PS: WATERLOO CONNECTION

Assessment of the Charred Plant Remains

By Ruth Pelling

Introduction

All of the samples taken during excavation (963) were processed for the recovery of charred plant remains from cremation urns, pits and associated features. Following a preliminary scan of all samples for presence/ absence of charred material, 320 were chosen for assessment of charred plant remains and charcoal. Samples were processed by flotation in a modified Siraf-type machine. The flots were collected onto a 250µm mesh and allowed to air dry slowly. The same samples, most of which were from Roman cremations, were assessed for identifiable charcoal by Dana Challinor (see below). Charred remains other than charcoal were observed in 23 samples. Of these 21 were submitted for detailed assessment.

The Fieldwork Event Aims which the assemblage can be expected to contribute to are as follows:

Fieldwork Event Aim 5: To recover other palaeo-economic indicators known to be well preserved: (eg. animal bone, molluscs, charred plant remains) to establish the fullest possible picture of the urban economy.
Fieldwork Event Aim 6: To recover palaeo-environmental indicators to elucidate the interaction of the town within the local environment.
Fieldwork Event Aim 9: To establish if spatial variations exist within the cemetery in relation to burial practice.
Fieldwork Event Aim 11: To establish the nature and distribution of structural features located within the cemetery.
Fieldwork Event Aim 12: To identify ancillary features associated with a specific burial practice.
Fieldwork Event Aim 14: To determine the nature of activity and land utilisation, other than that directly forming part of the cemetery, associated with the Roman town of Springhead.

Methodology

All cremation deposits encountered during the excavations were sampled for the recovery of charred plant remains and cremated bone, with some cremation urns sampled in 20 mm spits, so producing multiple samples. The charred remains were dominated by charcoal hence initial assessment was carried out by a charcoal specialist. A total of 21 samples in which charred remains other than charcoal were noted were submitted for further assessment. Flots submitted were first put through a stack of sieves from 500µm to 2mm mesh size in order to break them into manageable fractions. Each fraction was then scanned under a binocular microscope at x10 to x20 magnification. Any seeds or chaff noted were provisionally identified based on morphological characteristics and an estimate of abundance was made.

Quantification

Quantifiable grain was identified in 5 of the 21 samples assessed for charred seeds and chaff. In each case the number of items noted was less than 10. *Hordeum vulgare* (barley), *Triticum spelta* (spelt wheat) and a short grained *Triticum* sp. (wheat) were identified. The short grained *Triticum* is probably of a free-threshing species. Chaff was present in two samples, again in each case less than 10 items. The species identified in both samples was *Triticum* *spelta*. Weed seeds were also rare, and were present in small numbers in six samples. The species identified include *Rumex* sp. (docks), *Polygonum aviculare* (knotgrass), *Medicago/Trifolium* sp. (medick/clover) and *Bromus* sp. (brome grass). Occasional pulses were present in three samples (ARCPHL97 sample 35, ARCNBR98 samples 399 and 398). Preservation was poor, so identification is unlikely to be possible beyond the level of *Vicia/Pisum* sp. (bean/pea), with the exception of sample 399, in which two or more species appear to be present. A particularly interesting and unusual find from this sample were several (up to 50) seeds of *Vitis vinifera* (grape) including examples with some flesh still attached.

The preservation of cereal remains and the pulses was generally poor. The *Vitis vinifera* seeds tended to be very well preserved.

Provenance

The occasional cereal remains within the deposits are likely to represent occasional cereal processing debris which was present as background noise, or had perhaps entered the cremation pyres as kindling. Sample 399, context 11728 (ARCNBR98) is more curious however. The presence of grape flesh still attached to some of the seeds might indicate that whole grapes were placed on the funeral pyre, perhaps as a funerary offering. The pulses in this context may have derived from a similar origin. This sample was taken from a cremation pit. The remaining samples which produced seeds and chaff were from cremation pits, one grave and two cremation urns.

Conservation

The flots are in a stable condition and can be archived for long term storage.

Comparative Material

The range of species identified are appropriate for the Romano-British period. *Hordeum vulgare* and *Triticum spelta* have been recorded from the other contemporary sites within the rail link project (eg. Thurnham Villa and Hockers Lane). They are the principal cereals recorded throughout southern Britain at this time (Greig, 1991). Finds of grape seeds from the period are not common, although occasional seeds have been identified from several sites and a large assemblage was recovered from a 2nd century pit in Southwark, London (Willcox 1978). Viticulture has recently been demonstrated for Roman Britain. Bedding trenches excavated at Wollaston, near Northampton, were confirmed to be the remains of vineyards with the identification of *Vitis* pollen (Meadows, 1996). No other examples of deposits of grape within cremation deposits are known in either Kent or in southern Britain. Other food products are known in ritual deposits, notably *Pinus pinea* (stone pine) which has been found associated with ritual or temple deposits (Kislev 1988). The choice of stone-pine cones is presumably partly because it emits a pleasant scent when burnt although it is possible that the relatively exotic nature of certain food items makes them a valuable offering.

Potential for Further Work

Generally the concentration of seeds and chaff is too low to offer any potential for detailed analysis. The one sample which produced grapes and pulses does merit closer examination. The aspect of possible funerary deposits deserves to be explored. A detailed search through the published literature for comparable deposits is also recommended. This work should take two days of technical time and up to three days of specialist time.

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Charcoal

By Dana Challinor

Introduction

All of the samples taken during excavation (963) were processed for the recovery of charred plant remains from cremation urns, pits and associated features. Of these, 320 were chosen for the assessment of the wood charcoal. The purpose in sampling was to examine the evidence for change and continuity in burial practice. The samples were processed by flotation in a modified Siraf-type machine, with the flots collected onto a 250µm mesh.

The Fieldwork Event Aims to which the assemblage can be expected to contribute are as follows:

Fieldwork Event Aim 5: To recover other palaeo-economic indicators known to be well preserved: (eg. animal bone, molluscs, charred plant remains) to establish the fullest possible picture of the urban economy.
Fieldwork Event Aim 6: To recover palaeo-environmental indicators to elucidate the interaction of the town within the local environment.
Fieldwork Event Aim 7: To establish the chronology of the cemetery.
Fieldwork Event Aim 9: To establish if spatial variations exist within the cemetery in relation to burial practice.
Fieldwork Event Aim 11: To establish the nature and distribution of structural features located within the cemetery.
Fieldwork Event Aim 12: To identify ancillary features associated with a specific burial practice.
Fieldwork Event Aim 14: To determine the nature of activity and land utilisation, other than that directly forming part of the cemetery, associated with the Roman town of Springhead.

Methodology

A total of 320 flots were assessed. The volume of soil processed varied considerably (from 0.05 kg to 100 litres) according to the feature type. All cremation deposits were sampled in entirety for the recovery of charred plant remains and cremated bone; however, some of the cremation urns were sampled in spits of 20 mm, with the result that the individual samples were very small. For the assessment, only one spit from a single cremation burial was assessed, although several spits may need to be amalgamated to provide enough material in any further work. The flots were air-dried and divided into fractions using a set of sieves. Fragments of charcoal were randomly extracted, fractured and examined in transverse section under a binocular microscope at x10 and x20 magnification. Fragments caught in the >2mm sized sieves were quantified as identifiable. In the case of large flots, a sample of *c.* 20% was examined, although any quantification given is based on estimates of the entire flot. The flots were also scanned for the presence of any other charred plant remains.

Quantification

A total of 213 flots produced identifiable wood charcoal (Table 1). Six taxa were provisionally identified - *Quercus* sp. (oak), *Alnus/Corylus* (alder/hazel), cf. Salicaceae (willow, poplar), *Prunus* sp. (blackthorn, cherry), Maloideae (hawthorn, apple, pear etc.) and *Fraxinus excelsior* (ash). Some of the ring-porous taxa were difficult to identify as many fragments, and particularly small twigs, exhibited very slow growth and the full range of anatomical characteristics were not always visible. Some of the identified *Quercus*, for example, did not have the characteristic large pores and rays and will require examination at high magnification in all three planes.

There was some variation in the taxonomic composition between cremation deposits. Cremation pits produced the best preserved and largest quantity of charcoal, including some very large fragments with more than ten years growth evident. In contrast, cremation urns and vessels produced much smaller quantities of material and preservation was poorer. This may be due to the smaller soil sample sizes of the spit samples, but this was not always the case, as some of the cremation pit deposits which produced large assemblages were only a couple of kilogrammes in size. A few grave and pit samples also produced good assemblages, with similar taxonomic composition to the cremation deposits. *Quercus* was the most common taxon, present in almost all feature types, followed by Maloideae and *Fraxinus.* Some of the assemblages appeared to be dominated by a single taxon; in most cases this was *Quercus* but *Fraxinus* also predominated in some flots. No flot appeared to contain more than three taxa, but this will require confirmation through further analysis.

There was some cremated bone present in the cremation samples and one flot appeared to contain animal vertebrae (context 163). General charred amorphous material was present in most flots; some of this is likely to be carbonised liquid from the cremation process but it is also possible that other plant remains were present in the pyre. Coal was observed in most flots and modern seeds were common. The coal could be Roman in date although the very small quantities present suggest it is more likely to be modern. The presence of the modern seeds is probably due to contamination either when the site was first stripped or when some features were half sectioned. However, the integrity of the samples is unlikely to have been compromised. Small droplets of slag were noted in several cremation flots, suggesting that metallic objects may have been present on the cremation pyre, but these require examination by an appropriate specialist.

Provenance

The preservation of charcoal at this site was variable, with better preservation in the central part of the site. This may be due to local variations in soil type. The lower concentration of material is to be expected in the burial urns where the bone has been carefully removed from the pyre remains. Indeed, it is possible that more than a single burning event is represented in the composition of the cremation pits, although the lack of taxonomic diversity suggests either a single event or the deliberate selection of a species for fuelwood. Certainly, the evidence from the charcoal suggests continuity in burial practice and there is potential for a comparison between deliberately deposited pyre remains and the accidental inclusion of pyre debris in burial urns.

Conservation

The flots are in a stable condition and present no problems for long-term storage and archive.

Comparative material

It is interesting that the same limited range of taxa identified in the Waterloo Connection cremation deposits have been identified in cremation burials from Tutt Hill, Chapel Mill and Boys Hall Balancing Pond, despite a range in date from the Bronze Age to the Roman period.

Since individual assemblages show a lack of taxonomic diversity, the fuelwood must have been deliberately selected. Indeed, the predominance of a single taxon in prehistoric cremation assemblages, indicating the use of a single tree or specifically selected species in ritual activities, has been noted at Radley Barrow Hills (Thompson 1999, 352) and at Rollright Stones (Straker 1988). However, it has also been suggested that the abundance of oak or ash in cremation deposits, compared to other species, is a result of the pyre structure; the timber from these trees providing the supports in a central position, less likely to have been totally reduced to ash (Gale 1997, 82). The choice of fuelwood may have been determined by the burning properties of the wood (oak and ash burn very well), rather than ritual concepts.

Potential for further work

Since there has been little publication on Iron Age and Roman charcoal from cremation deposits (Gale 1997, 77), the charcoal from Waterloo Connection will provide a valuable addition. Indeed, the charcoal from this site has high potential to add to our understanding of regional Roman cremation practices, and the continuity and change within burial practices over time by comparison with earlier burials. It is recommended that the remaining unassessed flots are scanned to determine if any variation or trends have been missed in the sample covered in this assessment. More detailed analysis should then be carried out on a selection of assemblages to confirm identifications, to establish the presence of any additional taxa, to consider the evidence for deliberate selection of fuelwood and to explore regional trends and the possibility for woodland management practices.

It is been proposed that a programme of radiocarbon dating is undertaken to improve the chronology of the site. Advice has been sought from the Scientific Dating Co-ordinator at English Heritage (A Bayliss). The programme would require both high precision dating and the AMS measurement of cremated bone and involves the application of newly developed statistical techniques (Bayesian modelling) to the results to substantially reduce the probable date range (Lanting and Brindley 1998).

It should be possible to establish the date of individual samples to within a century or so by using high-precision measurements which would require 10-50 g of identified short-lived charcoal per burial.

It is likely that by submitting approximately 20 samples it will be possible to confirm both the start date and the end date of the period of use of the cemetery. Some measurements would be taken on human bone and some on charcoal. If AMS measurements (on either bone or charcoal) are applied, this scale of programme would be required to counteract the effects of statistical scatter on the measurements. A similar number of further dates could be required to address specific questions, such as the chronological range of *bustum* burials within the cemetery, although samples will wherever possible be selected to address multiple aims. Dating might be desirable for discrete groups of graves, or to assess the chronology of identified ritual practices; dating may also be useful to date human bone from the well/shaft, and to confirm the date of suspected Iron Age features.

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PS: NASHENDEN VALLEY

Assessment of the Charred Plant Remains and Charcoal

by Ruth Pelling

Introduction

A sample was recovered during watching brief works for the recovery of charred plant remains and charcoal, in order to characterise the isolated Romano-British (late 2nd-4th century AD) feature from which the sample was recovered.

The recovery and study of the material was undertaken in accordance with the Fieldwork Event Aims (see section 2, main report), in particular 1-3 and 5.

Methodology

A sample of 40 litres was processed by bulk water flotation and the flot collected onto a 250 μm mesh sieve. The flot was air dried slowly before being submitted for assessment. It was hoped that the sample would give some indication about the cereal economy of the site. The flot was assessed by scanning under a binocular microscope at x10 magnification. Any seeds or chaff noted were provisionally identified and an estimate of abundance made. Random fragments of charcoal were fractured and examined in transverse section at x10 and x20 magnification. The results of the assessment are noted in Table 4.1.

Table 4.1: Charred remains noted in the sample

Sample	Cxt	Vol. Deposit (l)	Vol Flot (ml)	Feature	Grain	Chaff	Weeds	Charcoal	Notes
1	44	40	250	Pit	+	+	+	++	Rhizomes

Key: +=1-10, ++= 11-50

Quantification

The flot measured approximately 250 ml in volume.

Charred plant remains were present in low numbers, with less than 10 items each of grain, chaff and weeds. The grain identified includes *Hordeum vulgare* (barley) and *Triticum spelta* (spelt wheat). Occasional monocotyledon rhizomes were noted, which could be derived from a grass, including the cereals. Their presence might indicate the use of turf as fuel, although there is no other evidence for this. Alternatively they might demonstrate the harvesting of cereals by uprooting. Two charcoal taxa were provisionally identified, Pomoideae (apple, pear, hawthorn etc) and *Quercus* sp. (oak).

Provenance

The sample is derived from the fill of a possible quarry pit which is likely to have been re-used for rubbish disposal. The cereal remains are likely to be derived from small-scale cereal processing, deposited with the charcoal, perhaps derived from the same burning episode, or fire.

Conservation

The flot is in a stable condition and can be archived for long-term storage.

Comparative Material

The cereal species recorded are well attested for Romano-British sites in southern Britain (see Greig 1991). Within the CTRL route, similar deposits representing small-scale cereal processing debris were also recorded at Hockers Lane. This is very different to the deposits sampled from Thurnham Villa for which much larger scale cereal processing is represented.

Potential for further work

Given the absence of good cereal remains and the limited charcoal, the sample offers no potential for further work. Spelt wheat and hulled barley, were the cereals most commonly cultivated during the Romano-British period in southern Britain. The samples provide no potential for extending this species list. The remains are characteristic of low levels of re-deposited remains of cereal processing activity.

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- MOLLUSCS

Assessment of the Molluscs

by Mark Robinson

Introduction

A column of 13 samples, in 0.1 m units, was cut from the top 1.3 m of colluvial sediments exposed in section in a stepped trench through the bottom of Nashenden Valley. 2 kg of each sample was floated onto a 0.5 mm mesh at the Oxford Archaeological Unit and the residue sieved down to 0.5 mm.

The recovery and study of the material was undertaken in accordance with the Fieldwork Event Aims (see section 2, main report), in particular 1-3 and 5. The aim of the assessment is to establish the potential of molluscan analysis to provide palaeoenvironmental information extending from the Mesolithic to the late Iron Age. It is hoped that comparisons can be made with molluscan sequences from the south side of the North Downs.

Methodology

Concentrations of shells are low in the flots. Therefore, it was decided that all the flots would be assessed. The flots were scanned under a binocular microscope at magnifications of x10 and x20. The abundance of taxa was recorded on a scale of + (present, 1-5 individuals), ++ (some, 6-10 individuals) and +++ (many, 11+ individuals). An estimate was also made of the total number of individuals in each flot excluding *Cecilioides acicula*. This species was excluded because it burrows deeply and provides no useful information on conditions as a sediment or soil formed. The identifications are divided into species groups in the table of results (Table 5.1).

Quantifications

All 13 samples were assessed from the single column. Concentrations of shells (excluding *Cecilioides acicula*) are very low (Table 5.1), with useful examples being present in only five flots.

Provenance

What material is present is likely to be contemporaneous with the deposits when they were laid down or last worked. All the samples have little potential related to the research objectives. The preservation of shell is poor.

Conservation

Since the samples have no useful potential for further work, it is recommended they be discarded.

Comparative Material

Much better molluscan assemblages are available for comparison from the south side of the North Downs at White Horse Stone (Robinson in prep). However, there is a hint of similarity with them, with more shade-loving species from the lowest part of the sequence to contain shells, whereas the shells from the top of the sequence are almost entirely open-country species. Unfortunately, the assemblages are too small to take this comparison further.

Potential for Further Work

The mollusc samples have no useful potential to address the original fieldwork aims or any new research aims. Therefore, no further work is recommended.

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Table 5.1: Nashenden Valley Mollusc Column

Column / Section Sample	**7026**	**7012**	**7011**	**7010**	**7009**	**7008**	**7007**	**7006**	**7005**	**7004**	**7003**	**7002**	**7001**
Context	**5006**	**5006**	**5006**	**5006**	**5005**	**5005**	**5005**	**5005**	**5005**	**5005**	**5004**	**5003**	**5003**
Depth (m)	**1.20-1.30**	**1.10-1.20**	**1.00-1.10**	**0.90-1.00**	**0.80-0.90**	**0.70-0.80**	**0.60-0.70**	**0.50-0.60**	**0.40-0.50**	**0.30-0.40**	**0.20-0.30**	**0.10-0.20**	**0-0.10**
Catholic Species *Cepaea* sp.	-	-	-	-	-	-	-	-	-	+	-	-	-
Open Country Species *Pupilla muscorum*	-	-	-	-	-	-	-	-	-	-	-	+	-
Vallonia costata	-	-	-	-	-	-	-	-	-	+	+	-	-
V. excentrica	-	-	-	-	-	-	-	-	-	-	+	-	+
Vallonia sp.	-	-	-	-	-	-	-	-	-	+	-	+	+
Shade-loving Species *Carychium* cf. *Tridentatum*	-	-	-	-	-	-	-	-	-	+	-	-	-
Acanthinula aculeata	-	-	-	-	-	-	-	-	-	+	-	-	-
Discus rotundatus	-	-	-	-	+	-	-	-	-	+	-	-	-
Vitrea sp.	-	-	-	-	-	-	-	-	-	+	-	-	+
Burrowing Species *Cecilioides acicula*	-	-	-	+	+	++	+++	+++	+++	+++	+++	+++	+++
Synanthropic, Exotic and Introduced Species *Candidula gigaxii*	-	-	-	-	-	-	-	-	-	-	-	+	-
Approx total (excluding *Cecilioides acicula*)	-	-	-	-	1	-	-	-	-	8	4	3	6

Key: +=1-5, ++=6-10, +++= >10

- GEOARCHAEOLOGY

Assessment of the Geoarchaeology

by Martin R Bates

Introduction

Investigation of the geoarchaeology of the exposed sequences involved visits to the site to either i) log sequences and advise on procedures for sediment and soil micromorphology sampling and, where appropriate, advise field staff on the recording of sequences exposed during excavation or ii) provide verbal comment on exposed sections.

Where section logging was required standard geological terminology was used to record sequences (see Methodology below). As part of this work a number of samples were recovered to allow for further specialised investigation, if required.

The assessment was undertaken in accordance with the Fieldwork Event Aims (see section 2, main report), in particular 1, 4-5. The aims and objectives of the geoarchaeological input to this phase of works focussed on identifying and interpreting stratigraphy and buried soil horizons within contexts associated in late-glacial environments (as previously identified by Wessex Archaeology within the area (URL 1997b).

Methodology

This report focuses on the description and interpretation of three sequences revealed during the course of archaeological investigation of the Nashenden Valley area. Detailed profile descriptions and interpretations are presented for two investigation sequences recorded in evaluation trenches 3113TT and 3123TT (Little Monk Wood ARC MON 98). Comment is also made on the sequence of deposits revealed during the course of excavation of a major trench at ARC NSH 98.

Sequences were recorded down-profile using standard geological terminology used in Quaternary science (Jones *et al*. 1999). All measurements on sequences are given relative to the top of the profile.

Quantifications

Three profiles were examined as part of this assessment. Profile descriptions for evaluation trenches 3113TT and 3123TT are presented in Tables 6.2a-2b.

The profile recorded in 3123TT (Table 6.2a) produced a sequence of Pleistocene and Holocene sediments recorded to a depth of 3 m below the ground surface. Two possible palaeosol horizons were identified in this sequence at depths of 0.94 m and 2.2 m below ground surface. An important break in deposition (an unconformity) was identified at 1.48 m depth and this boundary separated the Pleistocene from Holocene sediments.

The lowermost buried soil horizon (at 2.2 m depth) was sampled with a single kubiena tin across the sequence boundary to provide a sample of the possible pedogenic horizon. This horizon lies within a sequence of sediments interpreted as cold climate solifluction deposits and may represent the late-glacial (or Allerød) soil horizon that has been widely reported in south east England (Kerney 1963; Preece, 1998). A similar horizon was tentatively identified in previous investigations of this part of the route corridor (URL 1997b). The buried soil horizon within the overlying colluvium (at a depth of 0.94 m) is typical of soil horizons buried in sediments derived from slope wash processes and is likely to date to the Bronze Age or later (see similar examples in Preece 1992; Preece and Bridgland 1998).

The profile recorded in 3113TT (Table 8.2b) did not reveal any sediments likely to relate to the buried soil horizons seen in 3123TT. A typical Holocene colluvial sequence was identified to a depth of 1.05 m. Coarser flint and chalk rich gravels lay below this deposit. The status of the sediment between 1.05 m and 1.8 m depth remains equivocal and cold climate solifluction processes or colluvial processes eroding older Pleistocene sediments may have been responsible for the deposition of this unit.

A more extensive sequence of valley side deposits were exposed in excavations at ARC NSH 98. This trench was excavated at the location of the previous evaluation trench 1497TT (URL 1997b). Two major sections were drawn and described through these deposits. Similarities exist between these profiles and that described in 3123TT (see Table 6.2a). A complex series of deposits were noted to exist beneath the topsoil lying parallel to the modern ground surface (contexts 5001-5006). Bulk samples were taken from these units (Table 6.1).

Table 6.1: Context numbers and sample details: ARC NSH98

Context	Samples
5003	7001/7014 7002/7015
5004	7003/7016 7004/7017
5005	7005/7018 7006/7019 7007/7020 7008/7021 7009/7022
5006	7010/7023 7011/7024 7012/7025 7013/7026

The sediments are typical of valley side colluvial deposits of Holocene date, similar to those noted in 3123TT (0.00 – 1.48 m) and 3113TT (0.00 – 1.05 m) Tables 6.2a-b.

Sediments assigned to context numbers 5007-5008[1] appear to exhibit a sub-horizontal appearance and consist of a sequence of units containing variable quantities of gravel (both chalk and flint rich). Considerable complexity was noted within these units (see sub-divisions 1-9, context 5008). No samples were recovered from these units. These deposits are likely to date to the late Pleistocene and have been deposited by solifluction processes under cold climate conditions. No unequivocal evidence is present within these profiles to indicate the presence of a buried late glacial soil horizon similar to that noted elsewhere in Kent (Kerney 1963; Preece 1992; 1998; Preece and Bridgland, 1998) although the time interval within which this soil developed may be present within the profile. The absence of diagnostic traits makes it difficult to determine its position within the sedimentary profile.

[1] Context 5006 probably forms part of the late-glacial complex of sediments but may be a sediment reworked from the valley solifluction deposits either late in the Pleistocene or early in the Holocene.

Table 6.2. Profile descriptions: ARC 3123TT and 3113TT

a) 3123TT

Depth (metres) below ground surface	**Stratigraphic description**	**Inferred processes of deposition**
0.00 – 0.36	Mid to dark grey silt. Structureless and unconsolidated. Common modern rootlets, angular to rounded flint clasts (20-50 mm diameter). Common chalk clasts (5-10 mm).	Topsoil
	---diffuse contact---	
0.36 – 0.94	Reddish-brown silt. Homogenous, massive and structureless. Common modern roots and large empty root canals (5-10 mm). Occasional angular flint clasts (<50 mm) and occasional chalk clasts (5 mm). Chalk clasts increase in frequency with depth. Unit is dense and compact.	Holocene colluvium
	---abrupt contact---	
0.94 – 1.26	Very dark reddish-brown silt. Unit is similar to above but fewer chalk clasts than above.	Holocene colluvium with a possible buried soil developed in the upper part of the colluvium.
	---diffuse contact---	
1.26 – 1.48	Reddish-brown silt with very common to abundant small chalk clasts (<10 mm). Very rare flint clasts.	Holocene colluvium
	---sharp contact---	
1.48 – 1.52	Pale brown chalk pellet gravel.	Periglacial slope wash.
	---abrupt contact---	
1.52 – 1.65	Pale brown silt with common very small chalk clasts (1-2 mm). Structureless, massive and relatively loose.	Periglacial reworked loess.
	---abrupt contact---	
1.65 – 2.20	Very pale brown clast supported chalk pellet gravel interbedded with thin discontinuous beds of light brown silts (20-50 mm thick). Clasts are 20-40 mm near base and fine upwards to <1cm. Matrix is silt where present.	Periglacial slope wash gravels.
	---abrupt contact---	
2.20 – 2.60	Clast supported flint gravel at base becoming matrix supported upwards. Clasts are poorly sorted, <30 mm to >120 mm and typically angular. Smaller (10 mm) rounded to sub-rounded chalk clasts are common. Upper part of unit contains dark brown silt matrix with many smaller (<10 mm) chalk clasts. Unit is loose and unconsolidated. Common small, discontinuous carbonate tubules are present in the upper part of the unit.	Solifluction deposit with a pedogenic horizon in the upper part of sequence.
	---abrupt contact---	
2.60 – 2.84	White matrix supported chalk gravel with occasional flint clasts. Coarsens upwards. Clasts are 20-60 mm. Flint content also increases upwards. Dense and compact, structureless.	Solifluction deposit.
	---diffuse contact---	
2.84 -	White chalk gravel with chalky silt matrix . Matrix supported. Very dense and compact. Chalk clasts are angular (10-60 mm) . No observed flint. Structureless.	Solifluction deposit.
	---base of profile 3.00 m---	

b) 3113TT

Depth (metres) below ground surface	**Stratigraphic description**	**Inferred processes of deposition**
0.00 – 0.25	Mid greyish-brown silt. Modern roots and common. Occasional angular flint clasts. Structureless and loose.	Topsoil.
	---abrupt contact---	
0.25 – 1.05	Reddish-brown silt. Structureless and massive. Occasional angular flint clasts (20-50 mm). Occasional small (<10 mm) angular chalk clasts. Modern roots penetrate throughout unit.	Holocene colluvium.
	---undulating/abrupt contact---	
1.05 – 1.80	Reddish-brown to very dark reddish brown clast supported flint gravel. Gravel is very poorly sorted (20->100 mm) and clasts are angular. Matrix composed of silt. Occasional chalk clasts present. Structureless and massive.	Solifluction deposit or coarse colluvium
	---undulating/abrupt contact---	
1.80 -	Yellow to whitish-yellow chalk gravel. Clasts composed of flint and chalk (clasts<150 mm). Matrix is silt. Structureless and massive. Dense and compact.	Solifluction deposit.
	---base of trench 2.10m---	

Provenance

The stratigraphy present within the three trenches examined is representative of well known sequences that are better preserved elsewhere in Kent. The contexts described falls into two groups of sequences:

1: A lowermost group of deposits dominated by coarse flint and chalk rich gravels (that may contain evidence of a weathering horizon or soil development, e.g. in ARC 3123TT) deposited during the late Pleistocene under typically cold climate conditions (the exception to this is the buried soil horizon that would have developed under milder conditions during the late glacial interstadial 11-12ka BP);

2: An upper group of silts deposited by hillwash processes during the later part of the Holocene.

Conservation

Only one undisturbed sediment sample exists from these trenches (a kubiena tin for soil micromorphological analysis) from the lowermost potential pedogenic horizon in 3123TT. Desiccation of this sample will occur over time. Investigation of the soil micromorphological properties of this sample could be undertaken and this would necessitate impregnation of the sample, rendering it inappropriate for any other forms of investigation. Impregnation and preparation of a thin section through this deposit would provide a stable, long-term archive record of the nature of the buried soil horizon at this site.

Comparative material

Comparable material to the sedimentary units identified during the fieldwork exists at a number of locations within the CTRL corridor and beyond within southern England. Extensive sequences of late glacial and Holocene sedimentary units exist and have been the subject of assessment from the White Horse Stone and West of Boarley Farm sites to the east of Nashenden Valley within the CTRL corridor. Late Pleistocene and Holocene slope deposits have also been encountered within the Ebbsfleet Valley evaluation works (URL 1997a). Within the Medway Valley the late glacial soil horizon is well known from Upper Halling (Kerney 1963; Preece 1998) and a well dated sequence of late glacial/Holocene deposits were investigated at the site of the Channel Tunnel portal at Holywell Coombe (Preece and Bridgland 1998).

Potential for further work

The investigation was intended to focus on the potential of these sites for revealing new data regarding the nature of late glacial/early Holocene palaeoenvironmental change contemporary with the earliest stages of the recolonization of Britain by plants, animals and importantly humans at the end of the last cold phase. Despite the presence of sediments clearly associated with this final phase of the Pleistocene, well stratified sequences containing fossiliferous material dating to the late glacial period were not encountered in any of the sections recorded. In comparison to other sites along the CTRL (eg White Horse Stone and the Ebbsfleet Valley) the sections in Nashenden Valley do not add materially to our present understanding of the sequence of changes during the late Pleistocene/early Holocene transitional phase. Only a single kubiena tin was recovered from these horizons that could potentially be impregnated and examined or held as archive pending future investigation.

The samples through the overlying colluvial sequence from ARC NSH 98 provide a focus for investigations of Holocene or later Prehistoric landscape change. However, a near absence of archaeological material and environmental indicators suggests that the sequence has generally low potential for any further analysis.

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PS: WHITE HORSE STONE

- ASSESSMENT OF CHARRED PLANT REMAINS AND CHARCOAL

Charred plant remains and charcoal

By Ruth Pelling

Introduction

Samples of deposit were taken during excavation works for the extraction of charred plant remains. A percentage of features of all types and phases were sampled with an emphasis on representative spatial distribution.

Bulk samples were processed by flotation using a modified Siraf type machine and flots collected onto 250µm mesh sieves. Dried flots were submitted for assessment of their potential for detailed analysis.

The purpose of the sampling was to address issues of environment and economy of the site and to examine aspects of ritual activity in terms of the special deposits (See Section 2.2 - specifically Fieldwork Event Aims: 1, 5, 7-8, 11-4).

Methodology

All samples processed were submitted for assessment. Flots were first put through a stack of sieves from 500µm to 2 mm mesh size in order to break them into manageable fractions. Each fraction was then scanned under a binocular microscope at x10 to x20 magnification. Any seeds or chaff noted were provisionally identified based on morphological characteristics and an estimate of abundance was made. The results are recorded in an Access database on a sliding scale (+ = 1-10 items, ++ = 11-50, +++ = 51-100, ++++ = 101-1000, and >1000 items). Fragments of charcoal greater than 2mm were randomly fractured and examined in transverse section. Provisional identifications were made based on the distribution of pores.

Quantification

Details of the samples from each site are presented in the following tables.

Table 11.1.1: A Summary of Samples from White Horse Stone (ARCWHS98)

No. samples		Phase/Feature type												
	Phase	Phase 1	Phase 3 Neolithic	Phase 6 M-L Bronze Age			Phase 7 Late Bronze Age-Middle Iron Age							Phase 9 Roman
	Total	Holocene soil	Long house/ associated features	pits	gullies	Post-hole	Ditch	Graves	Cremation pits	Metal-working pits	Post-hole	pits	Pot-fill	Gullies/ ditch/pit
1-10	290	20	11	2	3	2	2	6	-	29	189	15	1	3
11-50	16	-	2	-	-	-	-	1	-	3	2	8	-	-
51-100	12	-	-	-	-	-	-	1	-	4	1	7	-	-
101-1000	9	-	-	-	-	-	-	-	-	1	3	4	-	-
>1000	5	-	-	-	-	-	-	-	3	-	-	2	-	-
Total	331	20	157	9	4	2	9	8	4	43	32	49	1	7

Table 11.1.1: cont.

