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Pollen analysis of sediment fills from well 11010 at Thurnham Roman Villa, Kent (ARC THM 98)

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1 INTRODUCTION

During excavation, three monolith samples were taken from the sediment fills of a Roman well (11010). After preliminary pollen analysis of these sequences the profile from sample 10305 through contexts 11984 and 11516 was found to have the best pollen preservation and was selected for a more detailed analysis.

The principal aims of this pollen study were to provide data for reconstructing the local vegetation environment of the villa in conjunction with study of plant macrofossils and insects also recovered from this waterlogged sediment sequence. The organic deposits infilling the well have been dated to the late Roman period and, as such, spans a period of changing use and occupation at the villa. It was anticipated that the pollen analysis would significantly contribute to the evidence for a period of woodland regeneration within the vicinity of the well throughout this period. The taphonomy of pollen recovered from well fills is, however, complex (Dimbleby 1985; Scaife 1999) and a further aim was to examine the character of the assemblage to provide new data from one of the few such features which have been studied.

2 POLLEN METHOD

Samples comprised organic detritus and samples of 1ml. volume which were taken at intervals of 20mm throughout 340mm of this profile. These 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 greater than 400 grains per level of dry land taxa (the pollen sum) were made for each level plus marsh taxa and spores. Absolute pollen frequencies were calculated using added exotics (*Lycopodium* spores) to known volumes of sample (Stockmarr 1971). Data obtained are presented in standard pollen diagram form (figures 1.a and 1.b). Percentages were 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 (1991) for plant descriptions.

3 THE POLLEN DATA

Initially, pollen analysis was carried out on three monolith profiles taken from the well (11010). Two of the three profiles produced useful information with monolith sample 10305 proving to have better pollen preservation and higher absolute pollen frequencies being on average 115,000 grains/ml. The upper levels of the well fills were devoid of pollen due to the fluctuating water table and oxidation. Profile 10305, by comparison, comprises waterlogged humic detritus with excellent preservation of pollen and other plant macrofossils and insects. A total of 69 pollen and spore taxa was recorded from the eighteen levels examined. Preliminary analysis of this (Scaife 1999) tentatively suggested that two pollen assemblage zones could be recognised with greater numbers of (Poaceae) grass pollen in the upper levels. However, full analysis at a closer sampling interval, with greater statistical validity, has demonstrated that the profile is largely homogeneous throughout with only minor differences recorded between the upper and lower levels (discussed below). As a result pollen zones have not been assigned to the differing levels. The overall vegetational characteristics are described as follows (see figures 1.a. and 1.b.).

Trees: These are dominant, forming 75-85% of total pollen. Arboreal pollen is dominated by *Fraxinus* (ash; to 72%). There is some reduction towards the top of the profile although percentages remain high (40-50%). Other trees include *Quercus* (oak; to 18%), *Alnus* (alder; 6%) and *Betula* (birch; to 7%). There are sporadic occurrences of *Pinus* (pine), *Ulmus* (elm), *Fagus sylvatica* (beech) and *Ilex aquifolium* (holly). The latter occurs only in the lower part for the profile.

Shrubs: Shrubs form *c.*15% of total pollen and are dominated by *Corylus avellana* type (here hazel; to 24%). There are occasional occurrences of *Salix* (willow), *Sorbus/Crataegus* type (whitebeam and hawthorn), *Prunus/Malus* type (wild cherry and apple), *Cornus cf. sanguinea* (dogwood), *Sambucus* (elderberry) and *Viburnum* (wayfaring tree). There are greater numbers of *Cornus, Prunus* type in the lower part of the profile.

Herbs: Although there is a relatively diverse assemblage of taxa, overall percentages are small (to a max. of *c.*20% total pollen). Poaceae (grasses) are most important (av. 5-10%). Other herbs occur only sporadically. These include taxa from a range of habitats including woodland (e.g. *Mercurialis perennis, Circaea*), grassland (Poaceae, *Plantago lanceolata*, *Rumex* spp., *Scabiosa*, Asteraceae type) and arable and disturbed ground (*Sinapis* type, Chenopodiaceae, *Convolvulus*, *Plantago major*). *Cannabis* type (including hop) is present in the lower half of the profile. Cereal type pollen is sparse with only occasional occurrences. 'Large Poaceae' are probably not cereal type but taxa such as *Glyceria fluitans* which have a size greater than >45-50u but without the thick exine, distinct columellae and robust pore and annulus of cereal grains.

Marsh/wetland: There are very few aquatic or marsh elements in spite of this being a well feature. Cyperaceae (sedges), *Typha angustifolia/Sparganium* (bur reed and reed mace) occur sporadically. cf. *Lemna* (duckweed) is present especially at 12cm.

Spores: There are only small numbers of spores of ferns with occasional *Pteridium aquilinum* (bracken), *Polypodium vulgare* (common polypody fern) and *Dryopteris* (monolete) type (typical ferns). Small numbers of *Sphagnum* (bog moss) are present.

