Report on pollen from Elms Farm, (Heybridge) Essex

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SUMMARY

Some of the pollen samples collected from wells and other waterlogged features contained plenty of well-preserved pollen, providing useful information about the circumstances of the site. The main feature of these pollen floras was of traditional hay meadow plants, suggesting that such hay meadows existed along the valley of the river Chelmer. There were also weeds, which might have been part of the background, or could show that the wells became filled up when areas were abandoned. Evidence of crops such as cereals and peas were often accompanied by parasitic worm ova, showing that the presumably disused wells were probably used for the disposal of sewage. A find of grape pollen could represent vineyards. The pollen evidence largely corresponds to that from the waterlogged seeds and beetle remains from these features.

INTRODUCTION

The site (TL 847082) lies on a gravel terrace in a meander of the river Chelmer in Essex (Clarke and Atkinson 1993). Excavations in 1993 and 1994-5 revealed occupation starting in the late pre-Roman Iron Age, continuing through the Roman period, with some early Saxon occupation as well (Atkinson 1995). The pollen in the samples was assessed (Greig 1996), and some further analysis has been done for this report.

SAMPLES

Twelve monolith samples of ca 50 cm each and two further samples were collected for pollen analysis, in parallel with studies of other biological material such as waterlogged plant remains and beetles.

The material was collected in the field by Peter Boyer as a series of monoliths, supported by detailed environmental sample record sheets and sketch plans of the sections. Most of the material is from waterlogged features such as ditches, wells and palaeochannels. Additionally, there are two possible buried soil surfaces. Pat Wiltshire visited the excavations to advise on sampling strategy. The writer did not see the site.

Laboratory work

The monoliths were sub-sampled in the laboratory to cover the main archaeological contexts, amounts of about 1 cm^3 being collected from the centre of each core with a cork borer.

Pollen preparation was done by disaggregating the material in 10% sodium hydroxide and

sieving through a 70 μm mesh to remove coarser material. Mineral material was separated out by swirling the suspension on a 15 cm watchglass and pouring off the lighter organic material, leaving the mineral part behind. The remaining fine suspension was sieved on a 10 μm mesh to remove clay, fine silt and fine organic particles, leaving pollen in the sieve. Acetolysis was done to remove cellulose and related material, and the swirl separation and fine sieving was repeated, because it is usually necessary. The remaining material was stained with safranin and mounted in glycerin jelly on to microscope slides for counting. The pollen was counted using a Leitz Dialux microscope, and identifications were checked with the writer's own pollen reference collection. The actual pollen counts vary according to the preservation, ranging from 28 to 389 pollen grains. Where worthwhile, some slides were also scanned for extra taxa, the presence of which is recorded by a +. In addition to pollen, spores and parasite ova were counted, and the presence of diatoms noted.

Results

The pollen results represent those obtained for the assessment (Greig 1996) with further samples counted, more counts and scans on some of the better samples assessed, and more work on detailed identification and interpretation. The analysis work was aimed at providing the maximum archaeologically useful information, and pollen slides were scanned for extra taxa rather than counting very large amounts of pollen, since the percentages are not very important for a series of discrete samples, as opposed to a succession. The pollen results are listed from oldest to youngest in Tables 1 and 2, with nomenclature partly according to Bennett (1994) and order according to Kent (1992). The results range from rather poor to excellent. Pollen analysis is good at detecting particular plants which have a good pollen record, are fairly exactly identifiable, and are characteristic of a particular kind of vegetation, and is especially useful in supplementing information from macrofossils because the records from trees, grasses, cereals and certain herbs such as plantains are generally better from pollen than from seeds. On the zoological side, parasite ova are detected, which provide indications of the presence of sewage. The results are discussed with reference to the seed report (Murphy 2000) and beetle results (Robinson 2000) to understand their full significance, and are compared with other well faunas and floras (Greig 1988, 1997) and with results on archaeological evidence of meadows (Greig 1984). The pollen results provide the evidence for distinct types of vegetation (such as grasslands, weeds, crops woodlands and wetlands), and this evidence is discussed in this order, feature by feature. The results are then

interpreted in terms of what they mean for the interpretation of the site as a whole, and in a wider regional context.

