Ancient Monuments Laboratory
Report 12/93

PALYNOLOGICAL ANALYSIS OF BRONZE AGE AND IRON AGE/ROMAN WATERLOGGED FEATURES FROM SLOUGH HOUSE AND CHIGBOROUGH FARMS, NEAR HEYBRIDGE, ESSEX

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Summary

Sequences of sediments from water holes and/or wells were subjected to palynological analysis. Description is made of changes in vegetation as the features accumulated sediment. A comparison of Slough House and Chigborough Farms is made for the Bronze Age and Iron Age/Roman times in terms of land use and impact of the settlements on the landscape.

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INTRODUCTION

A report on the palynological analysis of a series of waterlogged features from Slough House Farm has already been completed (Wiltshire, 1992). However, it was deemed necessary to carry out further analysis of feature F015 in order to achieve a clearer picture of the changing environment during the Bronze Age at the site, and additional data are presented here. Results of analysis of the Bronze Age and Iron Age water-logged features at Chigborough Farm are also presented. A detailed analysis of the macrofossil remains of these and other features from both sites are given in Murphy (1991), as well as a general description of soils.

The features were generally regarded to have been domestic wells and/or watering holes for stock. Their sediments offer an opportunity to investigate the spatial variation in landscape between Slough House and Chigborough Farms, two sites closely adjacent to one another, and an attempt has been made to compare the two sites for the Bronze Age and Iron Age/Roman periods. It must be stressed, however,that because of lack of resolution in chronology, any comparison must be considered with some caution and only in the broadest terms.

METHODS

Pollen

Samples of 1.0 g were subjected to standard techniques for concentration of palynomorphs (Dimbleby 1985) except that hydrofluoric acid was extended to 7 days because of the high silica content of the sediments. Palynomorphs were stained with safranine and mounted in glycerol jelly. A minimum of 300 grains were counted, with the average count being 350. Preparations were examined under phase-contrast microscopy at x400 magnification and at x1000 where necessary. Pollen nomenclature follows that of Moore and Webb (1979) and Moore, Webb and Collinson (1991). Gramineae grains of > 40 mμ with a mean annulus diameter of 8-10 mμ were referred to as 'cereal' (Edwards 1989). No attempt was made to differentiate between *Corylus* (hazel) and *Myrica* (sweet gale) pollen and, in view of the fact that hazel macrofossils were found, it was assumed that all coryloid pollen was indeed *Corylus.*

Counts were expressed as percentage total land pollen and spores except for obligate aquatic taxa; the latter were expressed as a percentage of total land pollen and spores plus obligate aquatics. It must be noted that there is a variation in scale on Figures 1a, b and c whilst in Figures 2 and 3, the vertical scale is not linear.

For Slough House Farm (F015), pollen and spherule abundances were quantified in relation to exotic marker grains (c.f. Stockmarr, 1971).

Loss on Ignition

Organic content of the sediments of Feature F015 (Bronze Age, Slough House Farm) were estimated by loss on ignition. Sediment samples were dried overnight at 104^{o}C and then ground

in a pestle and mortar. Triplicates of each sample (each of 10.0 g) were fired in a muffle furnace at 700°C until all organic material had combusted. The loss of weight represented the organic content and was was expressed as percentage dry weight of sediment. Each result represented the mean of triplicate estimations. Loss on ignition for features F645, F3887 and F2956 were carried out by Murphy (1991).

RESULTS AND DISCUSSION

SLOUGH HOUSE FARM (F015) - BRONZE AGE

Preliminary results obtained from this feature have already been presented and the vegetation history of the site given in broad outline (Wiltshire 1991). New data have been incorporated with the original data set and are given in Tables 1a, 1b & 1c and Figures 1a & 1b. The additional results serve to supplement information already gained from the initial analysis and also modify the original interpretation to some degree.

Figures 1a and 1b show that there were three distinct episodes of sediment accretion within the feature and that there appears to be a correlation between vegetation change and the nature of the three horizons within the profile.

Grey/Brown Silty Clay (Samples 21-35 cm): Loss on ignition showed this deposit to be the least organic horizon, while pollen was less concentrated than in sediments higher up the sequence. The lower pollen concentration might indicate that these basal silty clays accumulated more rapidly than the sandy upper layers, and could represent the period when the feature contained standing water and was functioning as a water hole. Constant disturbance of the hole caused by water extraction and/or trampling by stock animals might account for the relatively rapid accretion of the silty clay.

The strong correlation of the abundance of iron pyrite spherules (Wiltshire *et. al.* not yet published) with that of obligate aquatic plants such as *Lemna* (duckweed), *Hippuris* (mare's tail) and *Potamogeton* (pond weed) adds weight to the contention that these basal deposits were, indeed, laid down in a body of standing water. The spherules are microbially derived and are only formed when conditions at the sediment/water interface are highly sulphidic (with low redox potential, adequate levels of fermentation products, and reduced sulphur and iron [Wiltshire *et. al. ibid.*]). This means that the water within the hole was probably stagnant, eutrophic and possibly rather smelly.