No. samples		Phase/Feature Type				
	Phase	Unphased				
	Total	Gully/ditch	Metal working pit	pit	Post-hole	Tree-throw hole
1-10	14	-	-	5	9	-
11-50	8	-	-	1	6	1
51-100	2	-	-	1	1	-
101-1000	-	-	-	-	-	-
>1000	-	-	-	-	-	-
Total	55	5	7	12	29	2

Table 11.1.2: Summary of Samples from Pilgrims Way and West of Boarley Farm

No. samples		Phase/Feature type				
	Site	ARCPIL 98		ARCBFW98		
	Total	MBA	Undated	IA?	MSAX/Med	Undated
1-10	12	-	9	-	1	2
11-50	7	-	3	1	1	2
51-100	1	1	-	-	-	-
101-1000		-	-	-	-	-
>1000	1	-	-	-	1	-
Total	50	1	34	2	3	10

Table 11.1.3: Neolithic Samples for Further Analysis

Site code	Sample	Context	Fill of	Group	Feature	Period	Sample Volume (l)	Flot size (ml)	Grain	Chaff	Weed seeds	Other	Id-Other	Charcoal	Id-charcoal
ARCWHS	289	4876	4874	4806	Pit	Neolithic	28	5	+					+	
ARCWHS	691	5281	5280	5297	Post-hole	Neolithic	5	5	+						
ARCWHS	739	5310	5308	4806		Neolithic	32	5	+						
ARCWHS	637	5259	5256	4806	Post-hole	LN	10	5				+	Corylus	+	cf. Cor/Aln
ARCWHS	639	5258	5256	4806	Pit	LN	22	10				++	Corylus	+	
ARCWHS	673	5257	5256	4806	Pit	LN	40	60				+	Corylus	+	Que
ARCWHS	676	5259	5256	4806	Pit	LN	20	5				+	Corylus	+	Que
ARCWHS	634	4931	4929	5297	Pit	Neolithic	40	10				+	cf.Malus	+	flecks
ARCWHS	742	5316	5315	4806	Post-hole	Neolithic	15	10				+	Vicia faba?	+	

Table 11.1.4: Phase 7: Grave Samples for Further Analysis

Site	Sample	Context	Fill of	Sub-group	Description	Phase	Sample Volume (l)	Flot size (ml)	Grain	Chaff	Weed seeds	Other	Id-Other	Charcoal	Id-charcoal
ARCWHS	33	2291	2184	2184	Stomach area of skeleton 2291	7	26	50	+	+	++	+++	Brassica - min		
ARCWHS	704	8013	8012	8012		7	40	10	+	+		+	Vic/Pis	+	Que Pom
ARCWHS	705	8014	8012	8012		7	40	75	+			+	Cor	+	Pom Que

Table 11.1.5: Phase 7 Cremation pit samples for further analysis

Site	Sample	Context	Fill of	Sub-group	Feature	Type	Period	Sample Volume (l)	Flot size (ml)	Grain	Chaff	Weed seeds	Other	Id-Other	Charcoal	Id-charcoal
ARCWHS	491	6130	6132	6132	Pit	Cremation pit	E/MIA	12	1600	5000+	+++	+			+	Que
ARCWHS	492	6099	6132	6132	Pit	Cremation pit	E/MIA	40	200	1000+	++	+			+	
ARCWHS	517	6099	6132	6132	Pit	Cremation pit	E/MIA	40	250	++++	+	+	+	Brassica		

Table 11.1.6: Phase 7, Metal Working Pits

Site	Sample	Context	Fill of	Sub-group	Feature	Period	Sample Volume (l)	Flot size (ml)	Grain	Chaff	Weed seeds	Charcoal	Id-charcoal
ARCWHS	541	7015	7007	7007	Pit	IA	16	50	+	++	++	++	Pom Que
ARCWHS	733	7015	7007	7007	Pit			10	+	++			
ARCWHS	734	7015	7007	7007	Pit		2	10	+	++	+	+	
ARCWHS	736	7008	7007	7007	Pit	EIA?	2	60	+	++++	++	++	Que
ARCWHS	896	7202	7201	7201	Pit	EIA?	7	50	++	+++	+		
ARCWHS	901	7203	7201	7201	Pit		5	20	+	+++	+		
ARCWHS	902	7202	7201	7201	Pit	EIA?	7	20	++	+++	++		
ARCWHS	905	7202	7201	7201	Pit	EIA?	5	10	+	+++	+		

Table 11.1.7: posthole samples for further analysis

Site	Sample	Context	Fill of	Group	Feature	Type	Period	Sample Volume (l)	Flot size (ml)	Grain	Chaff	Weed seeds	Other	Id-Other	Charcoal	Id-charcoal
ARCWHS	152	4352	4350	4503	Post-hole	4 poster	EIA	25 ltr	50	+++					+	Que
ARCWHS	102	4335	4334	4503	Post-hole	4 poster	EIA	38 ltr	150	++++			+	Cor	++	Que Pom
ARCWHS	91	4127	4126		Post-hole	4 poster	EIA?	40 ltr	100	++++	+	+	+	Cor	+	
ARCWHS	151	4351	4350	4503	Post-hole	4 poster	EIA?	15 ltr	150	++++	+	+			++	Que

Table 11.1.8: Phase 7 pit samples for further analysis

Site	Sample	Context	Fill of	Group	Sub-group	feature	Period	Sample Volume (l)	Flot size (ml)	Grain	Chaff	Weed seeds	Other	Id-Other	Charcoal	Id-charcoal
ARCWHS	4	2108	2107		2107	Pit	EIA	40	100	+++					+	
ARCWHS	6	2111	2107		2107	Pit	EIA	20	300	1000+	++++	++++	++	silica awns		
ARCWHS	5	2109	2107		2107	Pit	EIA?	10	40	++++	++	+			++	Que
ARCWHS	9	2125	2130		2130	Pit	EIA	12	2000	5000+	+++	+++				
ARCWHS	495	6131	6132		6132	Pit	IA	2	10	+++	+					
ARCWHS	472	6122	6110		6110	Pit	EIA	40	50	+		+++	+	Vic/Lath	+	
ARCWHS	495	6131	6132		6132	Pit	IA	2	10	+++	+					
ARCWHS	1	2104	2155	2460	2155	Pit	EIA	40	150	+++	+	+			+++	Pru Que
ARCWHS	8	2154	2155	2460	2155	Pit	EIA	20	50	++	+	+	++	min - Brassica, sewage fly weeds	+	Pom Que
ARCWHS	9	2125	2130		2130	Pit	EIA	12	2000	5000+	+++	+++				

ARCWHS	16	2142	2214		2214	Pit	EIA	8	50	++++	+++	+++			+	
ARCWHS	31	2267	2276		2276	Pit	EIA	40	100	+++					+	Pom
ARCWHS	749	8076	8079		8079	Pit	EIA	40	200	+++	+	++	++	Cor	++	Pru Pom
ARCWHS	3	2106	2155	2460	2155	Pit	EIA	40	50	+++	+	++	+	min seeds	++	Pom
ARCWHS	7	2153	2155	2460	2155	Pit	EIA	40	200	+++	++	++			+	Pom

Table 11.1.9: Samples from Boarley Road West for further analysis

Site-code	Sample	Context	Fill of	Feature	Spot date	Sample Volume (l)	Flot size (ml)	Grain	Id-Grain	Chaff	Weed seeds	Other	Charcoal	Notes
ARCBFW98	2	1021	1057	Pit	Med	40	200	++	T.nk Hor	+		+	++	roots
ARCBFW98	4	1037	1057	Pit	IA?	40	200	++	Hor		+		+++	root
ARCBFW98	46	1144	1143	Pit		25	300	++	T.nk Hor Av			+	+++	v.v. rooty
ARCBFW98	47	1137	1142	Pit	MSAX?	30	500	1000+	T.nk Hor		+	+	+++	organic
ARCBFW98	48	1138	1143	Pit		40	100	++	T.nk Hor			+	+	

Table 11.1.10: Middle Bronze Age sample from Pilgrims Way for further analysis

Site-Code	Sample	Context	Fill off	Feature	Spot date	Sample Volume (l)	Flot size (ml)	Grain	Id-Grain	Chaff	Weed seeds	Other	Charcoal	Notes
ARCPIL98	24	573		Post-hole	MBA	7	40	+++	Hor T.spt				+	moss

White Horse Stone

Phase 1: Late Glacial to Early Holocene

A total of 20 samples were assessed from the buried Holocene soil (context 4144), selected from samples taken on a grid system from the full surviving extent of the buried soil (in order to examine the indications of local variation in the mollusc evidence from the buried soil, suggested during the evaluation). Charred plant remains were very rare. Occasional cereal remains (<10 grains) were noted in 10 samples with a single glume base in one sample. *Avena* sp. (oats), *Triticum spelta* (spelt wheat) and *Triticum spelta/dicoccum* (spelt/emmer wheat) were all noted. Nut shell fragments of *Corylus avellana* (hazel) and a single *Vicia/Pisum* sp. (vetch/bean/pea) were recorded (sample 97) and occasional tubers or rhizomes including of *Arrhenatherum elatius* (false oat-grass). Charcoal flecks were present in 18 samples, although in small quantities. Pomoideae and *Quercus* sp. were provisionally identified.

Phase 3-4: Neolithic

A total of 157 samples, mostly from the longhouse and associated features were assessed. Charred remains were very rare in all samples. Cereal grain, including free-threshing *Triticum* sp. (bread/rivet wheat) was noted in low numbers in 3 samples, while no chaff was noted. Woodland resources were also present in only low numbers, noted in 9 samples. Only one sample produced more than 10 items *Corylus avellana* nut shell fragments, a *Malus sylvestris* (crab apple) pip and an indeterminate nut/fruit were noted. Charcoal was present in 55 samples, although in small amounts of small fragments. The majority of the charcoal was of indeterminate species although *Quercus* sp. (oak), *Corylus/Alnus* sp. (hazel/alder), Pomoideae and coniferous woods (5 samples) were provisionally identified.

Phase 6 Middle-Late Bronze Age

A total of 15 samples were assessed, nine from pit 5421, four from ditch 4014 (possible deliberately placed deposits in the terminal) and two from 4-post groups 6140 (sample 389) and 6058 (sample 6001). No cereal remains were recovered from pit 5421, although occasional *Corylus avellana* (hazel) nut shell fragments were noted in two samples and charcoal in 5 samples, including Pomoideae and *Quercus* sp. The ditch terminal did produce occasional cereal grains from 3 samples, including *Hordeum vulgare* and *Triticum spelta/dicoccum*. Charcoal was present in three samples, again only in small amounts, and only Pomoideae was identified. One posthole sample produced a single *Hordeum vulgare* grain and indeterminate charcoal flecks (sample 6001).

Phase 6/7: Late Bronze Age/Early Iron Age and Early-Middle Iron Age

A total of 137 samples were assessed from features of Late Bronze Age to Middle Iron Age date. Samples were taken from post-holes, a cremation pit, graves, storage/refuse pits and metal working pits.

Four samples were assessed from cremation pits. No remains were present in pit 2415. All three samples from cremation pit 6132 were rich in cereal remains, with over 5000 grains in sample 491. All three deposits are dominated by essentially clean, processed grain with some chaff and weeds although minimal in relation to the grain. Charcoal was very rare. One *Brassica/Sinapis* sp. seed may represent a crop or a weed. The grain includes *Triticum spelta*, *Triticum dicoccum* (emmer wheat) and *Hordeum vulgare*. A radiocarbon date from this deposit gave a calibrated date of 760-390BC (68% confidence) or 800-200BC (95% confidence), suggesting an early Iron Age origin.

Three graves were sampled. Grave pit 2184 produced three samples from three fills, two of which produced only low levels of cereal remains (*Avena* sp. and *Triticum spelta/dicoccum*) and a slightly greater but still modest number of weeds. The third sample, sample 33 taken from the stomach area of the skeleton produced a similar low level of cereal remains but also some 51 to 100 mineralised seeds, provisionally all identified as *Brassica* sp. (cabbage, turnip, mustard etc). Two samples from grave 2296 produced only one cereal grain between them. Three samples from grave 8012 contained occasional grain and chaff but also occasional woodland resources including *Corylus avellana* nut shell and a *Prunus spinosa* (sloe) stone, as well as a single *Vicia/Pisum* sp. (vetch/bean/pea) seed.

Some 27 samples were taken from post-holes the majority of which produced only occasional or no cereal remains. Three samples did produce exceptional deposits, samples 102 and 151 from 4-post group 4503, and sample 91. All three produced grain rich deposits with very rare chaff or weeds (less than 10 items). Charcoal was also rare in these samples. Occasional *Corylus avellena* fragments were noted. *Triticum dicoccum* dominates sample 151, while *Triticum spelta*, *Hordeum vulgare* and *Avena* sp. were all noted.

Five metal working pits (sub-groups 7011, 7007, 7009, 7201 and 7205) were sampled segmentally, producing 43 samples. Low levels of cereals were noted in 29 samples including occasional grain and glume bases of *Triticum spelta/dicoccum*, *Triticum spelta*, *Triticum dicoccum* and *Hordeum vulgare*. Occasional flecks of *Quercus* sp. charcoal were also present. Sample 736 (sub-group 7007) produced an assemblage which was dominated by large amounts of cereal chaff (>100 items) with occasional grain and weeds. The chaff was dominated by *Triticum dicoccum* but also included *Triticum spelta*, *Hordeum vulgare* and an *Avena* sp. floret base. Moderate quantities of *Quercus* sp. charcoal were also present. Four samples from pit 7201 produced lesser but still good quantities of *Triticum dicoccum* and *Triticum spelta* chaff. The density of chaff in these samples is actually quite high given the small size of original sample (2 to 7 litres). Charcoal was present in 38 samples and was abundant in six. *Quercus* sp. was the taxon most commonly identified although non-*Quercus* charcoal was also present.

A total of 49 samples were assessed from storage/refuse or other pits. Four storage pit samples produced very good cereal deposits (samples 5, 6, 9 and 16). In sample 6 grain outnumbers chaff, although the chaff is still fairly common. Some silica chaff was also noted. Samples 5 and 9 were more grain rich with chaff present. Sample 16 produced abundant grain and *Bromus* sp. seeds but with no obvious glumes or rachis. This sample does however, contain a large amount of silica chaff (glume tips and awn fragments) which might suggest the absence of glumes is to do with preservation. The grain in all four samples is very well preserved. *Triticum spelta*, *Triticum dicoccum*, *Hordeum vulgare* and *Avena* sp. *Tritiucm dicoccum* dominates sample 9. A fifth sample (17, context 2215) produced no macroscopic seeds or chaff but did contain silica skeletons and phytoliths believed to derive from cereal remains. The presence of phytoliths might indicate that the absence of macroscopic remains is a result of preservation.

Another 10 pit samples produced useful assemblages of cereal or other plant remains. Generally these samples are dominated by grain, although there are some exceptions. Sample 472, an Early Iron Age deposit (pit 6110), produced very rare grain or chaff but numerous weed seeds. Sample 895 produced little grain but very frequent chaff and weeds. Two more samples of note are sample 3 (pit fill 2106) and 8 (pit fill 2154) both of which produced moderate quantities of *Hordeum vulgare* grain but also mineralised seeds, including of *Brassica/Sinapis* sp. Occasional sewage fly pupare were also noted in sample 8. Of the remaining pit samples, 22 produced low numbers of seeds and chaff while 13 contained no seeds or chaff.

Phase 9: Late Iron Age and Roman

Seven samples were assessed from Roman features, all from gullies and ditches. The gullies from part of a hollow way. Charred remains were very limited, with only 1 to 10 cereal grains noted from three samples, and no chaff or weeds. *Hordeum vulgare*, *Triticum spelta* and *Avena* sp. were provisionally identified. Occasional charcoal flecks included *Prunus spinosa*, Pomoideae and *Quercus* sp.

Undated

One additional metal working pit produced 7 samples, taken in segments (sub-group 7005). These samples are undated, although are presumably Iron Age. The samples produced indeterminate charcoal in one sample and no seeds or chaff.

A further 37 samples of unknown date were assessed from gullies, postholes and pits. Two samples from gullies produced occasional flecks of *Quercus* sp. charcoal. A total of 23 samples from postholes included three with occasional (1-50) cereal remains and one (sample 125) with more useful quantity of *Triticum spelta* grain. This sample produced no chaff and only occasional weed seeds. Of the ten pit samples, six contained no charred remains at all. Sample 74 produced a single *Avena* sp. grain. Three samples from pit 7222 produced low levels of grain chaff and weeds. *Hordeum vulgare*, *Triticum spelta* and *Triticum dioccum* were noted. Moderate quantities of *Quercus* sp. and Pomoideae charcoal were noted. Two tree-throw hole samples were assessed. Sample 383 produced a possible *Linum uisitatissimum* (flax) seed and *Corylus avellana* nut shell fragments. *Corylus/Alnus* sp. and Pomoideae charcoal were also identified. Finally, three ditch samples produced no charred remains. Samples from ditch/gully fills, and a pot fill produced only occasional grain and chaff.

Pilgrims Way

Thirty five samples from Neolithic, Bronze Age and medieval contexts were assessed from the Pilgrims Way site. Samples were taken from postholes, buried soils, cremation deposits, pits, a ditch fill and tree-throw holes. One posthole sample (context 573) is dated to the Middle Bronze Age. Charred seeds and chaff were noted in thirteen samples. Five samples (54, 55 60, 61 and 64) produced collected woodland resources including *Malus sylvestris* (crab apple) and *Corylus avellana* (hazel) nut shell fragments. One of those samples (54) also produced a possible bean or pea (*Vicia/Pisum* sp.). Cereal remains were noted in eight samples, generally very small amounts of grain. Sample 24 (context 573) produced a more noticeable amount of grain with 51 to 100 grains, including *Triticum spelta* and *Hordeum vulgare*. Chaff was not noted and weeds were limited to a single grass seed in sample 17. Charcoal was recorded in 24 samples, generally in very small amounts, with more frequent charcoal in six samples. Taxa provisionally identified include *Quercus* sp., Pomoideae, *Prunus spinosa* and coniferous charcoal in samples 54, 60 and 61.

West of Boarley Farm

A total of 15 samples were assessed from the West of Boarley Farm site. All the samples were taken from pits. Provisionally dated samples were of Iron Age, Middle Saxon and medieval date. Charred seeds and chaff were present in 9 samples. Generally remains consisted of low levels of cereal grain including of free-threshing *Triticum* sp. (bread/rivet type wheat), *Triticum spelta/dicoccum* (spelt/emmer wheat) from an Iron Age pit, *Hordeum vulgare* (barley) and *Avena* sp. (oats). One sample from a Middle Saxon pit (context 1137) was very rich with in excess of 1000 cereal grains amongst which free-threshing *Triticum* sp. *Hordeum vulgare* and *Avena* sp. were provisionally identified. Chaff was noted in only one sample (sample 2) and limited to a single hexaploid *Triticum* sp. (bread-type wheat) rachis. Weeds were also rare noted in very small numbers in three samples only. Additional possible food remains include a *Brassica* seed and mineralised *Vitis vinifera* (grape) pip (sample 2), *Vicia/Pisum* sp. (vetch/bean/pea), *Corylus avellana* nut-shell and a Prunus spinosa (sloe) stone. All samples produced charcoal, in abundant quantities in 5 samples. *Quercus* sp. and Pomoideae charcoal dominated while occasional *Corylus/Alnus* charcoal was also noted.

Provenance

The charred remains in the Holocene buried soil are likely to represent no more than redeposited material which has worked itself down the slope into the valley with the colluvial deposits. As *Triticum spelta* is not recorded prior to the Middle Bronze Age in the area, this material is likely to be intrusive and of Bronze Age or later date. Some Late Bronze Age artefacts are also present in the deposit. The charred remains recovered from the Neolithic long house and associated features and from the Bronze Age deposits are again likely to represent reworked re-deposited background deposits of cereal waste and woodland resources. The charcoal may be no more than the result of flecks present in the atmosphere from small-scale fires. There is no evidence for domestic activity on any scale and no evidence of structural wood. There is no evidence of ritually placed remains from the Bronze Age ditch terminal.

The majority of Iron Age samples produced only low concentrations of cereal remains, which are likely to represent no more than reworked cereal processing debris. The smaller number of exceptionally rich samples are very well preserved. These samples appear to have derived from deliberately placed deposits of cereals or burning accidents of some scale. These rich deposits might suggest that the absence or paucity of material elsewhere might be a result of preservation biases. Alternatively it is possible that cereal production was operated on a small scale only, and the richer samples represent exceptional accidents or special, ritual deposits. The assessment would appear to indicate that the pit samples, including the cremation pit generally consist of grain, chaff and weeds, thus is likely to be derived from unprocessed grain, possibly whole ears. The four-post structures seem to have produced cleaner; fully processed grain with only limited chaff or weeds. Where cereal remains are present within pots, such as in the cremation deposit, it would seem appropriate to suggest that they represent special placed deposits. Of particular interest is the fact that grain may have been deliberately burnt before being placed in the cremation pit in a pot. The metal working pits appear to be dominated by cereal chaff. Wood charcoal is also common in several samples. Both chaff and charcoal may represent fuel used as part of the metal production process, although it must be considered that they could represent no more than re-deposited cereal processing waste. The find of the mineralised *Brassica/Sinapis* seeds from the stomach area of the skeleton in grave 2184 is particularly interesting and could be derived from the gut content.

The Pilgrims Way charred remains are likely to have largely derived from background scatters of food processing waste. Some evidence exists of the collection of wild woodland resources. Charred grain is likely to have derived from processing accidents. There is no evidence of the by-products of cereal processing (the chaff and weeds) although this could be a result of preservation. The coniferous wood is present in those samples with woodland resources, which suggests it is an early prehistoric occurrence, although these samples are not dated.

Cereal grain and charcoal dominate the charred remains from West of Boarley Farm. The grain is likely to represent processed spoilt crop, perhaps thrown on fires. In most cases it is likely to be no more than re-deposited material present across the site and thrown into the pits with back-filled deposits. The grain rich sample may be the result of a deliberate dump of waste material. The charcoal is very mixed, so may perhaps represent firewood rather than structural remains. The dominance of free-threshing wheat would suggest that most of the samples are Saxon or Medieval in date.

Conservation

The flots are in a stable condition and can be archived for long term storage.

Comparative Material

Hazelnut shell tends to be the most commonly recovered plant of economic importance found within Neolithic and Early Bronze Age deposits in Britain. Crab apple is also recorded on a number of sites throughout the British Isles (see Moffett *et al.* 1989). The presence of these species is therefore not unusual for sites of this date, although the paucity of collected woodland resources was surprising given the large number of samples taken. This is perhaps more characteristic of ritual sites rather than domestic settlement sites. The samples do not suggest that cereal agriculture played a significant role at the sites, at least until the Middle Bronze Age, as suggested by sample 24 from Pilgrims Way. It is not possible to establish quite how significant cereal cultivation was at this time based on one sample, and it is too early to establish if agriculture was important elsewhere in Kent at this time. Within the CTRL project Neolithic and Early to Middle Bronze Age material was recovered from Eyhorne Street and Tutt Hill, where a similarly low concentration of remains were recovered, and the evidence for cereal production was again poor. There are no known published records of material of this date from within Kent.

The later prehistoric samples indicate that both emmer wheat and spelt wheat were being cultivated in the region in the Iron Age. The cultivation of emmer wheat is seen at other sites on the CTRL, such as Thurnham Villa and Eyhorne Street. There are occasional published records of emmer wheat in the Late Iron Age from Wilmington in Kent (Hillman, 1982) and from outside the region from Hascombe in Surrey (Murphy 1977) and Ham Hill in Somerset (Ede 1990). There appears to be a regional pattern in which, despite the widespread cultivation of spelt wheat, emmer wheat remained a significant crop and was cultivated throughout the Iron Age and Romano-British period. The White Horse Stone samples suggest that this tradition represents a continuation from the Bronze Age rather than a reintroduction within the Iron Age. Elsewhere in Britain the cultivation of emmer wheat in the Iron Age appears to be restricted to the Highland Zone with occasional records in southern Britain possibly representing no more that contamination of the spelt crop. On the continent spelt wheat is restricted to certain Alpine regions during the Iron Age while emmer wheat is much more widely cultivated (Bakels 1991).

It is very difficult to examine aspects of 'ritual' uses of plant remains due to the general nature of the botanical evidence. While an articulated skeleton may be easy to attribute to ritual, the charred grain recovered from the fill of a pit may simply represent re-deposited waste. Attempts to distinguish between ritual and rubbish were made in the Danebury Environs programme which suggested that the disposal of material seemed to be most related to the activities taking place close to those features (Campbell 2000). The fact that the present samples include charred grain deposited in pots in association with other 'placed' objects must imply some degree of ritual. A similar deposit was recovered during the evaluation at White Horse Stone.

The material from West of Boarley Farm provides some evidence for arable activity during the Middle Saxon period. The range of species identified is consistent with those usually recovered in the Middle Saxon and medieval period in Southern Britain, for example from West Cotton (Campbell 1994). To date there are no available assessment results for Saxon material within the CTRL project.

The later prehistoric material conversely offers very good potential for analysis (Fieldwork Event Aims 1, 5, 8) in order to explore both aspects of the arable systems in its local, regional and national context, and specific aspects of activity within the site including ritual.

Updated research aims

Themes concerning chronology, settlement, landscape and society (status, settlement organisation), material culture, regionality and processes of change can be addressed.

General

To produce a detailed species list of faunal and charred plant species. This will contribute to a national dataset (e.g. Environmental Archaeology Bibliography (EAB) English Heritage/University of York) of remains associated with Neolithic long house structures in Britain.

Chronology

To explore trends in crops grown and animals reared through time in order to build a chronological framework and to highlight gaps in that framework.

Settlement, landscape and society

What is the nature of Neolithic woodland habitat if the coniferous wood is confirmed as being of this date? It is suggested that the date of the coniferous charcoal should be confirmed by radiocarbon dating. Its contextual associations should be considered especially its occurrence in postholes of the Neolithic house and its absence from other contexts.

To further explore the economic basis of the Iron Age communities particularly:

Are there Late Bronze Age origins in arable intensification
To explore the treatment of emmer wheat and spelt wheat for example are they grown as a single crop or as separate crops
To explore the economic role of oats and brome grass
To explore the status of non-cereal crops such as Brassicas
To explore the treatment of cereal post-harvest including storage patterns
To investigate the composition of possible special deposits and the relationship/association between plant remains, faunal remains and other artefacts and between feature types.
To investigate the function of different features/areas.
To investigate the various types of fuel and their contextual associations

Regionality

Is there evidence for any non-local contact?

Processes of change

When was settled cereal-based agriculture fully established? Did this occur by the middle Bronze Age?

Recommended further work

Samples that produced plant remains and charcoal from the Neolithic long house and associated features should be analysed (species identification and quantification) given the archaeological importance of these contexts, even though the concentration of remains is low.

It is recommended that the Middle Bronze Age sample (sample 24) from Pilgrim's Way is sorted, and that the assessment results are considered in the final report.

It is recommended that the richer samples from pits and the postholes are sorted and analysed in full. In addition some of the charred seeds and chaff and the charcoal from the metal working pits should be analysed more closely to explore aspects of selection of fuel for industrial processes. While the majority of the charcoal identified so far was of oak, it is important to identify any additional taxa.

The residues of samples that produced mineralised remains should be checked for remains that have not floated. This material provides a useful additional source of information about cultivated species, which do not normally survive in the archaeological record, and should be considered in relation to storage and possible use of manure.

The relationship and association between grain deposits and other 'placed' remains in pits, particularly the metalworking residue, and animal bone should be explored. Any differences in deposit type across the site should be examined particularly differences between possible spoilt stored crop, disposed or reused cereal waste, ritually disposed cereal waste and ritually deposited cereal product. The possible ritual deposit recovered during the evaluation should be included in the analysis.

Saxon material is not widely available from the general area. It is therefore suggested that the rich sample from West of Boarley Farm, with an additional 3 or 4 samples, are sorted and analysed in full. Analysis of the wood charcoal from 4 or 5 of the deposits producing mixed taxa (assuming that these are confirmed as Saxon in date) would provide interesting information on fuel use in this period.

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– assessment of MOLLUSCS

Molluscs

By Mark Robinson

Introduction

A total of 284 samples were taken for molluscan analysis from four sites belonging to the White Horse Stone group of sites: White Horse Stone, Pilgrim's Way, West of Boarley Farm and East of Boarley Farm. Most of the samples were from the sections of trenches through dry valley sediments. They comprised 2 kg samples cut from the section in 0.05 m units as part of 11 columns. However 2 kg samples were also taken at 0.10 m intervals from a column from a prehistoric ditch, as spot samples at 10 m intervals from a gridded prehistoric palaeosol and as spot samples from tree-throw holes at White Horse Stone.

The samples were sieved down to 0.5 mm by the Oxford Archaeological Unit. The samples chosen for assessment were floated onto a 0.5 mm sieve and the flots dried. Both flots and residues were retained.

The study of the molluscs was to address several of the Fieldwork Event Aims (see section 2.2). The lower parts of some of the dry valley sequences were sampled to determine the Late Glacial landscape and environment within the area (Aim 3). It was also hoped that the columns and the gridded samples would assist with the determination of the local landscape setting of the Medway Megaliths (Aim 4) and the environment of the local late prehistoric communities (Aim 5).

Methodology

It was decided that the best approach to the assessment of the columns was to identify those which gave the best sequences and to assess them in detail. Columns C and F from White Horse Stone were thought to be the most useful because Column C has the longest later Holocene sequence and Column F the best Late Glacial / early Holocene deposits. Both columns spanned several thousand years, so samples were assessed at the closest possible intervals (0.05 m). On the basis of the results obtained, it was decided that it was unnecessary to assess a further four columns through similar deposits at White Horse. A preliminary examination of shells from the four columns from Pilgrims' Way, West of Boarley Farm and East of Boarley Farm suggested that they showed somewhat similar sequences to Columns C and F, so they were assessed at coarser intervals. Much uncertainty had been expressed as to what the deposit at White Horse Stone sampled with Column N represented. Since the concentrations of shells in these samples are low, all the samples were assessed.

It was decided to assess a haphazard selection of 20 samples out of the 60 from the gridded palaeosol at White Horse Stone and use the results to decide whether any more samples required assessment. Little variation was noted between all but one of the samples, so no further samples were assessed. A column from a prehistoric ditch was assessed at 0.2 m intervals because the deposits accumulated over a much shorter period of time than those from the valley bottom columns. The few spot samples from tree-throw holes at White Horse Stone were all assessed.

The flots assessed were scanned under a binocular microscope at magnifications of x10 and x20. The residues were also checked for shells, although the flotation was generally found to have given adequate shell recovery for assessment purposes. The abundance of taxa was recorded on a scale of + (present, 1-5 individuals), ++ (some, 6-10 individuals) and +++ (many, 11+ individuals). An estimate was also made of the total number of individuals in each flot excluding *Cecilioides acicula*. This species was excluded because it burrows deeply and provides no useful information on conditions as a sediment or soil formed. *C. acicula* can be extremely numerous and its inclusion in the total tends to obscure the results from the other species. (The other burrowing species listed, *Pomatias elegans*, only burrows just below the surface of loose soil or leaf litter, so does give useful palaeoecological information). The identifications are divided into species groups in the tables of results (Tables 12.1.2-7: White Horse Stone, Table 12.1.8: Pilgrims' Way, Table 12.1.9: West of Boarley Farm and Table 10: East of Boarley Farm). Nomenclature follows Kerney (1999).

Quantifications

Table 12.1.1 details the breakdown of the number of samples from each site and the number of samples assessed. Tables 12.1.2 - 10 give the range and abundance of shells in each of the samples that were assessed. Most of the samples contain sufficiently large assemblages of identifiable shells (excluding *Cecilioides acicula*) for useful palaeoecological interpretation. Where concentrations of shells are low, for example, in parts of Column F, this itself is of interpretative significance. The only bias noted in the assessment was that shells of *Pomatias elegans* and Limacidae are under-represented in the flots. This would be overcome in any full-scale analysis by sorting the residues as well as the flots.

