

## **Grant no. 4/2014**

### **Assessment of flotation samples from Glastonbury Abbey Abbot's Kitchen (GAK13)**

**NGR: ST 501 388**

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#### ***Introduction***

Archaeological excavations were carried out at in the Abbot's kitchen in Glastonbury Abbey in preparation for the installation of underfloor heating. Flotation samples were taken from two, broadly contemporary, series of floor deposits from different areas of the site dating from before the early 14<sup>th</sup> century standing structure. A further sample was taken from an early post-medieval probable fire pit. These samples were assessed in order to determine the concentration, diversity, state of preservation and suitability for use in radiocarbon dating, of any archaeobotanical material present. A further aim of this assessment was to evaluate the potential of this material to provide evidence for the function of the contexts, the economy of the site or for the nature of the local environment.

#### ***Recovery, processing and laboratory methods***

The flotation samples were processed for charred plant remains and wood charcoal by GeoFlo Southwest Geophysical and Flotation Services using a water separation machine. Floating material was collected in a 250µm mesh, and the remaining heavy residue retained in a 1mm mesh. The flots and heavy residues were air dried. Samples found to be rich in charred material were re-floated in order to maximise the recovery of charred remains.

The samples were assessed in accordance with English Heritage guidelines for environmental archaeology assessments (Jones, 2011). A preliminary assessment of the samples was made by scanning under a low power binocular microscope (x7-x45) and recording the abundance of the main classes of material present. Where fewer than five items of charred plant material were present, these were fully identified and quantified. Identification of plant material was carried out by comparison with material in the author's own reference collection and various reference works (e.g. Cappers *et al*, 2006). Cereal identifications and nomenclature follow Jacomet (2006). Other plant nomenclature follows Stace (2010). The composition of the samples is recorded below in table 1.

#### ***Preservation***

No intrusive roots were present in the samples indicating that the charred material present is unlikely to be intrusive, particularly as charred material was present in high densities.

Preservation of the charred cereal grains that were present was variable.

The low density of charred cereal grains present in the medieval floor deposits and the post medieval fire pit context 5 were generally well preserved, with little evidence of puffing or distortion and with epidermis generally intact. Cereal grains from medieval floor deposit context 106 however, were less well preserved with the majority of grains exhibiting puffing and distortion and retaining only fragments of epidermis.

Wood charcoal was abundant in the samples and preservation of the charcoal fragments was generally excellent with little evidence for vitrification or mineralisation. The wood charcoal present in sample 5 from floor deposit context 75 was however noted to be somewhat soft and friable which may hamper any identification of the charcoal in this deposit.

### ***Charred plant material***

Charred plant remains were present in low densities in the majority of samples with the exception of sample 13 from 12<sup>th</sup> to early 13<sup>th</sup> century floor deposit context 106 and sample 14 from early post medieval probable fire pit fill context 5.

The crop types represented in sample 13 were consistent with those represented at low densities in the other 12<sup>th</sup> to early 13<sup>th</sup> century floor deposits. Free threshing wheat type grains were the most frequently occurring type of charred plant material. A number of cereal grains with characteristics similar to free threshing wheat and other wheat types such as emmer or spelt were also present. Due to the lack of any positively identified wheat types other than free threshing wheat, it is however likely that all the wheat grains present are representative of free threshing wheat. A small number of free threshing wheat rachis internodes were also present in sample 13, which consisted of both bread wheat and rivet / macaroni wheat. Hulled barley grains were present at low densities, although no twisted grains, which would confirm the presence of six row barley, were noted during assessment. Oat grains were also present at low densities, although no oat floret bases were noted which would be necessary to confirm the presence of cultivated oat. Legumes including peas or beans were comparatively frequent.