The find of a single egg of a trichurid intestinal parasite (whipworm) might also indicate that stock animals had access to the water. However, this suggestion must be viewed with some caution in view of the fact that man and a large number of non-domesticated animals (including birds) are hosts to various species of whipworm (Smyth, 1962) so the origin of the parasite egg cannot be confirmed.

The feature was probably surrounded by an area of wet muddy soils (possibly prone to flooding), since pollen of plants characteristic of these habitats was found throughout the basal sediments. These include *Caltha* type (e.g. kingcup), *Mentha* type (e.g. water mint), *Apium inundatum* type (e.g. fool's water cress), *Valeriana* (valerian), *Filipendula* (meadow sweet) and Cyperaceae (sedges).

With such high levels of Gramineae (grasses) and herb pollen, it is clear that the general landscape was dominated by weedy grassland with few trees. However, Murphy (1991) found both leaves and acorn cupules of *Quercus* (oak) in the sediments, and oak was certainly the most important tree contributing to the pollen rain. Oak must have been growing very close to the feature (unless branches had been brought from elsewhere and dumped in the hole) but it is difficult to assess its importance in the wider landscape. Other trees and shrubs are consistently represented at low levels throughout the basal deposits and probably represent mixed woodland in the region some distance removed from the site.

High levels of grasses were accompanied by high values for 'weeds', particularly *Plantago lanceolata* (ribwort plantain), Lactuceae (e.g. *Taraxacum* - dandelion; *Leontodon* - hawkbit), *Trifolium* type (e.g. clover), *Ranunculus* type (e.g. buttercup), Rumex (docks), *Artemisia* (mugwort), *Urtica* type (e.g. stinging nettle) and *Pteridium* (bracken). All these may be found in a wide range of open habitats, including waste ground or grazed grassland. Indeed, the assemblage would indicate a diverse range of habitats around the water hole but with weedy, probably heavily grazed, grassland being very extensive. It must be noted, however, that cereals were being grown and/or processed on the site, and Murphy (1991) found remains of *Linum usitatissimum* (flax/linseed) and *Triticum* (wheat), so a mixed economy is indicated.

Brown Organic Sandy Clay (Samples 9-19 cm): The loss on ignition and pollen concentration were both significantly higher than in the lower sediments. Furthermore, obligate aquatics were not found. Iron pyrite spherules were found just above the junction of the two horizons while plants of wet soils were found up to 13 cm where a single grain of *Trollius europaeus* (globe flower) was recorded.

These lines of evidence would suggest that the sediments were accumulating more slowly than before with the result that relatively more pollen and other organic material material were being concentrated within the sediment. The absence of obligate aquatics and spherules from most of the horizon indicates a drying of the feature and this probably reflects its abandonment (see later). In fact, spherules were found just above the junction of the two horizons and this might suggest that standing water remained for a short time. The area around the hole certainly remained wet with relatively high levels of meadow sweet being recorded.

Brown Organic Sandy Clay (Samples 9-19 cm): At the transition this horizon and the basal silty clay , oak increased markedly and grass and bracken declined a little. As the feature

oak increases further along with shrubs, while the weedy grassland gradually diminished. It would seem that the water hole became abandoned and either oak woodland and scrub were allowed to colonise and grow on the site, or their management (coppicing and/or pollarding) declined so that they became more abundantly represented in the pollen record. Certainly, the increase in ruderals such as stinging nettle, mugwort and Chenopodiaceae (e.g. *Atriplex* - orache) might suggest a spread of these weeds onto land falling into misuse.

The marked increase in oak towards the top of the horizon was accompanied by a rise in shrub pollen and it is interesting to note that rosaceous shrubs typical of hedgerows such as c.f. *Crataegus* (hawthorn), c.f. *Prunus* (sloe), and c.f. *Rubus* (blackberry) were very well represented. It is tempting to suggest that the landscape was hedged but, in view of the evidence for abandonment of the water hole, it is, perhaps, more likely that the site became invaded by shrubs and thorn scrub. Thus, the relatively high shrub values might be indicative of neglect rather than the labour-intensive management of hedges.

In spite of the apparent derilection of the immediate area, cereals continued to be grown and/or processed nearby to the same extent as previously, or perhaps even slightly more intensively. It is possible, therefore, that grazing pressure was relaxed only in the immediate area of the watering hole and that the succession seen in the pollen diagram might not relate to the site a a whole.

Grey Organic Sandy Clay (Samples 1-7 cm): Loss on ignition was slightly lower and pollen concentration slightly higher than the previous horizon, while spherules, obligate aquatics and plants of wet soil were not found. This indicates that the feature itself and its immediate environs had dried very considerably, although conditions must have remained wet enough to allow pollen preservation. The pollen concentration also indicates an even slower sediment accretion than before and this contradicts Murphy's contention that the upper sandy fills accumulated more quickly than the lower ones.