Mid 1st - early 2nd century well 13883, phase IIIa, Area D (Table 1)

<1073> Contexts 18200 (top and bottom of layer), 18237, 18216 (lowest deposits in well). Pollen preservation very good, except 18216

Grassland; the pollen spectra are dominated by Poaceae (grass) pollen, together with the meadow plants *Plantago lanceolata* (ribwort plantain), *Centaurea nigra* (knapweed), *Trifolium pratense* (red clover) and S*anguisorba officinalis* (greater burnet). Pollen of *Filipendula* (meadowsweet) and *Caltha* (kingcup) could represent damp meadowland. The Lactuceae pollen record is also likely to represent grassland since most members of this group of composites are grassland plants, such as *Leontodon* sp (hawkbit), a typical grassland plant which was found among the macrofossils (Murphy 2000). The grassland shown here could have either been growing close enough to the well for the seeds and pollen to have been blown into the well with the wind, or alternatively whole grassy material (or its remains as dung) could have been put into the well. This last interpretation, that material was dumped into the well, seems likely since grassy material was noted among the macrofossils, but the beetle evidence suggests that natural dispersal may also have played a part, but that dung does not seem to be the source of this grassy material. The sample which was analysed for beetles was from the bottom deposits of the well (18216) where the pollen was rather sparse, and indeed so were the beetles, The significance of this evidence of grassland is further discussed below.

Weeds; pollen of a range of weeds is also present, some, such as *Fallopia convolvulus* (black bindweed), *Polygonum aviculare* (knotgrass) and *Hyoscyamus niger* (henbane) could be recognised from their pollen, and seeds of the first two were also found. Records of Chenopodiaceae, Caryophyllaceae and *Rumex* cannot be so exactly identified from pollen, but they probably correspond with the abundant macrofossil finds of *Chenopodium*, *Atriplex*, *Stellaria* and *Rumex* noted by Peter Murphy. Nettles were not detected by pollen, although they were recorded by macrofossils and insects, which suggests that their pollen record is rather erratic. 18237 contained a very large amount (67% total) of *Artemisia* (mugwort) pollen. This is a perennial weed, the seeds of which are not often found waterlogged as they

do not seem to preserve well. This may indicate longer-term weedy growth than the annual weeds mentioned above. The pollen, seeds and beetles all show that the surroundings were weedy, as might be expected in a settlement, either as part of the normal weed flora, or the larger weed flora of an abandoned area.

Crops; cereals; there was a trace of cereal pollen in each of the pollen samples. Parasite ova from the intestinal worms *Trichuris* (whipworm) and *Ascaris* (roundworm) were also present, which may have come from humans, although they also infest animals. These cereal and worm records may be connected, as both are found in sewage, cereal pollen persisting in grain and food made from it (Greig 1994). However, cereal pollen is also likely to have been blowing around any settlement such as this with chaff or straw, or to a lesser extent from standing crops.

Trees, woodland and scrub: there were only a few scattered grains of tree and shrub pollen which probably represent the background, although the *Sambucus* (elder) pollen could well be from local bushes, since the seeds were fairly abundant in all the macrofossil samples.

Aquatic plants; there are small records of a few wetland plants such as *Persicaria bistorta* (amphibious bistort) and Cyperaceae (sedges) and a single record of *Potamogeton* (pondweed), but little parallel evidence for the rich aquatic vegetation indicated by the beetles.

Changes; the pollen floras are fairly consistent apart from the large amount of *Artemisia* pollen and a range of other weeds in 18237. When this is disregarded, the differences in percentage and pollen types present is less marked.

Late 2nd - early 3rd century well 9421, phase IIIb, Area D

<481> 9894, 9895. Not much pollen in 9894, but good pollen in 9895 and these are the results discussed.

Grassland; the grassland suite of plants is the most prominent feature of the pollen spectrum from 9895.

Weeds; records of these probably include Caryophyllaceae, Chenopodiaceae, *Artemisia*, *Anthemis* tp, *Rumex*, and *Urtica*, as confirmed by the seed records.

Crops and parasite ova; a fairly substantial cereal pollen record and some *Trichuris* suggest cereal remains and possible sewage.

Woodland and scrub; there is little evidence of any woodland, although *Sambucus nigra* (elder) is abundant, and so were the seeds. Ericales provide evidence of some heathland.

Aquatic and wetland; Possible *Iris* (yellow flag) pollen was also present, apparently a change concentration of pollen.

The general interpretation is of grassland or grassy material in overgrown nutrient-rich surroundings such as an abandoned settlement. There are no beetle results for comparison.

Pit 9750, late 1st - mid 2nd C, phase IIIc, Area D
<443> 9796, (9848), 9853, 9849, 9855. All contained pollen in reasonable amounts.

Grassland; the main pollen taxa were Poaceae, Lactuceae, *Plantago lanceolata* and *Centaurea nigra*, so grassland is once again the main element represented.

Weeds; these are also present

Crops and parasites; there are sight cereal records in some samples, and *Trichuris* ova.

