

## **APPENDIX : WATERLOGGED PLANTS, MOLLUSCS, CHARCOAL AND INSECT INTERIM ASSESSMENT**

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### **Introduction**

Five samples were selected from two boreholes **WA2012\_BH02** and **WA2012\_BH05** for assessment of the recovery, survival and potential of waterlogged plant remains, charcoal, insects and molluscs to inform on past environments. Four came from **WA2012\_BH02** (at 4.04 to 4.14m below OD, 3.51 to 3.61m below OD, 0.69 to 0.59m above OD and a spot sample at 0.58m above OD). This sequence was dated at 0.74m OD, near the top of the sequence, on stems of common reed (*Phragmites australis*) to the Middle to Late Neolithic; 3100-2910 cal BC (SUERC-38608, 4020±35 BP) to 17400-16800 cal BC (SUERC-38609, 15825±40 BP) at 4.15m below OD, near the base of the sequence. A further sample came from **WA2012\_BH05** at 2.19 to 2.29m below OD, which was dated to around 2630-2460 cal BC (SUERC-38610, 4390±30 BP). In addition the residue from the foraminifera and ostracod sample at 0.58m above OD was also assessed.

The samples were processed for the recovery and assessment of mollusca, plant remains, insect remains and other waterlogged material.

### **Method**

The samples were processed by wet-sieving using a 0.25mm mesh size. The samples were visually inspected under a x10 to x40 stereo-binocular microscope to determine if waterlogged plant remains were preserved. Nomenclature follows that of Stace (1997). Other material present, in particular mollusc shells are also noted within Table 1 with further identifications carried out where possible.

### **Results**

#### *Waterlogged Plant Remains*

Organic material was present within all the samples, although within the lower two samples from borehole BH2, no identifiable remains were present and the remains were rather probably of roots and as such probably later in date than the deposit from which they were recovered.

The upper two samples dated prior to the Middle to Late Neolithic had larger assemblages comprising a mixture of aquatics and wetland plants. Of the aquatics several gametes of stonewort (*Chara* sp.) were recovered along with a single seed of spiked water-milfoil (*Myriophyllum spicatum*), and several of pondweed (*Potamogeton* sp.). Comparison with modern material suggests that these seeds are most likely of fennel-leaved pondweed (*Potamogeton pectinatus*). In one case the seed could be seen to be charred. Other aquatics present included water-crowfoot (*Ranunculus* subgenus *Batrachium*) and a single seed of horned pondweed (*Zannichellia palustris*). The size of the water crowfoot seeds, the poor definition of the ridges and comparison with modern material suggest that they are probably of brackish water-crowfoot (*Ranunculus baudotii*).

General wetland plants were represented by seeds of grey club-rush (*Schoenoplectus tabernaemontani*).

Plants relating to coastal and saltmarsh environments included several of oak-leaved/upright goosefoot (*Chenopodium glaucum/rubrum*), probable seeds of saltmarsh rush (*Juncus gerardii*). Terrestrial plants were represented by a single seed of common nettle (*Urtica dioica*).

The sample from BH5, dated to the Late Neolithic, also had a gamete of stonewort (*Chara* sp.). It also contained seeds of seablite (*Suaeda maritima*), as well as orache (*Atriplex* sp.), along with bulrush (*Typha latifolia/angustifolia*), and possible stems of horsetail (*Equisetum* sp.). Several rush seeds with a large cell pattern resembling those of sharp-rush (*Juncus acutiflorus*) were recovered, although other species with a similar cell pattern, such as blunt-flowered rush (*Juncus subnodulosus*) are also possible candidates.

#### *Molluscs Remains*

A high number of molluscs were observed within the spot sample from borehole BH2 at 0.58 m above OD. This assemblage included shells of *Hydrobia ventrosa* and *Hydrobia ulvae*.

A few shells of *Hydrobia* sp. were recorded within two samples within borehole BH2 (at 0.69 to 0.59m above OD and 3.51 to 3.61m below OD) along with *Ovatella myosotis/Leucophytia bidentata* in the lower sample.

No shells were recovered from the basal sample within BH2.

The sample from BH5 contained a few shells of *Hydrobia* sp. and *Tellina/Scrobicularia* type.

*Hydrobia ulvae* is 'a species restricted to brackish or salt water in estuaries, intertidal mudflats and saltmarshes', while *Hydrobia ventrosa* 'inhabits water of low to moderate salinities in quiet estuaries, ponds behind shingle bars, and lagoons and drainage ditches in coastal marshes' (Kerney 1999, 33 and 31). *Ovatella myosotis* and *Leucophytia bidentata* could also be found in these environments.

The small mollusc assemblage from BH5 is also indicative of a saltmarsh environment.

#### *Insects and Wood charcoal*

No remains of insects or charcoal were seen within the samples from Borehole 2. The sample from borehole 5 had some insect remains including remains of wing-cases (elytra) and a single head.

#### **Summary**

The boreholes indicate generally similar estuarine/tidally influenced environments with freshwater, brackish water and saltmarsh environments all represented.

In borehole BH2 elements such as stonewort (*Chara* sp.) can include brackish water species. Other species including fennel-leaved pondweed (*Potamogeton pectinatus*), horned pondweed (*Zannichellia palustris*), grey club-rush (*Schoenoplectus tabernaemontani*) and spiked water-milfoil (*Myriophyllum spicatum*), which taken

together with brackish water-crowfoot (*Ranunculus baudotii*) are indicative of slightly saline conditions. Shells of *Hydrobia* sp. are very good indications of saline conditions and brackish water in general, the shells being most common in the uppermost later Neolithic sample.