The pollen concentration in the upper horizon reached its highest level and this indicates that the sediment accumulated even slower than before. The organic content was slightly lower than in the more basal sediments and there were no aquatic plants, or even plants of which favoured wet soil. The indications are that the site had continued to dry out and pollen preservation was probably a function of damp and acidic conditions in the sandy matrix. The oak and scrub appear to have been cleared to some extent with grasses and ruderals, particularly stinging nettle and mugwort, increasing. Probably, this increase in grasses and weeds was simply a response to a reduction of the tree/shrub canopy rather than any intensification of grazing and extension of pasture.

Throughout the deposit, oak increased at the expense of virtually all other taxa until it reached a value of nearly 60% in the uppermost level. This probably means that the site itself had become

closed and dominated by trees (Heim, 1962) but open weedy and grassy areas certainly persisted in the area.

Conclusion

It would seem that, early in its history, the watering hole contained stagnant, possibly rather contaminated water and was surrounded by wet, waterlogged soils. It appears to have been covered with floating aquatic plants and supported wetland vegetation around its margins. The surrounding area was dominated by weedy, grazed grassland and cereal crops were grown and/or processed in the near vicinity. The length of time the water hole was functional cannot be ascertained but it would seem that it silted up relatively quickly (possibly due to trampling and disturbance), and was then abandoned.

After abandonment, the hole filled relatively slowly with sandy clay and the site became invaded by oak and scrub, although farming continued nearby and cereals were still being grown and/or processed locally. Later, there may have been some attempt at clearance and grass and weeds spread around the feature, but then it seems to have been abandoned again. Open weedy areas prevailed a little distance away but the immediate area seems to have been closed by a thick growth of oak.

It is likely that the upper sandy clays represent a much longer period of the site's history than the basal silty clays and it is possible that the functional watering hole was relatively short-lived.

CHIGBOROUGH FARM (F645) - BRONZE AGE

The results are shown in Table 2a and 2b and Figure 2. Figure 2 shows that there were two periods of sediment accretion, but unlike the Bronze Age feature at Slough House Farm, there appears to be only minor differences in the vegetation history presented by the two sediments.

Dark Organic Silty Clay Loam (Samples 94-110 cm): Murphy (1991) found the loss on ignition value to be of 11.5% for much of this basal deposit. Pollen of obligate aquatic plants were found throughout the horizon and this indicates the presence of (at least seasonal) standing water within the feature. Plants characteristic of wet soil were also represente d, incuding c.f. kingcup, sedges, meadow sweet and c.f. water mint, and these were probably growing in the area immediately surrounding the water hole.

Although it is obvious that the feature contained a pool of water, it is interesting that no iron pyrite spherules were found. It is known that these tiny iron pyrites bodies undergo decomposition when exposed to air (Wiltshire *et. al. ibid*), and it is possible that the water level fluctuated sufficiently to allow oxidation (and thus disappearance) of spherules but not of pollen.

There is remarkably little variation in the pollen spectra throughout this horizon. This could mean that the local vegetation was very stable and/or that these basal deposits accumulated rapidly so that they represent only a short period of time.

The high values for grasses, ruderals, and other weeds indicate that the landscape was dominated by weedy, grazed grassland, and 'waste ground' . Woodland may have been reduced to individual trees and shrubs, or have been growing some distance away. Although oak was the dominant tree, the nature of the background woodland was very diverse indeed, with many species of shrubs and climbers represented. It is possible that oak dominates the assemblage simply because it was growing nearer to the pollen site, remembering that if the basal deposits did indeed accumulate rather rapidly, it might be individual oak trees that were contributing to the pollen record rather than a succession of generations.

Cereals seem to have been grown and/or processed near the site; but great caution must be exercised here since Murphy (1991) found remains of *Glyceria fluitans* (which produces large pollen grains within the size range of cereal pollen), but no cereal macrofossils. It is possible, therefore, that the cereal curve could include a proportion of *Glyceria* pollen and the status of cereals at the site is in question.

Dark Slightly Organic Sandy Clay (Samples 75-85 cm): Murphy (1991) found the loss on ignition to vary between 9.7% and 5.3 %. Obligate aquatics were found throughout (at slightly lower abundance than in the basal deposit) so that standing water was present, but no plants of wet soil were represented. It is possible that the water table in the hole was lowering as the feature silted up. Again, the pollen curves show remarkably little variation throughout the horizon although there are some small differences between these and the pollen record in the lower deposit.

It must be noted that the depth axis on Figure 2 is not linear and that the basal deposits have been analysed with higher resolution than the upper. However, the differences in terms of pollen record between the two deposits is small. The high values for grasses and other herbs, including plantain and bracken suggest that the site continued to be very open indeed and dominated by weedy grassland and 'waste ground' as before. The lack of variation in both the oak and other trees curves suggest that these spectra represent background woodland, some distance removed from the pollen site. The only seemingly significant changes in the pollen spectra are in the grass and herb curves. Grasses decline slightly whilst other herbs (particularly plantains), increase. This could indicate increasing grazing pressures so that grass pollen was reduced in the pollen rain.