Table 12.1.1: Quantities of WHS site group mollusc samples

Site Name	Number of columns	Number of samples in columns	Number of other samples	Total number of samples taken	Number of columns assessed	Total number of samples assessed
White Horse Stone	8	120	71	191	4	12
Pilgrims' Way	2	24	0	24	2	11
West of Boarley Farm	1	31	0	31	1	12
East of Boarley Farm	1	38	0	38	1	94
	12	213	71	284	8	129

Table 12.1.2:White Horse Stone, Dry valley mollusc column C

Column / Section	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Sample	262	261	260	259	258	257	218	217	216	215	214	213	212	211	210	209	208	207	206	205	204	203	202	201	200	199	198	250	249
Context	4551	4551	4551	4551	4144	4144	4144	4144	4144	4144	4144	4144	4145	4145	4145	4145	4145	4146	4146	4146	4146	4146	4147	4147	4147	4012	4012	4012	4012
Depth (m)	1.40-1.45	1.35-1.40	1.30-1.35	1.25-1.30	1.20-1.25	1.15-1.20	1.10-1.15	1.05-1.10	1.00-1.05	0.95-1.00	0.90-0.95	0.85-0.90	0.80-0.85	0.75-0.80	0.70-0.75	0.65-0.70	0.60-0.65	0.55-0.60	0.50-0.55	0.45-0.50	0.40-0.45	0.35-0.40	0.30-0.35	0.25-0.30	0.20-0.25	0.15-0.20	0.10-0.15	0.05-0.10	0-0.05
Catholic species																													
Cochlicopa sp.	-	-	-	-	-	-	-	+	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichia hispida gp.	-	-	-	-	-	-	-	+	+	+	+	+	++	+	+	-	+	+	+	+	+	++	+	++	++	++	++	+++	+
Cepaea sp.	-	-	-	-	+	+	+	-	+	+	+	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Open-country species																													
Vertigo pygmaea	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-
Pupilla muscorum	-	-	+	+	+	+	-	+	+	++	++	+	+	-	-	-	+	+	-	+	-	+	+	+	+	-	+	+	+
Vallonia costata	-	+	+	+	+	-	++	+	+++	+++	+++	+	-	+	-	+	-	+	+	+	+	++	+	+	+	+	+	-	-
V. pulchella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-
V. excentrica	-	-	-	-	+	-	+	+++	+++	+++	+++	+	+	+	+	-	-	+	+	+	+	+++	+	+	+	+	+	+	+
Vallonia sp.	+	+	+	+	+	+	++	+++	+++	+++	+++	+++	+++	+	+	+	+	+	+++	+++	+++	+++	+++	+++	++	+	+++	+++	++
Helicella itala	+	-	-	-	-	-	-	-	+	+	++	+	+	-	+	+	-	+	+	+	++	++	++	++	++	+	+	+	+
Shade-loving species																													
Carychium cf. Tridentatum	-	-	-	-	+	+	+	+	+	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctum pygmaeum	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-
Discus rotundatus	-	-	-	-	-	+	+	+	+	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Vitrea sp.	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aegopinella pura	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Clausilia bidentata	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Burrowing species																													
Pomatias elegans	-	-	-	+	++	+	+	++	+	+	+	+	+	+	-	+	+	-	-	-	+	+	-	-	-	+	-	-	-
Cecilioides acicula	-	+	-	-	+	+	+	+	+	+++	++	+++	+++	++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++
Candidula intersecta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Monacha cantiana	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	-	-	-	+	+	+	+	-	+	+	+	+
Approx. total (excluding Cecilioides acicula)	5	3	10	30	15	25	70	110	140	110	120	45	30	15	10	13	8	21	30	40	35	85	60	45	40	20	35	45	19

Table 12.1.3: White Horse Stone dry valley mollusc column F

Sample	327	326	325	324	323	322	321	320	319	318	317	316	315	314	313	312	311	310
Context	4936	4936	4936	4935	4935	4935	4934	4934	4934	4933	4933	4933	4933	4144	4144	4144	4144	4144
Depth (m)	0.85-0.90	0.80-0.85	0.75-0.80	0.70-0.75	0.65-0.70	0.60-0.65	0.55-0.60	0.50-0.55	0.45-0.50	0.40-0.45	0.35-0.40	0.30-0.35	0.25-0.30	0.20-0.25	0.15-0.20	0.10-0.15	0.05-0.10	0-0.05
Catholic species																		
Cochlicopa sp.	-	-	-	-	+	+	+	-	-	+	-	-	+	-	-	-	-	-
Limax or Deroceras sp.	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichia hispida gp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+
Cepaea sp.	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	+	+	+
Open-country species																		
Abida secale	-	-	-	-	++	+	++	++	+++	+	+	-	-	-	-	-	-	-
Pupilla muscorum	+	++	+	++	+++	+++	+++	+++	+++	+++	+++	+++	++	+	+	-	-	-
Vallonia costata	-	++	+	++	+++	+	+	-	-	-	-	-	-	-	+	-	+	+
V. pulchella	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V. excentrica	-	-	-	-	+	-	+	-	-	-	-	-	-	+	-	-	-	-
Vallonia sp.	+	+	+	+	+++	+++	+++	+	+	+	-	-	-	-	-	-	+	++
Shade-loving species																		
Acicula fusca	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
Carychium cf. Tridentatum	-	-	-	-	-	-	+	-	-	+	+	-	-	+	-	+	+++	+++
Punctum pygmaeum	-	-	-	+	+++	+	+	+	+	-	-	-	-	-	-	-	-	+
Discus rotundatus	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	++	++
Vitrina sp.	-	+	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-
Vitrea sp.	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	+	+
Nesovitrea hammonis	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Aegopinella pura	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	+
A. nitidula	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
Oxychilus cellarius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+
Euconulus fulvus	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-
Cochlodina laminata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Clausilia bidentata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Burrowing species																		
Pomatias elegans	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	++	+++	+++
Cecilioides acicula	-	-	-	-	+	-	+	-	+	+	-	+	-	+	-	-	+	-
Synanthropic, exotic and introduced species																		
Helicidae indet.	-	-	-	-	+	-	-	+	+	+	+	-	+	+	-	-	-	-
Approx. total (excluding Cecilioides acicula)	2	24	9	40	130	55	95	100	150	80	55	25	11	12	5	16	85	100

Table 12.1.4: White Horse Stone subsoil hollow mollusc column N

Sample	341	340	339	338	337	336	335	334	333	332	331	330	329
Context	4013	4013	4013	4013	4013	4013	4013	4013	4013	4013	4013	4013	4013
Depth (m)	0.60-0.65	0.55-0.60	0.50-0.55	0.45-0.50	0.40-0.45	0.35-0.40	0.30-0.35	0.25-0.30	0.20-0.25	0.15-0.20	0.10-0.15	0.05-0.10	0-0.05
Catholic species													
Cochlicopa sp.	-	-	-	-	-	-	-	-	+	-	-	-	+
Trichia hispida gp.	-	-	-	-	-	-	+	+	+	+	++	+	+
Cepaea sp.	-	-	-	+	-	-	-	-	-	-	-	-	-
Open-country species													
Vertigo pygmaea	-	-	-	-	-	-	+	-	-	-	-	-	+
Pupilla muscorum	-	-	-	-	-	-	+	+	+	+	+	+	+
Vallonia costata	-	-	-	-	-	-	-	+	+	-	+	-	+
V. pulchella	-	-	-	-	+	-	-	-	-	-	-	-	+
V. excentrica	-	-	-	-	-	-	-	+	-	+	+	+	+
Vallonia sp.	-	-	-	-	-	-	+	+	+	-	+	+	+
Helicella itala	-	-	-	-	-	-	+	+	+	+	+	+	+
Shade-loving species													
Carychium cf. Tridentatum	-	-	-	-	-	-	+	-	-	-	-	-	-
Discus rotundatus	-	-	-	-	-	-	+	-	+	-	+	+	+
Vitrea sp.	-	-	-	-	-	-	-	-	+	-	-	-	+
Aegopinella nitidula	-	-	-	-	-	-	-	+	-	-	-	-	+
Oxychilus cellarius	-	-	-	-	-	-	-	-	-	-	-	-	+
Burrowing species													
Cecilioides acicula	-	-	-	-	+	-	+++	+++	+++	+++	+++	+++	+++
Synanthropic, exotic and introduced species													
Monacha cantiana	-	-	-	-	+	-	+	+	-	-	-	-	-
Approx total (excluding Cecilioides acicula)	0	0	0	1	2	0	13	15	16	10	14	14	35

Table 12.1.5: White Horse Stone mollusc gridded palaeosol samples

Column / Section	530E 540N	520E 570N	520E 550N	530E 490N	500E 500N	550E 520N	550E 480N	558E 490N	530E 510N	520E 530N	540E 540N	550E 570N	540E 570N	550E 580N	540E 590N	550E 600N	550E 610N	540E 610N	480E 500N	471E 500N
Sample	54	63	64	65	68	72	77	80	84	88	101	381	382	385	388	396	403	416	880	882
Context	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144
Catholic species																				
Cochlicopa sp.	+	+	+	-	+	+	+	+	-	+	-	-	-	-	-	+	-	+	-	-
Limax or Deroceras sp.	-	-	-	-	+	+	-	-	-	-	+	-	-	-	+	-	-	-	-	-
Trichia hispida gp.	+	+	++	+	++	+++	+	+	++	++	+	++	+	+	+	+	++	++	+++	+++
Cepaea sp.	+	+	+	-	+	+	+	+	-	+	+	-	+	-	+	-	+	+	+	+
Open-country specues																				
Truncatellina cylindrica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Vertigo pygmaea	+	-	+	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-
Pupilla muscorum	++	+	-	+	+++	++	+++	+++	+	+	-	+	+	-	+++	+	+	+	-	+
Vallonia costata	++	++	++	-	+++	+++	+++	+++	+++	+	+	+	+	+	+	+	++	+	+++	++
V. pulchella	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
V. excentrica	+++	+++	+++	+++	++	+++	+++	++	+++	++	+++	+	++	+	++	+	+	+	++	++
Vallonia sp.	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++
Helicella itala	+	+	++	++	++	++	++	++	++	+	+	+	+	++	++	+	++	++	+	+
Shade-loving species																				
Acicula fusca	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-
Carychium cf. Tridentatum	+	-	+	+	-	+++	+	+	-	-	-	-	-	-	-	+	-	+	+	-
Acanthinula aculeata	-	-	-	-	-	+	-	-	+	+	-	-	-	-	-	-	-	-	+	-
Ena obscura	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Punctum pygmaeum	+	-	-	-	-	+	-	-	-	-	-	+	-	-	+	-	-	-	-	-
Discus rotundatus	+	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Vitrina sp.	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	+	-
Vitrea sp.	-	-	-	+	-	++	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Nesovitrea hammonis	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Aegopinella pura	+	+	-	-	+	+++	+	-	-	-	-	-	-	-	-	-	-	+	+	-
A. nitidula	+	-	-	-	-	+++	-	-	-	+	+	-	-	-	-	-	-	-	+	-
Oxychilus cellarius	+	+	-	-	+	+	+	-	-	+	-	-	-	-	-	-	-	-	-	-
Cochlodina laminata	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	+	-	-	-
Clausilia bidentata	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-
Burrowing species																				
Pomatias elegans	++	+	-	+	+	+++	++	++	-	++	+	-	+	+	-	+	+	+	+	+
Cecilioides acicula	+++	+++	+++	+++	+++	+++	-	+	++	+++	-	+++	+++	++	+++	+++	+++	+++	+++	+++
Synanthropic, exotic and introduced species																				
Monacha cantiana	+	+	-	-	+	+	-	-	-	-	-	+	+	+	-	-	+	-	+	+
Helicidae indet.	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Approx. total (excluding Cecilioides acicula)	150	75	130	80	110	300	150	160	100	70	70	70	80	35	100	70	95	80	110	100

Table 12.1.6: White Horse Stone mollusc column S408, ditch 4048

Column / Section	408	408	408	408	408	408	408	408
Sample	170	168	166	164	162	159	157	155
Context	4049	4046	4044	4042	4042	4041	4012	4012
Depth (m)	1.75-1.80	1.60-1.70	1.40-1.50	1.20-1.30	1.00-1.10	0.70-0.80	0.50-0.60	0.30-0.40
Catholic species								
Cochlicopa sp.	-	+	++	++	+	++	-	-
Trichia hispida gp.	+++	+++	+++	+++	+++	+++	+++	++
Arianta arbustorum	+	+	-	-	-	-	-	-
Cepaea sp.	+	++	+	+	+	+	+	-
Open-country species								
Vertigo pygmaea	-	-	-	-	-	+	+	+
Pupilla muscorum	+	+	+	+	+	++	++	+++
Vallonia costata	++	+++	+	++	+++	+++	++	++
V. excentrica	-	+	+	+	+	++	+++	++
Vallonia sp.	+++	+++	++	+++	+++	+++	+++	+++
Helicella itala	-	+	+	-	+	+	+	++
Shade loving species								
Carychium cf. Tridentatum	+	-	-	-	-	++	+	+
Acanthinula aculeata	-	-	-	-	-	-	+	-
Ena obscura	-	+	+	+	-	-	-	-
Punctum pygmaeum	-	-	-	-	-	-	+	-
Discus rotundatus	+	-	+++	+++	++	++	+	+
Vitrea sp.	+	+	+	+	+	+	-	-
Aegopinella pura	-	-	-	-	-	+	-	-
A. nitidula	+	-	++	++	+	+	+	+
Oxychilus cellarius	+	+++	++	++	+	+	-	-
Cochlodina laminata	-	-	-	-	-	-	-	+
Clausilia bidentata	-	-	+	+	+	-	-	+
Burrowing species								
Pomatias elegans	+	+	+	-	+	+	+	+
Cecilioides acicula	-	+	+	++	++	+++	+++	+++
Approx. total (excluding Cecilioides acicula)	120	275	80	250	160	220	120	85

Table 12.1.7: White Horse Stone mollusc treethrow hole samples etc

Sample	154	383	656	764	871	875
Context	4516	5127	5278	5354	5388	5395
Catholic species						
Cochlicopa sp.	-	+	-	-	-	-
Trichia hispida gp.	-	-	-	-	+	+
Cepaea sp.	-	+	-	-	-	+
Open-country species						
Abida secale	-	-	-	-	+	-
Pupilla muscorum	-	-	+	-	+++	+
Vallonia costata	-	-	+	-	+	-
V. excentrica	-	+	-	-	-	-
Vallonia sp.	-	+	+	-	++	+
Helicella itala	+	-	-	-	-	-
Shade-loving species						
Acicula fusca	-	+	-	-	-	-
Carychium cf. Tridentatum	-	+++	+	-	+++	++
Discus rotundatus	-	+	+	-	+	+
Vitrea sp.	-	++	-	-	+	-
Aegopinella pura	-	+	-	-	+	-
Oxychilus cellarius	-	+	+	-	+	-
Clausilia bidentata	-	-	-	-	-	+
Trichia striolata (early)	-	+	-	-	-	-
Burrowing species						
Pomatias elegans	+	++	+	+	+	+
Sunanthropic, exotic and introduced species						
Helicidae indet.	-	-	-	-	+	-
Approx. total (excluding Cecilioides acicula)	4	35	9	3	50	20

Table 12.1.8: Pilgrim's Way dry valley mollusc columns

Sample	107	106	105	91	89	86	83	82	81	77	76	73
Context	970	961	960	923	923	923	923	923	857	856	856	856
Depth (m)	0.85-0.90	0.80-0.85	0.75-0.80	1.15-1.20	1.05-1.10	0.90-0.95	0.75-0.80	0.70-0.75	0.65-0.70	0.45-0.50	0.40-0.45	0.25-0.30
Catholic species												
Cochlicopa sp.	-	-	-	+	+	-	-	-	-	-	-	-
Trichia hispida gp.	-	+	++	+++	++	++	+++	++	++	+++	+++	++
Cepaea sp.	-	-	-	+	+	+	-	-	-	-	-	-
Open-country species												
Vertigo pygmaea	-	-	-	-	-	+	-	+	+	+	-	-
Pupilla muscorum	+	-	+	-	-	+	+	+	+	+	+	-
Vallonia costata	-	-	+	+	-	+++	+++	+++	+++	++	+	-
V. pulchella	-	-	-	-	-	-	-	-	-	-	-	+
V. excentrica	-	-	-	+	+	++	+++	+++	+++	++	++	+
Vallonia sp.	+	+	+	+++	++	+++	+++	+++	+++	+++	++	++
Helicella itala	-	-	+	-	-	+	++	+++	++	+	+	+
Shade-loving species												
Carychium cf. Tridentatum	-	-	+	++	+++	+	-	-	-	-	-	-
Acanthinula aculeata	-	-	-	+	-	-	-	-	-	-	-	-
Discus rotundatus	-	-	-	++	+	+	-	-	-	-	-	-
Nesovitrea hammonis	-	-	-	-	+	-	-	-	-	-	-	-
Aegopinella pura	-	-	-	+	+	-	-	-	-	-	-	-
A. nitidula	-	-	-	++	+	+	+	-	-	-	-	-
Oxychilus cellarius	-	-	-	+	-	-	-	-	-	-	-	-
Burrowing species												
Pomatias elegans	-	-	-	+	+++	+	+	+	-	+	-	-
Cecilioides acicula	-	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++
Synanthropic, exotic and introduced species												
Monacha cantiana	-	-	+	+	-	-	+	+	+	+	-	++
Approx total (excluding Cecilioides acicula)	2	2	18	70	75	130	100	115	100	60	70	35

Table 12.1.9: West of Boarley Farm dry valley mollusc column

Sample	43	41	39	37	35	33	29	24	20	17	14
Context	1167	1157	1157	1152	1156	1156	1151	1151	1155	1150	1150
Depth (m)	1.80-1.85	1.70-1.75	1.60-1.65	1.50-1.55	1.40-1.45	1.30-1.35	1.10-1.15	1.00-1.05	0.65-0.70	0.50-0.55	0.35-0.40
Catholic species											
Cochlicopa sp.	+	+	+	+	+	+	+	-	+	-	-
Trichia hispida gp.	-	+	+	+	+	++	++	+++	+++	+++	++
Cepaea sp.	-	+	+	+	+	-	+	-	+	+	-
Open-country species											
Vertigo pygmaea	-	+	+	+	-	+	-	+	+	+	-
Abida secale	+	-	-	-	-	-	-	-	-	-	-
Pupilla muscorum	-	++	+++	+++	++	+	+	+	+	+	+
Vallonia costata	-	+	+++	++	++	+++	+++	+++	+++	++	++
V. excentrica	-	++	+++	+++	+++	+++	+++	++	+	-	+
Vallonia sp.	+	+	+++	+++	+++	+++	+++	+++	+++	++	++
Helicella itala	-	+	+++	+++	+	++	++	+++	+	+	++
Shade-loving species											
Acicula fusca	-	+	-	-	-	-	-	-	-	-	-
Carychium cf. Tridentatum	-	++	+	-	-	-	-	+	+	-	-
Acanthinula aculeata	-	+	+	+	-	-	-	-	-	-	-
Punctum pygmaeum	-	-	-	+	+	-	-	-	-	-	-
Discus rotundatus	+	+	-	-	+	-	-	-	-	-	+
Vitrea sp.	-	+	+	-	-	-	+	+	-	-	+
Nesovitrea hammonis	-	-	+	-	-	-	-	-	-	-	-
Aegopinella pura	-	+	-	-	+	-	-	+	-	-	-
A. nitidula	-	+	-	+	+	+	+	-	-	-	-
Oxychilus cellarius	-	-	-	-	-	-	-	-	+	-	-
Clausilia bidentata	-	+	-	+	+	-	-	-	-	-	-
Trichia striolata (early)	+	-	-	-	-	-	-	-	-	-	-
Burrowing species											
Pomatias elegans	-	+++	+++	+++	++	+	+	+	-	-	-
Cecilioides acicula	-	+	+++	+++	+++	+++	+++	+++	+++	+++	+++
Synanthropic, exotic and introduced species											
Monacha cantiana	-	+	-	+	-	-	-	+	+	+	+
Approx total (excluding Cecilioides acicula)	4	110	145	175	130	160	175	190	160	70	50

Table 12.1.10: East of Boarley Farm dry valley mollusc column

Sample	50	48	45	43	40	36	29	26	19	11	7	5
Context	1030	1029	1029	1027	1027	1007	1007	1026	1026	1001	1001	1001
Depth (m)	2.35-2.40	2.25-2.30	2.10-2.15	2.00-2.05	1.85-1.90	1.65-1.70	1.45-1.50	1.30-1.35	0.95-1.00	0.70-0.80	0.30-0.40	0.10-0.20
Catholic species												
Cochlicopa sp.	-	+	-	-	+	-	-	+	+	+	+	-
Limax or Deroceras sp.	-	-	-	-	+	-	-	-	-	-	-	+
Trichia hispida gp.	++	+++	+++	+++	+++	+++	+++	++	+++	+++	++	++
Cepaea sp.	+	+	+	+	+	-	+	+	-	+	-	-
Open-country species												
Vertigo pygmaea	-	-	-	+	+	-	-	-	-	-	-	-
Pupilla muscorum	-	-	-	-	-	-	-	-	+	-	-	-
Vallonia costata	-	+	-	+	-	-	+	+	+	+	+++	++
V. pulchella	-	-	-	-	-	-	+	+	-	-	-	-
V. excentrica	-	+	+	+	+	-	+	-	+	-	+	+
Vallonia sp.	-	+	+	+	+	+	+	++	++	+	+++	++
Helicella itala	-	-	-	+	+	+	-	-	-	+	-	-
Shade-loving species												
Carychium cf. Tridentatum	+	+	+	+	+++	+	+	-	+	-	-	-
Acanthinula aculeata	-	-	-	+	+	-	+	-	-	-	-	-
Punctum pygmaeum	-	-	-	+	+	-	-	-	-	-	+	-
Discus rotundatus	+	+++	+++	+	++	+	-	-	-	-	-	-
Vitrina sp.	-	-	-	-	+	-	-	-	-	-	-	-
Vitrea sp.	+	-	-	+	+	-	-	+	-	-	+	-
Nesovitrea hammonis	-	-	-	-	-	-	-	+	-	-	-	-
Aegopinella pura	-	-	+	-	-	-	-	-	-	-	-	-
A. nitidula	-	+	-	+	+	-	-	-	-	-	-	+
Oxychilus cellarius	-	-	+	-	+	-	-	-	+	-	+	+
Cochlodina laminata	-	-	-	+	-	-	-	-	-	-	-	-
Clausilia bidentata	-	+	+	-	+	-	-	-	-	-	-	-
Burrowing species												
Pomatias elegans	+	+	+	+	+	+	-	-	-	-	-	-
Cecilioides acicula	+	-	-	-	+	+	+++	+++	+++	+++	+++	+++
Marsh species												
Succinea or Oxyloma sp.	-	-	-	-	-	-	-	+	-	-	-	-
Monacha cantiana	-	-	-	+	-	-	-	-	-	+	+	++
Trichia striolata	-	-	-	-	-	-	-	-	-	-	+	-
Approx. total (excluding Cecilioides acicula)	14	50	55	75	70	120	30	45	40	50	85	40

Provenance

The taphonomy of mollusc shells in colluvial deposits and soils is not simple. There are often problems with the movement of shells by earthworm activity, residual shells can be present and shells can be transported in colluvial sediment. However, these are all normal problems facing land snail analysis. The contexts sampled do not present any unusual problems of contamination with recent material or residuality. The potentials of the assemblages have not seriously been affected by factors of preservation.

All the groups of samples assessed represent good groups in the sense that they contain sufficient mollusc shells for environmental interpretations to be made. However, not all the groups have high potential in relation to the research objectives. The importance of the various groups is outlined here and considered again under Section 7, Potential for Further Work.

White Horse Stone Column C (Table 12.1.2)

The lower part of this sequence has sparse assemblages of open-country molluscs, such as *Pupilla muscorum*, which are likely to be Late Glacial in date. However, this part of the sequence is short and shell numbers are low, so it can only make a small contribution to determining the Late Glacial landscape and environment. The remainder of the sequence comprises a late Bronze Age / Iron Age palaeosol sealed beneath later prehistoric colluvial sediments. The palaeosol contains high concentrations of open-country molluscs, particularly *Vallonia costata* and *V. excentrica*. The colluvial sediments also contain the same open-country species, although in lower concentrations. The molluscs from this part of the sequence certainly have the potential to provided information on the later prehistoric environment.

White Horse Stone Column F (Tables 12.1.3)

Most of this sequence is Late Glacial to very early Holocene in date and it includes a palaeosol of possible Allerød date sealed between layers of solifluction debris. Shells of open-country cold-tolerant molluscs, particularly *Pupilla muscorum*, predominate. The palaeosol contains a richer assemblage in which *Vallonia costata* and *Punctum pygmaeum* are also numerous. *Abida secale* becomes more numerous above the palaeosol. These molluscan assemblages have the potential to show changing Late Glacial and early Holocene conditions. The majority of the shells in the top two samples of the column, however, are thermophilous shade-loving species. They are from a soil which probably represents a less disturbed version of the palaeosol in Column C. *Carychium* cf. *tridentatum* and *Discus rotundatus*, which are characteristic of woodland conditions, are well-represented. The "old woodland" snail *Acicula fusca* is also present. High numbers of *Pomatias elegans* possibly reflect surface disturbance, while the occurrence of *Vallonia* sp. suggests tree cover was not complete. It is thought likely that this part of the sequence is Neolithic, perhaps belonging to the period when clearance was beginning on the site. The results from these samples would therefore help to provide information on the environmental setting of the Medway Megaliths.

White Horse Stone Column N (Table 12.1.4)

It was uncertain at the time of excavation whether the deposits of Column N were Late Glacial or later prehistoric in date. The presence of *Discus rotundatus*, a thermophilous species, and *Monacha cantiana*, a late addition to the British fauna, suggests the latter date. However, the low concentration of shells in the samples means that the sequence is unable to contribute much to the reconstruction of the environment of the local late prehistoric communities.

White Horse Stone Gridded Palaeosol (Table 12.1.5)

When the site was being excavated, it was initially believed that the extensive palaeosol in the valley bottom at White Horse Stone, which was sealed beneath colluvial sediments, was Neolithic. A series of samples was taken on a grid at 10m intervals from the exposed surface of the soil with the hope that local variation in the vegetation cover, perhaps even the extent of a Neolithic clearance, could be detected. However, excavation of the soil showed that it had been cultivated and artefacts incorporated into it subsequent to the Neolithic and that it was not sealed by colluvium until the late Bronze Age or Iron Age. The occurrence of shells of *Monacha cantiana* in some of the samples is consistent with an Iron Age or more recent date for the soil. With the exception of one very rich sample (Sample 72) the gridded samples gave similar results, with high numbers of open-country species, particularly *Pupilla muscorum*, *Vallonia costata* and *V. excentrica*. Sample 72, in addition to the open-country species, also contains many shells of woodland species, such as *Carychium* cf. *tridentatum*, *Aegopinella pura* and *A. nitidula*. However, it is possible that this sample included underlying earlier deposits rather than that it reflected a difference in the Iron Age vegetation. The results from the gridded samples do give information on later prehistoric environment but they add little that is not shown by the sequence through the same palaeosol in Column C.

White Horse Stone Bronze Age Ditch Column S408 (Table 12.1.6)

The samples from the Bronze Age ditch at White Horse Stone contain useful quantities of shells and the sequence shows some evidence for environmental change, open-country species such as *Vallonia* sp., which predominated at the bottom of the ditch, being joined by shade-loving species such as *Discus rotundatus*, higher up the profile. This sequence has some potential to fulfil the research objectives.

White Horse Stone Tree-Throw Holes (Table 12.1.7)

The tree-throw holes have given useful but varied results. Sample 383, for example, contains almost entirely shade-loving species, such as *Carychium* cf. *tridentatum* and *Vitrea* sp. However, in Sample 871 they are joined by cold-tolerant open-country species, such as *Pupilla muscorum* and *Abida secale*, which had perhaps been brought up from earlier sediments by the roots of the falling tree. These samples will help with environmental reconstruction for the period of the Medway Megaliths.

Pilgrims' Way Columns (Table12.1.8)

The shorter column (Samples 107-105) extended through Late Glacial sediments beneath late prehistoric sediments. Shells in the Late Glacial sediments are sparse, but as might be expected, tolerate cold open conditions. This part of the sequence only has limited potential. The longer column (Samples 91-73) extended from a late Bronze Age to early Iron Age palaeosol sealed beneath Iron Age to medieval colluvial sediments. The samples from the palaeosol contain both open-country and shade-loving species. Sample 89 has quite a high concentration of *Pomatias elegans* and, given the occurrence of the shade-loving species, it is possible that this assemblage was related to clearance. The molluscs from the overlying sediments are predominantly open-country species, especially *Vallonia costata* and *V. excentrica*, but *Helicella itala* is also well represented in some samples. The sequence from Pilgrims' Way contributes to the later prehistoric research aims.

West of Boarley Farm Column (Table 12.1.9)

The very lowest sample of the sequence contains a mixed assemblage of shells, probably including both Late Glacial (eg *Albida secale*) and mid-Holocene (eg *Discus rotundatus*) material. Above this is a palaeosol assemblage of later prehistoric date, which contains both open-country and shade-loving molluscs. *Pomatias elegans* suggests some disturbance. The palaeosol was sealed by colluvial sediments, which contain shells of open-country molluscs. The results from the West of Boarley Farm sequence will make a useful contribution to determining the later prehistoric landscape.

East of Boarley Farm Column (Table 12.1.10)

Shade-loving species, especially *Discus rotundatus*, predominate in the bottom 0.5m of the column, although open-country molluscs are by no means absent. It was suggested that this part of the sequence was the fill to a hollow way. Above this level, open-country species predominate in colluvial sediments. The degree to which this sequence can address the fieldwork aims will become clearer when the deposits are dated more closely.

Conservation

The mollusc remains are stable in their various states at present: dried sieved samples, flots and residues from flotation. Further analysis would require the sorting of shells from the flots and residues but they would remain stable.

All shells sorted from samples for further analysis should be retained. They will be very compact, stored sample by sample in glass tubes. All flots that were assessed should also be kept. They are stored in small "minigrip" plastic bags and are likewise very compact. However, it is recommended that all the residues from the assessment that are not sorted and the sieved samples that were not assessed should be discarded. Sorting residues should also be discarded. All are both heavy and bulky.

Comparative Material

There are no other sites within the CTRL project yet identified with useful comparative material. There are, however, two major studies that have been undertaken on Chalk valley sequences in Kent which have included molluscan analysis, at Brook (Kerney *et al*. 1964) and Holywell Coombe, Folkestone (Preece and Bridgland 1999). Both sites yielded very important Late Devensian and Flandrian molluscan sequences and included the discovery of an Allerød soil at Holywell Coombe. Both these sites are of greater importance to Quaternary studies than the White Horse Stone group of sites. However, the Late Devensian - early Holocene deposits at White Horse Stone were laid down under drier conditions than the other two sites, so their mollusc assemblages are not identical. The archaeology related to the later deposits has been studied in more detail for the White Horse Stone group of sites than at Brook.

Potential for Further Work

The molluscs from the White Horse Stone group of sites have the potential to address, at least to some degree, most of the specified Fieldwork Event Aims that had been intended of them before fieldwork began. The sequence from White Horse Stone Column F has the potential to provide information on the changing Late Glacial environment and the transition to the early Holocene. Two aspects of this can be seen as of national significance in Quaternary studies: the palaeoenvironmental evidence from the possible Allerød soil and the evidence for the transition to the Holocene.

The samples from the top of White Horse Stone Column F and also from some of the White Horse Stone tree-throw holes have the potential to contribute information on the environmental setting of the Medway Megaliths. The results will be of use for interpreting the local environment of the Neolithic settlement at White Horse Stone and providing information towards building up a picture of the degree of tree cover in the region during the Neolithic. It is possible that Neolithic clearance was very local in Kent.

The sequences of White Horse Stone Columns C and S408, Pilgrims' Way Columns, West of Boarley Farm Column and possibly East of Boarley Farm Column all have the potential to assist with the determination of the environment of the local late prehistoric communities. There is at least a hint from the assessment results that the valley bottoms were not completely cleared until the late Bronze Age and agricultural intensification was late, which would certainly be of regional significance.

One additional research aim to have emerged from the assessment of the molluscs is that of adding to knowledge of the development of the British mollusc fauna. Some of the samples in Column F contain a species of Helicidae, which no longer occurs in Britain. It is possibly *Trochoidea geyeri*, although further work is necessary to confirm its identity. It is known from some deposits of Late Glacial age in Britain (Kerney 1999). *Monacha cantiana*, which is regarded as a possible Roman introduction to Britain (Kerney 1999), is present in some of the pre-Roman deposits at White Horse Stone. It is very plausible that *M. cantiana* was introduced to Britain via Kent in the prehistoric period. It is possible that a closely related species, *Monacha cartusiana*, which is now of very restricted distribution, is also present. This information would be of national significance.

Updated research questions

Themes concerning the late Glacial and Holocene environment and landscape history can be addressed.

Pleistocene-Holocene environment

What is the character of the late glacial and early Holocene environment?
What evidence is there for environmental change during the late glacial and early Holocene periods?

Recommended further work

It is recommended that molluscs from White Horse Stone Columns C, F and S408 and the White Horse Stone tree-throw holes be analysed in full to address the research aims described above.

It is further recommended that the results of the assessment of White Horse Stone Column N and the White Horse gridded samples be used in any final report but that no further analysis is necessary of these samples. Analysis of the remaining columns from White Horse Stone is unnecessary. This would entail the full analysis of 61 of the 191 samples taken from White Horse Stone.

It is also recommended that samples be analysed in full from the columns from Pilgrims' Way, West of Boarley Farm and East of Boarley Farm. It will not be necessary to analyse the molluscs from the colluvial parts of these sequences at intervals as close as 0.05m, so the work would involve the full analysis of about 50 samples out of the total of 93 from these sites.

- assessment of GEOARCHAEOLOGY

Geoarchaeology

By M Bates

Introduction

Investigation of the geoarchaeology of the exposed sequences involved visits to the site to either i) log sequences and advise on procedures for sediment and soil micromorphology sampling and, where appropriate, advise field staff on the recording of sequences exposed during excavation or ii) provide verbal comment on exposed sections.

Where section logging was required standard geological terminology was used to record sequences (see below). As part of this work a number of samples were recovered to allow for further specialised investigation.

The aims and objectives of the geoarchaeological input to this phase of works focused on identifying and interpreting stratigraphy and buried soil horizons within contexts associated with the late-glacial and Holocene environments. This work and the assessment were designed to specifically address Fieldwork Event Aims (see Section 2.2, aims 2 and 5).

Methodology

This report focuses on the description and interpretation of three sequences revealed during the course of archaeological investigation of the White Horse Stone (ARC WHS98), the Boarley Farm site (ARC BFW98) and the Pilgrim's Way site (ARC PIL98) areas. Detailed profile descriptions and interpretations are presented for two investigation areas (ARC WHS98, section 440 and section 1098 and Pilgrim's Way section, ARC PIL98) that were recorded in the field by the specialist geoarchaeologist (Tables 14.1.5-6).

Sequences were recorded down-profile using standard geological terminology used in Quaternary science (Jones *et al*, 1999). Context descriptions are provided for the relevant parts of the sections specific to the geoarchaeological aims (Tables 14.1.5-6).

Quantifications

Two profiles (or section complexes) were examined as part of this assessment. Context descriptions for units related to section 440 and a section adjacent to (1098) at the ARC WHS98 site, and from beneath the Pilgrims' Way sequence (ARC PIL98), are presented in Tables 14.1.5-6.

The profile recorded at White Horse Stone (ARC WHS98, section 440) contained a sequence of Pleistocene and Holocene sediments recorded to a depth of c. 1.5m below the ground surface. This profile was orientated at 90º to the main axis of the valley and crossed the full width of the valley bottom area. A single, major buried soil horizon was identified in this sequence, context 4144, that rested on chalk and flint rich sediments interpreted to be late Pleistocene solifluction sediments (4151, 4551). The presence of the pedogenic horizon immediately above the late Pleistocene deposits implies the presence of an unconformity of some considerable duration spanning much of the early Holocene. This has recently been confirmed by age estimates of 4911±60 BP (NZA-11463) and 4974±60 BP (NZA-11464) from a Neolithic structure cut into this interface and buried by the pedogenic horizon. The pedogenic horizon is buried by a series of colluvial slope wash sediments (4012, 4145, 4146, 4147, 4148, 4149, 4150 and 4152).

The sediments within this profile have been sampled at four locations along the trench profile using both sediment monolith tins (Table 14.1.1) and soil kubiena tins (Table 14.1.2).

Table 14.1.1: Sediment monolith record data, ARC WHS98. Section 440

Monolith number	OAU sample numbers	Contexts sampled
1	104	4149, 4144, 4151
2	105	4012, 4152
3	106	4144, 4151
4	107	4144, 4151
5	108	4012, 4147, 4146
6	109	4146, 4145
7	110	4012, 4148, 4147, 4146
8	111	4146, 4145, 4144
9	191	4145, 4144. 4551
10	192	4145, 4144, 4551

Table 14.1.2. Kubiena tine record data, ARC WHS98. Section 440

Kubiena number	OAU sample numbers	Contexts sampled
1	112	4144
2	113	4144
3	114	4144, 4151
4	115	4144
5	116	4146
6	117	4146, 4145
7	118	4145, 4144
8	119	4145, 4144
9	120	4147, 4146
10	121	4146, 4145
11	122	4144

The stratigraphic position of the buried soil horizon (4144) is similar to that of other buried soil horizons that have been widely reported in south east England (e.g. at Kiln Combe in East Sussex – Bell 1983). A similar horizon had been tentatively identified in previous investigations of this part of the route corridor (Union Railways Ltd 1997a). The buried soil horizon is overlain by colluvium that is typical of sequences inferred to have formed from slope wash processes (Bell 1983; Bell and Boardman 1992).

A more extensive sequence of valley side deposits were exposed in excavations at the southern end of the White Horse Stone site (section 1098) adjacent to and beneath the Pilgrim's Way section (ARC PIL98). Two major sections were drawn and the key contexts present described (see Table 14.1.6). The stratigraphic sequences exposed in these trenches revealed extensive sequences of deposits interpreted to date from the end of the last cold period underlying a sequence of colluvial sediments and deposits related to the Pilgrim's Way track. The sedimentary units thought to date to the late glacial phase are similar to those previously reported from the area (ARC WHS97, Trench 3035TT, section 1) during the evaluation phase of works at the site (Union Railways, 1997a). A tentative correlation between contexts revealed in the various trenches is presented in Table 14.1.3.

Table 14.1.3. Relationship of contexts between sections at White Horse Stone and Pilgrim's Way.