A moderate density of wild or weed plant seeds was also present in sample 13. Taxa commonly associated with grassland but which may also represent arable weeds include wild vetches or peas (*Vicia / Lathyrus*), melilot, medicks or clovers (*Melilotus / Medicago / Trifolium*), woundwort (*Stachys* sp.) and grasses (Poaceae). Stinking mayweed (*Anthemis cotula*) is a more a typical weed of cultivation. Taxa commonly associated with damp soils include common spike-rush (*Eleocharis palustris*) and sedges (*Carex* spp.). Also present were docks (*Rumex* spp.) and daisy family (Asteraceae).

A low density of cereal grains was present in sample 14, with both hulled barley and free threshing wheat being represented. A free threshing wheat rachis internode identified as bread wheat was present. Seeds of wild or weed plants were abundant in this deposit. Taxa commonly associated with grassland but which may also represent arable weeds include vetches or peas (*Vicia / Lathyrus*), melilot, medicks or clovers (*Melilotus / Medicago / Trifolium*), sheep's sorrel (*Rumex acetosella*), hoary / ribwort plantain (*Plantago media / lanceolata*), selfheal (*Prunella vulgaris*) and grasses (Poaceae). Taxa more typical of fertile disturbed ground and cultivation include knotgrass (*Polygonum arenastrum / aviculare*), cleavers (*Galium aparine*) and black nightshade (*Solanum nigrum*). Common nettle (*Urtica dioica*), which is commonly associated with nitrogen enriched soils such as those in the vicinity of human habitation or where animals congregate, was also present.

### **Wood charcoal**

Wood charcoal was abundant in every sample with the exception of sample 8.

In samples 1 – 4 from 12<sup>th</sup> to early 13<sup>th</sup> century floor deposit contexts 69, 71, 73 and 74, both diffuse and ring porous taxa were present. The ring curvatures of the charcoal fragments were both strong, indicating the presence of smaller branches or twigs, and weak, indicating the use of larger branches or trunk material.

In sample 5 from 12<sup>th</sup> to early 13<sup>th</sup> century floor deposit context 75, both diffuse and ring porous taxa were present although the ring curvatures of the charcoal fragments were not generally visible.

In sample 7 from 12<sup>th</sup> to early 13<sup>th</sup> century floor deposit context 77, the charcoal fragments were predominantly of diffuse porous taxa with some ring porous taxa also present. Ring curvatures were again both strong and weak.

In samples 9 and 10 from 12<sup>th</sup> to early 13<sup>th</sup> century floor deposit contexts 52 and 53, both diffuse and ring porous taxa were present. Ring curvatures were both strong and weak.

In samples 12 and 13 from 12<sup>th</sup> to early 13<sup>th</sup> century floor deposit contexts 55 and 57, the charcoal fragments were predominantly of diffuse porous taxa with some ring porous taxa also present. Ring curvatures were both strong and weak.

In sample 14 from early post medieval fire pit context 5, the charcoal fragments were predominantly of ring porous taxa, probably oak, with narrow growth rings indicating fast growth.

### ***Bone***

Bone, including fish bone and small mammal bone, was abundant in every sample with the exception of sample 8 and sample 14.

### ***Shell***

Snail shells (Mollusca) were abundant in sample 1 from floor deposit context 69 with a moderate number also being present in floor deposit context 71. Low numbers of snail shells were also present in sample 9 from floor context 52, sample 10 from floor deposit context 53 and fire pit fill context 5.

### ***Other material***

A fragment of metallurgical debris around 2mm in size was present in sample 12 from floor deposit context 56.

### ***Discussion and recommendations for further work***

The main cereal and other economic plant types present in the samples from Glastonbury Abbey Abbot's kitchen are bread wheat, rivet or macaroni wheat, hulled barley, peas or beans, grape and fig. These crop types are typical of those present in medieval archaeobotanical assemblages from southern England. More locally, the cereal crop types from Glastonbury Abbey are comparable with those present in later medieval and post medieval contexts studied as part of the Shapwick Project (Straker, Campbell and Smith 2007).