Conclusion

The deposits in this feature probably accumulated rather quickly and there is little variation in the pollen spectra throughout the profile. Standing water was present throughout the feature's

history but it may have been drier during the infill of organic sandy clay in the upper levels. The site was dominated by open, weedy grassland and waste ground with ruderals and weeds. The background woodland was very diverse with oak as dominant. It must be stressed that the proximity of the woodland is very difficult to assess although Murphy (1991) found macrofossils of a number of shrub taxa; this implies the existence of some scrub around the water hole.

CHIGBOROUGH FARM (F3887) - IRON AGE

The results are shown in Table 3 and Figure 3. It can be seen that the lithology was more varied than in Feature F645 and four distinct horizons were recognised. A pollen sample was analysed in each of the three upper horizons although these had not been investigated for macrofossil content.

Grey/Brown Coarse Clay Loam with Sand (Samples 104-146 cm): Pollen of obligate aquatics were found up to 122 cm although macrofossil analysis showed them to be present throughout the horizon. This indicates the presence of standing water within the feature during the period of sediment accumulation and, again, the relative lack of variation in the pollen curves would suggest that the sediment accumulated rather quickly. There were no iron pyrite spherules and this might indicate a fluctuating water table with periodic aeration, or possibly a rapid infilling of the hole resulting in the failure in the development of conditions conducive to their formation.

The presence of sedge and meadow sweet pollen, and a relatively wide range of macrofossils of plants of wet soil such as water mint, *Lycopus europaeus* (gypsywort), and *Juncus spp.* (rushes)(Murphy 1991), show that the immediate surroundings were wet and muddy.

The region overwhelmingly appears to have been dominated by weed-ridden grassland and waste ground with only remnants of oak-dominated, mixed woodland prevailing in the landscape. The watering hole itself appears to have been fringed with willow. The grassland was probably grazed since relatively high levels of plantain and bracken were recorded. Cereals were grown and/or processed near to the feature and Murphy (1991) found flax/linseed remains which further attest to a mixed economy at the site.

Grey/Brown Clay Silt Loam (Sample 106 cm): No aquatic plants were recorded from this layer and differences in the vegetation record are minimal. Sedge pollen indicates that the edges of the feature were probably still wet and, although there is no indication from the pollen record of standing water within the feature, macrofossil finds of duckweed indicate it must have been present at least seasonally. Surrounding vegetation seems to have altered very little although there appears to have been some removal of oak; the local willow also seems to have been reduced. Cereals were still being grown/processesed at the site.

Grey/Brown Sandy Clay Loam (Sample 94 cm): Macrofossil evidence indicates the presenc standing water but no aquatic plants were recorded in the pollen spectra.
There was very little change in the vegetation and the increase in grass pollen probably has little significance in terms of gross land use. Cereals continued to be grown/processed locally.

Grey/Brown Silty Clay Loam (Sample 74 cm): Both duckweed and pondweed were present in this sediment and sedge pollen was recorded as well as *Sphagnum* spores. The feature must have had standing water and wet, 'boggy' edges. The major significant change in vegetation was that hazel appears to have increased and became the best represented woody plant. But the environs of the site were still dominated by weedy, grazed grassland and waste ground, with some cereal production/processing being carried out.

Conclusion

The macrofossil (though not the pollen) evidence indicates that standing water was present throughout the history of the feature. Both data sets suggest a margin of wet, muddy soil around the hole, while the pollen data indicate that it was fringed with willow.

Although the four horizons within the lithology have small associated changes in the pollen spectra, it is rather difficult to assess the significance of the observed variation. The pollen diagram (Figure 3) and the percentage data (Table 3) suggest that, throughout the history of the feature, the environs of the site offered an open landscape with oak-dominated, mixed deciduous woodland in the hinterland. However, with such a low representation of woodland taxa, it is difficult to assess whether trees and shrubs were actually present as isolated individuals.

A degree of heterogeneity in habitat is suggested by the herbaceous flora. Grazed grassland with abundant herbs, and possibly patches of bracken, seem to dominate throughout, but relatively high frequencies for ruderal taxa such as Chenopodiaceae, *Cirsium* (thistles) and docks suggest areas of disturbed, open soils. Arable farming is suggested by cereal-type pollen and *Triticum* (wheat) and linseed/flax macrofossils.

The change in lithology in the upper horizons seems, tentatively, to be associated with a change in land use. Both oak and willow appear to have been cleared to some degree while grass and bracken seem to have spread. In the uppermost horizon, weeds increased in frequency while hazel seems to have replaced oak as the dominant woody plant.