Interpreted sedimentary unit	WHS 98, section 440	WHS 97, ARC 3035TT (Union Railways, 1997a)	WHS 98, section 1098	PIL 98, Pilgrim's Way Section
Colluvial sediments	4012, 4145-1450, 4152	630	9000-9004	9003-9004
Main post-glacial pedogenic horizon	4144	631	9005	9005
Post 'Allerød' solifluction deposits	4151, 4551	635	9006-9007	9006-9007
'Allerød' pedogenic horizon	Not present	636	9008	9008
Pre 'Allerød' solifluction deposits	Not present	637-640	9009	9009-9010

The units identified have been sampled with sediment monolith samples being taken to sample key units (Table 14.1.4).

Table14.1. 4. Context numbers and sample details: ARC WSH98, section 1098 and Pilgrim's Way (PIL 98).

OAU sample numbers	Contexts sampled
177	9004, 9005, 9006
978	981, 982, 983, 984

The uppermost sediments are typical of valley side colluvial deposits of Holocene date (9000-9004) similar to those noted in section 440 (see above). These deposits bury a well-developed unit preliminarily interpreted as a buried soil horizon of later Prehistoric date (9005). The underlying sediments consist of a sequence of units containing variable quantities of gravel sized particles (both chalk and flint rich) (9006, 9007, 9009, 9010). Within this sequence, thought to have formed under cold climate periglacial slopewash conditions, lies a sediment (9008) thought to be similar to the horizon known elsewhere in Kent as the Allerød soil[2] (Kerney, 1963; Preece and Bridgland, 1998). Considerable complexity was noted within these units (see sub-divisions 1-9, context 5008).

A further point to note concerns the discovery of large numbers of sarsen boulders within the excavated areas (e.g. see Figure 4, Union Railways (South) Ltd., 1999). The geological origin of these boulders remains to be fully determined, however recent work on similar boulders

[2] The late glacial interstadial soil horizon that is widely recognised in south eastern England has been given the name the Allerød soil (Kerney, 1963) and this terminology is widely used today (e.g. see Preece and Bridgland, 1998). Within the Medway catchment area the site at Upper Halling has recently been designated as the regional stratotype for the late glacial sequences (including both the late glacial soil horizon and the solifluction deposits above and below the soil horizon). This is known as the Upper Halling Bed and forms part of the Brook Formation (Gibbard and Preece, 1999). All deposits discussed in this report and assigned to the late glacial period would therefore be equated with the Upper Halling Bed. Other terms may also be used to describe the late glacial soil horizon including the Windermere Soil however, this term is inappropriate due to chronological discrepancies at the type site (Prof. Mike Walker pers. comm. July 2000). In this report the term late glacial soil horizon is used and this equates with use of the term Allerød soil as proposed by Kerney (1963).

from other localities in southern England may provide clues as to the mode of formation, and reasons for the concentration of such boulders, in the valley base area of the site (e.g. see Ullyott *et al*., 1998, 2000: Catt and Hepworth 2000).

Provenance

The stratigraphy that is present and described at the White Horse Stone and Pilgrim's Way site is representative of well known sequences that are preserved elsewhere in Kent. The contexts described fall into two groups of sequences:

A lowermost group of deposits dominated by coarse flint and chalk rich gravels (and an intercalated weathering horizon or soil development, e.g. context 9008) deposited during the late Pleistocene under typically cold climate conditions (the exception to this is the buried soil horizon that would have developed under milder conditions during the late glacial interstadial 11-12ka BP) and an upper group of silts deposited by hillwash processes during the later part of the Holocene.

Conservation

A considerable quantity of undisturbed sediment samples exists from these trenches (see Tables 14.1.1, 2 and 4). These samples contain material from both the major post-glacial soil horizon (contexts 4144, 631 and 9005) and the late glacial (Allerød) soil horizon (636, 9008). Desiccation of these samples will occur over time. Investigation of the soil micromorphological properties of the samples could be undertaken and this would necessitate impregnation of the sample rendering it inappropriate for any other forms of investigation. However, this is only a problem with sample 978 from the Pilgrim's Way section where a specific kubiena tin was not taken for micromorphological investigation. Impregnation and preparation of thin-sections through these deposits would provide a stable, long-term archive record of the nature of the buried soils horizons at this site.

Comparative material

Comparable material to the sedimentary units identified during the fieldwork have been identified at number of locations within the CTRL (Union Railways Ltd., 1997b) corridor and beyond within southern England. Extensive sequences of late glacial and Holocene sedimentary units exist and have been the subject of assessment from the Nashenden Valley within the CTRL corridor (Union Railways Ltd., 2000 in prep.). Late Pleistocene and Holocene slope deposits have also been encountered within the Ebbsfleet Valley evaluation works (Union Railways Ltd., 1997c). Within the Medway Valley the late glacial soil horizon is well known from Upper Halling (Kerney 1963; Preece 1998) and a well dated sequence of late glacial/Holocene deposits have been investigated at the site of the Channel Tunnel portal at Holywell Coombe (Preece 1992; Preece and Bridgland 1998).

Potential for further work

Investigation of the sites described here aimed to focus on the potential of these sites for revealing new data regarding:

The nature of late glacial/early Holocene palaeoenvironmental change contemporary with the earliest stages of the recolonization of Britain by plants, animals and importantly humans at the end of the last cold phase and the development of the changing Holocene landscape.

The presence of sediments clearly associated with the final phase of the Pleistocene were noted to contain fossiliferous material in places. In comparison to other sites along the CTRL (e.g. Nashenden Valley) the sections at White Horse Stone are significantly better developed and more widespread in their preservation than previously thought. Potential exists here to investigate the timing and nature of environmental change during this time period.

Updated research aims

Themes concerning the late Glacial/Holocene environment have the potential to be addressed.

Late Glacial/Holocene environment

What is the character of the late glacial and early Holocene environment?

Recommended further work

This will include a full report on the sequences described here integrated with other lines of environmental evidence and incorporating both the radiometric and OSL dating.

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Table 14.1.5: Context/Sediment description: ARC WHS98, section 440 (11/9/98)

Context Number	**Stratigraphic description**	**Inferred processes of deposition**
4012	Mid grey-brown silt with common sub-angular chalk pellets (5-20 mm). Occasional angular flint clasts (20-40 mm). Unit is loose and structureless. Modern roots penetrate through unit. Large (c.10 mm wide) empty root canals are present. Mollusc fragments noted.	Holocene colluvium.
4144	Dark brown soft, friable silt. Contains common chalk clasts (4-6 mm) of sub-rounded to sub-angular shape. Unit is loose and unconsolidated. Rare angular flint clasts and common white precipitate in root canals (2-4 mm long) noted. Upper part of unit contains large (40-80 mm), clasts of angular tabular flints resting parallel to upper surface of unit.	Pedogenic horizon.
4145	Dark brown clayey-silt. Homogenous and firm. Shell fragments, very small (1-2mm) chalk and flint particles noted. A network of root canals containing secondary /carbonate precipitate noted. Base of unit is marked by a zone of large angular flint cobbles (c. 50mm in size).	Holocene colluvium.
4146	Reddish-brown to grey slightly clayey-silt with very fine chalk grains (1-2mm). Occasional angular flint clasts (20-50mm). Patches of ?carbonate precipitate noted in places. Empty branching root canals noted. Shell fragments are common. Unit is compact and firm with a slightly blocky structure.	Holocene colluvium with possible weathering and ?soil formation.
4147	Mid grey-brown silt with common sub-angular chalk pellets (5-20 mm). Common angular flint clasts (20-80mm). Unit is loose and structureless. Modern roots penetrate through unit. Large (c. 10mm wide) empty root canals are present. Mollusc fragments noted.	Holocene colluvium.
4148	Reddish-brown silt with common sub-angular chalk pellets (5-20mm). Occasional angular flint clasts (20-40mm). Unit is loose and structureless. Modern roots penetrate through unit. Large (c.10mm wide) empty root canals are present. Mollusc fragments noted.	Holocene colluvium.
4149	Dark to mid-brown clay-silt with common large, angular flint clasts (<80mm). Chalk clasts appear to be angular and increase in size up-profile from <10mm to >20mm. Structureless and moderately dense and compact.	Holocene colluvium.
4150	Mid greyish-brown silt. Chalk and flint clasts are present (typically sub-angular shape and 20-40mm in diameter). Occasional larger clasts up to 6cm. Modern roots are present and large (10mm wide) empty root canals. Mollusc fragments common.	Holocene colluvium.
4151	Yellowish-white chalk pellet gravel with chalky silt matrix. Chalk clasts are very common, sub-angular in shape and typically less than 10mm.	Periglacial solifluction.

4152	Coarse clast supported flint gravel. Clasts are angular, 40-100mm in diameter and probably slightly rolled. Some flint clasts appear to be shattered *in situ*. Matrix consists of light brown silt. Large empty root canals penetrate unit. Sediment is dense and compact.	Holocene colluvium.
4551	Light yellowish-brown to strong yellowish-brown silt containing chalk and flint clasts. Very dense and compact. Flints are 20-40mm, angular and sharp. Chalk clasts are angular and <5mm. Empty root canals penetrate unit.	Periglacial solifluction.

Table 14.1.6:Profile WHS 98 Section 1098 and PIL 98 section (21/9/98)

Context Number	Stratigraphic description	Inferred processes of deposition
9006	Light greyish-brown chalk pellet gravel with a chalky silt matrix. Clasts (<10mm) are common at base and decrease in frequency up-profile. Unit is soft and malleable.	Cold climate slope wash deposit.
9007	Very well bedded white to very pale grey silt with dark greyish-brown silt. Laminae dip downslope and are wavy, undulating and discontinuous. Large angular blocks of flint (40-140mm in diameter) occur. Occasional small chalk clasts (<10mm) are present.	Cold climate slope wash deposit.
9008	Brownish-grey silt with occasional small chalk clasts. Unit appears to become darker up-profile. Occasional black flecks are noted within unit (?charcoal). Occasional possible root traces (small, 2-3mm wide, branching systems).	Weathered silt, subject to incipient pedogenesis.
9009	The upper part of this unit consists of a yellowish-brown silt with common small (<5mm) sub-angular chalk clasts. In places chalk content increases up-profile. Unit is dense, compact, structureless and massive. The lower part of this unit consists of pale brown to brownish-yellow chalk pebble gravel. The unit is matrix supported and clasts of chalk are typically 10-40mm in size and sub-angular but rolled. Unit is structureless and contains no flint.	Cold climate slope wash processes.
9010	Light yellowish-brown chalk rich silt with very common flint clasts. The unit is matrix supported. Chalk clasts are poorly sorted, 10-40mm and sub-angular and rolled. Flints are typically less than 100mm in size, poorly sorted and angular. In places the flints are shattered *in situ*. The unit is massive and structureless.	Cold climate solifluction processes.

– ASSESSMENT OF SOIL MICROMORPHOLOGY

Soil micromorphology

By Richard Macphail and John Crowther

Introduction

The multi-period site of White Horse Stone, Kent (Oxford Archaeological Unit) was visited and sampled by Dr Macphail and further samples were collected by Dr Martin Bates. Archaeology, samples, assessment strategy and archaeological (environmental/geoarchaeological) potential were discussed between Dr Macphail and the OAU (27-5-2000, 24-8-2000), and with Drs Martin Bates and John Crowther.

This work and the assessment were specifically designed to address a number of the Fieldwork Event Aims (see Section 2.2, aims 1-5).

Four soils of archaeological importance occur at White Horse Stone, namely:
1. The Allerød palaeosol (see Bates),
2. The Neolithic long house soil (posthole and drip gully fills),
3. The later prehistoric palaeosol, and
4. The Iron Age occupation soil (posthole and pit fills).

Soil studies will provide a necessary component to the landscape, environmental and cultural reconstruction of the White Horse Stone site. Precedents have been set at other chalk soil sites at the Channel Tunnel site of Hollywell Coombe, Folkestone, Kent (Preece 1992)(Allerød palaeosol), at Windmill Hill (Whittle *et al*. 1999) (Neolithic occupation on the chalk), and at Maiden Castle (Macphail, 1991)(Iron Age chalk soils and occupation). These and other sites (see below) provide analogues and databases. Archaeological chalk soils have also been undergoing experimental studies by Crowther and Macphail at the Overton Down Experimental Earthwork (Bell *et al.* 1996).

Samples and assessment results

The Allerød palaeosol

Monolith samples were examined at the OAU. The Allerød palaeosol is well preserved and appears to be similar to other soils of this location, type and age studied in the 1960s by Cornwall (e.g. Holborough, Kent; Cornwall reference soil thin-section collection; Macphail and Scaife 1987, Figure 2.4)(Kerney 1963), and more recently by Kemp on the Isle of Wight (e.g. soil micromorphology and earthworm granule studies; Preece *et al*. 1995). On the other hand, few Allerød palaeosols have been studied in sufficient soil micromorphological and chemical detail in order to reflect the full natural impact of the Allerød interstadial and the possible influence of Late Upper Palaeolithic humans upon it. An exception is the Allerød palaeosol formed on a limestone breccia, and associated with Late Palaeolithic occupation at King Arthur's Cave, Wye Valley, which was studied in detail through soil micromorphology and chemistry (Macphail, Crowther and Cruise 1998, unpublished report to Dr N Barton, Oxford Brookes University). This soil and three others contain burned bone and charcoal, inferring human activity.

The Neolithic longhouse soil (posthole and drip gully fill)

Soils were examined in monoliths, sub-sampled and assessed through soil micromorphology and by determinations of: loss-on-ignition (LOI) at 375˚C for 16 hours, which provides a measure of the organic matter content (Ball 1964); phosphate-P (total phosphate), separated into its inorganic (phosphate-P_i) and organic (phosphate-P_o) components, using the method described by Dick and Tabatabai (1977), but excluding the oxidation stage for phosphate-P_i;

low frequency mass-specific magnetic susceptibility (χ), maximum potential susceptibility (χ_{max}) and percentage fractional conversion (χ_{conv}), following the procedures developed by Crowther and Barker, 1995); pH (1:2.5, water); and an estimate of carbonate content (Hodgson 1974). In the first instance, four thin-sections (M625a, M529a, M473a and M618) and four chemical samples (x625a, x529a, x473a and x618)(Table 15.2) were assessed, the first three being post hole fills and the fourth a drip gully fill.

Scanning of the thin-sections revealed that the drip gully fill (context 5156) is largely attributable to subsoil silting, with only limited background evidence of human activity, and this is reflected in the relatively low LOI (2.19%), phosphate-P concentration (0.642 mg g^{-1}) and magnetic susceptibility (χ, 37.5 x 10^{-8} SI kg^{-1}) and χ_{conv} (22.1%) (Table 15.4). By comparison, the results from the different posthole fills (Tables 15.3-4) show stronger signs of human activity. Soil micromorphological findings from the posthole fills can be summarised into:

a) Natural characteristics – dominant chalk gravel, the presence of earthworm worked soils and earthworm granules;
b) mixing – presence of topsoil and subsoil from mature rendzinas and calcareous brown earths (Andover 1 soil association)(Avery 1990; Jarvis *et al.*, 1984), including highly humic decalcified A1h horizon material, mixed with
c) anthropogenic soils - rich to very rich in fine to medium size charcoal and rare burned silt, with
d) anthropogenic components – wood charcoal, many charred mollusc fragments and rare burned bone.

Interestingly, the three posthole fills suggest different levels of human activity on the ground surface in the immediate vicinity of the postholes. Context 529, for example, contains the strongest anthropogenic signature, with charcoal-rich soils, burned soil, much burned mollusc shell and inclusions of burned bone (Table 15.3); and relatively high LOI (4.28%), χ (80.1 x 10^{-8} SI kg^{-1}) and χ_{conv} (29.2%) figures, and very high phosphate-P concentration (4.34 mg g^{-1}) (Table 15.4). The latter, which is mostly inorganic (84.1%), could be largely attributable to the presence of bone fragments, although more systematic soil micromorphological analysis will be required to fully interpret this fill. Sample 473a also shows strong signs of magnetic susceptibility enhancement, as might be associated with burning, and some degree of phosphate enrichment. Sample 625a, on the other hand, displays less evidence of human activity.

Such natural chalk soils and soils affected by human activity, can be compared with unburied and buried experimental rendzinas of long term pastures of the Overton Down Experimental Earthwork (Crowther *et al.* 1996), buried Neolithic chalk soils at Easton Down and Windmill Hill (Macphail 1993; Whittle *et al.* 1999). The suite of natural rendzina/calcareous brown earth soils identified at White Horse Stone are consistent with types found at the above-cited sites. Of particular interest are the occupation soils at Windmill Hill, which are similar to those at White Horse Stone, contain charred organic matter and burned mollusc shell; but at White Horse Stone these soils have a very strong association with a longhouse structure. More work will be needed to deduce whether soils present in 529 relate to occupation floors, possibly associated with a hearth (*cf.* Pimperne House(s), Butser Ancient Farm) (Macphail and Cruise in press). The soil micromorphology and bulk analyses independently demonstrate that posthole fills differ in character, possibly reflecting the organisation and use of the long house, as recorded elsewhere in later prehistoric long houses by macrofossil studies of posthole fills (tripartite organisation; e.g., Viklund 1998). Bulk analysis, employing the different methods of organic matter measurements, phosphate analysis and magnetic susceptibility assays of further posthole fills, may well be able to advance our comprehension of the Neolithic long house. This would greatly contribute to any programme of spatial studies involving charred remains recovery. Soil micromorphology, as shown above, will aid any spatial reconstruction of the site through identifying sources of organic matter, burned materials, and phosphate (bone, organic matter/animal dung)(Macphail and Goldberg 1995).

The later prehistoric palaeosol

Examples of the prehistoric palaeosol were examined in the field and at the OAU. These composed excellent examples of probably colluvially over-thickened rendzinas (colluvial rendzinas; Avery 1990). It is very important to understand how such a mature soil cover formed, and under what conditions, because this soil likely developed after Neolithic/Bronze Age occupation, and was likely extant during the Iron Age (as assessed below). At Maiden Castle, Hampshire, a major humic soil horizon, just like the one at White Horse Stone, formed between significant Neolithic and Iron Age episodes, and essentially "downland" soils formed during this period, probably through grazing (Macphail 1991). It will be very useful therefore to carefully study the soil micromorphology, chemistry and magnetic susceptibility characteristics of the prehistoric palaeosol at White Horse Stone, building upon the Neolithic soil database. The work will also complement the land snail analysis of the soil. It will also be useful to choose one profile for detailed analysis and compare it with two others from the slope, in order to examine variations down the soil catena and possible variations in landuse likely to be contemporary with the Iron Age settlement.

The Iron Age occupation soil (posthole and pit fills)

Soil samples taken from Iron Age settlement deposits were carefully selected on site to answer specific questions posed by OAU in accordance with the Field Work Event Aims (see Section 2.2) and excavation findings, concerning the function of features, site formation processes and cultural activity. In order to complement macrofossil analysis of these features, it is suggested that five thin section samples (M142, M143a, M143b, M144 and M145) and seven bulk samples be analysed. Turf remains, ashed dung and cereal processing waste, any industrial debris, as found at Early Iron Age Maiden Castle and LBA/EIA Potterne, may well be recognised (Macphail 1991; Macphail 2000).

Updated research aims

Themes concerning the late Glacial/Holocene environment and settlement, landscape and society have the potential to be addressed.

Late Glacial/Holocene environment

What is the character of the late glacial and early Holocene environment?

Settlement, landscape and society

What is the character and extent of Neolithic activity within the longhouse? To what extent is it domestic in character?
What is the character and extent of Iron Age occupation within the settlement? What activities are represented?
What evidence is there for fields and what was their function?

Recommended further work

In connection with land snail studies, it is suggested that soil micromorphology and chemistry, grain size and mineral magnetic studies on bulk samples, should be carried out on two examples of the Allerød palaeosol.

It is suggested that a substantial amount of work could be carried out on the long house soils, as follows:

a) full soil micromorphological analysis of the posthole and gully fills, and to include a lower sample from post hole 529 (M529b), in order to fully characterise the different components contributing to the bulk analytical findings and to allow inferences concerning site formation processes of Neolithic long house floor deposits,

b) full bulk analysis of posthole fills examined in thin section, in order to understand changes with depth (another 4 samples),

c) bulk analysis of some 30 posthole fills selected from around 100 samples taken, in order to aid a spatial reconstruction of the long house and its organisation.

It is suggested that three profiles from the later prehistoric palaeosol are investigated, one in detail and two as comparisons from different slope-unit positions, including an example from near the settlement if possible.

Soil micromorphology will comprise standard description and counting (and digital recording of microfabrics and components; microprobe analysis where necessary, etc.), while bulk analyses will include LOI, phosphate analysis, magnetic susceptibility, pH, carbonate (as in the initial assessment) and organic carbon, with grain size and nitrogen analysis on selected samples (Bullock *et al*. 1985; Courty *et al*. 1989; Crowther and Barker 1995; Crowther *et al*. 1996). This will allow full characterisation of these ancient soils and the identification of past environmental and cultural conditions.

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- Assessment of luminescence dating

Luminescence dating

By Ed Rhodes

Introduction

Age estimates have been derived for four sediment samples from the site of White Horse Stone, near Aylesford, Kent, using luminescence dating methods. The samples were collected by OAU staff, and submitted to the Luminescence Dating Laboratory, Research Laboratory for Archaeology and the History of Art, University of Oxford. Initial sample preparation was undertaken in 1999, and mineral separation and luminescence dating procedures were undertaken between July and October 2000. At the time that the samples were prepared and dated, no details of their relative stratigraphic positions had been provided, and the age estimates were conducted “blind”.

An interesting suite of 4 preliminary dates has been measured. An interpretation based on the luminescence ages estimates and the stratigraphic relationships of the samples using a bayesian methodology appears to confirm the identification of an Allerød soil horizon. There is a degree of age inversion observed for the measured age estimates, discussed in further detail below, which suggests that some further investigation into the source of this phenomenon is warranted.

Methodology

With respect to sample preparation, these samples proved difficult to deal with in a number of ways. The preferred material for OSL dating within the Luminescence Dating Laboratory is fine to medium sand-sized quartz. While the samples did contain a certain amount of sand-sized material, only for sample X270 (ARC WHS98 309) was a sufficient quantity of quartz grains recovered for OSL dating. Following unsuccessful attempts for the remaining three samples to separate sand-sized quartz grains, the isolation of silt-sized quartz grains was attempted, using fluorosilic acid treatment. This methodology works well for quartz-rich silt samples, but for samples from a chalk bedrock provenance, previous results have been mixed in their degree of successful quartz isolation. For these samples, only negligible yields of silt-sized quartz grains were separated. In order to allow the determination of luminescence dates from these samples, fine-grained polymineral aliquots were prepared.

For sample X270 (ARC WHS98 309), a quartz OSL age based on the SAR (single aliquot regenerative-dose) protocol was measured. Owing to the low yield of quartz grains, only a brief concentrated HF acid treatment was used, and the natural alpha dose contribution was included in the age calculation.

For samples X267, X268 and X269 (ARC WHS98 306, 307 and 308 respectively), fine-grained polymineral age estimates were measured, using a post infrared blue OSL methodology. This allows the derivation of two semi-independent dates for each sample, using IRSL and OSL respectively. In each luminescence measurement step, an IRSL measurement directly precedes each OSL measurement. The IRSL signal is expected to be dominated by contributions from detrital feldspar grains, while the OSL signal is expected to have a significant contribution from quartz grains. Previous application of this methodology from samples from within late prehistoric ditch fill contexts suggests that the OSL signal can yield self-consistent age estimates, also consistent with the expected age of the dated context, while the ISL age estimates tend to provide more scattered results, and have a tendency to overestimate the depositional age.

All OSL and IRSL measurements were made using Risø automated luminescence readers, using a natural and regenerated dose preheat of 220°C for 10s and a test dose preheat of

200°C for 10s. All luminescence emission signals were detected using Hoya U340 glass filters.

Sample details and results

Results of the age estimates derived are presented in Table 18.1, presented in approximate stratigraphic order.

Table 16.1: IRSL and OSL dating results from Profile G.

Lab Code	Field Code	Context	Sedimentary interpretation	IRSL age	OSL age
X267	306	4933	Solifluction deposit above soil	18,600±2,500	21,000±2,200
X269	308	4935	Allerød soil	21,200±1,800	16,800±1,700
X270	309	4935	Allerød soil	-	14,500±1,400
X268	307	4936	Solifluction deposit below soil	15,200±1,500	13,500±1,200

Discussion

Luminescence dating of sediments is a technique that determines the total environmental radiation that sample grains have been subject to since their last exposure to daylight. If deposition occurs with an insufficient daylight exposure event, luminescence dates may overestimate the true depositional age. Sediments such as aeolian sands or loess are usually found to be ubiquitously well bleached (exposed to light), while shallow marine and well-sorted fluvial deposits appear to be generally reliable materials with occasional slight age overestimates. The dating of sediments whose constituent grains may have been exposed to very little daylight, such as colluvial sediments, is subject to potential age overestimates, and some care must be taken in the interpretation of dating results for these materials. However, so long as there is no risk of age underestimation (due to other characteristics or sample behaviour), such dates may be interpreted as firm maximum age estimates. Where several samples are dated, it is extremely unlikely that each will suffer from the same degree of age overestimation, and hence the true age is often approached. The incorporation of stratigraphic relationships into a bayesian age model allows the optimum estimate of deposition for part or all of a suite of samples. This approach is well established for applications involving radiocarbon dating, and has been adopted for these luminescence dates.

Important to the reliability of this bayesian methodology is the assumption that the samples are not subject to effects, which may lead to age underestimation. While this is well established for quartz OSL signals, feldspar TL, IRSL and OSL signals may all suffer from anomalous fading, which can lead to age underestimates. This is the primary reason that dating based on quartz is generally preferred. In this suite of dates, the inclusion of one age estimate (X270) based on quartz, and the expectation that the post-IR blue OSL methodology preferentially isolates the quartz OSL signal is felt sufficient to justify this approach here. Therefore, it is the OSL dates that are discussed henceforth, while the IRSL are not considered useful in terms of providing reliable chronological control.

Two samples (X269 and X270) from a horizon tentatively identified as an Allerød soil, provided OSL age estimates which are consistent with each other within their associated uncertainties, though slightly older than expected for this period (Table 16.1). A sample from the layer immediately beneath this horizon gave a slightly younger age estimate, suggesting that this apparent overestimate was probably a result of incomplete bleaching. The age of this sample (X268) is consistent with deposition occurring immediately prior to the Allerød (Windermere Interstadial). It should be remembered that it is the age of the deposition of the soil parent material, rather than the period of soil formation, that luminescence dating is expected to provide for samples X269 and X270, within the soil horizon. The final OSL age estimate from solifluction deposits above the soil gives a significantly older age estimate of 21,000 ± 2,200 years. This would appear to represent sediment deposition without sufficient light exposure, perhaps catastrophically or very rapidly, possibly as a result of mass movement. The most likely period for this event would appear (from the other dates) to be the Younger Dryas cold period (or Loch Lomand Stadial). The LGM (last glacial maximum) age is interesting (perhaps representing aeolian input by loess-forming processes at peak LGM conditions, before later re-deposition), as is the implied contrast in depositional style between the solifluction deposit above and below the Allerød soil (perhaps the lower deposit was dominated by a series of minor slopewash events as opposed to a possible single mass movement event for the upper deposit), though it is not felt possible to conclude anything firmly on these matters without further investigation.

Table 16.2 provides a summary of the age estimate limits from the bayesian analysis of the OSL dates, performed using OxCal software, providing an age model for samples in a bounded stratigraphic sequence. This age model explicitly assumes that the ages are reliable, except for possible overestimation (resulting from incomplete zeroing at the time of deposition). The presence of such overestimation is implied by the observed age reversal, in particular for sample X267. To model this possible overestimation, the low age probability distribution was widened by a factor of five. This factor is somewhat arbitrary; however, a measure of the magnitude of the value required is provided by the maximum degree of age inversion observed. The value of this factor will affect the "agreement indices" quoted in Table 3. Values of > 60% are considered acceptable. However, it will make little difference to the central ranges of the age model results. These results appear to confirm the origin of the presumed Allerød soil; the age model results for the samples collected within the soil are 13,800 to 9,000 years before 2000AD for X 269 and 14,500 to 10,200 years for X270.

Table 16.2. Bayesian age model results at one standard deviation limits. An allowance for incomplete bleaching of all samples was made by multiplying the low age half gaussian distribution by a factor of 5.

Lab Code	Field Code	Context	Sediemtary interpretation	Age model range 1σ (years before 2000)	Agreement Index (%)
X267	306	4933	Solifluction deposit above soil	13,500-7,000	72.8
X269	308	4935	Allerød soil	13,800-9,000	104.2
X270	309	4935	Allerød soil	14,500-10,200	121.9
X268	307	4936	Solifluction deposit below soil	15,200-11,300	113.8

Potential

The application of a bayesian age model to a series of four OSL age estimates has allowed the confirmation of the assigned chronostratigraphy. By making sensible statistical allowance for the effects of incomplete bleaching, the age model can constrain the most likely age of samples forming a coherent sequence. The potential of such an approach is huge within a wide range of archaeological and environmental applications.

Further detailed research into the nature and magnitude of the overestimates for these samples is possible, but is unlikely to provide significantly better chronological resolution.

Given that the dating program has completed its objective in confirming the date of the lowest deposits within the dry valley as belonging to the Late Glacial phase of the Pleistocene, then there is no further potential. Other samples taken from elsewhere within the dry valley but from the same stratigraphic horizons, if processed and run, should be expected to replicate the above results.

Recommended further work

The results should be integrated with the environmental evidence from this sequenece.

PS: BOWER ROAD

- Macroscopic Plant Remains and Charcoal

Charred Plant Remains and Charcoal

by Dana Challinor

Introduction

Soil samples were taken during the excavation for the recovery of charred plant remains and charcoal. A range of features, dating to the Romano-British period, were sampled including ditches, pits, postholes and waterholes. The samples were taken in accordance with the Fieldwork Event Aims for the site, which are set out in section 2 of the main report, above. Soil samples were taken in order to provide environmental and economic data, and environmental remains have particular relevance to the general CTRL Research Aims in establishing regional patterns of cereal economy in the Roman period.

Methodology

A total of 55 samples were taken on site. 24 samples were processed by flotation in a modified Siraf-type machine, with the flots collected onto a 250µm mesh. The volume of soil processed varied (from 1 to 41 litres) according to the feature type. All 24 samples processed produced flots which were submitted for assessment. In addition to the samples which produced charred plant remains, there was one sample from pit 242 (context 250) which appeared to contain waterlogged preservation. With the exception of this flot which was retained wet, the flots were air-dried and divided into fractions using a set of sieves. Each fraction was then scanned under a binocular microscope at x10 to x20 magnification. Any seeds or chaff noted were provisionally identified based on morphological characteristics, and an estimate of abundance was made. Fragments of charcoal were randomly extracted, fractured and examined in transverse section. Fragments caught in the >2mm sized sieves were quantified as identifiable.

Quantification

Twenty flots produced identifiable charred remains (Table 8.1). All of these produced cereal grain, predominantly *Triticum spelta/dicoccum* (spelt/emmer wheat), with occasional *Hordeum vulgare* (barley) and some short grained *Triticum* sp. (wheat) which may be either a free-threshing bread type wheat or a short grained spelt. Quantities of cereal grain varied considerably, from a few grains (1-10) to more than 1000. Large assemblages were present in several deposits (124, 125, 508, 559 and 891), spanning the Roman period from AD 70-150 to 270-400. Chaff was also abundant in these samples; mostly *Triticum spelta/dicoccum* glume bases, but *Hordeum* rachis, and charred awn fragments were also recognised. A range of weed seeds were also noted in most samples; these included *Rumex* (docks), small Gramineae (grasses) and Leguminoseae (legumes) but the majority of richer samples were dominated by *Bromus* subsect *Eubromus* (brome grass) seeds. A couple of nutshell fragments, thought to be *Corylus avellana* (hazel), were noted in contexts 124 and 162.

The samples were generally rich in wood charcoal, with a range of taxa - *Quercus* sp. (oak), *Fraxinus excelsior* (ash), *Alnus/Corylus* (alder/hazel), *Prunus* sp. (blackthorn, cherry) and Maloideae (hawthorn, apple, pear etc).

The waterlogged remains from pit 242 (context 250; sample 50) were examined by Dr Mark Robinson of the Oxford University Museum. Vast quantities of degraded *Rubus fruticosus* (blackberry) seeds were visible but other seeds were rare, with only a few *Juncus* (rush) seeds noted. The flot also contained some poorly preserved mineralised material; fragments of wood and other plant tissues, as well as insect larvae. The fine residue fraction from this sample was also examined. Mineralised small ungulate droppings were noted, as well as some twisted plant fibres, not inconsistent with spun wool. Small faunal remains, including a possible fish scale were present in both the flot and residue.

In general, the preservation of charred material was moderate, although many of the grains were infused with sediment. The quantity of cereal remains, found in a range of features, is indicative of crop processing activities on the site. The cereal remains at Bower Road, however, are not typical of processing waste which contains few grains but frequent glume bases and some weeds. At this site, the majority of samples were dominated by grain or grain-sized weeds, comparable to assemblages formed by accidental burning during spikelet processing or storage. The aisled barn at Thurnham Roman Villa, similar to the structure excavated at Bower Road, was associated with a corn dryer which produced similar assemblages. The wood charcoal is likely to represent the dumped remains of fuel, potentially from fires associated with the crop processing. The range of taxa present suggests that there was little deliberate selection of firewood, which was probably collected on an *ad hoc* basis according to availability.

The waterlogged remains from context 250 were very poorly preserved and limited to woody fragments and robust seeds. This indicates that the deposit was not permanently anaerobic. The mineralised remains, while not well-preserved, were not inconsistent with material usually found in cess pits. In any case, it is certainly an unusual deposit.

Provenance

The samples were from a range of features of all periods and from all areas of the site (see Table 8.1). Of the five particularly rich samples recommended for further analysis (see below), two are from ditches around the posthole building (contexts 508 and 559 from subgroups 171 and 181), and three are from discrete pits (contexts 124 and 125 from 2nd-century pit 123, and context 891 from 1st- to 2nd-century pit 886 immediately south of the main site). The waterlogged and mineralised remains from context 250 are from pit 242, which contains human and animal bone, pottery and glass suggestive of a special, possibly terminal, deposit.