Bread wheat is the most commonly represented wheat species in medieval archaeobotanical assemblages, although rivet or macaroni wheat is also present at sites in southern England (Moffett 2006, 49). It is likely that rivet wheat is represented rather than macaroni wheat due to the climate and ecological conditions in Britain (Moffett 2006, 49). Documentary records indicate that wheat was the preferred cereal for bread consumed by those of high status (Stone 2006, 17). Bread wheat is preferable to rivet wheat for bread flour but rivet wheat produces tall strong straw (Moffett 2006, 48). A sample from Glastonbury Abbey Great Barn later medieval floor surface and two samples from Shapwick House later medieval moat platform contained rachis internodes which were mostly of rivet or macaroni wheat (Straker, Campbell and Smith 2007, 879). Both bread wheat and rivet or macaroni wheat were present in post medieval samples from demolished houses south of Shapwick House

as well as in post medieval fills of the moat of Shapwick House (Straker, Campbell and Smith 2007, 880; Smith and Campbell 2007).

Barley was also an important crop in the medieval period and was generally the principal cereal used for brewing ale (Stone 2006, 12). Documentary evidence indicates that oats were also grown in significant quantities as a crop (Green 1984, 104; Stone 2006, 13) although archaeobotanical finds of oat grains cannot usually be distinguished from wild oats, due to a lack of oat chaff. Barley and oats were also present in the later medieval samples from the Shapwick Project although no oat floret bases were recovered (Straker, Campbell and Smith 2007, 879).

Documentary and archaeobotanical evidence suggest that legumes became an important component of medieval agricultural produce from the end of the 13<sup>th</sup> century and that both peas and beans were used by monastic institutions (Green 1984, 107). Documentary evidence also indicates that vineyards were a common component of monastic gardens and archaeological remains of grapes are frequent from high status sites (Green 1984, 110) as are figs, which are likely to have been imported in dried or preserved form (Stone 2006, 34). Vetches were cultivated in the medieval period, although likely as fodder and not for human consumption (Stone 2006, 12; Moffett 2006, 53).

The cereal grains present in the samples from Glastonbury Abbey Abbot's kitchen are likely to have been charred accidentally during food preparation or as a result of accidents during drying before storage. Some grain may also form a component of crop processing waste which was burnt as fuel. It has also been suggested that charred cereal remains in medieval archaeobotanical assemblages may have originated in thatch which was swept into the hearth (Moffett 2006, 52).

The assemblage of wild or weed plant seeds from Glastonbury Abbey Abbot's kitchen includes a range of taxa commonly associated with cultivation or fertile disturbed soils. It is likely that these seeds were harvested along with the crops and charred as crop processing waste. The presence of stinking mayweed in particular is typical of Roman and later charred plant assemblages and has been interpreted as an indicator of the expansion of agriculture onto heavier clay soils. Other sources of wild or weed plant seeds however may include kindling, waste roofing or flooring material and animal fodder. A limited range of plant species commonly associated with grassland were also present. A similar combination of wild plant species typical of cultivated or disturbed ground and grassland were present in later medieval and post medieval samples studied as part of the Shapwick Project. It is possible that these

grassland taxa are representative of managed hay meadows which were a component of later medieval farming practice (Straker, Campbell and Smith 2007, 879).

Documentary evidence also indicates that wood and charcoal used for fuel were supplied to monastic institutions from their local estates (Green 1984, 109). It is likely that much woodland was managed as a valuable resource with a sustained yield during the medieval period in England (Rackham 2003, 137). A reduction in the use of shrubby species for fuel in medieval and post medieval charcoal samples studied as part of the Shapwick Project was interpreted as possibly relating to more intensive systems of woodland management (Gale 2007, 894). The ring curvatures of many of the charcoal fragments in the samples from Glastonbury Abbey Abbot's kitchen were observed to be strong, indicating the use of smaller branch material which would be consistent with the use of coppiced poles for fuel although further analysis would be required in order to investigate this.