A COMPARISON BETWEEN SLOUGH HOUSE FARM AND CHIGBOROUGH FARM

An attempt has been made to describe the vegetation changes in the environs at both sites through time. Tables 4a and 4b contain sample mean values for all taxa represented in the following features: Chigborough Farm - F645 and Slough House Farm - F015 (both Bronze Age), Chigborough Farm - F3887 (Iron Age) and Slough House Farm - F2956 (Romano-British - see Wiltshire 1991 for table of pollen percentages). These individual percentage values may be

regarded as representing the status of each taxon within the history of each feature.

Figure 4 presents the mean percentage values for (a) trees, shrubs and climbers (b) grasses (c) cereals (d) dryland herbs and (e) spore-forming plants (mainly ferns) for both sites for Bronze Age and Iron Age/Romano-British times. Figure 5 gives a comparison of the species richness (total number of taxa) and abundance (mean percentages) of groups (a) and (d), above, at both sites for the Bronze Age and Iron Age/Romano-British times. It must be noted that willow has been omitted from the pollen sum in this diagram since its over-representation distorts the pollen record.

Figures 4 and 5 show that woodland was a significant component of the surrounding vegetation at Slough House Farm during the Bronze Age, with woody taxa (excluding willow) averaging 31.1% of total pollen throughout the sequence. Figure 5 and Table 4a show that the woodland was diverse, with twenty woody taxa being recorded, but oak was overwhelmingly dominant. Figure 1a also shows that it was only after apparent abandonment of the site that trees and shrubs (particularly oak), reached high values. The immediate site had been very open early during the life of the water hole, but it had become overgrown and closed by the time infilling of the feature was complete. By Roman times, the woodland had certainly diminished both in importance and species richness, and woody taxa reached an average of only 12.5% (although the area around the Roman water hole supported considerable amounts of willow). In particular, the thorny scrub seems to have been cleared by Roman times.

Grassland, with a rich assemblage of weeds, including bracken, was extensive in the Bronze Age and some cereals were grown and/or processed in the vicinity. Figure 4 shows that by Roman times, the grassland was even more extensive, but Figure 5 and Table 4b indicate that its weed flora was diminished, both in species composition and abundance of individual herbaceous taxa. This reduction in richness could be the result of more intense grazing pressure within the pastures.

With trees and shrubs (excluding willow) accounting for only 21.3%, the Bronze Age landscape at Chigborough Farm was certainly an open one. However, the woodland and scrub was even more species-rich than at Slough House Farm and, indeed, the status of woodland and local scrub for the two sites was probably very similar; oak was dominant and a large number of forest trees and shrubs, and local scrub taxa, were represented in the pollen spectra.

By the Iron Age, oak and many other trees and scrub taxa seem to have been cleared. The grassland had extended considerably and, in spite of a reduced species richness, weeds were almost as abundant as in the Bronze Age. There was a significant increase in bracken. This fern is common in acid oak woodland and the clearance of trees might have resulted in better dissemination of spores. On the other hand, this aggressive and invasive plant might have spread into the extending grassland as a consequence of higher grazing intensities. Bracken is both toxic

and grazing resistant, and is often an indicator of high stocking densities on poor, acid pasture (Grime *et. al.* 1988). The acid nature of local soils is borne out by the find of *Calluna* (heather) and *Sphagnum* at both sites.

Figure 4 indicates the relative importance of cereals at each site and it is clear that at Slough House Farm, arable farming/processing seemed to be at a lower level in the Bronze Age than in Roman times; at Chigborough Farm the situation is reversed with cereal-type pollen being more abundant in the Bronze Age feature (F645). It must be remembered, however, that *Glyceria* macrofossils had been found in F645 (Murphy 1991), and this grass produces pollen grains which are easily confused with those of early cereals. The status of arable farming at both sites should be treated with caution but, the pollen data would suggest that cereals were more important at Slough House Farm in Roman times than at Chigborough Farm in the Iron Age.

Figures 4 and 5 show that, in spite of the observed differences between the sites, they do appear to have been very similar in their surrounding vegetation and to have been subjected to similar impacts. Both had open landscapes in the Bronze Age but with more abundant and diverse woodland than in later times, and with oak being the dominant tree. Both had weedy, diverse grassland, and a mixed economy is indicated for both areas. Throughout time, oak and other trees and shrubs were felled, creating an even more open terrain, but the grassland became less species-rich, possibly because of intense grazing and general pressure of land-use.

Slough House Farm appears to have been slightly nearer to the woodland edge, or possibly supported more scattered trees and bushes. Although grassland extended in later times at both sites, there seems to have been greater grazing pressures at Chigborough Farm, with bracken possibly invading the pastures.

The pollen of a very varied and wide flora was found at these sites and many ecological groups were represented. This emphasises the heterogeneity of microhabitats in the environs of the settlements and only a very broad view has been given in this report.