Woodland and scrub; there is very little sign.

Aquatic and wetland; again, little sign.

The flora is small and less informative than some other samples, and their are no other results from seeds or beetles to compare, although it probably represents similar circumstances the other contexts from Elms Farm discussed here.

Well 8188, late 2nd - early 3rd C, phase III-IV, Area E

<1832> The top sample 8167 had some thin pollen, the lower one 8214 had a good range of well-preserved pollen.

Grassland; this was the main feature of the pollen flora, which was mainly of the grassland suite of plants, Poaceae, *Centaurea nigra* (knapweed) and *Plantago lanceolata* (ribwort plantain) and *Trifolium repens* (white clover). 8167 had a concentration of Lactuceae and the pollen was rather thin, which might partly be the result of poor preservation. In contrast, in most of the other samples with large amounts of Lactucae pollen the preservation is good, shown by the great range of pollen types as well as by the records of preservation state made during counting, and in these samples the high Lactucae seems to be "real", and not the result of concentration as the result of the disappearance of frailer pollen. The seeds also indicate mainly grassland plants.

Weeds; these are not particularly abundant in the pollen flora, and nor were they in the seed floras apart from *Urtica* (nettle).

Crops; cereal pollen was present in 8214.

Woodland and scrub; hardly represented.

Aquatic and wetland; hardly represented.

The beetles also indicate organic refuse and also weedy or grassy vegetation. It therefore seems clear that the well fill contained mainly the remains of decayed grassy material, with some cereal remains.

Feature 9036, late 1st C B.C. - mid 1st C A.D., phase II, Area D

<336> 9035, 9046, (9053) pollen preservation moderate except 9053

The samples came from a monolith through the fills of an alluvial spread in a pit or channel noted by Pat Wiltshire as having potential for pollen analysis, and consisting of fairly organic material and gravel. The uppermost context 9035 contained some countable pollen, mainly

Poaceae, Lactuceae and Cyperaceae, with some Cerealia-type. 9040 contained no pollen, 9046 contained a little, giving a partial count similar to 9035, and 9053 no pollen. These results are not detailed, and there is no additional data from seeds or beetles. They are generally similar to the other pollen floras obtained from Elms Farm.

Pit 9029, mid 2nd century, phase IIIc, Area D

<338> A feature containing organic material, with rather varied results; 8009 contained no pollen, 9028 contained some, while 9064 provided a good pollen spectrum.

Grassland; once again dominated by the suite of grassland plants Poaceae (phytoliths also present), Lactuceae, *Centaurea nigra, Sanguisorba officinalis* (greater burnet) and *Geranium* (cranesbill).

Weeds; these include fairly substantial records of Caryophyllaceae, Chenopodiaceae, *Anthemis* tp. (meyweeds etc.) and a record of *Cirsium* tp. (spear thistles).

Crops, parasite ova; Cultivated plants include Cerealia-type pollen including *Secale* (rye), and *Pisum sativum* (pea) is present.

Woodland and scrub; little sign; *Picea* (spruce) was seen which is unusual as it is not native to Britain, however the pollen is neither poorly preserved as might be the case if it was from redeposited pre-Quaternary material, nor is it fresh enough to appear to be intrusive modern material.

Aquatic and wetland; The presence of *Armeria* (thrift) shows coastal habitat similar to today's salt marsh pastures, and sides of creeks (Jermyn 1974, p 128), although this material could have been brought in by animals that pastured at a distance from the site. There is a small wetland or damp meadow component with Cyperaceae (sedges etc.) and *Filipendula* (meadowsweet).

The seeds from 9064 and two other contexts were very few and therefore add little to this information from the pollen (Murphy 1996). The material contained charcoal and phytoliths, and seems to have been partly burnt.

Well 14984, early - mid 4th C, phase IV-V, Area L

<796> and <797> 14939 10 cm from bottom, <736> 14939 10 cm from top; pollen does not seem to be preserved, <797> 5 cm from bottom, good pollen. (see also <807> from the same well).

As with some of the other samples, pollen was only preserved at the bottom of the feature, where it was abundant with a large flora.

Grassland; the herbs include the grassland suite, including the clovers *Trifolium pratense* (red clover), *T. dubium* (lesser trefoil) and possible *Lathyrus* sp. (vetchling). Grass seeds were present among the macrofossils.

Weeds; some probable weeds are represented by records of Caryophyllaceae, Chenopodiaceae, *Artemisia,* Aster type, Brassicaceae and *Rumex*. Seeds of members of some of these groups were abundant.