Further analysis of the charred plant assemblage present in sample 13, context 1065 and sample 14, context 5 would be recommended in order to provide a fully quantified record of the rich assemblage of charred plant remains present in these samples. Full sorting would also be expected to result in the identification of wild or weed plant taxa which may have been missed during the initial scan. The full analysis of the wild or weed seed assemblage in particular, would be expected to provide information concerning crop husbandry practices as well as possible evidence for managed pasture or hay meadows. This analysis would be expected to take two and a half days.

Relatively few medieval and post medieval charcoal assemblages have been analysed from the South West (Smith 2002, 113-115). Further analysis of the wood charcoal assemblage present in the samples from Glastonbury Abbey would also therefore be recommended in order to further investigate the possible presence of wood from managed sources as well as to investigate the wood taxa utilised for fuel and therefore the availability of woodland and scrub in the local area. It would be recommended that at least the wood charcoal assemblage from sample 4 context 74, sample 7 context 77, sample 10 context 53, sample 13 context 106 and sample 14 context 5 be fully analysed. This analysis would be expected to take 5 days.

Suitable material for use in radiocarbon dating was present in all of the samples with the exception of sample 8. This material is in the form of whole roundwood charcoal pieces or charcoal fragments with strong ring

curvatures, indicating that this charcoal is representative of small branches or twigs and therefore of short life material. The high density of the charcoal in these samples and the lack of intrusive roots indicates that there is a low likelihood that this material will be intrusive.

There are also well preserved charred cereal grains present in samples 6, 9, 12, 13 and 14 and well preserved pulses in samples 9, 10 and 11. This short life material would also be suitable for radiocarbon dating, although these charred plant remains are present in low densities in all but sample 13. The likelihood that this material will be intrusive is low however, as it is a component of the high density charcoal samples.

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### Appendix 1 – Tables

Table 1 - Archaeobotanical sample scanning table

Archaeobotanical Sample Scanning Table							
SITE: Glastonbury Abbey Abbot's kitchen (GAK13)							
NGR: ST 501 388							
CONTEXT NUMBER	69	71	73	74	75	76	77
FLOTATION SAMPLE NUMBER	1	2	3	4	5	6	7
CONTEXT TYPE	floor deposit	floor deposit	floor deposit	floor deposit	floor deposit	floor deposit	floor deposit
PROVISIONAL DATE	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th
SAMPLE VOLUME (litres)	40	22	15	10	45	5	6
FLOT VOLUME (millilitres)	400	200	50	50	725	300	50
% intrusive roots	0	0	0	0	0	0	0
Charred plant material (*key += > 5 items, ++ = > 10 items, +++ = > 30 items, ++++ = > 50 items, +++++ = > 100 items.)							
CROP MATERIAL*							
Barley grain ( <i>Hordeum</i> sp.)	1	2					
Bread / club wheat type grain ( <i>Triticum aestivo-compactum</i> type)	1					1	
Probable bread / club wheat grain ( <i>Triticum</i> cf. <i>aestivum</i> )							
Bread / club wheat / spelt wheat ( <i>Triticum aestivo-compactum</i> / <i>spelta</i> )			1			2	
Wheat grain indet. ( <i>Triticum</i> sp.)							
Cereal grain indet.							
Large seeded legume							0.5
Grape ( <i>Vitis vinifera</i> )		1	4				
Fig ( <i>Ficus carica</i> )		1	1				