4 DISCUSSION; THE LATE ROMANO-BRITISH HABITAT OF THURNHAM VILLA

The taphonomy of pollen incorporated in well sediments is complex and the data may be difficult to interpret compared with naturally accumulating fen or bog peat sequences. As a consequence there have been few pollen studies in the past with which to compare the data obtained from the Thurnham well. Exceptions are the studies of Roman wells by Barber (1976) at Portchester Castle, Hants., Pomeroy Wood, Honiton, Devon (Scaife 1999), Farmoor, Oxfordshire (Lambrick and Robinson 1979) and at Aston Clinton, Bucks. (Scaife forthcoming in R. Masefield) and small watering holes at Peterborough, Cambs. (Scaife 1994). Certainly, there have been few pollen studies of such narrow, stone or timber lined, true wells. However, in spite of the taphonomic problems associated with these features, these studies demonstrate that useful palaeo-habitat information can be obtained, especially as part of an interdisciplinary study carried out in conjunction with insect remains and plant macrofossils.

The pollen and spores contained in the sediments of such wells may come from a variety of sources; that is, derived via 'normal' airborne means or insect vectors as well as pollen from secondary sources including human and animal faeces, offal, domestic waste including floor coverings and food remains. All of the latter may contain considerable quantities of pollen which can strongly bias pollen assemblages in occupation areas (Greig 1982) and especially if such material was dumped in the well. The presence of such secondary pollen may also complicate the interpretation of the pollen spectra since the possible dominance of this secondary element may have masked 'naturally' derived items from which interpretations of the local environment can be made. All of these elements are likely to derive from areas very close to the site and may provide information on local habitats and domestic utilisation of plant resources.

At Thurnham, pollen has been preserved in the waterlogged levels of the well fills. Profile 10302 through a deposit sealing the obviously waterlogged fills and the upper levels of profile 10303 were devoid of pollen. Microscopic plant debris remaining in these sediments was highly oxidised and it is likely that fluctuating ground water table and drying out of the sediments has degraded and/or destroyed the pollen. Profile 10305 (examined here) remained much wetter and consequently, pollen preservation is good and absolute pollen frequencies are much higher.

Pollen assemblages obtained from other Romano-British well sediments have all shown paucity of tree and shrub pollen and a marked dominance and diversity of herbs. This is in a large part due to two factors. That is, the presence of much autochthonous material (as noted above) which was dumped into the well and second, the agricultural and open habitats which might be expected in proximity to the habitation. The most important aspect of this study is the remarkably high values of tree pollen and especially *Fraxinus excelsior* (ash) pollen. This taxon is usually greatly under represented in pollen spectra (Andersen 1970, 1973) and such values are in any circumstances exceptional. This also clearly relates to the presence of ash seeds which have also been recovered from these well fills (Oxford Report 31st August 1999). It would appear, therefore, that ash trees were growing local to the site and most probably overhanging the well. It has also been considered that these organic remains may be dumped material given the homogeneity of the pollen spectra but, however it seems more probable that the organic build up was solely from accumulating leaf debris. Sporadic occurrences of holly (*Ilex aquifolium*) and beech (*Fagus sylvatica*) and their poor representation in pollen spectra suggest that these trees were also present and possibly important in proximity to the site. Dogwood (*Cornus sanguinea*), apple or wild cherry (*Prunus/Malus* type), willow (*Salix*) and elderberry (*Sambucus*) are likely to have formed areas of scrub, as open woodland under-storey or as constituents of hedgerows. For pollen representation, these would have to have been growing in proximity to the site/villa. The latter (elderberry) is especially associated with areas of human habitation.

The broader regional vegetation is represented by oak (*Quercus* (*cf. robur*), elm (*Ulmus*) and hazel (*Corylus avellana*) from local and regional woodland growth. Alder (*Alnus glutinosa*) is present throughout but with values that suggest it represents growth and transport from some distance, perhaps from valley bottom alder carr. Values of these non-local elements will, however have been suppressed by the on-site importance of ash.

Compared with the other well studies noted (Barber 1976; Lambrick and Robinson 1979; Scaife 1999) there are remarkably few herbs with notably little cereal pollen and associated weeds of human disturbance and agriculture (segetals/ruderals). Grasses (Poaceae) and taxa of pastoral habitat are in evidence (ribwort plantain, scabious, dandelion types, buttercups etc., docks) whilst small quantities of meadowsweet (*Filipendula ulmaria*), comfrey (*Symphytum*), sedges (Cyperaceae) and bur reed/reed mace (*Sparganium* type) are indicative of some wetter meadow soils and wet ditches or ponds. One of the original aims was to examine the character of arable cultivation at Thurnham. From the substantial quantities of charred grain it is clear that cereals were being used. However, it is now recognised that typical crops such as spelt wheat (*Triticum spelta* L.) was in many cases grown on other farms, transported and stored for consumption elsewhere (Jones 1981). This involved crop processing at the consumer site and with the threshing and winnowing this typically liberated cereal (and associated arable weed) pollen trapped in the ears of grain (Robinson and Hubbard 1979). This has been suggested as a common source of arable pollen in various types of archaeological contexts including wells (Lambrick and Robinson 1979) and latrines the latter where pollen is ingested, and is little influenced by the digestive system. Here, this component is surprisingly small with only small numbers of cereal pollen and possible segetal weeds. A single record of Mawes worm (*Ascaris*) is present with cyst at 30cm. This would suggest that arable cropping, cereal processing and overall use of the villa was negligible at the time of sediment accumulation during the late Roman period. Seed capsules of flax (*Linum usitatissimum*) have been found in the well suggesting that flax may have been a local crop. Pollen evidence for this was not forthcoming but, however, this is not surprising since its pollen is one of the most poorly represented of crop plants, being rare even in flax retting pits (Scaife unpublished).