The water fleas eggs are of some interest as generally this genera is more associated with freshwater. However, some species, including *Daphnia magna*, are found in coastal rock pools and small ponds, and quite tolerant of some degree of salinity (Teschner 1995).

Terrestrial components include common nettle (*Urtica dioica*) and goosefoot (*Chenopodium glaucum/rubrum*) which could indicate muddy areas on the edge of the channel.

The sample from borehole BH5, which is likely to be later in date, was generally similar. However, there are indications of both a saltmarsh environment seen from the seeds of seablite (*Suaeda maritima*) and a more marine influenced environment seen from the fragments of *Tellina/Scrobicularia* type shells. Common bulrush (*Typha latifolia*) can be found in slightly saline environments, with lesser bulrush (*Typha angustifolia*) recorded as replacing the former with increasing salinity, and both species being ousted by common reed (*Phragmites australis*) in more saline environments (Grime *et al.* 1988, 582-2). The presence of seeds of common nettle (*Urtica dioica*), bramble (*Rubus* sp.), rushes (*Juncus* sp.) and possible seeds of buttercup (*Ranunculus* sp.) probably point to patches of localised scrub and marshy grassland.

## References

- Grime J. P, Hodgson J. G, Hunt R. 1988. *Comparative plant ecology: a functional approach to common British species*. London: Unwin Hyman
- Kerney, M., 1999, *Atlas of the Land and Freshwater Molluscs of Britain and Ireland*.
- Stace, C, 1997, *New flora of the British Isles* (2<sup>nd</sup> edition), Cambridge: Cambridge University Press. Colchester: Harley Books.
- Teschner, M. 1995, Effects of salinity on the life history and fitness of *Daphnia magna*: variability within and between populations. *Hydrobiologia* **307**: 33-41.

**Table 1. Waterlogged Plant Remains, Molluscs and other environmental material**

	<b>Borehole</b>	BH2	BH2	BH2	BH2	BH5
<b>Depth top</b>		4.86	4.75	8.95	9.48	7.92
<b>Depth base</b>		4.86	4.85	9.05	9.58	8.02
				-	-	-
<b>Depth top mOD</b>		0.58	0.69	3.51	4.04	2.19
				-	-	-
<b>Depth base mOD</b>		0.58	0.59	3.61	4.14	2.29
<b>Flot size</b>		10ml	5ml	25ml	10ml	5ml
<b>Original Volume</b>		?ltr	1ltr	1ltr	1ltr	1ltr
<b>Species</b>	<b>Common Name</b>					
<i>Chara</i> sp.	stonewort	1	6	-	-	1
<i>Equisetum</i> sp. stem	horsetails	-	-	-	-	cf.1
<i>Ranunculus</i> subgen <i>Ranunculus</i>	buttercup	-	-	-	-	cf.1
<i>Ranunculus</i> <i>baudotii</i>	brackish water crowfoot	-	2	-	-	-
<i>Urtica dioica</i>	common nettle	-	1	-	-	1
<i>Chenopodium glaucum/rubrum</i>	oak-leaved/red goosefoot	2	5	-	-	-
<i>Atriplex</i> sp.	orache	-	-	-	-	1
<i>Suaeda maritima</i>	sea-blite	-	-	-	-	2
<i>Rubus</i> sp.	bramble	-	-	-	-	1
<i>Myriophyllum spicatum</i>	spiked water-milfoil	-	1	-	-	-
<i>Potamogeton</i> sp.	pondweed	-	+	-	-	-
<i>Potamogeton</i> cf. <i>pectinatus</i>	fennel-leaved pondweed	+	9+1c	-	-	-
<i>Zannichellia palustris</i>	horned pondweed	-	1	-	-	-
<i>Juncus</i> sp. (cf. <i>gerardii</i> )	saltmarsh rush	+	-	-	-	-
<i>Juncus</i> sp.	sharp rush	-	-	-	-	cf.2
<i>Schoenoplectus tabernaemontani</i>	grey club-rush	-	cf.7	-	-	-
<i>Typha latifolia/angustifolia</i>	bulrush	-	-	-	-	1
Stem culms		+	-	-	-	-
<b>Other Waterlogged</b>		-	-	-	-	-
<i>Cristatella mucedo</i>	bryozoa statoblast	1	-	-	-	-
<i>Daphnia magna</i> (type)	Water flea	-	10+	-	-	-
<b>Molluscan</b>		-	-	-	-	-
<i>Hydrobia ventrosa</i>		++	-	-	-	-
<i>Hydrobia ulvae</i>		++	-	-	-	-
<i>Hydrobia</i> sp.		+	+	+	-	+
<i>Ovatella myosotis/Leucophytia bidentata</i>		-	-	+	-	-
<i>Tellina/Scrobicularia</i> type		-	-	-	-	+
<b>Other</b>		-	-	-	-	-
Porifera	sponges	+++	+	-	-	-
Insects		-	-	-	-	+
Fish bones and scale		-	++	-	-	-

Borehole	PMCI			
	mbGL	mbGL	mOD	mOD
	from	to	from	to
BH02	4.75	4.85	0.69	0.59
BH02	8.95	9.05	-3.51	-3.61
BH02	9.48	9.58	-4.04	-4.14
BH05	7.92	8.02	-2.19	-2.29

I'll come and explain

**Table 1.**