<b>Archaeobotanical Sample Scanning Table</b>							
<b>SITE: Glastonbury Abbey Abbot's kitchen (GAK13)</b>							
<b>NGR: ST 501 388</b>							
<b>CONTEXT NUMBER</b>	<b>69</b>	<b>71</b>	<b>73</b>	<b>74</b>	<b>75</b>	<b>76</b>	<b>77</b>
<b>FLOTATION SAMPLE NUMBER</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
CONTEXT TYPE	floor deposit	floor deposit	floor deposit	floor deposit	floor deposit	floor deposit	floor deposit
PROVISIONAL DATE	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th
SAMPLE VOLUME (litres)	40	22	15	10	45	5	6
FLOT VOLUME (millilitres)	400	200	50	50	725	300	50
% intrusive roots	0	0	0	0	0	0	0
<b>Total identifiable crop material</b>	-	-	+			-	-
<b>WILD / WEED PLANT MATERIAL*</b>							
Spurge ( <i>Euphorbia</i> sp.)	1						
Docks ( <i>Rumex</i> spp.)			2				
Sheep's sorrel ( <i>Rumex acetosella</i> ) - uncharred			+				
Cleavers ( <i>Galium aparine</i> )							
Daisy family (Asteraceae)						1	
Probable stinking mayweed ( <i>Anthemis</i> cf. <i>cotula</i> )		1					
Large seeded grass (>2mm Poaceae)						1	
<b>Total identifiable wild / weed plant material</b>	-	-	+			-	
<b>NON SEED PLANT MATERIAL*</b>							
> 4mm wood charcoal fragments	+++++	+++++	+++	++++	+++++	+++++	+++
> 2mm wood charcoal fragments	+++++	+++++	+++++	+++++	+++++	+++++	+++++
> 2mm vitrified charcoal							
> 2mm roundwood	-		-	-	-	+	
Intrusive plant material / non-plant material (- = < 5 items, + = > 5 items, ++ = > 10 items, +++ = > 30 items, ++++ = > 50 items, +++++ = > 100 items.)							
Bone	+++++	+++++	+++++	++++	+++++	++++	+++++
Snail shells (Mollusca)	++++	+++					
Sample summary information							
Charred plant material suitable for further analysis	x	x	x	x	x	x	x
Wood charcoal suitable for further analysis	✓	✓	✓	✓	✓	✓	✓

<b>Archaeobotanical Sample Scanning Table</b>							
<b>SITE: Glastonbury Abbey Abbot's kitchen (GAK13)</b>							
<b>NGR: ST 501 388</b>							
<b>CONTEXT NUMBER</b>	<b>69</b>	<b>71</b>	<b>73</b>	<b>74</b>	<b>75</b>	<b>76</b>	<b>77</b>
<b>FLOTATION SAMPLE NUMBER</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
CONTEXT TYPE	floor deposit	floor deposit	floor deposit	floor deposit	floor deposit	floor deposit	floor deposit
PROVISIONAL DATE	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th
SAMPLE VOLUME (litres)	40	22	15	10	45	5	6
FLOT VOLUME (millilitres)	400	200	50	50	725	300	50
% intrusive roots	0	0	0	0	0	0	0
Charred material suitable for C14 dating	✓	✓	✓	✓	✓	✓	✓
Retain flots	✓	✓	✓	✓	✓	✓	✓

Table 1 continued.

<b>Archaeobotanical Sample Scanning Sheet</b>							
<b>SITE: Glastonbury Abbey Abbot's kitchen (GAK13)</b>							
<b>NGR: ST 501 388</b>							
<b>CONTEXT NUMBER</b>	<b>79</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>56</b>	<b>106</b>	<b>5</b>
<b>FLOTATION SAMPLE NUMBER</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14?</b>
FEATURE TYPE	hearth	floor deposit	floor deposit	floor deposit	floor deposit	floor deposit	fire pit
PROVISIONAL DATE	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	Early post medieval
SAMPLE VOLUME (litres)	0.5						45
FLOT VOLUME (millilitres)	5	1150	800	1950	1800	500	200
% intrusive roots	0	0	0	0	0	0	0
Charred plant material (*key += > 5 items, ++ = > 10 items, +++ = > 30 items, ++++ = > 50 items, +++++ = > 100 items.)							
<b>CROPS AND OTHER ECONOMIC PLANTS*</b>							
Barley grain ( <i>Hordeum</i> sp.)					3	+	5
Barley rachis internode ( <i>Hordeum</i> sp.)							1
Probable oat grain (cf. <i>Avena</i> sp.)				1		-	