Crops, parasites; cultivated plants include cereals and peas. A substantial parasite ova count of both *Trichuris* and *Ascaris* suggests that part of the cereal record may be connected with sewage.

Tree and shrub pollen; this was much higher than in the other samples, at 18% total pollen, with the main woodland trees *Quercus* (oak), *Ulmus* (elm) and *Tilia* (lime) all present, perhaps brought from nearby woodland to the site with moss.

Aquatic and wetland; wetland plants include Cyperaceae, *Persicaria bistorta* (amphibious bistort) and *Sparganium* tp. (bur-reed).

This may be a rather mixed deposit with grassy material, weedy material, cereal remains and /or sewage and rubbish.

Wooden lined well 6280, to end of 2nd century, phase III-IV, area H

<2170> 16074. The pollen was not abundant and only a small count of 51 grains was possible from 13 traverses of the slide.

The pollen consisted mainly of Poaceae (grasses) and other herbs, but with a surprisingly large amount of *Tilia* (lime).

River deposits, 3rd century, phase IV, area R

<2410> 12142, 12101, 12135. Pollen was generally abundant and well-preserved.

Grassland; these plants were the main element, with the largest flora from the lowermost sample 12135.

Weeds; a varied weed flora is present, including *Urtica* (nettle) in the lowermost sample 12153.

Crop plants; these include a few records of cereals, a possible *Pisum* (pea) record, and one of *Vitis* (grape-vine), which has been carefully checked against modern reference material. This is a very interesting find, since it raises the question whether grapes were being cultivated here, and which is further discussed below. Only one possible ovum of *Trichuris* was seen.

Tree and shrub pollen; this was generally very low, moderate in 12135.

Wetland plants; records were also concentrated in the lowest samples and diatoms were seen, so the channel seems to have remained water-filled.

The seed flora was small, although both the seeds, the beetles and the pollen indicated nettles. The beetle evidence also suggests that grassland was present.

Cut 7221

<1214> 7258, 40 cm from bottom; some pollen; <1214> 7256, 25 cm from bottom; pollen; <1214> 7255, 17.5 cm from bottom; some pollen; <1214>, 7254, 10 cm from bottom; some pollen; <1214> 7253, 5 cm from bottom; some pollen. These pollen floras were too small for a worthwhile interpretation.

Well, 14984, to early 3rd C, phase IV-V, Area L

<807> 20034. Pollen sparse but fairly good.

Grassland; Poaceae, Lactuceae, *Plantago lanceolata*, *Trifolium pratense* and a possible record of *Onobrychis* (sainfoin), a fodder crop and wild plant of chalky soil.

Weeds; range of weeds were present as in other contexts.

Crops; there were records of cereal pollen, and a parasite ovum of *Ascaris* was present.

Woodland and aquatic plants were represented by a few records.

Buried soil 16221 in feature 16252, undated, possibly late Iron Age, phase 0 (II?), area H

<2189> soil. Pollen preservation was only adequate and the flora was small and relatively uninformative.

DISCUSSION

What do these well fills tell us about the site?

Biased evidence

The various well and other feature fills contained pollen which indicated very much the same groups of plants: mainly grassland, weeds, a few crops and some woodland and wetland. The seed floras represent this information somewhat differently, with weeds being the most prominent plants by far, and the beetle faunas show up what must be the same evidence in yet another light. This illustrates the bias imposed by the way that some grassland plants leave a good pollen record, whereas most weeds leave a very good seed record, and insects show up other aspects of the evidence, such as whether the plant remains are likely to have come from whole plant material, decaying refuse, dung or simply from the surroundings. This discussion therefore draws upon all the available evidence to make the best interpretation of the pollen evidence.

How did the well fills form? wells in use or backfilled?

Most wells show signs that they were made by digging a well shaft down as deep as desired, and then by constructing a lining for the shaft. The well was then used for obtaining water, either for humans or for stock. Things would inevitably fall into the well in the course of time, but it is not known if wells were cleaned out periodically, or re-dug. Then at some stage the well might become disused and either continue to silt up by natural accumulation, or be deliberately backfilled or used for the disposal of waste. Backfilled wells are quite numerous on some Roman sites, in distinct contrast to the rather infrequent occurrence of wells in medieval sites. This might suggest that wells might have had some special significance in Roman times, causing them to be so frequently dug and backfilled.