Final Comments

Caveats must be applied to any interpretation of these pollen data since the strict chronological relationship of the various features is unknown. Furthermore, to obtain a comprehensive picture of the vegetation and husbandry within the landscape, more features from each period would need to be analysed.

QUOTED LITERATURE

Edwards K.J. (1989)
The cereal pollen record and early agriculture. In Milles A., Williams D., & Gardner N. (Eds): The Beginnings of Agriculture. Symposia of the Association for Environmental Archaeology 8. BAR International Series 496. 113-125.

Dimbleby G.W. (1985)
The Palynology of Archaeological Sites. Academic Press Inc., London.

Grime J.P., Hodgson J.G. & Hunt R. (1988)
Comparative Plant Ecology. A functional approach to common British species. Unwin Hyman. London, Boston, Sydney, Wellington.

Heim J. (1962)
Recherches sur les relations entre la vegetation actuelle et le spectre pollinique recent dans les Ardennes Belges: Bull. Soc. Roy. Bot. Belgique 96. 5-92.

Moore P.D. & Webb J.A. (1979)
An Illustrated Guide to Pollen Analysis. Hodder and Stoughton, London, Sydney, Auckland , Toronto.

Moore P.D., Webb J.A. & Collinson M.E. (1991)
Pollen Analysis (2nd Ed). Blackwell Scientific Publications, Oxford, London, Edinburgh, Boston, Melbourne, Paris, Berlin, Vienna.

Murphy P.L. (1991)
Plant macrofossils and multi-period excavations at Slouth House Farm and Chigborough Farm near Heybridge, Essex. Ancient Monuments Laboratory Report No. 64/91.

Smyth J.D. (1962)
Introduction to Animal Parasitology. The English Universities Press Ltd., London.

Stockmarr J. (1971)
Tablets with spores used in absolute pollen analysis. Pollen et Spores 13, 614-621.

Wiltshire P.E.J. (1992)
Palynological Analysis of Sediments from a Series of Waterlogged Features at Slough House Farm, near Heybridge, Essex. Ancient Monuments Laboratory Report No. 25/92.

Wiltshire P.E.J., Edwards K.J. & Bond S. (In preparation)
Microbially-derived metallic sulphide spherules, pollen, and the waterlogging of archaeological sites.