Archaeobotanical Sample Scanning Sheet							
SITE: Glastonbury Abbey Abbot's kitchen (GAK13)							
NGR: ST 501 388							
CONTEXT NUMBER	79	52	53	54	56	106	5
FLOTATION SAMPLE NUMBER	8	9	10	11	12	13	14?
FEATURE TYPE	hearth	floor deposit	floor deposit	floor deposit	floor deposit	floor deposit	fire pit
PROVISIONAL DATE	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	Early post medieval
SAMPLE VOLUME (litres)	0.5						45
FLOT VOLUME (millilitres)	5	1150	800	1950	1800	500	200
% intrusive roots	0	0	0	0	0	0	0
Bread / club wheat type grain ( <i>Triticum aestivo-compactum</i> type)						++	
Probable bread / club wheat grain ( <i>Triticum cf. aestivum</i> )					4	++++	1
Bread wheat chaff ( <i>Triticum aestivum</i> )						-	1
Emmer wheat / bread / club wheat ( <i>Triticum dicoccum / aestivo-compactum</i> )						+	
Spelt wheat / Bread / club wheat / ( <i>Triticum spelta / aestivo-compactum</i> )						++	
Wheat grain indet. ( <i>Triticum</i> sp.)				1	5	++++	
Cereal grain indet.							
Peas / beans ( <i>Pisum sativum / Vicia faba</i> )		2.5	1	3		-	
Large seeded legume		2				++	1
Small seeded legume						++	
Grape ( <i>Vitis vinifera</i> )				1		1	
Nutshell		4					
<b>Total identifiable crop material</b>		+	-	+	++	+++++	+
WILD / WEED PLANT MATERIAL*							
Common nettle ( <i>Urtica dioica</i> )							+
Pea family (Fabiaceae)						++	
Vetch / pea ( <i>Vicia / Lathyrus</i> )						-	+
Melilot / medick / clover ( <i>Melilotus / Medicago / Trifolium</i> )						+	+++
Bramble ( <i>Rubus fruticosus</i> agg.)							+



<b>Archaeobotanical Sample Scanning Sheet</b>							
<b>SITE: Glastonbury Abbey Abbot's kitchen (GAK13)</b>							
<b>NGR: ST 501 388</b>							
<b>CONTEXT NUMBER</b>	<b>79</b>	<b>52</b>	<b>53</b>	<b>54</b>	<b>56</b>	<b>106</b>	<b>5</b>
<b>FLOTATION SAMPLE NUMBER</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14?</b>
<b>FEATURE TYPE</b>	hearth	floor deposit	floor deposit	floor deposit	floor deposit	floor deposit	fire pit
<b>PROVISIONAL DATE</b>	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	C12th – early C14th	Early post medieval
<b>SAMPLE VOLUME (litres)</b>	0.5						45
<b>FLOT VOLUME (millilitres)</b>	5	1150	800	1950	1800	500	200
<b>% intrusive roots</b>	0	0	0	0	0	0	0
<b>&gt; 2mm vitrified charcoal</b>							
<b>&gt; 2mm roundwood</b>		++	+++	+++	++	+++	-
<b>Thorn</b>							-
<b>Leaf buds</b>					-		
<b>Tuber / rhizome</b>							
<b>Intrusive plant material / non-plant material (- = &lt; 5 items, + = &gt; 5 items, ++ = &gt; 10 items, +++ = &gt; 30 items, ++++ = &gt; 50 items, +++++ = &gt; 100 items.)</b>							
<b>Bone</b>		+++++	+++++	+++++	+++++	+++++	
<b>Snail shells (Mollusca)</b>		+	++				-
<b>Metallurgical debris</b>					-		
<b>Sample summary information</b>							
<b>Charred plant material suitable for further analysis</b>	x	x	x	x	x	✓	✓
<b>Wood charcoal suitable for further analysis</b>	x	✓	✓	✓	✓	✓	✓
<b>Charred material suitable for C14 dating</b>	x	✓	✓	✓	✓	✓	✓
<b>Retain flots</b>	x	✓	✓	✓	✓	✓	✓