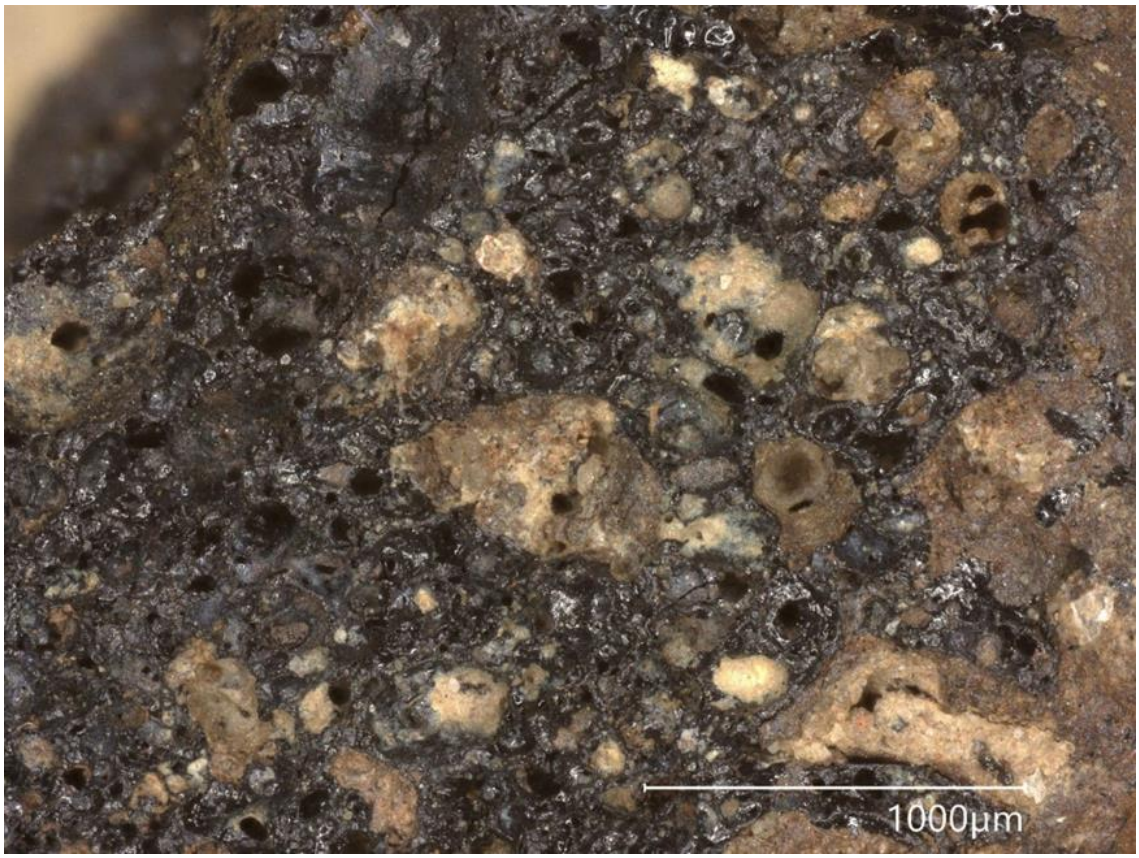


Context [406], fragment 8 x100

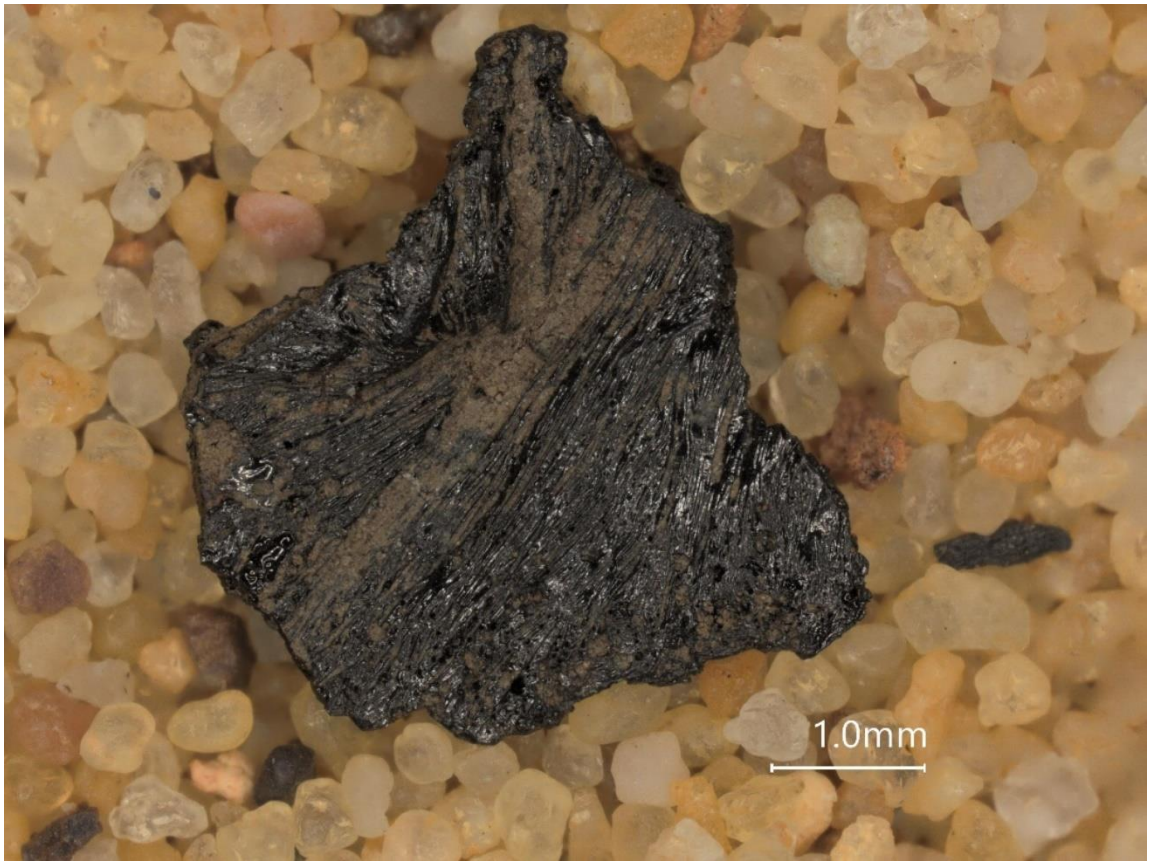


Context: [406]. Fragment 2, x100.

Context: [424]. Fragment 3, x40.



Context: [424]. Fragment 6, x100.



Context: Base of Wall; fragment 3, x40

Context: Base of Wall; fragment 3, x100