Overall, the exceptional representation of tree and shrub pollen, especially that of ash, suggests a locally wooded habitat. There is a corresponding and surprising lack of herbs and especially a lack of evidence for arable cropping. This also contrasts with the rich assemblages of charred cereal remains from earlier phases of the villa. It can only be concluded that the organic sediments filling the well represent build up of leaf litter and other plant debris from over-hanging trees which colonised the site during the later phase of villa use in the late 3rd and 4th centuries.

5 SUMMARY AND CONCLUSIONS

Pollen analysis has been carried out on the sediment fills of well 11010 and has produced assemblages dominated by tree and shrub pollen. Ash is notably important and attains unparalleled high percentage values. This must relate to very local ash woodland growing above the well site. The evidence of woodland would seem at odds with the view that this was an active, Roman Villa pursuing agriculture. However, since this sequence comes from the top of the well and is of late Romano-British age, this may be evidence of woodland regeneration nearing the final periods of activity at the villa. Other woodland elements are also present and include oak and hazel which is perhaps the regional woodland of drier soils whereas records of alder will have come from wetter zones such as valley carr woodland and trees fringing river systems. Other local and near local elements are also evidence with beech, holly, cherry or apple and dogwood. There is the possibility that these may have been either elements of woodland regeneration and/or hedgerow constituents. The lesser quantities of herb pollen indicate grassland component rather than cereal cultivation.

Finally, it can be noted that there have been few previous studies of pollen obtained from the sediment fills of wells. Whilst it is clear from this study that their is potential for providing information on the local vegetation, the taphonomy is not well understood. This study adds to the database of such studies and its importance lies in the markedly different pollen assemblages observed compared with previous analyses.

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APPENDIX 1: ROMAN WELL STRATIGRAPHY

Three monolith profiles were taken from the sediment fills of the Roman well (11010). These were taken from two sections 10590 (columns 10302, 10303) and 10591 (column 10353). These were sub-sampled for pollen analysis (Scaife section **) and the stratigraphy of the three profiles has been described. Colours are taken from a standard Munsell chart. It should be noted that the colours given for the humic materials are largely dark grey to black. These are likely to be the post oxidation state which would have occurred rapidly after excavation.

Section 10590; Column 10302

This is the uppermost column of the sequence. Overall, the sediments comprise highly detrital organic material with occasional chalk and flint fragments and clasts of a paler silt. The upper-most 60mm is slightly darker and more humified than below which is slightly greyer. With the exception of occasional charcoal specks, there were no obvious human artefacts.

Depth mm.	
0 – 60	Very dark grey to black (5Y 2.5/1 to 3/1), highly humified detrital organic matter containing some fine silt and clay. No organic structure present. Contains small clasts of chalk (to 1mm) and occasional larger fragments to 10mm.
60 – 210	Dark grey highly humic silt (5YR 3/1) containing occasional paler grey clasts of fine silt (esp. 165-173mm) (5Y 4/1 to 5/1). Chalk fragments (to 10mm) are present (150-160mm) and angular to sub-rounded flints to 30mm at 90-110 and 1180-200mm. There is no obvious vegetative structure. Occasional charcoal fragments (1-2mm) were observed.

Section 10590; Column 10303

This profile contains very substantial fragments of wood with occasional twigs set in a matrix of dark, highly humified detrital organic (peaty) matter (5Y 2.5/1 or 2.5Y 3/1).

Depth mm	
O – 50	Very dark grey/black humic silt with no apparent vegetative structures.
500 – 330	As above but containing substantial wood fragments at 50 – 120mm; 200 – 240 mm and 260 – 330mm.
330 – 360	Black, highly humified, structureless detrital peat (10YR 2/1) containing occasional root fragments and a small twig and chalk fragment.

Section 10591: Column 103053; Context 11984.

Overall, this column contains substantially more fine twigs and comminuted mollusca than the other profiles described. The matrix is similar consisting of very dark (oxidised) detrital material with little fine structure.

Depth mm	
0 – 60	Very dark brown detrital peat/humus (10YR 2/2 to black 10YR 2/1). Contains occasional small twigs.
60 – 145	Woody detrital peat/humus. Very dark (10YR 2/2 to10YR 2/1). Containing moss fragments and twigs. Occasional grey inclusions to 7mm (10YR 5/1).
145 - 160	Silty layer. Humic, dark grey (10YR 4/1).
160 – 230	Very dark detrital peat/humus containing wood fragments and small twigs. Comminuted shell at 180-190; 260-270 and 290.
230 - 240	As above but with slightly more silt.