APPENDIX 1

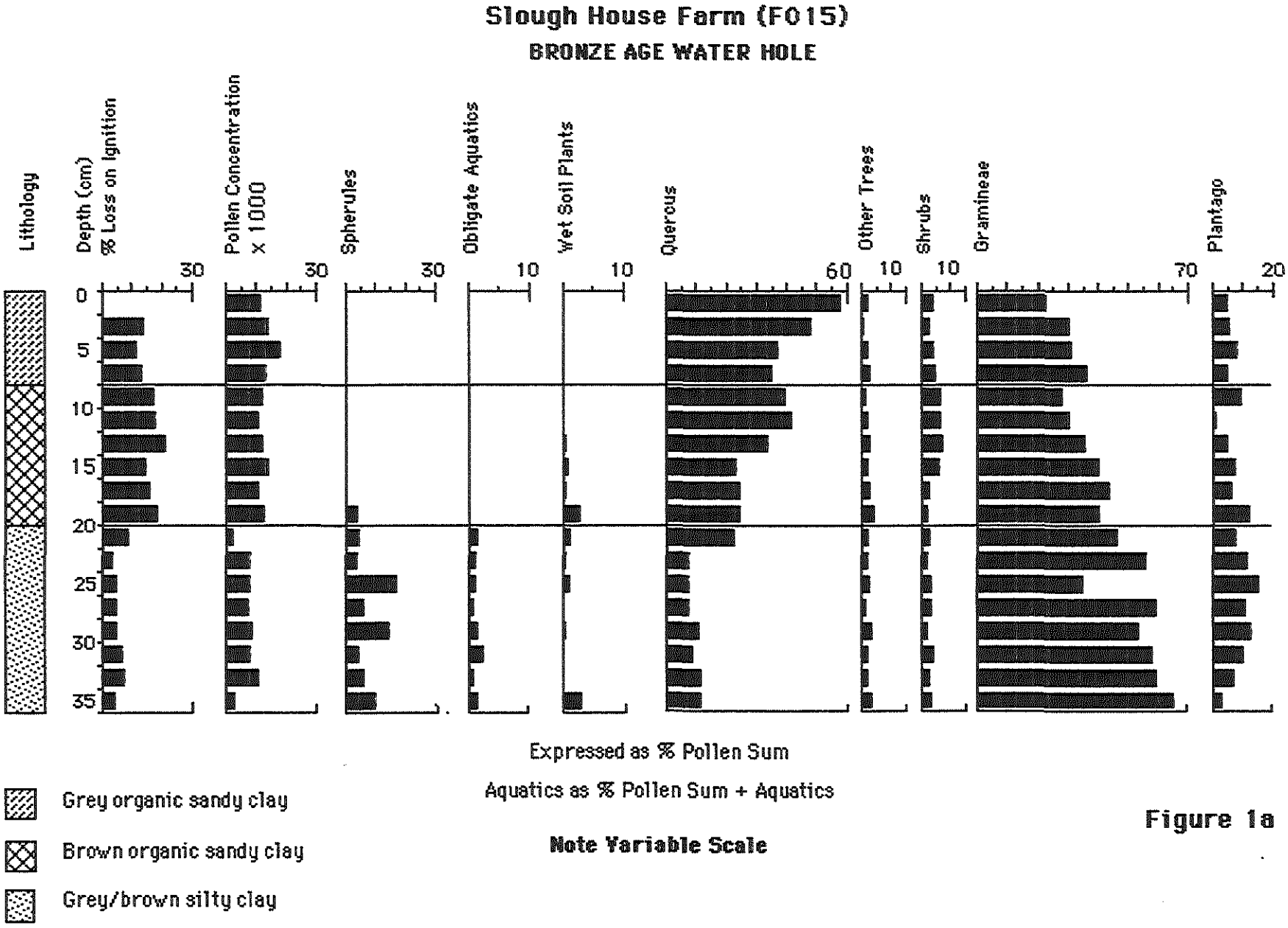

Slough House Farm (F015)
BRONZE AGE WATER HOLE
Lithology
Depth (cm)
% Loss on Ignition
Pollen Concentration
x 1000
Spherules
Obligate Aquatics
Wet Soil Plants
Quercus
Other Trees
Shrubs
Gramineae
Plantago
30
30
30
10
10
60
10
10
70
20
0
5
10
15
20
25
30
35
Expressed as % Pollen Sum
Aquatics as % Pollen Sum + Aquatics
Note Variable Scale
Grey organic sandy clay
Brown organic sandy clay
Grey/brown silty clay

Figure 1a

Slough House Farm (FO15)