Comparative Material

The range of species identified are appropriate for the Romano-British period. The cereal taxa, *Hordeum vulgare* and *Triticum spelta*, are the principal cereals recorded throughout southern Britain at this time (Greig 1991) and have been recorded from other contemporary sites within the CTRL project (eg. Thurnham Villa, Hockers Lane and East of Station Road). In addition, deposits from Thurnham Villa and Hockers Lane have produced *Triticum dicoccum*, which has not been recorded at Bower Road. However, the presence or absence of *T. dicoccum* will need to be confirmed at the analysis stage. It is one of the research aims to establish how important this crop was in the region during the Roman period.

The mineralised material is very unusual for this period. Only two other sites (Silchester, Hampshire and Uley, Gloucester) have produced mineralised deposits of Roman date (Mark Robinson, pers. comm.)..

Conservation

The flots are in a stable condition and can be archived for long term storage.

Potential for further work

The following section discusses potential for further work in the light of the Landscape Zone Priorities and Fieldwork Event Aims.

Five samples of charred plant remains are recommended for full analysis (samples 1, 4, 46, 47 and 67). These have the potential to provide economic information for the site as well as to aid understanding of regional agricultural patterns. Further analysis of the distribution of charred plant remains across the site may enhance understanding of the function of structures and areas of the site, and the nature and range of activities carried out there. Current knowledge of the agricultural activities of the area in the Iron Age and Romano-British periods is limited and the CTRL projects offer the opportunity to conduct a regional study.

Further work on the wood charcoal would increase the species list, but is not considered necessary, as it has little potential to add to the economic or environmental understanding of the site.

The presence of Roman mineralised remains is of regional as well as national interest. The provenance of this material enhances its value, as pit 242 contained possible special deposits of human and animal bone, pottery and glass and may represent a terminal deposit. Full analysis of the mineralised remains may add to the list of material associated with this special deposit and thus be of value for the analysis of ritual practice during the Roman period. Although the preservation at Bower Road is not very good, the material is rare enough to warrant further work

It is recommended that full analysis is carried out on the five richest charred samples and the mineralised material. The full analysis comprise standard procedures of sorting the material , identifying and counting it. The faunal remains should also be looked at by a specialist.

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Table 8.1: Samples with charred plant remains and charcoal

Sample	Context	Feature	Period	Sample size (l)	Flot size (ml)	Charcoal	Charcoal id	Grain	Chaff	Weed seeds	Notes
1	508	Ditch	270-400	41	70	+++	*Fraxinus* Maloideae	+++	+++	+++	Charred awn frags
2	515	Ditch	-	37	40	+	*Quercus* Maloideae	+	+	+	*Triticum spelta* spikelet fork.
4	559	Ditch	LIA-70	40	45	++	*Alnus /Corylus* Maloideae	+++	+++	+++	Small bones
5	419	Ditch	-	20	75	++++	*Quercus* Maloideae	+		+	
6	417	Postpipe	ERB	20	18	+	*Quercus*	+		+	
15	338	Posthole	ERB	12	45	++++	*Alnus/Corylus Prunus*	+		+	Lots snails
21	463	Ditch	200-270	40	60	+	*Quercus*	+	+	-	
22	464	Ditch	ERB	22	55	+	*Quercus*	+	-	-	
23	367	Ditch	100-150	38	80	+++	*Quercus Fraxinus*	++	+	+	Charred awn frags
26	215	Water hole	270-300	40	70	++	*Alnus/ Corylus Fraxinus*	++	++	+	*Hordeum* rachis
27	243	Pit	4th C	40	25	++++	Maloideae *Quercus Alnus/ Corylus*	+	-	+	
44	102	Water Hole	130-200	40	30	+	*Alnus/ Corylus Quercus*	+	+	-	
46	124	Pit	150-200	0	28	++	*Quercus* Maloideae	++++	+++	++++	*Corylus avellana* nutshell
47	125	Pit	150-200	35	35	+++	*Quercus* Maloideae	+++	++++	++++	
48	126	Pit	3rd C	22	28	++	*Quercus* Maloideae	++	++	++	
49	148	Pit	70-200	32	35	++	Maloideae *Alnus /Corylus*	++	+	++	
53	104	Water Hole	ERB	20	15	+	*Quercus Prunus*	+	-	-	Lots snails
54	162	Water Hole	70-150	40	40	+++	*Quercus* Maloideae	+	+	+	*Corylus avellana* nutshell
56	673	Posthole	RB	0	30	+++	*Quercus*	+	-	-	
67	891	Pit	70-150	0	800	+++	Maloideae *Alnus/ Corylus*	1000+	++++	+++	Charred awn fragments

+ = 1-10 items; ++ = 11-50 items; +++ = 51-100 items; ++++ = 101-1000; 1000+ = >1000

Molluscs

Assessment of Molluscs

by Mark Robinson

Introduction

A total of 31 samples were taken for molluscan analysis from the 2nd-3rd century Roman settlement at Bower Road. The samples were from sections through a pit and ditches. They comprised 2 kg samples cut from the sections as part of 5 columns. The quantities of mollusc samples are listed in Table 9.1.

The samples were floated onto a 0.5mm sieve and the residues sieved down to 0.5mm by the Oxford Archaeological Unit. Both flots and residues were dried and retained.

The samples were taken in accordance with the Fieldwork Event Aims for the site, which are set out in section 2 of the main report, above. The study of the molluscs was intended to provide information on the local contemporaneous environment of the Roman site.

Methodology

It was decided to assess what appeared to be a representative range of samples to cover all the archaeological features that have been sampled. Two columns were assessed from the ditch of the rectangular enclosure (Sections 4 and 39 from Group 171) because they appeared to be of different character.

The flots assessed were scanned under a binocular microscope at magnifications of x10 and x20. The residues were also checked for shells. Many broken and calcium carbonate-encrusted shells, mostly of woodland species, had failed to float in some of the samples. The abundance of taxa in the flots was recorded on a scale of + (present, 1-5 individuals), ++ (some, 6-10 individuals) and +++ (many, 11+individuals). An estimate was made of the total number of individuals in each flot excluding *Cecilioides acicula*. This species was excluded because it burrows deeply and provides no useful information on conditions as a sediment or soil formed. (The other burrowing species listed, *Pomatias elegans*, only burrows just below the surface of loose soil or leaf litter, so does give useful palaeoecological information.) The identifications are divided into species groups in the table of results (Table 9.2). Nomenclature follows Kerney (1999).

Quantifications

Table 9.1 details the breakdown of sample numbers and the number of samples assessed. Recovery of shells by flotation was incomplete in some samples but this would be overcome in any full-scale analysis by sorting the residues as well as the flots.

Provenance

Three faunal elements occur in the flots: shade-loving species of relatively dry woodland, species of dry open habitats and species of stagnant water. The woodland fauna includes the “old woodland” snail *Acicula fusca* and the rare snail *Vertigo pusilla* which no longer occurs in Kent. Many of the shells of woodland snails have encrustation of calcium carbonate on them. The occurrence of an old woodland fauna does not seem entirely compatible with a Roman settlement on the site and the encrustation of some of these shells suggests they had a separate origin from the other shells. It is thought most likely that they had been re-worked from the colluvial sediment and they were earlier Holocene in origin. Unfortunately, the colluvium had not been sampled. The species of open habitats probably represent the contemporaneous fauna of the Roman settlement. They mostly comprise *Vallonia costata* and *V. excentrica* but are not particularly abundant. The aquatic species probably lived in standing water in the archaeological features. They are all "slum aquatic" molluscs, which are able to tolerate stagnant conditions and episodes of drying out. By far the most numerous is *Anisus leucostoma*, which is particularly abundant in Samples 18 and 19 from Section 39. It is possible that this part of the ditch held water for longer than the other contexts.

The high degree of residuality in the molluscan assemblages greatly reduces their value for meeting their research objective. They do show that the archaeological features at least seasonally held standing water. However, it is not possible to use snail evidence to determine whether the Roman settlement was entirely open or had much scrub on it.

Conservation

The mollusc remains are at present stable as dry flots and residues . Further analysis would require sorting of shells from the flots and residues but they would remain stable. If the recommendation that no further analysis is undertaken is followed, it is recommended that the flots and residues should be discarded.

Comparative material

No other sites within the CTRL project have given similar problems with residual material. However, in situ earlier Holocene woodland assemblages were found at White Horse Stone. Residuality is, however, a general problem in molluscan studies.

Potential for Further Work

The following section discusses potential for further work in the light of the Landscape Zone Priorities and Fieldwork Event Aims.

The molluscs from Bower Road appear to have no potential for further useful work, given the problem with residual material.

Recommendations

It is recommended that a very brief summary of the results of the molluscan assessment be incorporated in any final report, including mention of the occurrence of residual earlier Holocene shells of woodland species which had probably been derived from colluvium and the occurrence of contemporaneous snails of stagnant water in the Roman features.

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Table 9.1: Quantities of mollusc samples

Number of columns	**Number of samples in columns**	**Number of other samples**	**Total number of samples taken**	**Number of columns assessed**	**Total number of samples assessed**
5	31	0	31	4	12

Table 9.2: Mollusc Columns

Column/Section	**54**	**54**	**4**	**4**	**4**	**4**	**4**	**39**	**39**	**39**	**74**	**74**
Sample	**33**	**30**	**14**	**12**	**11**	**9**	**7**	**19**	**18**	**16**	**55**	**54**
Context	**345**	**345**	**515**	**515**	**515**	**508**	**508**	**464**	**463**	**462**	**160**	**160**
Catholic species												
Cochlicopa sp.	-	-	-	+	-	-	-	+	+	-	-	-
Trichia hispida gp.	++	+	+	-	+	-	-	+	+	+	+	+
Arianta arbustorum	-	-	-	+	-	-	-	-	+	-	-	-
Cepaea sp.	-	+	+	-	-	-	-	-	-	-	-	-
Open-country species												
Pupilla muscorum	-	-	+	-	-	-	-	-	-	+	-	-
Vallonia costata	+	-	+	+	-	-	-	+	-	-	-	-
V. excentrica	+	+	+	-	-	-	-	-	-	+	-	-
Vallonia sp.	+	-	+	+	+	-	-	+	-	+	+	+
Shade-loving species												
Acicula fusca	-	-	-	-	-	-	-	-	-	-	+	-
Carychium sp.	++	-	+	++	+	-	-	+++	+	++	+++	-
Vertigo pusilla	-	-	-	-	-	-	-	+	-	-	-	-
Punctum pygmaeum	-	-	-	-	-	-	-	+	-	-	-	-
Discus rotundatus	+	+	+	+	++	-	-	++	+	+	+	-
Vitrea sp.	-	+	+	+	-	-	-	+	+	-	+	-
Nesovitrea hammonis	+	-	-	-	-	-	-	-	-	-	-	-
Aegopinella pura	-	-	-	-	-	-	-	+	-	-	+	+
A. nitidula	+	-	-	-	-	-	-	+	-	-	+	-
Oxychilus cellarius	-	+	+	+	-	-	-	+	-	-	+	-
Euconulus fulvus	-	-	-	-	-	-	-	+	-	-	-	-
Clausilia bidentata	-	-	-	-	-	-	-	+	+	-	+	-
Burrowing species												
Pomatias elegans	-	-	-	-	-	-	-	+	-	-	-	-
Cecilioides acicula	-	-	-	+	-	-	-	+	+	++	-	+
Slum aquatic and amphibious species												
Lymnaea truncatula	+	-	-	+	-	-	-	+	-	+	-	-
L. peregra	-	-	++	-	-	-	-	++	+	-	-	-
Anisus leucostoma	+	-	-	+	-	-	-	+++	+++	+	+	-
Other aquatic species												
Pisidium sp.	-	-	-	+	-	-	-	+	+	-	-	-
Approx Total (excluding Cecilioides acicula)	*50*	*10*	*40*	*35*	*15*	*0*	*0*	*250*	*500*	*30*	*50*	*5*

PS: THURNHAM ROMAN VILLA

- macroscopic plant remains and charcoal

by Ruth Pelling

Assessment of the Charred Plant Remains and Charcoal

Thurnham Roman Villa (ARC THM 98) and Honeyhills Wood (ARC HHW 98)

Introduction

Samples of archaeological deposits were taken during excavation works at Thurnham Roman Villa (ARC THM 98) and Honeyhills Wood (ARC HHW 98) for the recovery of charred plant remains.

The recovery and study of the samples was undertaken in accordance with the Fieldwork Event Aims for the site, which are set out in section 2 of the main report, above. The sampling programme aimed to address general questions concerning the diet and cereal economy of the site as well as gaining specific information about the function and nature of individual features, buildings or activity areas. On a wider, regional and national level it was hoped to gain information about the Late Iron Age and Romano-British economy of Kent and to look at the development of agricultural trends through the periods particularly at the time of the Roman conquest.

Methodology

Sampling on site ensured that deposits from all major feature types and phases were represented. Where possible, samples were taken from discrete and secure contexts with the minimum of intrusive material or contamination. Multiple samples were taken from a corn-drier for detailed analysis and interpretation of the function of the feature.

All samples were processed and submitted for assessment of their potential for analysis. Samples were processed by bulk water flotation and flots were collected onto 250μm mesh sieves. Residues were retained on 1mm sieves.

Quantification and Provenance

A total of 249 samples were taken from the Thurnham Villa main site and one sample from Honeyhills Wood. The volume of material processed ranged from 3 to 40 litres. The volume of flots ranged from about 10 ml to 4 litres, but is generally in the region of 50 to 250ml. Table 10.1 shows the number of samples for each feature type. The samples are discussed by feature type. Table 10.2 indicates contexts that contained useful quantities of seeds or chaff.

Ditches

The majority of ditch samples were of Late Iron Age to early Roman date.

The best results were seen in samples from early Roman phase 3 ditches 20400 (the proto-villa boundary) and 10660 (the east side of the enclosure). Sample 10346 (context 12203; ditch 10660) produced a large flot (600ml) with in excess of 1000 items each of grain, chaff and weed seeds. Grain included both *Triticum spelta* (spelt wheat) and *Hordeum vulgare* (barley) as well as some short grained *Triticum* sp. (wheat) which may be either a free-threshing bread type wheat or a short grained spelt. The chaff includes both *T. spelta* and *T. dicoccum* glume bases and *Hordeum* *vulgare* rachis. Frequent *Bromus* subsect *Eubromus* (brome grass) seeds were noted amongst the weeds.

Three other samples (10380, 10381, 10383), all from ditch 20400, contained reasonable quantities of material with up to 100 grains and in two cases up to 100 items of chaff. Weeds were noted in all three samples. Cereal remains noted included *Triticum spelta* with some germinated grain and *Hordeum vulgare*. These richer flots produced moderate to well preserved remains.

Of the remaining ditch samples 33 flots produced no charred seeds or chaff and only small quantities of charcoal if any, and 30 produced a limited range of grain and chaff and very few weeds. Flots were generally small and the preservation of remains poor.

Moderate quantities of *Quercus* sp. charcoal were seen in the richer samples and occasional to moderate quantities in other samples. Possible Pomoideae charcoal was noted in one sample.

Structures

Four samples were taken from structures, but the results are poor. Samples 10063 and 10062 both produced small flots (*c* 10ml) with less than 10 items. A *Hordeum vulgare* grain and a *Triticum spelta* glume base were identified. No weeds were noted in either sample. *Quercus* sp. (oak) flecks were noted in both samples. Samples 10276 and 10275 produced slightly bigger flots (400 and 100ml) consisting almost entirely of charcoal. Very occasional cereal grains (less than 10) were noted but no chaff. The charcoal identified included *Quercus* sp. and Pomoideae.

Postholes

Ten posthole samples were assessed, and the flots were generally small. Two samples (10059 and 10664) produced no seeds or chaff. Charred plant remains were generally limited in the remaining samples. Samples 10272 and 10061 contained between 11 and 50 cereal grains while sample 10294 contained a similar number of chaff items. The other samples produced only 1 to 10 items of grain, chaff and/or weed seeds. The cereal species noted in the samples included *Triticum spelta* (spelt wheat) and *Triticum spelta/dicoccum* (spelt/emmer wheat) and *Hordeum vulgare* (barley). *Quercus* sp. charcoal is present in small quantities and possible Pomoideae in sample 10277.

Postpipes

A total of 21 samples were assessed from postpipes. Charred seeds and chaff were noted in all samples, generally in low numbers. Four samples produced more than 11 cereal grains, one of which also produced 51-100 items of chaff and 11-50 weed seeds (sample 10038; postpipe within the aisled building). Cereals identified included *Triticum spelta* (spelt wheat), some of which had germinated, *Hordeum vulgare* (barley) and *Avena* sp. (oats). The chaff was generally dominated by *Triticum spelta* glume bases. In addition to the cereals occasional *Corylus avellana* (hazel nut) shell fragments were noted and *Prunus* sp. (sloe, plum etc.) stones were present in samples 10280 and 10038. Charcoal was noted in all samples, mostly of *Quercus* sp. (oak) but with some Pomoideae and possible *Corylus/Alnus* sp. (hazel/alder).

Gullies

Four samples were assessed from gullies. Sample 10060 produced 11 to 50 items each of grain, chaff and weeds. The remaining samples produced only low levels of remains. Sample 10052 did produce a very large flot but this consisted predominantly of *Quercus* sp. (oak) charcoal. The cereal remains noted in the samples included *Triticum spelta*, some of which had germinated and occasional *Avena* sp. (oats).

Ovens and Hearths

Six oven and 13 hearth samples were assessed. Eight samples produced no seeds or chaff and a further five contained only small quantities levels of material. Three samples, two from hearths and one from an oven, produced more useful quantities of remains each with 50 to 100 grains; the two hearth samples were from the aisled building, while the oven sample was from the late (4th century) oven within the villa building. *Hordeum vulgare* (barley), *Triticum spelta* (spelt wheat) and a short grained *Triticum* sp. (wheat) were all recorded. Chaff was infrequent but does include possible *Triticum aestivum* type rachis as well as *Triticum spelta* glume bases. Weeds were again infrequent. Occasional *Corylus avellana* (hazel nut) shell fragments were noted and a *Vicia/Pisum* sp. (vetch/bean/pea). Charcoal was present in most samples and in large amounts in three. *Quercus* sp. appears to be dominant while *Corylus/Alnus* sp., Pomoideae and *Prunus* sp. may also be present.

Inhumations

Two samples were assessed from early Roman inhumations. Both produced low levels of remains with between 10 and 50 items of grain, and chaff. *Triticum spelta* and *Triticum spelta/dicoccum* were noted and occasional *Quercus* sp. charcoal.

Pits

A total of 20 samples were assessed from pits, mostly of Late Iron Age to Early Roman date. Ten samples contain no charred remains and a further eight samples contain only very small to moderate amounts. Two samples (from contexts 10548 and 12372) produced very large amounts of charred remains; these were from context 10548 (part of feature 10570 in the extreme south-east of the site), and context 12372 (from post-row 11500 north of the main villa house). There were over 1000 chaff items in each and over 100 grains in sample 10378. Weeds were present in fairly low numbers (11 to 50).

Cereals identified include *Triticum spelta*, including germinated grain, *Hordeum vulgare*, *Avena* sp. and *Triticum* cf. *dicoccum* (possible emmer wheat) noted amongst the grain. The very large quantities of chaff were dominated by *T.spelta* glume bases. The pit samples also tended to contain moderate to large amounts of charcoal, mostly *Quercus* sp. with occasional Pomoideae (apple, hawthorn etc.) and possible *Corylus/Alnus* sp. (hazel/alder).

Corn-drier

A total of 12 samples were assessed from the corn-drier, of which six produced useful numbers of remains. The composition appears to vary between samples with different proportions of grain, chaff and weeds. *Triticum spelta* dominated the assemblages, while *Hordeum vulgare* and *Avena* sp. were also noted. Several of the *T.spelta* grains had germinated. In addition to the cereals, *Vicia/Pisum* sp. (vetch/bean/pea) and *Linum usitassimum* (flax) seeds were also noted in sample 10019.

Well

Two samples from well deposits produced only occasional grain, chaff and weeds. *Triticum spelta*, *Triticum spelta/dicoccum* and *Chenopodium album* (fat hen) were all noted. Occasional charcoal of *Quercus* sp. and Pomoideae were also identified.

Layers

A total of 80 samples were assessed from archaeological layers. Useful quantities of material were present in 14 samples. Up to 50 grains were noted in samples 10022, 10049, 11083, 10016 and 10287 (within the Aisled Building, and in the vicinity of the corn-drier), with 50-100 items of chaff in all but sample 10049 which had in excess of 100 chaff items. Weeds were present in all 6 of these samples although in smaller numbers. Cereal species noted were *Triticum spelta*, including germinated grain, *Hordeum vulgare* and *Avena* sp. *Linum usitassimum* (flax) was present in sample 10023.

Samples 10019 and 10452 (aisled building), 10025 (layer within ditch 10660), and 10414 (layer containing material raked out of oven 15280 in the aisled building) each contained 51-100 grains. Sample 10452 contains more than 100 items of chaff, while the remains of these samples have less than 50 items. All five produced between 11 and 50 weed seeds. Cereals identified included *Triticum spelta*, *Hordeum vulgare*, *Avena* sp., *Triticum dicoccum* and possible free-threshing *Triticum* sp. Occasional *Vicia/Pisum* sp. and *Linum usitassimum* were also noted.

The remaining four samples (10097, 10017, 10024 and 10405), all from the area of the oven in the aisled building, were very rich indeed. Samples 10024 and 10405 contained over 1000 items each of grain and chaff. Weeds, particularly *Bromus* sp. (brome grass) were very numerous in sample 10017 and in particular in 10024. The cereal species identified include *Triticum spelta*, *Triticum dicoccum*, *Hordeum vulgare* and *Avena* sp. Germinated grain and sprouted caryoptiles were present in sample 10017. Charcoal was present in moderate quantities in most samples, generally of *Quercus* sp, with occasional *Corylus/Alnus*, *Prunus spinosa* and Pomoideae charcoal.

The remaining 32 samples had much lower concentrations of remains while seeds and chaff were entirely absent from six samples. The occasional grain and chaff noted included *Hordeum vulgare*, *Triticum spelta* and *Avena* sp. Other items noted include *Prunus spinosa* (sloe) stones, *Vicia/Pisum* sp. (vetch/bean/pea) and *Corylus avellana* (hazel) nut shell.

Other

Six samples from other features were assessed. Two contained no charred seeds or chaff while three contained only limited numbers of grain and virtually no chaff. However, sample 10040 (from a layer overlying the enclosure ditches east of the villa) contained in excess of 100 grains including *Triticum spelta* and *Hordeum vulgare*. Occasional chaff and weeds were also noted. Charcoal present in six samples and in very large quantities in three, was mostly identified as *Quercus* sp. (oak), with occasional Pomoideae (apple/pear/hawthorn etc.) and possible *Prunus spinosa* (sloe).

Honeyhills Wood

The single sample from Honeyhills Wood produced occasional Pomoideae charcoal and a recent (modern) apple core. No charred seeds or chaff were present.

Conservation

The samples are in a stable condition. If kept dry they can and should be archived for storage, until final decisions are made about further analysis.

Comparative material

There is little published botanical material from Roman villa sites in Kent. Comparable published assemblages include The Mount Villa at Maidstone (Robinson 1999), and the Roman small town at Springhead (Campbell nd). As yet unpublished material has been analysed from a Romano-British settlement at Monkton, Mount Pleasant on the Isle of Thanet (R Pelling unpublished).

Further afield, material from a comparative site has been published from Bancroft Roman Villa in Buckinghamshire. Charred plant remains from this site were examined from the villa, mausoleum and a corn-drier (Nye and Jones 1994, 562-565; Pearson and Robinson 1984, 565-584). Several corn-driers from areas across southern Britain have now been sampled (Van der Veen 1989), including a recently excavated structure at Grately, Hampshire, which is associated with a villa and aisled hall (G Campbell pers. comm).

Within the CTRL project similar material although in low levels has been recovered from the Late Iron Age and early Romano-British deposits at South of Snarkhurst Wood, East of Station Road and Church Lane Smeeth. There spelt wheat and barley were the principal cereals represented while low levels of emmer wheat were also noted. Further material which may be contemporary has been reported from South of Beechbrook Road. In the context of the wider Landscape Zone Aims of the CTRL project, these small assemblages will be of value as indicators of the presence or absence of poorly understood crops such as emmer wheat, oats and pulses on sites of different types. Charred plant remains are present in samples taken at Northumberland Bottom, and good material of comparable date may be available here. Good charred plant remains are present from the Early Iron Age site at White Horse Stone and may provide evidence for change between the Early Iron Age and Roman periods.

Published records of Late Iron Age and Romano-British date generally tend to be dominated by spelt wheat with barley and occasionally oats. The role of emmer wheat is not yet understood although good evidence of its cultivation during the Late Iron Age is available from Wilmington in Kent (Hillman 1982) and from outside the region from Hascombe in Surrey (Murphy 1977) and Ham Hill in Somerset (Ede 1991). In the Romano-British period, evidence from sites such as Tiddington (Moffet 1986), or Barton Court Farm (Jones and Robinson 1984) suggests emmer to be a minor crop compared to spelt, possibly even present as a weed of the spelt crop. More recently much larger assemblages were recovered from a site at Mansfield College in Oxford (R Pelling, unpublished) suggesting it was, at least occasionally, deliberately cultivated as a crop.

Potential for further work

CTRL Landscape Zone Priorities and Fieldwork Event Aims

The following section discusses potential for further work in the light of the Landscape Zone Priorities and Fieldwork Event Aims.

There is great potential to address some of the original research aims of this site, particularly in understanding of the agricultural regime of a Roman Villa complex. There are good samples available from all phases of Romano-British activity, which have the potential to shed light on agricultural trends such as increasing crop diversity, or the introduction or intensification of garden crops or cash crops.

In terms of assessing the transition from the Iron Age to the Roman period, in general the Iron Age deposits offer less potential for analysis, as the samples generally provide poorer information. Material is available, however, from the Late Iron Age to Early Roman period, which must relate to pre-and post conquest activity.

In terms of assessing the decline of the villa, good samples are available from a number of late contexts, including the corn-drier, the soil layer overlying the smithy, and the late oven inside the main villa house. These samples have the potential to provide valuable information about continuing agricultural exploitation of the site despite its apparent abandonment for occupation. They will provide an interesting contrast with the earlier Roman samples and may show evidence of change in the agricultural regime.

The distribution of rich samples over the site suggests that they have good potential to contribute to analysis of the function of structures, and the existence of functional zones. The corn-drier in particular produced very rich deposits and offers good potential for further investigation of its function.

The Thurnham assemblage can be combined with the evidence from other sites mentioned above, to provide an overview of the representation of species at a variety of different rural settlements of different types. A comparison with the Early Iron Age material from White Horse Stone should also provide useful information regarding change in agricultural regimes.

New research aims and objectives for the CTRL archaeology project

On a regional and national scale there is potential to examine whether the patterns for this period in Kent are consistent with elsewhere in southern Britain or if there are any trends visible not seen outside the region. It has been noted above that there are few published studies of plant remains from this region. The Thurnham assemblage therefore has the potential to provide a valuable addition to understanding of the Roman agricultural regime in Kent.

It is recommended that richer samples are analysed in detail from each category of feature, with samples selected covering the full range of periods. All the corn-drier samples containing charred remains should be analysed.

Samples from the inhumations, the well, and the structures offer little potential for further work.

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Hockers Lane (ARC 420 62+200-63+000)

Introduction

Samples were taken during excavation works at Hockers Lane, for the recovery of charred plant remains and charcoal.

The deposits sampled were of Late Iron Age to early Romano-British date(*c* AD 0–70).

The sampling was undertaken in accordance with the Fieldwork Event Aims for the site, which are set out in section 2 of the main report, above. The samples were taken in order to address questions concerning the diet and cereal economy of the site and particularly to examine any difference in economy and cereal production between Hockers Lane and Thurnham Villa. All the samples examined are listed in Table 10.3.

Methodology

The sampling programme was intended to recover material from the full range of feature type and date excavated. Samples were taken from ditches, pits and layers. Twenty samples, ranging from 3 to 40 litres in volume, were processed by bulk water flotation and the flots collected onto

250µm mesh sieves. Flots were air dried slowly before being submitted for assessment Each flot was assessed by scanning under a binocular microscope at x10 magnification. Any seeds or chaff noted were provisionally identified and an estimate of abundance made. Random fragments of charcoal were fractured and examined in transverse section at x10 and x20 magnification.

Quantification

A total of 26 flots were assessed. Flots were small (10 to 150 ml) and contained frequent roots. Occasional molluscs were present in samples 26 and 29.

Charred plant remains were absent from seven samples, while a further five samples contain no seeds or chaff but did contain occasional charcoal. Two samples produced no cereal remains but occasional *Corylus avellana* (hazel nut) shell fragments and charcoal.

Cereal grain was present in 10 samples, while chaff was present in only two samples. Sample 11 (context 84) produced 10 to 50 items each of cereal grain, chaff and weeds, with between 50 and 100 items in total. The cereal remains included *Triticum spelta* (spelt wheat) glume bases and *Triticum spelta/dicoccum* (spelta/emmer wheat) grain. No charcoal was present in this sample. The remaining samples produced low levels of cereal remains (less than 10 items) which include the grain of *Triticum spelta*, *Triticum spelta/dicoccum* and *Hordeum vulgare* (barley).

Charcoal was present in 11 samples in generally low quantities but with frequent remains in two samples. The taxa identified were *Quercus* sp. and Pomoideae.

Provenance

Sample 11 was taken from a pit fill. The remaining samples which produced low levels of cereal remains were from pits, ditch or gully fills and an archaeological layer. Samples producing *Corylus avellana* fragments were all from ditch or gully fills.

Conservation

The flots are in a stable condition and can be archived, although it is not necessary to retain the flots for long-term storage.

Comparative Material

The range of species recorded during the assessment is well-attested for Late Iron Age and Romano-British sites in southern Britain (see Greig 1991). The small scale of cereal processing represented can be contrasted with Thurnham Villa for which very large scale cereal production is attested. The possible cash crops or oil crops at Thurnham Villa are not represented at Hockers Lane.

Potential for further work

Given the absence of good cereal assemblages and charcoal other than oak and Pomoideae the samples offer no potential for further work. The range of species, spelt wheat and hulled barley, were the cereals most commonly cultivated during the Iron Age and Romano-British period in southern Britain. The samples provide no potential for extending this species list. The remains are characteristic of low levels of redeposited remains of cereal processing activity.

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Table 10.1: Thurnham Roman Villa ARC THM 98: Number of samples from each category of feature

No. of items of seeds or chaff	**Total**	**Feature Type**										
		Layer	Pit	Ditch/ Gully	Not known	Well	Struct-ures	Hearth/ Ovens	Inhumations/ Cremations	Corn-drier	Post-hole	Post-pipe
0	74	11	9	33	-	-	-	6	-	5	10	-
1-10	109	36	7	30	3	2	4	5	2	1	7	17
11-50	28	13	2	2	-	-	-	-	1	-	3	3
51-100	19	10	-	3	-	-	-	1	-	2	-	1
>100	14	6	1	4	1	-	-	-	-	4	-	-
>1000	6	4	1	1	-	-	-	-	-	-	-	-
Total no. samples	**249**	**80**	**20**	**72**	**6**	**2**	**4**	**19**	**3**	**12**	**20**	**21**

Assessment of the Waterlogged Plant Remains

by Ruth Pelling

Thurnham Villa (ARC THM 98)

Introduction

Samples of waterlogged deposits were taken from the well 11010 during excavation works at Thurnham Villa, for the recovery of waterlogged plant and insect remains.

Bulk samples were taken in the field and kept wet in sealed bags and plastic boxes. Sub-samples of 1kg were submitted for assessment of waterlogged plant remains.

The recovery and study of the samples was undertaken in accordance with the Fieldwork Event Aims for the site, which are set out in section 2 of the main report, above. The sampling programme aimed to recover evidence for the diet and economy of the site as well as gaining information about the local environment of the well.

Methodology

A sample from each deposit believed to be waterlogged was submitted for assessment. Sub-samples of 200g were processed by a simple wash over technique and collected onto a 250µm mesh. This will not provide an exhaustive species list but should provide sufficient material to assess the presence or absence of waterlogged material, the quality of preservation, the density of any remains and an indication of the range of species or types of material present.

Each flot was then washed through a stack of sieves ranging from 2mm to 250µm mesh size. Each fraction to 500µm was scanned, while still wet, under a binocular microscope at x10 to x20 magnification. Provisional identifications were made and an approximation of abundance on a three point scale (+ = present, ++ = some; +++ = many).

Quantifications

A total of seven samples were assessed. A summary of the material noted in each sample is displayed in Table 10.4. Five samples produced waterlogged material. Two samples (10377 and 10013) produced no waterlogged material, while several *Triticum spelta* (spelt wheat) glume bases were noted in sample 10377.

Samples 10347 (cxt 12227), 10351 (cxt 11516), 10306 (cxt 11984), 10293 (cxt 11982) and 10352 (cxt 11985) all produced waterlogged remains. The species noted during the assessment are displayed in Table 10.5. Woodland or scrub species and species characteristic of ruderal habitats are most numerous in the deposits. The ruderal species are those which are characteristic of disturbed habitats and often nitrogen rich soils, such as might be found within a settlement. Included in this group are *Urtica dioica* (stinging nettle), *Conium maculatum* (hemlock), *Pastinaca sativa* (wild parsnip), and *Carduus/Cirsium* sp. (thistle). True arable weeds are not commonly represented although some of the ruderal species will also occur in cultivated habitats including cereal crops. Large quantities of moss were present in four of the five samples and include at least two species.

The woodland or scrub species represented include wood fragments, and seeds as well as numerous leaf pads and bud scales of unidentifiable species. The wood identified includes

Fraxinus sp. (ash), *Quercus* sp. (oak) and Pomoideae (hawthorn, apple, pear etc.). Seeds noted included *Prunus spinosa* (sloe), *Ilex aquifolium* (holly), *Crataegus monogyna* (hawthorn), *Cornus sanguinea* (dogwood), and *Fraxinus excelsior* (ash). The species would suggest the presence of mixed deciduous or oak woodland, with a scrubby component at the margins of the wood or as an under-storey, with holly, sloe, hawthorn and dogwood. Sloe will not tolerate deep shade so is likely to have occurred in clearings or on the wood margins.

The *Prunus spinosa* stones are only tentatively identified at this stage. They have an appropriate surface texture but are large for sloe and very pointed, although too small for other *Prunus* species. As sloe spreads vegetatively as opposed to being seed germinated, it is usual to have many individual plants of the same clone. A slight variation in seed shape would then be seen in all the individuals of one given population. This population appears to be characterised by a pointed stone.

Several of the herbaceous species represented are common within woods or on the wood margins. This group includes *Conium maculatum*, *Arctium* sp. (burdock) and *Lapsana communis* (nipplewort).