The above scheme of the life cycle of a well shows that the layers filling a well may not necessarily represent the period when the well was in use, and in fact much of a well fill may have accumulated during disuse or from material dumped into the well shaft. Even though one well may have been abandoned in a large or small area of disuse, perhaps, while parts of the rest of the site may have still been occupied, and waste from these occupied areas may be preserved in fills of abandoned wells, thus providing useful evidence about the site. Therefore, despite the various possible sources of material filling wells, the fact that they preserve waterlogged evidence makes them valuable sources of evidence about the whole occupied area.

Grassland

The most obvious vegetational group seen in the pollen from the well and other feature fills is grassland, represented in decreasing order of abundance by Poaceae (grasses), Lactuceae (composites including hawkbits and dandelions), *Plantago lanceolata* (ribwort plantain), *Filipendula* (meadowsweet), *Trifolium pratense* (red clover), *Trifolium repens* (white clover), *T. dubium* (trefoil) and possible *Onobrychis* (sainfoin). There were macrofossil records of all of these, although the clover could not be identified to species. In addition, there were pollen records of *Centaurea nigra* (knapweed) and *Sanguisorba officinalis* (greater burnet), and macrofossil records of *Rhinanthus* (yellow-rattle), *Leontodon* sp (hawkbit), *Prunella vulgaris* (self-heal) and the identification of the grass *Alopecurus* (foxtail), noted as a likely hay assemblage (Murphy 2000). This particular group of plants has similarities with seasonally flooded, traditionally maintained hay meadows (Rodwell 1992, pp 56-7). Experimental work on hay from such meadows shows that the representation of the actual plants shows up in

rather different proportions in the seeds and the pollen, but that various characteristic plants such as *Centaurea nigra* (knapweed) and *Sanguisorba officinalis* (greater burnet) could be expected to show up in the archaeological remains of hay from such meadows (Greig 1984). Up to now, there has been rather little archaeobotanical evidence from archaeological sites suggesting such hay meadows, even in areas close to surviving meadows (Greig 1999). This group of remains from Elms Farm does seem to provide evidence that hay from this traditional type of meadow was present either as a stored product or even growing nearby. This is highly likely, as there is much low-lying damp land in the surroundings (Atkinson and Preston 1998) which would be the most appropriate use for this kind of land, either as meadow or pasture.

Weeds

The pollen records add to the evidence obtained from the seeds to show that weeds were widespread. The main question is how representative this is of the site of a whole, or whether as has been suggested (Greig 1988) that the weeds are perhaps over-represented because of their high seed production, and that the overgrowth and abandonment indicated might have been quite local, perhaps from particular small holdings falling into disuse, rather than being representative of the site as a whole.

Crops and parasites; possible grape growing

The consistent presence of cereal pollen demonstrates the presence of cereals in some form or other, either as grain (supported by the evidence from grain pests among the beetles), or as grain, straw or chaff (supported by the presence of charred cereal remains) or remains in sewage (supported by the presence of parasite ova). The evidence of widespread sewage contamination in the wells raises the question whether most of these deposits represent phases of disuse.

A few pollen grains were identified as *Pisum* (pea). Although fresh reference material is very distinctive, somewhat corroded and crumpled archaeological material is not easy to identify with certainty, but the identifications were re-checked in order to be sure that peas were present.

A single grain of *Vitis* (grape vine) was identified in the channel fill, raising the question

whether grapes might have been grown nearby, even on such slight evidence as this. There are parallels, in the form of possible Roman vineyards in the Nene valley discovered both from planting trenches and from grape pollen in the fills of nearby ditches (Brown and Meadows 2000). It is not easy to detect viticulture by pollen analysis, as the dispersal of *Vitis* pollen, and therefore its pollen record, is poor (Diot 1989, p 165). This, and other evidence from France suggests that grapes, and also other probable Roman introductions *Juglans* (walnut) and *Castanea* (chestnut) are scarcely detectable by their pollen until they are grown extensively (Van Zeist and Van Der Spoel-Walvius 1980, p 102).

Wetlands and coast

Wetland vegetation was restricted to rather scattered records of a few taxa. The most consistent was *Persicaria bistorta* (amphibious bistort), which could have grown in the damp meadow habitat discussed under grasslands, as could the Cyperaceae (sedges etc.) pollen. Well 9421 contained much *Iris* (yellow flag) pollen.

Some pollen of *Armeria* (thrift) in pit 9029 provides a little evidence of coastal habitat, although this could have been either fairly local, or have been brought in with animals which had grazed upon salt marshes.

Trees and woodland, scrub

This was hardly represented at all, as might be expected from an occupied site, apart from scattered records of *Sambucus nigra* (elder), the seeds of which were also abundant. Only in well 14984 was there a significant amount of woodland tree pollen, which might perhaps been brought in with some woodland product such as moss.

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