Occasional damp or wet ground species were identified. *Eleocharis palustris* (spikerush) requires its roots to be submerged in water for at least part of the year so tends to be associated with seasonally flooded ground, particularly grassland. *Sparganium erectum* (branched bur-reed) is characteristic of wet mud or the shallow water of ponds, ditches etc and ungrazed marshland. Both species are likely to have been growing in wet ground around the well.

In addition to the occasional spelt wheat glume bases, a fragment of capsule of *Linum usitatissimum* (flax) is also possibly derived from a cultivated crop. It will not persist as a weed for very long so certainly suggests the cultivation of flax at some stage, even if not directly derived from the cultivated crop itself.

Provenance

The samples are derived from waterlogged fills which are assumed to relate to the post-abandonment phase of the well (11010), and therefore possibly the later phases of occupation at the site. The samples are listed in Table 10.6. Sample 10347 (context 12227) is the lowest excavated fill of the well and thought to be related to the collapse of the feature. Contexts 11516, 11982 and 11984 are organic deposits containing worked and unworked wood, moss and leaf litter. Context 11985 is associated with the upper tier of stake lining and derives from packing fill between the stake lining and well shaft. It is believed that the well construction dates from the early-mid 2nd century and that it was infilling by the 4th century.

The assessment results may hint that the lower fills, samples 10347 and 10351 have a slightly higher ruderal component that the upper fills. Conversely the upper fills contain greater quantities of woodland and scrub species. Furthermore, the flax capsule, the only good evidence so far of arable activity in the deposits, was identified from the lower fill. This might suggest, therefore, that human activity is attested at the time of the abandonment of the well, while the later fills suggest an increasing regeneration of the local woodland and scrub cover. This needs to be further explored at analysis level.

Conservation

If the samples are to be stored for any length of time before analysis it is recommended that they are refrigerated or kept in a cold store. They can be kept in such an environment for some time as either unprocessed deposit or processed flot. The samples should certainly be retained pending decisions about final analysis.

Comparative Material

No long waterlogged sequences are known for this date from with the CTRL project or the Kent region. While long well sequences of this type are rare, a similar sequence is known from Barton Court Farm in Abingdon, Oxfordshire (Miles 1984). The mosses from that particular site were very interesting as they were of deliberately collected woodland species used as a filter and packing in the well wall.

Potential for further work

CTRL Landscape Zone Priorities and Fieldwork Event Aims

The following section discusses potential for further work in the light of the Landscape Zone Priorities and Fieldwork Event Aims.

Good waterlogged well deposits can provide very useful data not available if only charred remains are recovered. Such remains might include the identification of leafy plants or seeds of foods which require no heat as part of their preparation, such as herbs and spices, as well as habitat information about the microenvironment of the feature and the environment of the wider area. Well deposits can cover some considerable time period so provide a sequence of data relevant to changing environment and activity for many years; in this case perhaps two centuries. The preservation of the material from the Thurnham Villa well deposits is very good.

The very good samples available offer the potential to examine aspects of the surrounding environment of Thurnham Villa towards the end of the period of occupation, and possibly at the abandonment of the site. The lower deposits also offer some potential for adding to the existing economic data already available from the charred remains. This will provide information for the analysis of the decline of the villa, and for the ways in which this decline was reflected on the villa site itself, and in its local environment. Additional evidence for economic activity and the agricultural regime is likely to be obtained, as is evidence relating to the diet (and therefore the status) of the site's inhabitants.

It is recommended that sub-samples of the five deposits are examined in detail for their plant macro-fossils including the wood. It is not possible at this stage to establish if the mosses represent deliberately collected mosses for lining the well and filtering the water, or if they represent mosses growing on the upper wall of the well which have subsequently fallen into it.

The mosses were exceptionally well preserved and the species and provenance should therefore be identifiable. It is likely that some, if not all, of the moss was collected from the surrounding area for use as a water filter in the well. Mosses have very specific habitats, and can provide additional information about woodland environments in the surrounding area. It is recommended that a sub-sample of the mosses is examined by a recognised expert.

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- Pollen

by Robert Scaife

Assessment of the Pollen

Thurnham Roman Villa (ARC THM 98)

Introduction

Three monolith profiles were taken from the sediment fills of well 11010 during excavation works at Thurnham Roman Villa.

The recovery and study of the pollen profiles was undertaken in accordance with the Fieldwork Event Aims for the site, which are set out in section 2 of the main report, above. The principal aims of the pollen assessment were to ascertain whether pollen and spores were present or absent in the organic fills of this well and thus, the potential of the material for reconstructing the local environment of the villa. In spite of the complex taphonomy of pollen in the fills of wells (Dimbleby 1985; Scaife 1999), the initial research design recognised the environmental potential of the material, especially since the well was in the proximity of a crop processing area and corn-drier.

Methodology

Samples of 1-2ml volume taken at a sampling interval of 80mm were prepared using standard procedures for the extraction of sub-fossil pollen and spores outlined in Moore and Webb (1978) and Moore *et al.* (1991). Pollen counts of 100-150 grains per level of dry land taxa (the pollen sum) were made at each level plus marsh taxa and spores. In some levels, especially higher in the profile, pollen was poorly preserved and sparse and as such, a smaller number of grains was counted.

Data obtained are presented in standard pollen diagram form (Figures 11.1 and 11.2). Percentages have been calculated as follows:

Sum = % total dry land pollen (tdlp)

Marsh/aquatic = % tdlp+sum of marsh/aquatics

Spores = % tdlp+sum of spores

Misc = % tdlp+sum of misc. taxa

Taxonomy in general follows that of Moore and Webb (1978) modified according to Bennett *et al.* (1994) for pollen types and Stace (1992).

Quantification, Provenance and Stratigraphy

Three monolith profiles were taken from two sections of the sediment fills of the Roman well (11010). These were 10302 and 10303 (from section 10590) and 10305 (from section 10591). The overall stratigraphy of these profiles was examined during sub-sampling for pollen analysis, and is shown below. All measurements are depths in mm.

Section 10590

Column 10302 (top column) (no pollen)

Depth mm

0-60mm Dark grey/black silt

60-210mm Grey silt containing chalk fragments and some stones (120 & 180-210mm)

Column 10303 (lower column)

0-360mm Fine grained dark grey clay/silt. Humic. Containing substantial wood (trunk/fragments). Wood at 50-120mm, 200-250mm, 200-360mm

Section 10591

Column 10305

0-330mm Dark detrital/humic organic sediment containing small twigs to 10mm diameter set in black oxidised silt

Pollen profiles

Pollen was present in two of the three profiles. Although this is only an assessment study**,** some variations in the pollen spectra are in evidence and tentative pollen zonation has been carried out. The palynological characteristics of these profiles are shown below.

Profile 10305

Two pollen assemblage zones have been recognised in the 640mm of this profile which contained pollen and spores. These are defined and characterised as follows.

Zone 1: 320mm - 200mm. *Fraxinus*-*Corylus* type-Poaceae**.** Absolute pollen frequencies (apf) range from 35,000 at the base to 165,000 grains/ml. Tree pollen are dominant with *Fraxinus* at high values (to 78%). There are small numbers of *Betula*, *Quercus, Fagus* and *Alnus*. *Corylus avellana* type is the principal shrub (21%) with single records of *Cornus* and *Prunus/Malus* type. There are generally few herbs with Poaceae to 11%. There are few marsh taxa or spores.

Zone 2: 200mm - 0mm. *Quercus*-*Fraxinus*-*Corylus* type. The apf values range from 54,000 to 92,000 grains/ml. *Fraxinus* remains important but declines progressively throughout the zone (av. 50%). There are sporadic occurrences of *Betula, Fagus* and *Pinus*. There is an increase in the numbers and diversity of herbs although overall, numbers remain small compared to tree and shrubs (10-15%). These herbs include Poaceae (<10%) and occasional cereal type pollen. Spores of *Pteridium aquilinum*, monolete/*Dryopteris* type and *Equisetum* occur sporadically.

Profile 10303

Pollen was absent in the upper 80mm of this monolith/section and absolute pollen frequencies were low throughout. Two pollen assemblage zones can, however be delimited in the lower 280mm of this monolith profile.

Zone 1: 320mm - 200mm. *Fraxinus*-*Quercus*-*Corylus* type. The apf values are the highest recorded in this profile at 13,575 grains/ml but decline above. *Fraxinus* declines sharply from 40% to 6% whilst *Quercus* is expanding (28%). There is a single level (240mm) with a high

Alnus percentage (20%). *Corylus* type remains the dominant shrub (40%). There are generally few herbs with only small numbers of Poaceae (5-6%) and a sporadic cereal pollen. The intestinal parasite, *Trichuris* was noted at 240mm.

Pollen is less well preserved in this column than in profile 10305, and there is the possibility of differential preservation especially in the upper levels where pollen becomes sparse. This is may be indicated by the increases in spores and pollen of Lactucoideae (dandelion types). The lower half of the profile (zone 1) compares with profile 10305 in having high values of *Fraxinus* (ash). However, unlike 10305, there is a decline from 200mm with *Quercus* and *Corylus* type remaining important. There is a single aberrant peak of alder, the taphonomy of which is conjectural.

Zone 2: 200mm - 80mm. *Quercus-Corylus* type-Poaceae. The apf. values are low and diminish upwards through this zone to 6,000 grains/ml. *Quercus* remains important with highest values at 80mm. Herbs become more important with Poaceae to 30% at 80mm. There are peaks of *Ranunculus* type (6%), and Lactucoideae (18%). There are increases in spores of *Pteridium aquilinum* (to 7%) and *Polypodium vulgare*.

General comments

At Thurnham, pollen has been preserved in the water-logged fills of the well, that is, in the lowest levels. Profile 10302 in the upper fills (contexts 10296 and 10297) was devoid of pollen. Microscopic plant debris remaining in these upper sediments was highly oxidised and it is likely that a fluctuating ground water table and drying-out of the sediments has degraded/destroyed the pollen. This similarly applies to the upper levels of monolith 10303 where pollen was similarly absent in the top 80mm.

Profile 10305 was, however, apparently much wetter and consequently, pollen preservation and absolute pollen frequencies much higher. This profile therefore perhaps provides the most useful information.

The most important aspect of this profile are the remarkably high values of *Fraxinus* (ash) pollen. This taxon is usually greatly underrepresented in pollen spectra (Andersen 1970, 1973) and as such these values are exceptional. This clearly relates to the presence of ash seeds which were also recovered from the well. This must relate to the presence of ash woodland locally and overhanging the well, rather than dumped material; consistent numbers throughout the depth of sediment implies longevity of the ash woodland/tree. The presence of *Quercus* (oak) and *Corylus* type (most probably hazel) suggests local woodland growth.

Compared with other well studies (noted below), there are few herbs, with notably little cereal pollen and associated weeds (segetals/ruderals). The latter tends to derive from ordure and similar deposits, which apparently became incorporated into wells. The Thurnham evidence thus suggests that the well was clean. It is also clear that there was little pollen input from the nearby crop-processing area. This is perhaps surprising since pollen incorporated into the husks of cereals (Robinson and Hubbard 1977) will have become liberated during crop-processing procedures.

Comparative material

The taphonomy of pollen wells is complex and the data may be difficult to interpret compared with naturally accumulating peat/sediment sequences. As such, there have been few studies with which to compare the data obtained from the Thurnham well. Exceptions are the studies of Roman wells by Barber (1976) at Portchester Castle and at Pomeroy Wood, Honiton (Scaife 1999), which have produced pollen data that demonstrate that useful information can be obtained, especially in conjunction with insect and plant macrofossil studies. The contained pollen and spores may come from a variety of sources, derived via 'normal' airborne means or insect vectors, but are likely to derive from areas very close to the site.

However, wells are also likely to contain pollen from secondary sources including human and animal faeces, offal, domestic waste including floor coverings and food remains. All of these may contain considerable quantities of pollen which can strongly influence and bias pollen assemblages (Greig 1981; 1982) if this material was dumped in the well. The presence of such secondary/derived pollen may complicate the interpretation since the possibility of the dominance of this secondary element may have masked 'naturally' derived pollen from which interpretations of the local environment can be made.

Potential for further work

CTRL Landscape Zone Priorities and Fieldwork Event Aims

The following section discusses potential for further work in the light of the Landscape Zone Priorities and Fieldwork Event Aims.

From the assessment analysis carried out, it is clear that of the three pollen columns taken/available, the most productive is 10305. This has the highest absolute pollen frequencies and the best pollen preservation, due to its continuously waterlogged state. Subsequent study should concentrate on this sequence.

The pollen assemblages are dominated by ash, which attains remarkably high values. This may relate to very local woodland growing on/above the site. This and other evidence of woodland would seem at odds with the view that this was an active agricultural Roman Villa. Since the sequence comes from the top of the well, this may be evidence of woodland growth on abandonment of the villa. This suggests that the pollen assemblage has good potential to contribute to analysis of the character of the late and post Roman environment of the villa.

Further pollen study, including detailed counting of grains from column 10305, should form an integral part of a fuller environmental analysis which might include study of seeds, wood and insects. Such an integrated study would provide comparative and possibly corroborative data, and would aid the overall interpretation and study of the history of the local landscape.

New research aims and objectives for the CTRL archaeology project

There are few previous studies of pollen obtained from wells. Whilst it is clear that the pollen has the potential for providing information on the local vegetation, the taphonomy is not well understood. Any additional studies would act as valuable comparative data.

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- molluscs

by Mark Robinson

Assessment of the Molluscs

Samples taken from the Roman well 11010 at Thurnham Roman Villa for waterlogged plant remains were simultaneously scanned for the presence of molluscs.

Molluscs and insects were present in four of the seven samples assessed (see Table 10.4).

During the assessment of these samples for insect remains (see Appendix 13), the presence of molluscs was noted.

Shells of land snails were present in all four samples (10347, 10351, 10352 and 10293). Their concentration is of the order of 60 shells per kg. The majority are species of woodland or shaded habitats such as *Discus rotundatus, Aegopinella nitidula and Marpessa laminata*. There are very few shells of open-country species.

Some molluscs are highly habitat-sensitive, and can provide additional evidence for subtle variations, both temporal and spatial, in the surrounding environment. The molluscs from the well support the other evidence for local scrub regeneration around the well, and will thus contribute to study of the decline of the villa, and its contemporaneous local environment. Only a small number of samples contained suitable remains, and the study of molluscs should be undertaken in conjunction with other sources of environmental data.

It is recommended that molluscs are extracted from the samples to be analysed for waterlogged macroscopic remains, and identified by species, and reported upon.

- insects

by Mark Robinson

Thurnham Roman Villa SRC THM 98

Assessment of the Insects

Introduction

A total of seven bulk samples were taken from the late Roman well 11010 during excavation works at Thurnham Villa, for the recovery of waterlogged biological remains. The samples are each of the order of at least 12kg. They are kept wet in sealed plastic bags and boxes.

Sub-samples of 200g were sieved down to 0.25mm for the assessment of waterlogged macroscopic plant remains. Insect remains were noted in four of these sub-samples. A further sub-sample of about 12kg from one of these contexts was washed over onto a 0.25mm sieve to extract organic remains and the flot subjected to paraffin flotation to concentrate the insect remains in it.

The sampling programme was undertaken in accordance with the Fieldwork Event Aims for the site, which are set out in section 2 of the main report, above. The retrieval of the insect remains was designed to address two of the Fieldwork Event Aims: investigating the decline of the villa (the well fills excavated possibly belonged to the time of abandonment of the site) and determining the local environment of the site.

Methodology

It was decided that the best approach was to use the assessment of the macroscopic plants to identify samples that contained insect remains. These sub-samples were rather small for a full insect analysis, so a much larger sub-sample from one of the samples (10352) to contain insects was subjected to paraffin flotation to give a wider range of material for assessment.

The flots were scanned under a binocular microscope at magnifications of x10 and x20. The abundance of taxa was recorded in Table 13.1 on a scale of + (present, 1-5 individuals), ++ (some, 6-10 individuals) and +++ (many, 11+ individuals). Nomenclature for Coleoptera (the majority of the insects) follows Kloet and Hincks 1977). The insects were subsequently stored in 70% ethanol.

Quantifications

Four out of a total of seven samples were assessed. Table 13.1 gives the range and abundance of insects in each sample that was assessed. The results show that all the samples assessed will contain sufficiently large assemblages of insects for useful palaeo-environmental analysis. No obvious bias was noted with the recovery of remains.

Provenance

The samples are derived from waterlogged fills which are assumed to relate to the post-abandonment phase of the well and therefore the final stage (4th century AD) of occupation of the site. Samples 10347, 10351 and 10293 represent general fills to the well, while sample 10352 consists of mossy material from between a stake lining and the well shaft.

The insects from the samples can be divided into a minority which lived in the well, mostly small water beetles such as *Ochthebius* sp. and the majority which were derived from the surrounding terrestrial landscape. The latter group variously fell into the well, flew in or were amongst refuse discarded into it. All four samples assessed represent good groups for analysis.

The terrestrial insects are from a wide range of habitats. Some evidence for woodland is provided by carabid beetles such as *Abax parallelepipedus* and *Patrobus atrorufus*. However, grassland insects such as the grass-feeding bug *Aphrodes* sp. and the elaterid beetle *Agriotes* sp. are also present. The presence of domestic animals is suggested by the scarabaeoid dung beetles *Geotrupes* sp. and *Aphodius* cf. *sphacelatus*. No insects associated with timber structures or indoor habitats have been noted. Of particular interest is the occurrence of numerous examples of workers of *Apis mellifera* (honey bee) in sample 10352.

Conservation

The waterlogged samples are not stable and their organic content will decay over a period of several years unless kept cold. It is therefore recommended that prior to analysis, the samples should be kept refrigerated either as unprocessed samples or processed flots. All samples should be kept until decisions have been taken on further analysis.

Comparative Material

No other waterlogged Roman well deposits are known from the CTRL project or elsewhere in Kent. Probably the best comparative insect sequence is from a 4th century well at the Barton Court Roman Villa, Abingdon, Oxfordshire (Robinson 1986). Very diverse and informative insect assemblages were recovered from the main fills of the well and remains of woodland insects were found in moss which had been packed between the stones of the well lining.

Potential for Further Work

CTRL Landscape Zone Priorities and Fieldwork Event Aims

The following section discusses potential for further work in the light of the Landscape Zone Priorities and Fieldwork Event Aims.

The insect remains are very well preserved. All the samples show good potential to meet the research objectives. The evidence for partly wooded conditions is possibly a reflection of the decline of the villa. The insects certainly show much evidence for the local environment.

It is recommended that further sub-samples from the four samples assessed be subjected to paraffin flotation to extract insect remains such that about 200 individuals of terrestrial Coleoptera (beetles) are available for analysis from each sample. A very detailed environmental reconstruction should be made from their quantitative analysis.

New research aims and objectives for the CTRL archaeology project

One new research aim has emerged from the assessment. Honey bee has been identified from other Roman sites in Britain, for example from Godmanchester, Cambridgeshire (Robinson unpublished). However, the Thurnham remains are very well preserved and offer the opportunity to establish the sub-species represented by the pattern of their wing venation. It is therefore recommended that the bee wings should be extracted carefully from the flots and examined in detail.

Detailed palaeoenvironmental reconstruction from insect evidence for a Roman villa would certainly be of regional significance for Kent. If the decline of the villa is part of the general early

5th century collapse of Roman Britain, the results would be of national significance. The honey bee evidence is of national significance.

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Table 13.1: Insects from Well 11010, Thurnham Villa

Sample	10347	10351	10352	10293
Context	12227	11516	11985	11982
Species				
Forficula auricularia	+	-	+	-
Pentatoma rufipes	-	-	+	+
Aphrodes sp.	+	-	+	-
Carabus sp.	-	-	+	-
Leistus sp.	-	-	+	-
Nebria brevicollis	+	-	+	-
Patrobus atrorufus	-	+	-	-
Trechus obtusus or quadristriatus	-	-	+	-
Bembidion sp.	+	-	+	-
Pterostichus cf. cupreus	-	-	+	-
P. madidus	-	-	+	-
Abax parallelepipedus	-	-	+	-
Harpalus S. Ophonus sp.	-	-	+	-
Badister bipustulatus	-	-	+	-
Hydroporus sp.	-	+	-	-
Helophorus aquaticus or grandis	-	-	+	-
Helophorus sp. (brevipalpis size)	+	-	+	-
Cercyon sp.	-	-	+	-
Megasternum obscurum	-	-	+	-
Hydrobius fuscipes	+	-	-	-
Anacaena globulus	+	+	+	+
Ochthebius sp.	-	-	+	-
Hydraena sp.	-	-	+	-
Limnebius sp.	-	-	+	-
Choleva or Catops sp.	+	-	+	-
Thanatophilus rugosus	+	-	-	-
Silpha sp.	-	-	+	-
Micropeplus sp.	-	-	+	-
Lesteva sp.	-	-	+	-
Anotylus sculpturatus gp.	-	-	+	-
Philonthus sp.	-	-	+	-
Tachinus sp.	+	-	+	-
Geotrupes sp.	+	+	+	-
Aphodius cf. Sphacelatus	+	-	-	+
Aphodius sp.	-	-	+	-
Hoplia philanthus	-	-	+	-
cf. Cyphon sp.	+	+	-	-
Dryops sp.	-	+	-	-
Athous sp.	+	-	+	-
Agriotes sp.	-	-	+	-
Cantharis sp.	-	-	+	+
Malachius sp.	+	-	-	-
Atomaria sp.	-	-	+	-
Longitarsus sp.	-	-	+	-
Altica sp.	-	-	+	-
Chalcoides sp.	-	-	+	-
Psylliodes sp.	+	-	-	-
Phyllobius sp.	-	-	+	-
Barypeithes araneiformis	-	+	-	-
Sitona sp.	-	-	-	+
Plinthus caliginosus	-	+	-	-

Ceuthorhynchinae indet.	-	+	+	+
Myrmica sp.	-	-	+++	-
Apis mellifera	-	-	+++	-
Approx total per kg	90	55	50	45

+ (present, 1-5 individuals); ++ (some, 6-10 individuals); +++ (many, 11+ individuals)

PS: SOUTH OF SNARKHURST WOOD

Macroscopic Plant Remains and Charcoal

Charred Plant Remains and Charcoal

by Ruth Pelling

Introduction

Samples were taken during excavation works at South of Snarkhurst Wood for the recovery of charred plant remains and charcoal.

Features sampled included ditches, postholes forming a circular structure and four-post structures and pits. All features sampled were of late Iron Age to Early Roman date (1st century BC to 1st century AD). Samples were processed using bulk water flotation and the flots collected onto 250µm mesh sieves. Flots were air dried slowly before being submitted for assessment. All residues were processed.

The samples were taken in accordance with the Fieldwork Event Aims for the project, which are set out in section 2 of the main report, above. The purpose of sampling was to investigate economic activity at the site and to refine understanding of the development of the settlement.

Methodology

Samples were taken from each class of archaeological feature, focussing on secure contexts. In total 26 samples were taken for the recovery of charred plant remains, 25 from the main excavation site and one sample during the watching brief. The volume of deposit processed for each sample ranged from 2 to 40 litres. All the samples were processed and submitted for assessment. Each flot was first put through a stack of sieves (2mm, 1mm and 500µm) in order to break them into manageable fractions. Each fraction was then scanned under a binocular microscope at a magnification of x10. Any charred seeds and chaff were provisionally identified and an estimate of abundance was made. Fragments of charcoal were randomly fractured and examined in transverse section at x10 and x20 magnification.

Quantification

A total of 26 samples were assessed. The results are shown in Table 1 below. Flots were generally quite small and contained frequent rootlets. Charred seeds and chaff were absent from 11 samples. One sample contained between 11 and 50 charred items. The remaining 11 samples contained only low levels of cereal grain and chaff with occasional weed seeds (0-10 items). Both cereal grain and chaff were present in the samples. *Hordeum vulgare* grain was noted in 9 samples. Hulled wheat grains were recorded in 8 samples while glume bases were noted in 9 samples. In most cases the preservation of both grain and glume bases was poor and identification was not possible to species. Both *Triticum spelta* and *Triticum dicoccum* were noted amongst the occasional better preserved remains. Weeds were generally only rarely observed and included *Rumex* sp. (docks), *Vicia/Lathyrus* sp. (vetch/tare/vetchling) and small seeded Gramineae (grasses). In addition, nutshell fragments of *Corylus avellana* (hazel) were noted in one sample (sample 100).

Charcoal was present in low numbers in 12 samples. Three samples contained moderate quantities while six samples contained quite frequent amounts. *Quercus* sp. (oak) dominates the charcoal assemblages. Pomoideae (apple/pear/hawthorn etc) and *Prunus spinosa* (sloe) were occasionally noted. The identification of the non-*Quercus* charcoal is tentative.

Provenance

The richer of the samples was derived from a ditch (context 126). Low levels of remains and charcoal were recovered from the full range of features. There appears to be no relationship between the quantity and quality of the remains and feature type. The preservation of material is poor to moderate. In part this is the result of damage during charring. Some abrasion may have occurred as the result of post-depositional damage. The preservation is such that there is little potential to take the identifications of cereal remains any further.

Conservation

The flots are in a stable state and can be archived for long term storage. It is recommended that the flots are retained until completion of the CTRL post-excavation report.

Comparative material

The range of material noted in the samples is generally typical of the late Iron Age and Roman periods throughout southern Britain, with spelt wheat the dominant cereal and hulled barley also cultivated. The role of emmer wheat (*Triticum dicoccum*) is less well known than spelt for this period. There is good evidence of its cultivation in the late Iron Age from Wilmington in Kent (Hillman 1982) and from outside the region from Hascombe in Surrey (Murphy 1977) and Ham Hill in Somerset (Ede 1991). In the Romano-British period, evidence from sites such as Tiddington (Moffet 1986) or Barton Court Farm (Jones and Robinson 1984) suggest emmer to be a minor crop compared to spelt; possibly even present as a weed of the spelt crop. More recently much larger assemblages were recovered from a site at Mansfield College in Oxford (Pelling, unpublished).

Potential for further work

The samples offer only limited information about the economic activities at the site and do not refine understanding of the development of the settlement. The samples do provide some useful data in terms of the development of the archaeobotanical dataset for the region as a whole. Barley and hulled wheat, including both spelt and emmer, are represented. There is no evidence of cereal processing, and it is not possible to establish if the cereals were locally produced or were imported into the site. There is no potential for more detailed analysis of these samples. The quantity and range of material is such that detailed analysis will not provide any additional information to the assessment. However, the results of the assessment are useful and should be included in the final reports. Of particular importance is the presence of emmer wheat, albeit in low numbers. The role of emmer wheat in the cereal economy of the Iron Age and Romano-British period is not well understood at present, and this assemblage provides further evidence for its cultivation on a small scale.

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Table One: the Charred Plant Remains

Context	Type	Period	Sample No.	Sample size (l)	Flot size (ml)	Grain	Identified grain	Chaff	Identified chaff	Weed seeds	Other
10		LIA	1		20	+	Hor	-		+	-
126	Ditch	LIA - 50	100	35	150	++	Hor T.spt/dic	++	T.dic T.spt/dic	+	+
132	Ditch	0 - AD50	102	13	10	-		-		-	-
143	Posthole	40 - 70	103	16	10	-		-		-	-
152	Posthole		104	20	10	-		-		-	-
153	Posthole		105	21	10	+	indet	-		-	-
157	Posthole	c.AD43 - 70+	106	4	50	-		+	T.spt/dic	-	-
158	Posthole	c.AD50 – 180+	107	20	50	+	indet	+	T.spt/dic	-	-
165	Posthole		108	15	100	+	Hor T.spt/dic	+	T.cf dic	+	-
166	Posthole		109	11	10	-		-		-	-
173	Pit	AD40 – 70	111	40	150	+	T.spt Hor	+	T.spt/dic	+	-
173	Pit	AD40 – 70	112	40	150	+	T.sp	+	T.spt/dic	+	-
186	Ditch	LIA	113	20	10	-		-		-	-
183	Ditch		116	40	50	-		-		-	-
127	Pit		119	40	150	-		-		-	-
259	Ditch		120		10	-		-		-	-
261	Ditch	AD40 - 70	121	40	150	+	T.spt/dic Hor	+	T.spt/dic	+	-
125	Ditch	AD40 - 70	122	2	10	-		-		-	-
233	Pit	LIA - 43+	123	40	100	-		+	T.spt/dic	+	-
268	Pit		124		10	-		-		-	-
266	Pit		125	26	10	-		-		-	-
269	Pit	LIA - 70	126	30	10	+	T.spt/dic	-		-	-
237	Other	AD30 - 70	127	40	100	+	Hor	-		-	-
238	Other	AD40 - 50+	128	40	250	+	Hor	+	T.spt/dic	+	-
280	Other	LIA - 50+	129	26	250	+	T.spt/dic Hor	-		-	-
252	Other	LIA - 50	130	40	100	+	Hor T.spt/dic	-		+	-

+ = 1-10 items/charcoal present; ++ = 11-50 items/charcoal moderate; +++ = 51-100 items/charcoal common
Hor *Hordeum vulgare*; T. spt *Triticum spelta*; T. dic *Triticum dicoccum*; T. sp *Triticum* sp.; Cory *Corylus avellana*

PS: WEST OF BLIND LANE

- macroscopic plant remains

Assessment of Charred Plant Remains

by Ruth Pelling

Introduction

Samples were recovered for charred plant remains and charcoal during excavation works at West of Blind Lane. Despite the evaluation suggesting the environmental potential of the site was poor, small number of representative samples were recovered from a range of features for comparative purposes. Eight samples were taken in total from a middle-late Bronze Age ditch, two late Iron Age-Roman ditches, a late Iron Age post hole and a layer in the southern part of the site where a number of features other than ditches are concentrated.

The samples were taken in accordance with the Landscape Zone Priorities and Fieldwork Event Aims for the site, which are set out in section 2 of the main report, above. The aim of taking the samples was to elucidate the function and economic basis of the site.

Methodology

Samples were taken from a representative range of feature type and period. In total 8 samples were taken for the recovery of charred plant remains. The volume of deposit processed for each sample ranged from 7 to 40 litres. Samples were processed by bulk water flotation using a modified Siraf machine, and the flots collected onto 250 µm mesh sieves. Flots were air dried slowly before being submitted for assessment. Six samples produced flots and were submitted for assessment. Each flot was first put through a stack of sieves (2 mm, 1 mm and 500 µm) in order to break them into manageable fractions. Each fraction was then scanned under a binocular microscope at magnification of x10. Any charred seeds and chaff were provisionally identified and an estimate of abundance was made. Fragments of charcoal were randomly fractured and examined in transverse section at x10 and x20 magnification.

Quantification

A total of 6 samples were assessed. A summary of the assessment results are shown in Table 7.1 below. Flots were generally quite small and contained frequent rootlets and modern moss. Charred seeds and chaff were noted in three samples, in each case in low numbers (less than ten items). Cereal grain was noted in two samples and included *Hordeum vulgare* (barley), while a *Triticum spelta* (spelt wheat) glume base was noted in another sample. A single weed seed was noted. In addition one *Vicia/Pisum* sp. (vetch/pea) pulse was recorded. Charcoal was noted in all samples, but generally in low quantities of poorly preserved indeterminate taxa. More abundant quantities of *Quercus* sp. (oak) charcoal were noted in two samples.

Provenance

The occasional cereal and pulse remains were recorded from two late Iron Age-Roman ditch samples and a sample of disturbed natural or eroded deposit in which a scatter of slag, perhaps derived from marling, was recorded. Small quantities of slag or clinker were also noted in this sample. The remains are likely to represent no more than background scatters of cereal processing debris present in the deposits across the site. There is unlikely to be any significant association with feature type. The presence of cereal remains does suggest some cereal consumption occurred on the site, although there is no evidence of significant cereal production or processing.

Conservation

The flots are in a stable state and can be archived for long term storage.

Comparative Material

Few deposits of middle-late Bronze Age date have been examined from the CTRL. Recently material of middle Bronze Age date has been examined from a site at Dartford (Pelling unpubd) which produced a large deposit of cereal grain and chaff, and included both emmer and spelt wheat. Evidence for large-scale cereal production from this period is therefore known from within the Kent region and is also known from outside it, for example from Black Patch, East Sussex (Hinton 1982). The evidence now suggests this is a period of agricultural change in which spelt wheat was replacing emmer wheat, possibly quite rapidly.

Evidence for the late Iron Age and early Roman period is more prominent within the region of the CTRL. There is evidence of cereal production and crop processing from some sites, for example the East of Station Road site and Eyhorne Street, which also produced early Iron Age deposits. Cereal remains suggestive of small scale production and processing were also present, for example, at South of Snarkhurst Wood and Hockers Lane. Evidence across southern Britain (eg from the Danebury Environs region, Campbell 2000; Greig 1991) indicates intensive cereal production was occurring in many, although not all areas and that barley and spelt wheat were the prominent cereal crops of the period, although emmer wheat is also recorded from some sites.

Potential for Further Work

The samples offer only limited potential for examining aspects of the economic activities at the site in any more detail. The absence of significant seeds or chaff is such that no further work is recommended. Nevertheless the general absence of evidence for large-scale cereal production is important and should be considered in any overview.

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Table 7.1: Summary of charred plant remains

Sample details					**Flot details**						
Sample	**Context**	**Feature Type**	**Period**	**Sample size (l)**	**Flot size (ml)**	**Grain**	**Chaff**	**Weed seeds**	**Other**	**Charcoal**	**Comments**
2001	2131	Natural layer 2131	?	40	30	+	-	+	-	++	Clinker?
2002	2063	Ditch 3007	LIA	35	5	+	-	-	-	+	Roots/moss
2003	2136	Ditch 3006	M-LBA	32	5	-	-	-	-	+	Roots/moss
2004	2053	Ditch 3006	M-LBA	40	10	-	-	-	-	+	Roots/moss
2005	2125	Ditch 3008	LIA-RO	40	10	-	+	-	+	+	Roots/moss
2006	2128	Post-hole 2130	LIA	7	60	-	-	-	-	+++	

PS: CHURCH LANE/ EAST OF STATION ROAD

Assessment of the Charred Plant Remains

by Ruth Pelling

Introduction

Samples were recovered during excavation works at East of Station Road for the recovery of charred plant remains and charcoal. A total of 18 samples were processed by flotation in a modified Siraf-type machine. The flots were collected onto a 250 µm mesh and allowed to air dry slowly. The samples were taken from ditch fills, pit fills and a tree-throw hole with the intention of examining the economy of the site and its interaction with the local environment. The deposits are of late Iron Age - early Roman date.

Methodology

All the samples processed were submitted for assessment. Flots were first put through a stack of sieves from 500 µm to 2 mm mesh size in order to break them into manageable fractions. Each fraction was then scanned under a binocular microscope at x10 to x20 magnification. Any seeds or chaff noted were provisionally identified based on morphological characteristics and an estimate of abundance was made.

Quantification

Of the 18 samples assessed six contained charred remains other than charcoal (Table 1). Cereal grain was infrequent, present in only four samples, and always less than 50 items (usually less than 10). Chaff was more commonly present, recorded in five samples. Three samples contained quite useful quantities, with 51 to 100 items. Weeds were noted in three samples, again in low numbers. In addition a single monocotyledon rhizome was noted in sample 22 from burnt pit 1345.

The cereal species noted were dominated by *Triticum spelta* (spelt wheat), with *Hordeum vulgare* (barley) grain noted in sample 1. The weeds noted included *Montia fontana* (blinks), *Rumex* sp. (docks) and *Tripleurospermum inodorum* (scentless mayweed), all presumably occurring as weeds of the arable crop.

Charcoal was present in 13 samples and in abundant quantities in six samples. *Quercus* sp. (oak) dominated the assemblages, while Pomoideae (apple, pear, hawthorn etc.) was the only other taxon noted. Much of the charcoal was poorly preserved and presented difficulties for identification due to the presence of iron deposits.

Provenance

The remains are typical of cereal processing waste, with few grains but frequent glume bases and some weeds. It is likely that the waste has been reused in fires as fuel and then discarded as refuse. The chaff rich samples all came from ditch fills. The samples from burnt pits 1349 and 1361 (samples 21, 22 and 23) were rich in charcoal but produced few cereal remains.

Conservation

The flots are in a stable condition and can be archived for long term storage.

Comparative Material

Hordeum vulgare and *Triticum spelta* have been recorded from other contemporary sites within the CTRL project (for example Thurnham Villa, Waterloo Connection and Hockers

Lane). They are the principal cereals recorded throughout southern Britain at this time, for example in the Danebury Environs area (Campbell, 2000). Some of the richer deposits from Thurnham Villa and Hockers Lane have also produced emmer wheat and oats, which have not been recorded a the East of Station Road site. It will be important for addressing the fieldwork aims to establish how important these crops were and at what date, and equally to establish when they are absent.

Potential for Further Work

While the concentration of remains in the deposits are not comparable in terms of scale to those of the larger sites, such as Thurnham Villa, they do provide additional information which within the context of the CTRL project as a whole is very important. Prior to the CTRL work knowledge of the agricultural activities of the area in the Iron Age and Romano-British periods was very limited indeed. There is now the opportunity to conduct an informative landscape study, within which the smaller sites, such as this one, will add useful additional information for the study of past agricultural regimes and change in cereal production and exploitation of the landscape over time. It would be of value for addressing Fieldwork Event Aims 2 and 3 to produce an extensive dataset so as to track the occurrences or absences of the poorly understood crops such as emmer wheat, oats and the pulses. It is therefore recommended that in order to produce a worthwhile data-set, the three samples (3, 19 and 20) which produced large quantities of chaff are examined in detail.

Bibliography

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Assessment of the Waterlogged Plant Remains

by Ruth Pelling

Introduction

Samples of waterlogged deposit were taken from the fills of the palaeochannel in trench 17 at East of Station Road for the recovery of plant, molluscan and insect remains. One of the fills, context 1726, from which samples 16-18 were taken, produced occasional sherds of late Iron Age – early Roman pottery. The purpose of the sampling was to provide information on the local and wider environment of the area in the period in which the later Iron Age-early Roman site adjacent was occupied. Bulk samples were taken in the field and kept wet in sealed bags and plastic boxes. Sub-samples were submitted for the assessment of waterlogged plant remains.

Methodology

A sub-sample from each waterlogged deposit sampled was submitted for assessment. Sub-samples of 200 g were processed by a simple wash over technique and collected onto a 250 µm mesh. This will not provide an exhaustive species list but should provide sufficient material to assess the presence or absence of waterlogged material, the quality of preservation, the density of any remains and an indication of the range of species or types of material present.

Each flot was then washed through a stack of sieves ranging from 2 mm to 250 µm mesh size. Each fraction to 500 µm was scanned, while still wet, under a binocular microscope at x10 to x20 magnification. Provisional identifications and an approximation of abundance on a three point scale (+ = present, ++ = some; +++ = many) were made.

Quantification

Five samples from two deep deposits within the palaeochannel (contexts 1725 and 1726) were assessed. The samples from context 1726 are believed to be of late Iron-Age - early Roman date. A summary of the material noted in each sample is shown in Table 1.

Table 3 shows the plant species noted in each sample.

The two upper deposits, samples 14 and 15 from context 1725, produced abundant fragments of poorly preserved wood. Generally the wood was not easily identifiable, although it was recognised as non-*Quercus* (non-oak). Some possible Pomoideae (apple/hawthorn etc) was recorded in sample 15. Few seeds were noted with the exception of occasional *Corylus avellana* (hazel) nut shell fragments, *Sambucus nigra* (elder), *Urtica dioica* (stinging nettle) and a *Cratagegus monogyna* (hawthorn) stone, all of which suggest scrub-land type vegetation with some nitrogen loving ruderal species. Occasional seeds of *Apium nodiflorum* (foll's watercress), may have been growing on the edges of the channel.

The samples taken from context 1726 (samples 16, 17 and 18) produced a greater ranged of plant remains. Samples 16 and 17 particularly produced a good range of plant remains and also several insect fragments. The upper of the three samples, 17, produced a flora which suggests damp or wet grassland (*Ranunculas acris/repens/bulbosus*, *Lychnis flos-cuculi*, *Rumex conglomeratus*), with occasional *Salix* sp. (willow) and perhaps a scrubby background suggested by *Prunus spinosa* (sloe) and some ruderal habitats. Some wet ground or marshy species which were presumably growing on the banks of the channel or within the muddy sub-strata of the channel itself include *Apium nodiflorum*, *Lycopus europeaus* (gipsywort) and *Sparganium erectum* (branched bur-reed). A large number of leaf fragments and some bud-scales were also present in this sample. Sample 18 produced a more restricted range of species which included plants likely to be growing along the edge of the channel (*Apium graveolens* and *Polygonum persicaria/lapathifolium*) and a possible ruderal element (*Fumaria* sp., *Atriplex* sp. and *Rumex* sp.). A single charred glume base of *Triticum spelta/dicoccum* (spelt/emmer wheat) was also recovered from sample 18, an appropriate cereal for the late Iron Age or Early Roman period. The lower of the three samples again produced a more varied species list. Again there was a range of plants which suggest damp, or even quite wet, ground alongside the river (*Montia fontana* subsp. *chondrosperma*, *Conium maculatum*, *Apium nodiflorum* and *Polygonum persicaria/lapathifolium*), with *Alisma plantgo-aquatica* and *Sparganium erectum* perhaps within the channel itself. There appears to be much reduced grassland element, although *Leontondon* sp. was identified. There is possibly a greater arable or ruderal component represented by this lowest sample, with *Brassica/sinapis* sp., *Galeopsis* sp., *Chenopodium album*, *Rumex* sp., *Valerianella dentata*.

Provenance

The three more productive samples are from a peaty layer thought to be of late Iron Age to early Roman date and so are probably more or less contemporary with the adjacent site. The remains present within the samples are likely to have derived from wind blown species growing within the vicinity and some plants growing within the channel or its edge which have dropped their seeds into the water. There is no evidence of deliberately dumped deposits within the samples. The lower deposits seem to suggest a predominantly grassland type habitat while the upper deposit produced samples containing mostly wood fragments, perhaps deriving from a single tree.

Conservation

If the samples are to be stored for any length of time before analysis it is recommended that they are refrigerated or kept in a cold store. They can be kept in such an environment for some time as either unprocessed deposit or processed flot.

Comparative Material

Few waterlogged deposits of the Late Iron Age or Early Roman period have been examined from the CTRL corridor. Deposits from a well at Thurnham Villa have the potential to shed light on the environment in the late Roman period at the time of the abandonment of the villa.

The present set of samples should provide some information about the local environment earlier on in the Roman period.

Potential for Further Work

Good waterlogged well deposits can provide very useful data not available if only charred remains are recovered. Such remains might include the identification of leafy plants or seeds of foods which normally do not survive, as well as habitat information about the microenvironment of the feature and the environment of the wider area. The preservation of the material from the palaeochannel deposits is good. The samples offer the potential to examine aspects of the surrounding environment of the East of Station Road site at the time of use of the adjacent site. It is recommended that if the dating is confirmed sub-samples of 0.5 to 1 kg of samples 16-18 are examined in detail for their plant macrofossils, in order to address the Fieldwork Event Aims. Particular aims will be to define the environment and economy of the site and the position and interaction of the site with the local environment.

Table 1: East of Station Road: summary of the charred plant remains

Context	Feature	Period	Sample No	Sample Vol (l)	Flot size (ml)	Grain	Chaff	Weed seeds	Charcoal	Notes
1318	Ditch 1319	LIA-RO	4	10	50				+	uncharred root? Wood
1320	drainage ditch	LIA-RO	5	7	10		+			
1215	Ditch 1341	LIA-RO	6	10	10					roots/ modern weeds
1217	Ditch 1218	LIA-RO	7	7	10					Roots
1314	Ditch 1315	LIA-RO	3	10	10				++	
1307	Ditch 1326	LIA-RO	2	11	10	+	+++			
1706	Ditch 1707	LIA-RO	8	4	20				+++	
1712	Ditch 1713	LIA-RO	9	4	100				+++	
1708	Ditch 1707	LIA-RO	10	10	50				+++	
6008	gully 6009	LIA-RO	1	10	10	+			++	
1714	layer	LIA-RO	11	6	10				++	
1715	1716	LIA-RO	12	6	50				+++	
1614	Ditch 1615	LIA-RO	13	18	10				++	
1330	Ditch 1331	LIA-RO	19	10	20	++	+++	++	++	
1345	Ditch 1358	LIA-RO	20	10	20	+	+++	+		Roots
1350	burnt pit 1349	LIA-RO	21	10	20				+	Roots
1351	burnt pit 1349	LIA-RO	22	10	30		+	+	+++	Rhizome
1363	burnt pit 1361	LIA-RO	23	4	200				++++	

+ = 1-10

++ = 11-50

+++ = 51-100

++++ = 101-1000

1000+ = >1000

Table 2: East of Station Road: summary of waterlogged plant remains

Sample	Context	Weight assessed (g)	Total waterlogged	Total charred	Id-charred	Seeds/ fruits	Wood	Leaf/B ud	Molluscs	Insects	Notes
14	1725	200	+++	-	-	+	+++	-	-	+	
15	1725	200	+++	-	-	+	+++	+	-	+	Scrub, ruderal
16	1726	200	+++	-	-	+++	-	-	++	+	Wet, ruderal, grass
17	1726	200	+++	+	Medick T.sp. glume	+++	-	+++	-	+++	scrub, ruderal, grass
18	1726	200	++	-	-	++	+	+	-	+	Ruderal

+ = 1-10

++ = 11-50

+++ = 51-100

++++ = 101-1000

1000+ = >1000

Table 3: East of Station Road: summary of species of waterlogged plants identified (seed/nutlet etc. recorded unless otherwise stated)

Species	**Sample**	14	15	16	17	18
	Context	1725	1725	1726	1726	1726
	Weight (g)	200	200	200	200	200
Ranunculus acris/repens/bulbosus	Buttercup	-	-	-	+	-
Fumaria sp.	Fumitory	-	-	-	-	+
Brassica/Sinapis sp.	Turnip/ Mustard etc	-	-	+	-	-
Lychnis flos-cuculi	Ragged robin	-	+	-	+	-
Stellaria media agg.	Chickweed	-	-	-	+	-
Montia fontana subsp *chondrosperma*	Blinks	-	-	+	-	-
Chenopodium album	Fat hen	-	-	+	+	-
Chenopodium sp.		-	-	-	+	-
Atriplex sp.	Orache	-	-	-	-	+
Prunus spinosa	Sloe, fruit stone	-	-	-	+	-
cf. *Crataegus monogyna*	Hawthorn, fruit stone	-	+	-	-	-
Conium maculatum	Hemlock	-	-	+	-	-
Apium nodiflorum	Fool's watercress	-	+	+	+	+
Polygonum persicaria/lapathifolium	Red shank/persicaria,	-	-	+	-	+
Rumex conglomeratus	Sharp dock	-	-	-	+	-
Rumex sp.	Docks	-	-	+	+	+
Urtica dioica	Stinging/Common nettle	-	+	-	-	-
Corylus avellana	Hazel nut shell frag.	+	-	-	-	-
Salix sp.	Willow bud	-	-	-	+	-
Solanum sp,	Nightshade	-	-	+	+	-
cf. *Anagalis* sp.	Pimpernel	-	-	-	+	-
Labiatae	Labiate, small seeded	-	-	+	-	-
Lycopus europaeus	Gipsywort	-	-	-	+	-
Galeopsis sp.	Hemp-nettle	-	-	+	-	-
Sambucus nigra	Elder	+	-	-	-	-
Valerianella dentata	Narrow fruited cornsalad	-	-	+	-	-
Carduus/Cirsium sp.	Thistle	-	-	-	+	-
Leontodon sp.	Hawkbit	-	-	+	-	-
Alisma plantago-aquatica	Water plantain	-	-	+	-	-
Sparganium erectum	Branched bur-reed	-	-	+	+	-
Carex sp.	Sedge	-	+	-	-	-
cf. Pomoideae	Hawthorn/Apple etc wood	-	+++	-	-	-
Non-*Quercus* sp.	Non-oak wood	+++	-	-	-	-
Indet	Bud scales	-	+	-	-	-
Indet	Leaf frags	-	-	-	+++	-
Charred Remains						
Triticum spelta/dicoccum	Spelt/Emmer wheat glume	-	-	-	-	+
Medicago/Trifolium sp.	Medick/Clover	-	-	-	-	+

+ = 1-10

++ = 11-50

+++ = 51-100

++++ = 101-1000

1000+ = >1000

- pollen

Assessment of the Pollen

by Robert G Scaife

Introduction

Machine trenching at the East of Station Road site revealed a palaeochannel containing layers of organic material, minerogenic sediments and a branch from an oak tree (Figure 5). Environmental samples were taken from this profile including 3 monoliths for pollen analysis. This pollen assessment was carried out to ascertain if sub-fossil pollen and spores are present in the sediments and the potential of the profiles for reconstruction of local vegetation environment and land use in the Iron Age and Romano-British period. Pollen analysis has been carried out on two of the three monolith profiles. Pollen has been successfully recovered and preliminary pollen diagrams constructed. Assessment data are presented here.

Methodology

The open sections were sampled using plastic monoliths. Sub-samples were taken at an interval of 80 mm and 160 mm in the laboratory at the same time as the sediments were described. Samples of 2 ml volume were prepared using standard procedures for the extraction of sub-fossil pollen and spores outlined in Moore and Webb (1978) and Moore *et al.* (1991). Fuller details are given at the end of this Appendix. Absolute pollen frequencies were calculated using an added exotic/spike (Stockmarr 1971, *Lycopodium* tablets) to the known volumes of sample. Pollen counts of generally 100-150 grains per level (the pollen sum) were made where possible plus pollen of all extant marsh taxa and spores of ferns. Data obtained are presented in standard pollen diagram form (Figures 6 and 7) with percentages calculated as follows:

Sum = % total dry land pollen (tdlp)

Marsh/aquatic = % tdlp+sum of marsh/aquatics

Spores = % tdlp+sum of spores

Misc = % tdlp+sum of misc. taxa.

Taxonomy in general follows that of Moore and Webb (1978) modified according to Bennett *et al.* (1994) for pollen types and Stace (1992) for plant descriptions.

Quantification

Column 1

This is the upper of the two profiles examined and spans contexts 1723, 1724 and 1725. Pollen column 2 from context 1725 (not examined here) is represented within this column.

The Stratigraphy

Depth mm

0-280 - Buff coloured clay with brown mottling. 10YR 6/4 and 10YR 5/6 to 10YR 5/8.

280-510 - Homogeneous, fine silt-clay. Buff coloured 10YR 5/2.

510-580 - Transition with occasional black organic inclusions.

580-670 - Black organic/humic material.

670-860 - Grey/Brown silt. 10YR 4/2 - 10YR 4/6

860-910 - Black, organic/peat. Fibrous/fragmentary.

910-1000 - Sandy silt. yellowish 10YR 5/6 or 10YR 5/8.

The Pollen Data

Three local pollen assemblage zones are recognised in the 880 mm of this profile. These are characterised as follows.

Zone 1: 880 mm - 840 mm. *Alnus*. Absolute pollen frequencies in this basal level/zone are 62,047 grains/ml. Although only a single sample, this zone is delimited by markedly higher values of *Alnus* than in subsequent zones (76%). This corresponds with organic/peat material contrasting with largely minerogenic sediments in overlying levels. Other trees include small numbers of *Quercus* (8%), *Fraxinus* and *Corylus* type (5%). There are few herbs with Poaceae (9%) being most important.

Zone 2: 840 mm - 320 mm. *Quercus-Alnus-Corylus* type-Poaceae. Absolute pollen frequencies values range from 32,000 to 97,000 grains/ml. This zone is characterised by *Quercus* (28%), *Alnus* (av. 5%) and *Corylus* type (20%). There are also *Betula, Pinus, Fraxinus* and *Fagus* all of which occur sporadically. *Corylus* type is the dominant shrub (15%). There is an expansion of herbs from zone 1 with Poaceae dominant (to 35%). Cereal type is present. Spores comprise *Pteridium aquilinum* (28%), *Dryopteris* type and *Polypodium*.

Zone 3: 320 mm - 80 mm. Absolute pollen frequencies values decline to 19,482 grains/ml. This zone is characterised by a reduction in numbers and diversity of tree pollen. *Alnus* (15%) and *Corylus* type (20%) remain the most important tree and shrubs. Herbs expand. Poaceae expands to 40%. Cereal pollen has highest values (5%). Spores of ferns remain consistent with *Pteridium aquilinum* (declining to 10%). *Sphagnum* is present.

Vegetation Interpretation

Woodland: The lowest organic unit lying between 910 mm and 860 mm contains substantial pollen values of *Alnus* (alder) zone 1. It is thus likely that this peat formed under alder woodland (carr) which was growing in the wetter valley bottom or palaeochannel. Subsequently, values are reduced but remain in sufficient quantity to suggest that this community remained within the region. Of the other tree pollen, *Quercus* (oak) is the most important type with *Corylus* (hazel). These were probably the main elements of local and regional woodland vegetation growing in a range of habitats. *Tilia* (lime/linden), *Fraxinus* (ash) and *Fagus* (beech) are all present in zones 1 and 2. These are all poorly represented in pollen assemblages (Andersen 1970,1973) and as such these occurrences may imply some local growth. In zone 3 there is a reduction in tree pollen although *Corylus* remains. This may be a 'real' decline in woodland or may be due to changing taphonomy as evidenced by changes in the stratigraphy.

This column (1) lies higher in the stratigraphy/section than column 3, the latter extending down into the underlying bedrock. Column 3 shows a predominately herbaceous environment which therefore suggests that the alder (and other woodland) discussed above may be woodland recolonisation.

Herbs: The relatively small values of trees and shrubs and the importance of herbs dominated by Poaceae but with evidence of cereals and associated weeds (eg *Persicaria* and *Fallopia*) are strong evidence of the local arable and pastoral agriculture. The presence of bracken (*Pteridium aquilinum*) suggests waste/abandoned ground or rough pasture.

Marsh/Wetland: There is limited representation of wetland types which may have formed the autochthonous marsh community. *Alnus* noted above present in the basal wood peat is the exception. Subsequently, Cyperaceae (sedges) and occasional *Typha/Sparganium* (reed-mace and bur reed) are the only indicators.

Column 3

This is the lower of the two pollen monoliths examined and as such predates column 1. The profile spans contexts 1726, 1727, 1730 and 1731.

The Stratigraphy

Depth mm

0-140 - Grey silt 10YR 4/1

140-400 - Orange/grey fine sand/silt with organic specks.

400-620 - Coarser sand containing molluscs 10YR 4/4 or 10YR 4/6

620-660 - Stone horizon.

660-750 - Grey silt 10YR 5/1 to 10YR 4/1.

The Pollen Data

The 0.56 m of Section 3 examined for pollen has been divided into 2 local pollen assemblage zones. These are characterised from the bottom of the diagram at 560 mm as follows.

Zone 1: 560 mm - 360 mm. Poaceae-cereal type-*Plantago lanceolata*. Absolute pollen frequencies range from 13,000 grains/ml at the base to 32,600 grains/ml. This zone has been defined tentatively by the higher values of cereal type and *Plantago lanceolata* pollen (to 6% and 20% respectively). Overall, tree and shrub pollen is sparse (10% and 5% respectively) with only small numbers of *Quercus* (4%) and *Alnus* (9%) present consistently. Herbs are dominant with Poaceae most important (to 67%). *Plantago lanceolata* and cereal, as noted, have higher values. There is also a moderately diverse range of other herb types including Brassicaceae, Chenopodiaceae, *Polygonaceae* and Asteraceae types. Marsh/wetland types include Cyperaceae (<5%) and *Typha angustifolia/Sparganium* type (to 20%). Spores are relatively important with *Pteridium aquilinum* (20%) and *Dryopteris* type (monolete) (11%) at base of the profile.

Zone 2: 360 mm - 0 mm. Poaceae-Lactucoideae-*Pteridium aquilinum*. Absolute pollen frequency values range from 61,000 to 15,000 grains/ml. This zone is delimited by some reduction of cereal type and *Plantago lanceolata* from zone 1 and an expansion of *Pteridium aquilinum*. Tree and shrub pollen values remain small with a possible decrease in *Quercus*. Herbs remain dominated by Poaceae (to 60%) with *Plantago lanceolata* (peaks to 10%) and Lactucoideae (12%). There is an increase in Apiaceae types and Asteraceae types (*Anthemis* type, *Bidens* type, Aster type, *Centaurea nigra* type.). *Pteridium aquilinum* is the principal spore peaking to 30%.

Vegetation Interpretation

Compared with Column 1, there are substantially fewer trees and shrubs with *Quercus* at levels suggesting regional long distant input or sporadic local growth. It should also be noted that the dominance of grasses here, if growing on/very near the sample site, may have had a statistical depressing effect on elements such as the arboreal pollen coming from further afield. Herbs are dominant with a strong representation of grasses (Poaceae) and other pasture types (eg *Plantago lanceolata*). Arable types are also present including cereal type and weeds which were possibly associated with disturbed ground and cultivation.

Comparative Material and Potential for Further Work

This study has demonstrated that pollen is preserved in the peat and minerogenic sediments filling this valley bottom. Thus, there is the potential for reconstructing further the local vegetation and environment of the site and adjacent interfluves on which prehistoric and later woodland clearance and agriculture activity took place.

Some indication of dating has been given by the presence of pottery in the colluvial sediments overlying these valley fills. Although pollen is not a dating medium, there are certain indications that the sediments analysed are in fact of very late prehistoric age. This argument is based on the rather small values of trees and shrubs which had presumably been cleared at an earlier date. Most importantly, there is very little pollen of *Tilia* (lime/lindens). It is now accepted that *Tilia* formed the dominant or at least co-dominant tree over much of Southern and Eastern England prior to its clearance - the often seen 'lime decline' in pollen diagrams. Whilst this latter phenomenon was diachronous, there is also a wealth of information demonstrating that lime woodland was cleared during the middle and late Bronze Age. This would fit well with the suggested date of this valley sediment sequence as indicated by the archaeology/artefacts.

The pollen profiles thus have the potential for reconstructing in more detail the local landscape/environment of the Iron Age-Roman period for which there is the evidence of fields, field boundaries, pits and gullies etc. This addresses Landscape Zone Priority 1 and Fieldwork Event Aims 2, 4 and 5 for the sites, which are set out in section 2 of the main document, above.

This assessment has demonstrated that pollen is preserved and it is suggested from the character of the pollen assemblages that the sequences may be contemporary with the field system at East of Station Road. Consequently, further and more detailed analysis of these profiles offers the potential for studying local environment and land use history related to the archaeology. It should also be considered that there are few pollen data from this region of the country compared with the north where there are substantially more pollen preserving environments. Furthermore, there is also a paucity of pollen data as a whole which can be related accurately to the late prehistoric and early historic period. The following are suggested.

Adopt a closer pollen sampling interval of 40 mm.

Adopt a standard pollen sum of 400 or more grains per level where preservation makes this possible.

Radiocarbon dating of the profiles would be desirable to confirm that the sequence is contemporary with the local archaeology.

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- wood

Assessment of the Wood

by Nick Mitchell

Introduction

A single piece of wood was recovered from palaeochannel deposits sampled in trench 17 of the East of Station Road site. The circumstances of its deposition are considered below since it has bearing upon the interpretation of the sample submitted for radiocarbon dating. The purpose of recovering the piece of wood was to provide dating evidence for the sequence of palaeochannel deposits from which environmental samples had been taken.

Methodology

The wood was unwrapped and cleaned and a full record was made since there is nothing to be gained by revisiting the material at the full analysis stage.

Quantification

A single piece of oak, 0.78 m long with a diameter of 0.37 m, was recovered from palaeochannel deposits 1730/1731 (

Table 4). It is broken at one end at a branch-point and is itself most likely to be a branch. It is possible that the branch has a small part of a worked surface at the branch-point, where it may have been lopped. However, with the wood in such poor condition it is not possible to tell if this is a genuine worked surface and it is most likely that it is not worked.

Provenance

Considering its position, upright within natural silt 1731, it is probable that this branch is the remnant of a tree growing on the adjacent river bank which fell, submerging a limb into the preserving waterlogged silts. In these circumstances the majority of the tree/branch remains exposed and rots away leaving a large stub such as this example. A sample of sapwood has been submitted for radiocarbon dating but the circumstances of its deposition mean that the context being dated must be carefully considered. It is most likely to have been deposited during the build up of layer 1727 (see Figure 5).

Comparative Material

There is no other instance of such a tree-fall find from CTRL but the author has excavated similar examples from Eton rowing lake, Buckinghamshire, (unpublished).

Potential for Further Work

Although the branch is slow-grown it is unlikely to produce a dendrochronology date since the centre of the tree has rotted away leaving only approximately 50 rings. Radiocarbon is therefore suggested as the only viable method of dating and a sample of sapwood has been submitted. No further analysis is required.

Table 4: East of Station Road: summary of wood

Context	Material	Count	Comments
1730	oak	1	stump of branch

- insects and molluscs

Assessment of the Insects and Molluscs

by Mark Robinson

Introduction

A total of five bulk samples were taken from palaeochannel sediments of possible late Iron Age to Roman date at East of Station Road for the recovery of biological remains (Figure 5). The samples are each of the order of 10 kg. They are kept wet in sealed plastic bags and boxes.

Sub-samples of 200 g were sieved down to 0.25 mm for the assessment of waterlogged macroscopic plant remains. Insect remains were noted in four of these sub-samples.

It is hoped that the analysis of the insect remains can contribute to the fieldwork aim of obtaining a palaeoenvironmental sequence for the area spanning at least the Iron Age and the early Roman period.

Methodology

It was decided that the most efficient approach to the assessment was to use the wash-overs which had been prepared for the assessment of waterlogged macroscopic plant remains. The flots were scanned under a binocular microscope at magnifications of x10 and x20. The abundance of taxa was recorded in Table 1 on a scale of + (present, 1-5 individuals), ++ some, 6-10 individuals) and +++ (many, 11+ individuals). Nomenclature for Coleoptera (the majority of the insects) follows Kloet and Hincks (1977). The insect remains were subsequently stored in 70% ethanol.

Quantifications

All five samples were assessed and four were found to contain insect remains. Table 1 gives the range and abundance of insects in each sample. The results show that all the samples with insects will contain sufficiently large assemblages of insects for useful palaeoecological analysis. No obvious bias was noted with the recovery of remains.

Numerous mollusc shells are also present in Samples 16 and 18 from the bottom of the palaeochannel. Their concentration is up to 1000 shells per kg. The majority are species of flowing water, particularly *Bithynia tentaculata* and *Valvata piscinalis*.

Table 1: East of Station Road: summary of insect remains

Section	41	41	41	41	41
Sample	16	18	17	15	14
Context	1726	1726	1726	1725	1725
Depth	46.42	46.54	46.80	47.00	47.28
Trichoptera indet - larva	-	+	-	-	-
Trichoptera indet - larval case	+	+	-	-	-
Aphrodes sp	-	-	+	-	-
Bembidion sp	-	-	-	+	-
Pterostichus madidus	-	-	+	-	-
Harpalus affinis	-	+	-	-	-
Helophorus sp (brevipalpis size)	-	+	-	+	-
Megasternum obscurum	-	-	-	+	-
Anacaena sp	-	-	+	-	-
Limnebius papposus	-	-	+	-	-
Lesteva sp	+	-	-	-	-
Anotylus rugosus	-	-	+	-	-
Stenus sp	-	-	-	+	-
Geotrupes sp	-	-	+	-	-
Aphodius sp	-	-	+	-	-
Helichus substriatus	-	-	+	-	-
Oulimnius sp	+	-	+	-	-
Normandia or Riolus sp	-	-	-	+	-
Agrypnus murinus	-	+	-	-	-
Agriotes sp	-	-	+	-	-
Cantharis sp	-	-	+	-	-
Cerylon sp	-	-	-	+	-
Enicmus transversus	-	-	+	-	-
Altica sp	+	-	-	-	-
Chaetocnema concinna	-	+	-	-	-
Apion sp	-	+	+	-	-
Sitona sp	-	+	-	-	-
Hypera punctata	-	+	-	-	-
Acalles turbatus	-	-	-	+	-
Ceuthorhynchinae indet	-	+	-	-	-
Gymnetron pascuorum	-	-	+	-	-
Lasius sp	+	+	-	-	-
Hymenoptera indet	+	-	-	-	-
Diptera indet - puparium	-	+	-	-	-
Approx total per kg	***35***	***50***	***60***	***30***	***0***

\+ = 1-10

++ = 11-50

+++ = 51-100

++++ = 101-1000

1000+ = >1000

Provenance

The samples are derived from waterlogged sediments which possibly began to accumulate in the palaeochannel as the result of the fall of a tree rooted into the bank. Sherds of late Iron Age / early Roman pottery were recovered from the upper part of the sequence. The insects from the samples can be divided into the bankside and aquatic species from the channel itself and those derived from the surrounding terrestrial landscape. The occurrence of the elmid beetles *Oulimnius* sp. and *Normandia* or *Riolus* sp. shows that the channel carried clean, well-oxygenated moving water. The terrestrial insects from Samples 16, 18 and 17 are characteristic of grassland conditions. They include *Agrypnus murinus*, whose larvae feed on the roots of grassland plants and *Gymnetron pascuorum*, which feeds on *Plantago lanceolata* (ribwort plantain). The presence of domestic animals is suggested by scarabaeoid dung beetles such as *Geotrupes* sp. In contrast, the insects from Sample 15 are more characteristic of woodland conditions, with *Cerylon* sp. which occurs under bark and *Acalles turbatus* which bores into dead wood.

The insects in Samples 16, 18 and 17 are well preserved and those in Sample 15 are in adequate condition for identification. All four of these samples show potential to meet the research objectives provided they can be dated securely. (The occurrence of *Pterostichus madidus*, a beetle which has not previously been recorded in deposits earlier than late Roman, in Sample 17, raises a slight doubt about the presumed date of the sequence).

Conservation

The waterlogged samples are not stable and their organic content will decay over a period of several years unless kept cold. It is therefore recommended that prior to analysis, the samples should be kept refrigerated either as unprocessed samples or processed flots. Samples 15, 16, 17 and 18 should be kept until decisions have been taken on further analysis.

Comparative Material

No other waterlogged insect sequences from later prehistoric and Roman palaeochannel deposits are known from the CTRL project or elsewhere in Kent. The best comparative insect material from the project is from the Roman well at Thurnham. However, work on insect remains from deposits of this date in the upper Thames Valley has shown the value of insect evidence for palaeoenvironmental reconstruction (eg Robinson 1992).

Potential for Further Work

The insect remains show good potential to address the original research aims. They certainly show much evidence for the local environment and the apparent transition from grassland to more wooded conditions is of interest. It is recommended that further sub-samples from the four samples to contain insects are subjected to paraffin flotation to extract insect remains such that 100-200 individuals of terrestrial Coleoptera (beetles) are available for analysis from each sample. A palaeoenvironmental reconstruction should be made from their qualitative analysis. The results would be of regional significance for Kent.

The molluscs from the bottom of the palaeochannel support the insect evidence that clean well-oxygenated water flowed along it. It is recommended that molluscs are extracted from the samples to be analysed for waterlogged macroscopic plant remains and reported on.

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- dating

Assessment of the Radiocarbon Date

by Chris Hayden

Introduction

A sample of sapwood from a large piece of an oak branch which had been preserved in deposits at the base of the palaeochannel in trench 17 was submitted for radiocarbon dating. The sample was intended to provide a *terminus post quem* for the sequences of environmental samples taken from stratigraphically later contexts.

Method

The sample was analysed using an accelarator mass spectrometer to determine its conventional radiocarbon age, percent modern and $\Delta^{14}C$ based on the NBS-I oxalic acid standard, and the $\delta^{13}C$ was measured using a stable isotope mass spectrometer.

Material and Context

The sample was taken from the sapwood of the branch, this being the youngest part closest in age to the date of the tree's death. The date of death of the tree is assumed to be roughly contemporary with the date of its deposition. It is likely that the branch became deposited in the palaeochannel deposits as a result of a tree falling. Only the portion of the branch embedded in the deposits was preserved, the rest rotting away. The date of death of the tree thus probably post-dates the deposition of context 1731 into which it is embedded (Figure 5). Its relationship with context 1730 is less certain, but its seems likely that its deposition was roughly contemporary with the deposition of this context. Whatever the case, it provides a clear *terminus post quem* for the environmental samples which begin in context 1727 above.

Results

The sample results are tabulated below. A copy of the certificate, issued by the Rafter Radiocarbon Laboratory, and the OxCal calibration graph, is attached.

Lab ref	Context	Sample	Date	1σ	2σ
NZA-12234	ARC STR99 ctx 1730 (base of waterlogged palaeochannel sequence	Oak branch (sapwood)	7968 ±60	95.4% confidence 7050cal BC - 6690 cal BC	68.2% confidence 7040cal BC - 6780 cal BC

The date is considerably earlier than anticipated. Late Iron Age pottery was recovered from the upper part of the sequence and assessment of the pollen cores suggested that the whole sequence was most likely to be of later prehistoric date. The taphonomy of the channel sequence is complex and not particularly well-defined. Initial interpretation of the stratigraphy suggested that the branch might not be contemporary with the deposits in which it was embedded. The preliminary radiocarbon date suggests that the branch does indeed belong with the earliest deposits in the sequence.

If the environmental sequence is to be of any value for environmental reconstruction in fulfilment of the fieldwork event aims and landscape zone priorities, further radiocarbon dating will be required to confirm the mesolithic date suggested for the early part of the sequence, the late Iron Age date suggested by the artefactual evidence for the upper part, and the chronology of the intervening deposits.

Potential for Further Work

The environmental sequence has produced clear results of direct relevance to achieving Landscape Zone Priority 1 and Fieldwork Event Aims 2, 4 and 5 for the site, which are set out in section 2 of the main report, above. It would be desirable to establish more precisely the date of this sequence, in particular to date the major changes observed in the pollen record by radiometric means. There are samples of waterlogged remains from contexts 1726 and 1725 which may allow further radiocarbon dates to be obtained for these contexts. The most significant change in the pollen and insect evidence, between grassland and woodland recolonisation, occurs between these two contexts, which at present are thought most likely to be of late Iron Age or Roman date. Further dates may allow a more precise estimate of the date at which the field system appears to have fallen into disuse to be obtained. Statistical methods are now available which will allow an estimate of the date range chronological boundary between the two contexts to be made (eg Bronk Ramsey 1995).

Unfortunately, the period of time in which the transition is likely to have occurred (the 2nd century AD) corresponds to a very flat area in the calibration curve followed by a marked wiggle which means that material dating in calendar years from *c* AD 125 to 250 and perhaps later will produce very similar radiocarbon dates. The OxCal calibration package will simulate the kinds of radiocarbon dates one could expect for material of a given calendar age and a given error (here taken as ±60 years). It is possible to use these simulated dates to see how accurate an estimate of the date of the transition it may be possible to obtain. Simulations have been run assuming that one, two or three samples of similar or differing dates have been taken from each context (ie two, four and six determinations in total). The results, shown in Table 6-Table 11, suggest that even if two samples were taken from each context the date range would still be likely to be nearly three hundred years. If only two samples are taken the range may be much greater, possibly over 400 years. This level of accuracy is insufficient to address the question at issue which is whether the change in the landscape occurs roughly at the same as the field system goes out of use (in the 2nd century AD), or whether the change occurs nearer the end of the Roman period. Larger numbers of samples could reduce the range: six samples, for example, typically reduce the range more usefully to less than 200 years, and further increases in the number of samples produce smaller ranges.

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Table 6: simulation of two close dates

Calendar date for which C14 date estimated	Calibrated date range (95%) incorporating stratigraphic data	
AD 120	200 BC	AD 90
DATE OF TRANSITION	**130 BC**	**AD 290**
AD 130	AD 70	AD 350

Table 7: simulation of two more distant dates

Calendar date for which C14 date estimated	Calibrated date range (95%) incorporating stratigraphic data	
AD 70	0	AD 240
DATE OF TRANSITION	**AD 50**	**AD 330**
AD 160	AD 110	AD 390

Table 8: simulation of four close dates

Calendar date for which C14 date estimated	Calibrated date range (95%) incorporating stratigraphic data	
AD 110	40 BC	AD 210
AD 120	40 BC	AD 210
DATE OF TRANSITION	**AD 50**	**AD 290**
AD 130	AD 110	AD 390
AD 140	AD 110	AD 390

Table 9: simulation of four more distant dates

Calendar date for which C14 date estimated	Calibrated date range (95%) incorporating stratigraphic data	
AD 80	210 BC	AD 90
AD 120	0	AD 260
DATE OF TRANSITION	**AD 80**	**AD 350**
AD 140	AD 200	AD 440
AD 180	AD 180	AD 440

Table 10: simulation with six dates

Calendar date for which C14 date estimated	Calibrated date range (95%) incorporating stratigraphic data	
AD 70	170 BC	AD 120
AD 100	110 BC	AD 130
AD 120	90 BC	AD 140
DATE OF TRANSITION	**0**	**AD 190**
AD 140	AD 50	AD 320
AD 160	AD 80	AD 380
AD 190	AD 50	AD 320

Table 11: simulation with eight samples

Calendar date for which C14 date estimated	Calibrated date range (95%) incorporating stratigraphic data	
AD 70	60 BC	AD 150
AD 90	40 BC	AD 180
AD 100	110 BC	AD 140
AD 120	50 BC	AD 170
DATE OF TRANSITION	**AD 60**	**AD 220**
AD 140	AD 120	AD 390
AD 160	AD 90	AD 320
AD 170	AD 130	AD 400
AD 190	AD 120	AD 390

PS: CHAPEL MILL

- Plant remains

Assessment of Charcoal

by Dana Challinor

Introduction

During strip, map and sample excavation works at Chapel Mill, five samples were taken in order to sample two cremation pits in their entirety for the recovery of charred plant remains and cremated bone.

The samples were taken in accordance with the Fieldwork Event Aims for the site, which are set out in section 2 of the main report, above. The purpose in sampling was to examine the evidence for change and continuity in burial practices between the late Iron Age and the Roman period.

Methodology

All five samples were processed and assessed. The volume of soil processed ranged from 8 to 40 litres. The samples were processed by flotation in a modified Siraf-type machine, with the flots collected onto a 250µm mesh. The flots were air-dried and divided into fractions using a set of sieves. Fragments of charcoal were randomly extracted, fractured and examined in transverse section under a binocular microscope at x10 and x20 magnification. Fragments caught in the >2mm sized sieves were quantified as identifiable. In the case of large flots, a sample of *c* 20% was examined. The flots were also scanned for the presence of any other charred plant remains.

Quantification

A total of five samples was assessed, of which four produced identifiable wood charcoal (Table 10). Four taxa were identified - *Fraxinus excelsior* (ash), *Quercus* sp. (oak), *Alnus/Corylus* (alder/hazel) and a single fragment of coniferous wood, cf. *Pinus* sp. (pine). Ring-porous taxa are more easily recognisable at low magnification, although the identification of the diffuse porous taxa is tentative and the presence of coniferous wood will need to be confirmed. Pit 205 produced a huge quantity of charcoal in its upper fill, with an assemblage dominated by large pieces of *Fraxinus excelsior* and a very little *Quercus* charcoal. The lower fill of the same pit had a similar composition but produced fewer and smaller fragments of charcoal. Pit 213 contained a different assemblage which was dominated by *Alnus/Corylus* type charcoal. In this pit, the primary fill produced the greatest quantity of charcoal and the coniferous wood. Most of the flots also contained some charred amorphous tissue, possibly parenchymatous. Indeed, both flots from pit 205 produced some charred tubers and monocotyledonous rhizomes. A small amount of coal and modern material, such as insect remains and seeds, were present in all flots.

Provenance

There is a marked contrast in the selection of fuelwood for cremation in the two cremation pits at this site. However, there is no suggestion that more than a single burning event is represented in the composition of both pits, as all the assemblages appeared to be dominated by a single taxon (it is assumed that the *Alnus/Corylus* type charcoal is either one or the other as the fragments exhibited similar patterns). The presence of other taxa in the assemblages, although in smaller quantities, may relate to the position of the wood in the fire or it may represent the remains of artefacts placed on the funeral pyre. The preservation of the charcoal was very good and concentration was high, which is to be expected in a burial pit containing the remains of the original pyre. Sample 100 produced large fragments of ash charcoal with up to seven years growth, from which a clear pattern was discernible. This pattern was compatible with those produced by the practice of woodland management, but some of the large pieces clearly fitted together to form a single branch, suggesting that a single branch/tree had been used as fuel. It would be difficult to infer woodland management from a single tree, and no other flot produced fragments of a large enough size.

Conservation

The flots are in a stable condition and present no problems for long-term storage and archive.

Comparative material

The predominance of a single taxon in prehistoric cremation assemblages, indicating the use of a single tree or specifically selected species in ritual activities, has been noted at Radley Barrow Hills (Thompson 1999, 352) and at Rollright Stones (Straker 1988). It has also been suggested that the abundance of oak or ash in cremation deposits, compared to other species, is a result of the pyre structure, the timber from these trees providing the supports in a central position, less likely to have been totally reduced to ash (Gale 1997, 82). The presence of tubers in cremation deposits has been noted elsewhere (e.g. Jones 1978, 108; Carruthers 1992, 63; Moffett 1999, 245) and may have been linked to ritual activity. At Chapel Mill, the evidence is more convincing for the use of grass as tinder, since the small burnt rhizomes would not be edible. However, there has been little publication on Iron Age and Roman charcoal from cremation deposits (Gale 1997, 77), although other sites along the CTRL are likely to provide comparable data.

Potential for further work

The utility of further work on these samples is dependent upon obtaining better dating through which it would be possible to determine whether or not the cremation pits are contemporary. It is anticipated that minimal work could be carried out to confirm the predominance of a single taxon and the absence of other taxa. Certainly, it is not considered that full fragment counts would provide useful information. A full discussion of the charcoal from these cremation deposits will allow valuable comparisons to be made with other sites, both regionally and nationally.

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Table 10: Summary of charcoal from cremations

Sample details					**Flot details**		
Pit	**Context**	**Period**	**Sample no.**	**Sample size (l)**	**Flot size (ml)**	**Charcoal**	**Taxa**
205	203	LIA	100	38	1400	1000+	*Fraxinus excelsior* *Quercus* sp.
	204	LIA	101	40	150	++	*Fraxinus excelsior*
213	211	-	103	35	250	+++	*Alnus/Corylus* *Quercus* sp. cf. *Pinus* sp.
	212	-	104	38	300	++++	*Alnus/Corylus*

+ = 1-10; ++ = 11-50; +++ = 51-100; ++++ = 101-1000; 1000+ = >1000

PS: BOYS HALL BALANCING POND

- PLANT REMAINS

Assessment of the Charcoal

by Dana Challinor

Introduction

A total of five samples were taken during the excavation from the deposits of five cremation urns, which were sampled in their entirety for the recovery of charred plant remains and cremated bone. The cremation urns were dated to the late Iron Age and early Roman period. The purpose in sampling was to examine the evidence for change and continuity in burial practices between the late Iron Age and the Roman period.

Methodology

All five of the samples taken were processed and assessed. The volume of soil processed ranged from 1 litre to 7 litres. The samples were processed by flotation in a modified Siraf-type machine, with the flots collected onto a 250µm mesh. The flots were air-dried and divided into fractions using a set of sieves. Fragments of charcoal were randomly extracted, fractured and examined in transverse section under a binocular microscope at x10 and x20 magnification. Fragments caught in the >2mm sized sieves were quantified as identifiable. In the case of large flots, a sample of *circa* 20% was examined. The flots were also scanned for the presence of any other charred plant remains.

Quantification

A total of five samples was assessed, of which four produced identifiable wood charcoal (Table 12). Two taxa were identified - *Quercus* sp. (oak) and Maloideae (hawthorn, apple, pear etc.). Ring-porous taxa, and particularly *Quercus*, are easily recognisable at low magnification, although the identification of Maloideae is tentative. It appeared from the way in which the charcoal had fragmented that most of the flots contained only *Quercus* charcoal. Indeed, non-oak charcoal was noted in only one sample (context 39). No other charred plant remains were present.

Provenance

Most of the cremation urns were dated to the early Roman period and one was late Iron Age in date, although the close spacing of the features suggests that the cremation urns were more or less contemporaneous. Certainly, the evidence from the charcoal suggests continuity in burial practice. The preservation of the charcoal was reasonable, but the concentration was low, which is to be expected in burial urns where the bone has been carefully removed from the pyre remains. The charcoal fragments were too small in size to provide information on activities such as woodland management.

Conservation

The flots are in a stable condition and present no problems for long-term storage and archive.

Comparative material

The predominance of a single taxon in prehistoric cremation assemblages, indicating the use of a single tree or specifically selected species in ritual activities, has been noted at Radley Barrow Hills (Thompson 1999, 352) and at Rollright Stones (Straker 1988). It has also been suggested that the abundance of oak or ash in cremation deposits, compared to other species, is a result of the pyre structure; the timber from these trees providing the supports in a central position, less likely to have been totally reduced to ash (Gale 1997, 82). There has been little publication on Iron Age and Roman charcoal from cremation deposits (Gale 1997, 77) so there are few comparable sites, although other excavations along the CTRL are likely to provide a wealth of comparable material.

Potential for further work

Full analysis on these samples is unlikely to provide more information on the nature of their composition than was ascertained at the assessment. Nevertheless, a full discussion of the charcoal from these cremation deposits will allow valuable comparisons to be made with other sites, both regionally and nationally. Therefore, it is important that the results are included in any future publication.

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Table 12: Summary of charcoal from cremations

Sample details					**Flot details**		
Pit	**Context**	**Period**	**Sample no.**	**Sample size**	**Flot size (ml)**	**Charcoal**	**Taxa**
39	39	AD 70-200	1	1 litre	5	++	*Quercus* sp. Maloideae
	40	AD 70-200	2	1.1 kg	18.5	+++	*Quercus* sp.
43	45	LIA-AD 70	3	1 litre	3	+	*Quercus* sp.
	44	AD 70-200	4	7 litres	40	++	*Quercus* sp.

+ = 1-10; ++ = 11-50; +++ = 51-100

PS: HURST WOOD

- plant remains

Assessment of the Charcoal

by Dana Challinor

Introduction

A total of seventeen samples were taken during the excavation from the deposits of seven burnt pits and two cremation pits. Fourteen were from the excavation at Hurst Wood and three were from the watching brief at East of Newlands. The purpose in sampling was to examine the evidence for change and continuity in burial practices, and to consider the function of the pits.

Methodology

The samples were processed by flotation in a modified Siraf-type machine, with the flots collected onto a 250µm mesh. All seventeen of the samples taken were processed and assessed. The volume of soil processed ranged from 4 to 44 litres. The flots were air-dried and divided into fractions using a set of sieves. Fragments of charcoal were randomly extracted, fractured and examined in transverse section under a binocular microscope at x10 and x20 magnification. Fragments caught in the >2mm sized sieves were quantified as identifiable. In the case of large flots, a sample of *c* 20% was examined, although any quantification given is based on estimates of the entire flot. The flots were also scanned for the presence of any other charred plant remains.

Quantification

A total of seventeen samples were assessed, of which sixteen produced identifiable wood charcoal. Three taxa were provisionally identified - *Quercus* sp. (oak), *Alnus/Corylus* (alder/hazel) and Maloideae (hawthorn, apple, pear etc.). A possible fourth taxa was present in pits 104 and 122 at Hurst Wood; small round fragments with very large pores, wide rays and a distinctive ridged stem, which potentially could be charred rootwood. Superficially, the charcoal looked like *Clematis vitalba* (clematis), but could equally be *Vitis vinifera* (vine) as the growth rings were not wide enough for the full anatomical characteristics to be displayed. Further work is required to identify this charcoal.

The two middle-late Bronze Age cremation pits at East of Newlands differed in taxonomic composition (pit 3 containing *Quercus* and pit 7 containing *Alnus/Corylus*), but the concentration of charcoal was low in both (Table 1).

All of the burnt pits at Hurst Wood produced medium to large assemblages dominated by *Quercus*, some with smaller quantities of Maloideae and the possible rootwood fragments (Table 2).Other charred plant remains were scarce and limited to a single glume base from context 22 and a couple of weed seeds from pit 140. Context 143 produced two immature grape seeds, which appeared to be charred although further tests will be needed to confirm this. Roots and modern seeds were present in most flots.

Provenance

The apparent dominance of a single taxon in the cremation deposits at East of Newlands is appropriate for cremation burials of this period and provides evidence for the local practice of deliberate selection of fuelwood.

The fact that the burnt pits at Hurst Wood are also dominated by a single taxon suggests deliberate selection of fuelwood for a specific purpose. Consequently, it is possible that the function of these pits was for making charcoal. Preservation was generally very poor; most of the charcoal fragments were infused with sediment, hindering examination of the anatomical patterns. The preservation status of the grape seeds requires elucidation. If contemporary with the dated pits, it could suggest evidence for vine-growing on the site, although the dating of these features is very uncertain and there is little potential for further analysis.

Conservation

The flots are in a stable condition and present no problems for long-term storage.

Comparative Material

The predominance of a single taxon in prehistoric cremation assemblages, indicating the use of a single tree or specifically selected species in ritual activities, has been noted at Radley Barrow Hills (Thompson 1999, 352) and at Rollright Stones (Straker 1988). It has also been suggested that the abundance of oak or ash in cremation deposits, compared to other species, is a result of the pyre structure, the timber from these trees providing the supports in a central position, less likely to have been totally reduced to ash (Gale 1997, 82).

Traditional methods for making charcoal may shed light on the possiblility that the pits at Hurst Wood were used to make charcoal. Traditional charcoal burners do utilise shallow pits but the dimensions are generally larger than those at Hurst Wood (Edlin 1949, 160). Moreover, there was no real evidence for the layers of straw, grass or bracken traditionally used to shut out the air, although this may be a bias of preservation. Indeed, there are other taxa which make better charcoal than *Quercus*, such as *Frangula alnus* (alder buckthorn), *Alnus glutinosa* (alder) and *Salix* sp. (willow) (Edlin 1949, 165). In fact, *Quercus* has such good burning properties as a wood fuel, it hardly seems necessary to make it into charcoal, although this would depend upon the purpose of the charcoal burning.

Potential for Further Work

Detailed analysis on these samples is unlikely to contribute greatly to our understanding of the site. However, the *Clemtis/Vitis* charcoal should be properly identified and time should be allotted to an examination of the grape seeds. Radiocarbon dating of the grape seeds may be appropriate. The presence of this material suggests wine growing in the vicinity, and the suggested late Saxon date for this is of considerable interest as an indicator of when this was taking place. It would be of value to confirm both the species identification, and the radiocarbon date with the dating of a second sample. This would contribute to CTRL research priorities at Landscape Zone Level concerning changes in agricultural practice over time.

The results from the cremation pits provide a few further details of the practice of cremation which appear to conform to wider patterns along the CTRL and may thus make a small contribution to our understanding of burial practices.

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Table 1: East of Newlands: summary of charcoal

Sample details					**Flot details**		
FFeature	CContext	PPeriod	Ssample no.	SSample size (l)	FFlot size (ml)	**Charcoal**	**Taxa**
3	2	MBA	1	14	45	++	*Quercus* Stone plinth or machine base.
7	6	MBA	2	4	1	+	*Alnus/Corylus*

+ = 1-10; ++ = 11-50; +++ = 51-100; ++++ = 101-1000; 1000+ = >1000

Table 2: Hurst Wood: summary of charcoal

Sample details					**Flot details**		
FFeature	CContext	PPeriod	Ssample no.	SSample size (l)	FFlot size (ml)	**Charcoal**	**Taxa**
23	22	M-LIA	3	40	200	+++	*Quercus* sp.
27	28	M-LIA	1	30	25	++	*Quercus* sp.
	29	M-LIA	2	19	110	+++	*Quercus* sp. Maloideae
49	50	MIA	3	13	8	++	*Quercus* sp.
	51	MIA	4	4	45	+	*Quercus* sp.
	52	MIA	5	18	30	+	*Quercus* sp.
104	105	undated	7	8	220	+++	*Quercus* sp.
	106	undated	8	13	25	++	*Alnus/Corylus* *Quercus* sp. cf. *Clematis/Vitis*
	107	undated	9	30	40	++	*Quercus* sp. cf. *Clematis/Vitis*
102	103	undated	10	20	200	+++	*Quercus* sp. *Alnus/Corylus*
122	124	undated	11	20	700	1000+	*Quercus* sp.
	125	undated	12	21	110	+++	*Quercus* sp. cf. *Clematis/Vitis*
140	142	MIA	13	30	325	+++	Maloideae *Quercus* sp.
	143	MIA	14	44	60	++	Maloideae *Quercus* sp.

+ = 1-10; ++ = 11-50; +++ = 51-100; ++++ = 101-1000; 1000+ = >1000

- dating

Assessment of the Radiocarbon Dates

Introduction

Single samples from two burnt pits at Hurst Wood were submitted for radiocarbon dating. The samples were taken from pits which contrasted in size, form and location as far as was possible given the need to obtain datable sample. They were intended to provide an indication of the date, and hopefully the range of dates of the burnt pits on this site.

Method

The sample was analysed using an accelarator mass spectrometer to determine its conventional radiocarbon age, percent modern and $\Delta^{14}C$ based on the NBS-I oxalic acid standard, and the $\delta^{13}C$ was measured using a stable isotope mass spectrometer.

Material and Context

The two samples consisted of fragments of burnt plant material. From amongst the fragments of wood charcoal, two samples from small twigs or stems were selected, one probably Maloideae *(hawthorn, apple, pear etc.) and the other probably* Clematis vitalba *(clematis) or* Vitis vinifera *(vine). The selection of twigs and stems ensures that the date obtained should be close to the date of death of the plant. The need to select material of this kind rather than unidentified wood charcoal, severely restricted the range of contexts which could be dated, and the original intention to date pits which differed in size, shape and location, and which thus might be of differing date, could not all be fulfilled. One sample was eventually taken from context 143, the upper fill of pit 140, a flat-based, rectangular burnt pit. The other was from context 107, the primary fill of pit 104, a concave-based circular pit. Although contrasting in shape, both are amongst the larger pits on the site, and both lie at the northern end of the site. The upper fill of pit 104 contained a few fragments of fired clay, whilst pit 143 also contained a few sherds of middle-late Iron Age pottery, two pieces of flint and what may be a grape pip. The dates may thus provide a test of the extent to which these finds are likely to be residual.*

Results

The sample results are tabulated below.

Table 3: Radiocarbon results obtained during the assessment

Lab ref	Context	Sample	Date	1σ	2σ	Comment
NZA-12274	ARC HWD98 ctx 107 (sample 9)	Burnt plant material (clematis vitalba)	1076±60	895-1017 cal AD	820-843 cal AD plus 862-1035 cal AD	From charcoal-rich fill of burnt, circular, concave pit 104
NZA-12284	ARC HWD98 ctx 143 (sample 14)	Burnt plant material (maloidiae)	2742 ±45	922-828 cal BC	993-810 cal BC	From charcoal-rich fill of burnt, rectangular, flat-based pit 140

Widely divergent (Bronze Age and Late Saxon) radiocarbon dates have been obtained, indicating either that similar activities were carried out on the site over a very long period of time, or more likely, that the pits contain residual organic material as well as artefacts. If the former is true, all of the burnt features would need to be radiocarbon dated in order to examine their chronology. If the latter is true, further radiocarbon results would not resolve the dating problem at all. Since in either case the function of the pits will remain uncertain, no further dating is recommended.

There would be some intrinsic value in confirming the Saxon date of the *clematis vitalba* or *Vitis vinifera* charcoal from pit 104 and/ or the grape pips from the pit 143, with another radiocarbon date, to establish the date of the possible vine cultivation.

No radiocarbon dating is recommended for other contexts in this group of sites as the features are either sufficiently dated by artefactual evidence or show evidence for a high level of residual material

PS: SE OF EYHORNE ST

- plant remains

Charred Plant Remains

by Ruth Pelling

Introduction

Samples were recovered during excavation works for the recovery of charred plant remains and charcoal. Dated deposits are either from the early Neolithic to the early Bronze Age or are Iron Age. A total of 34 samples were processed by bulk water flotation and the flots collected onto 250 μm mesh sieves. The volume of deposit processed ranged from 10 to 40 litres. Flots were air dried slowly before being submitted for assessment.

The recovery and study of the charred plant remains was undertaken in accordance with the Fieldwork Event Aims (see Section 2.2), in particular Aim 1.

The samples were taken in order to address questions concerning the diet and cereal economy of both the Neolithic/early Bronze Age and the Iron Age settlements. In addition a spot find of a *Malus sylvestris* (crab apple) core was recovered during the excavation from a late Neolithic context (18, pit 19).

Methodology

The sampling programme was intended to recover material from the full range of feature type and date excavated. Samples were taken from ditches, pits, layers, post-holes and tree-throw holes. Each flot was assessed by scanning under a binocular microscope at x10 magnification. Any seeds or chaff noted were provisionally identified and an estimate of abundance made. Random fragments of charcoal were fractured and examined in transverse section at x10 and x20 magnification.

Quantification

A total of 9 Neolithic/Early Bronze Age flots and 15 Iron Age flots were assessed. A further 10 flots of unknown date were also assessed.

Of the early prehistoric samples, two contained no charred plant remains and two contained charcoal only. Cereal remains were only present in small numbers (less than ten grains) and no chaff was noted. Four samples (1-4) produced fragments of *Corylus avellana* (hazel) nut-shell, including very large amounts in sample 1. These samples also contained moderate to abundant quantities of charcoal, including *Quercus* sp. (oak) and *Corylus/Alnus* sp. (hazel/alder). The cereal remains noted included *Hordeum vulgare* (barley) and hulled wheats including *Triticum spelta* (spelt wheat). The *Triticum spelta* in pit 23 is likely to be contamination from the later prehistoric deposits as it is not known in Britain from before the middle Bronze Age.

Of the 15 Iron Age samples charred remains were abundant in six, including over 1000 grains in at least two samples. Grain appears to dominate these deposits although abundant chaff and weed seeds were also noted. The cereal remains noted were dominated by *Hordeum vulgare* (barley) and *Triticum spelta* (spelt wheat), although *Triticum dicoccum* (emmer wheat), and *Avena* sp. (oats) were also recorded. Occasional additional plant items included *Brassica/Sinapis* sp. seeds, which may be derived from cultivated brassicas (cabbage, mustard etc.), a bracken frond, hazel nut shell fragments and hawthorn stones. Noticeable amongst the weeds were large quantities of *Bromus* subsect *Eubromus* (brome grass) seeds in samples 24 and 25. The preservation of remains in these samples is exceptionally good. Three samples contained fewer but still useful quantities of grain chaff and weeds. The remaining six samples contained little or no cereal grain and no chaff.

The undated samples produced very limited remains. No seeds or chaff were present in seven samples, while two samples contained occasional *Corylus avellana* (hazel-nut) shell fragments only and one sample (32) contained a single *Hordeum vulgare* (barley) grain. Charcoal was generally rare but more frequent in sample 8, consisting entirely of *Quercus* sp. (oak).

Table 6.1.1: Summary of plant remains in undated samples

Sample	Context	Feature	Period	Sample size (l)	Flot size (ml)	Grain	Id-Grain	Chaff	Id-Chaff	Weed seeds	Other	Id-Other	Charcoal	Comments
8	90	Pit		10	150	0		0		0	0		+++	
9	99	Ditch		20	20	0		0		0	0		+	Worm capsules
15	114	Pit	PR?	10	10	0		0		0	+	Corylus	+	
16	127	Pit		16	10	0		0		0	0		+	Modern insects worm capsul
20	138			30	10	0		0		0	0		+	
21	144	Ditch		7+10	10	0		0		0	+	Corylus	+	Rooty
22	146	Ditch		20	10	0		0		0	0		+	Roots, sand, coal
32	205	Pit		40	10	+	Hor	0		0	0		++	
33	189	Tree	PR?	40	10	0		0		0	0		0	
34	215	Pit		40	10	0		0		0	0		+	

Table 6.1.2: Summary of plant remains in Neolithic and Early Bronze Age samples

Sample	Context	Feature	Period	Sample size (l)	Flot size (ml)	Grain	Id-Grain	Chaff	Id-Chaff	Weed seeds	Other	Id-Other	Charcoal	Comments
1	22	Pit 23	LNE;BA	40	200	0		0		0	++++	Corylus	++++	pit
2	24	Pit 23	LNE;BA	26	50	+	T.spt/dic T.spt Hor	0		0	++	Corylus	++	small pit
3	61	Pit 60	LNE;BA	40	100	+	indet	0		+	+	Corylus	++	pit
4	62	Pit 60	LNEBA	16	150	+	Hor	0		0	++	Corylus	++	pit
5	71	Posthole 70	LNE?	10	10	0		0		0	0		+	Roots
6	72	Posthole 70	LNE?	10	10	0		0		0	0		+	charcoal flecks
7	73	Postpipe in posthole 70	LNE?	32	10	0		0		0	0		0	Occ. modern weeds
12	102	Pit 100	E-MNE	29	20	+	T.spt Hor	0		0	0		++	
13	103	Pit 100	E-MNE	20	10	0		0		0	0		0	

Table 6.1.3: Summary of plant remains in Iron Age samples

Sample	Context	Feature	Period	Sample size (l)	Flot size (ml)	Grain	Id-Grain	Chaff	Id-Chaff	Weed seeds	Other	Id-Other	Charcoal	Comments
11	76	Hollow 35/74	E-MIA	40	10	+	T.sp	0		0	0		+	
17	123	Hollow 124	E-MIA	10	10	0		0		+	0		+	
18	133	Ditch 135	E-MIA	36	20	+	Hor indet	0		0	0		+	Rooty
19	134	Ditch 135	E-MIA	40	50	+	Indet	0		0	0		+	Modern weeds, coal
23	11	Hollow 35/74	E-MIA	40	20	+	Hor	0		+	+	Corylus	++	
24	172	Pit 170	E-MIA	40	400	1000+	Hor T.spt T.dic Av	++	T.spt Av (wild)	++++	+	Brassica	+	Grain rich
25	173	Pit 170	E-MIA	40	300	++++	Hor T.spt T.dic	++	T.spt/dic Hor	+++	+	Crataegus	+	Grain rich
26	180	Pit 170	E-MIA	40	150	++++	Hor T.spt Av	+	T.spt/dic	++++	0		++	Grain rich
27	164	Pit 161	E-MIA	20	1500	1000+	Hor T.spt Av T.dic	+++	T.spt T.dic Hor	+++	+	Bracken	+	grain rich, less bromus
28	165	Pit 161	E-MIA	40	150	++++	Hor T.spt T.dic Av	++	T.spt/dic	+++	0		0	Grain rich
29	167	Pit 161	E-MIA	40	100	++++	Hor T.spt T.dic Av	++	T.spt T.dic	+++	+	Brassica	0	Grain rich
30	178	Pit 175	E-MIA	40	300	+++	Hor T.spt T.dic	+	T.spt	++	+	Vic/Pis Rosa?	++	preservation excellent
31	222	Pit 226	LIA	40	50	+++	Hor T.spt	+	T.spt	++	0		+	
35	223	Pit 226	LIA	40	50	+++	T.spt T.dic Hor Av	+	T.spt/dic	+	0		0	
36	225	Pit 226	LIA	14	10	++	Hor T.spt/dic Av	0		+	0		+	

Hor = Hordeum; T.dic = Triticum dicoccum; T.sp = Triticum sp.; Vic/Pis = Vicia/Pisum sp.
T.spt = Triticum spelta; T.spt/dic = T. spelta/dicoccum; Av = Avena sp.

Provenance

The hazelnut rich early prehistoric deposits were derived from pits (23 and 60), and also contained frequent charcoal. It is likely that they represent the redeposited remains of fires, including the fuel. The fact that the hazelnut is represented by broken shell fragments rather than whole nuts suggests it to be derived from food residues, rather than entering the deposits attached to fuel wood.

The grain rich Iron Age samples are all derived from pits (161 and 170). It must therefore be considered that they are derived from stored product, perhaps recovered more or less *in-situ*, although the mixture of several types of cereal grain might contradict this. The presence of glume bases and weeds suggest that the grain had not been fully processed. The ditch deposits contained little or no material, and the remains that were present are likely to be no more than redeposited background scatters or 'noise', present across the site.

Conservation

The flots are in a stable condition and can be archived in their present state for long-term storage.

Samples that have been demonstrated to have no potential could be discarded.

Comparative Material

Hazelnut shell tends to be the most commonly recovered plant of economic importance found within Neolithic and Early Bronze Age deposits in Britain. Crab apple is also recorded on a number of sites throughout the British Isles (see Moffett *et al.* 1989). Hazelnuts clearly played an imported role in a Neolithic-early Bronze Age diet which must have still included a large wild element despite the introduction of agricultural technology at the beginning of the Neolithic. The Eyhorne Street samples do not suggest that cereal agriculture played a significant role and these results will be important for wider comparative analysis, although it is too early to establish if agriculture was important elsewhere in Kent at this time. Within the CTRL project Neolithic material has been identified from the White Horse Stone group and Tutt Hill. There are no known published records of material of this date from within Kent.

Spelt wheat and barley are the principal cereal species known in Southern Britain from the Iron Age (Greig 1991). Emmer wheat is less frequently recorded although there is some evidence of its cultivation from Late Iron Age sites. Within Kent a deposit of roughly equal proportions of emmer and spelt were recovered from a late Iron Age pit at Wilmington (Hillman 1982). Large deposits of emmer wheat have also been recovered from late Iron Age pits at Hascombe, Surrey, (Murphy 1977, 82-84), and Ham Hill, Somerset (Ede 1991). The late Iron Age deposits so far assessed from the within the Channel Rail Link project have not produced comparable results in terms of scale, although both spelt wheat and emmer wheat were represented within contemporary deposits at Thurnham Villa and South of Snarkhurst Wood. The Roman deposits from Thurnham Villa suggest a similar agricultural tradition was continuing into the Romano-British period. The evidence from within Kent is therefore suggesting that despite the widespread cultivation of spelt wheat, emmer wheat was also being cultivated within the Iron Age and Romano-British period. It is not clear whether this represents a continuation from the Bronze Age or a reintroduction within the Iron Age.

Potential for Further Work

Given the limited range of plant remains from Neolithic-Bronze Age and from Iron Age deposits within the region the present samples have considerable potential for increasing our existing dataset for the area. The Neolithic-Bronze Age samples are unlikely to extend the known species list for the period but will provide valuable data for the region. The Iron Age samples are exceptionally rich and therefore offer great potential for investigation of the role of specific cereals, such as emmer wheat and oats, as well as broader agricultural trends at both the site and within the region. Emmer wheat is now known from the Late Iron Age, but has not been widely recorded and it has not been established if it is present as a relic of earlier agricultural systems or is a reintroduction. It is therefore important to fully record (species identification and quantification) these present samples and extend the existing dataset. Likewise, oats are recorded in significant numbers from some sites in this period, but it is not clear how much it was cultivated or how much it appears as a weed. The late Iron Age deposits may represent *in-situ* stored products. In addition to providing valuable information about agricultural systems at the site, there is also therefore the potential to look at storage patterns and possible structured deposition in a ritual context. This data will be of particular value for comparison with the Iron Age settlement at White Horse Stone. The analysis of some charcoal from Neolithic/Bronze Age deposits may shed light on the woodland landscape in the period and provide some information about woodland management. The charcoal in the Iron Age period is very limited but its identification could shed light on what species was used for fuel. This would involve species identification and quantification.

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