BRONZE AGE WATER HOLE

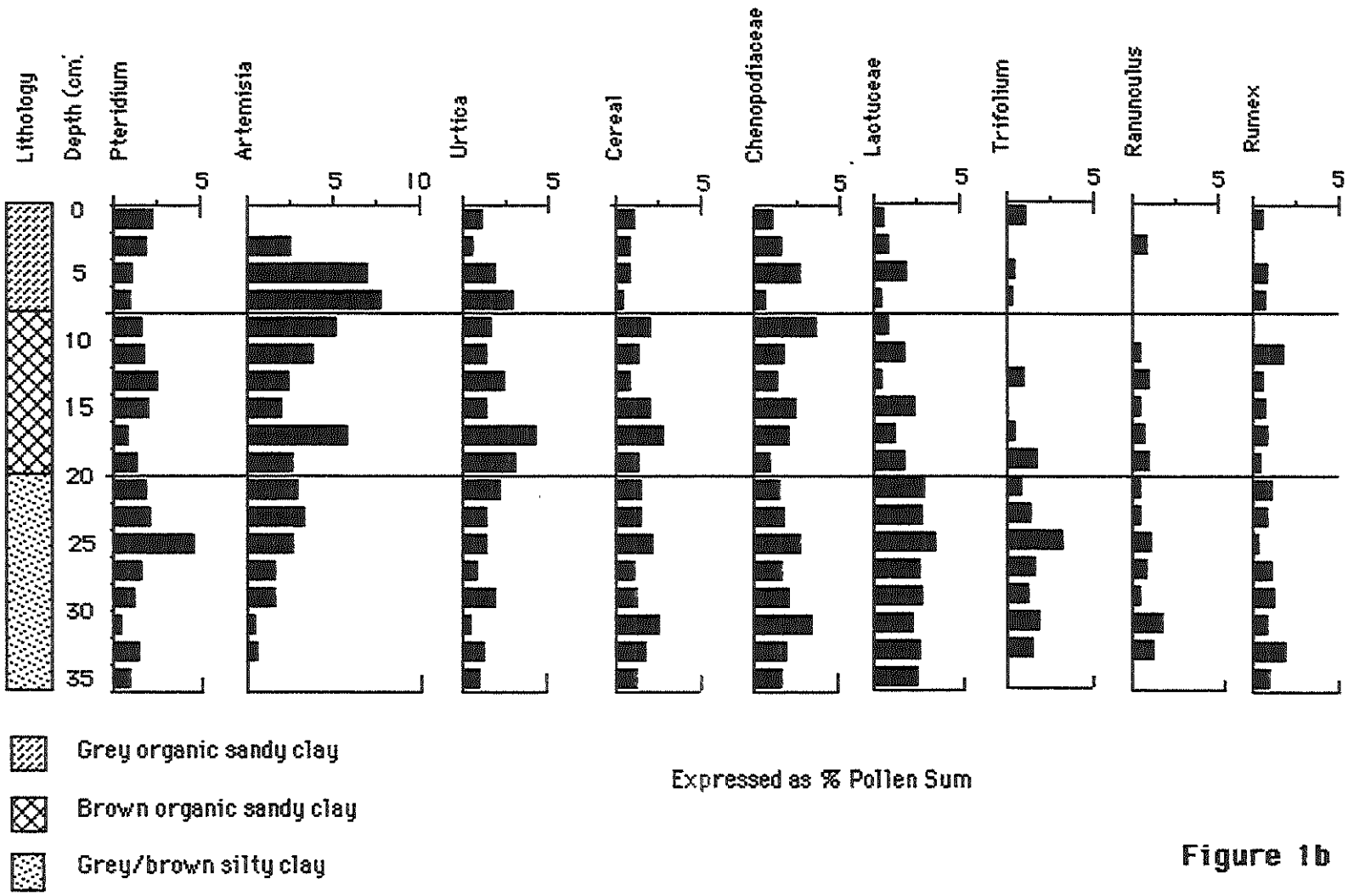


Figure 1b

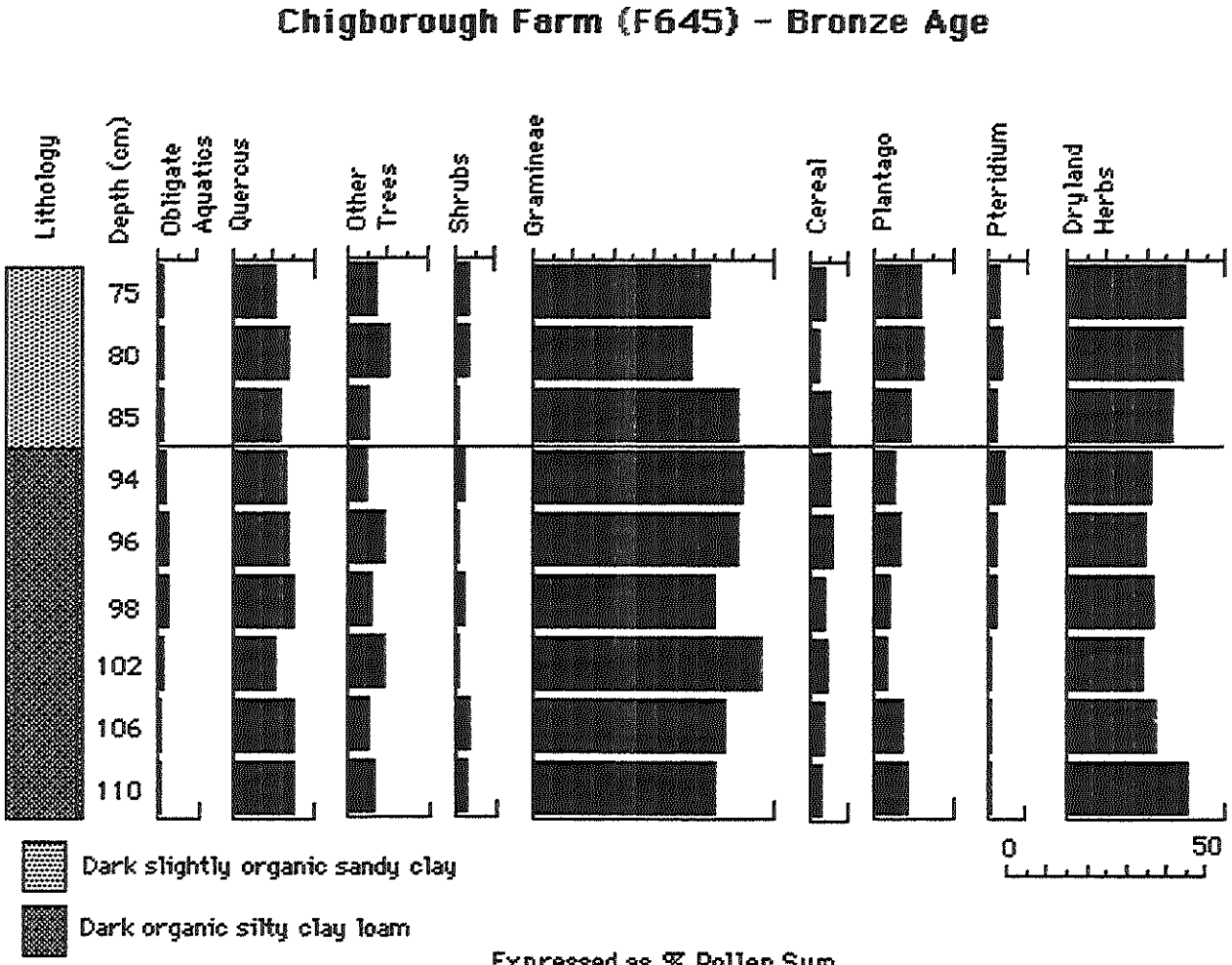
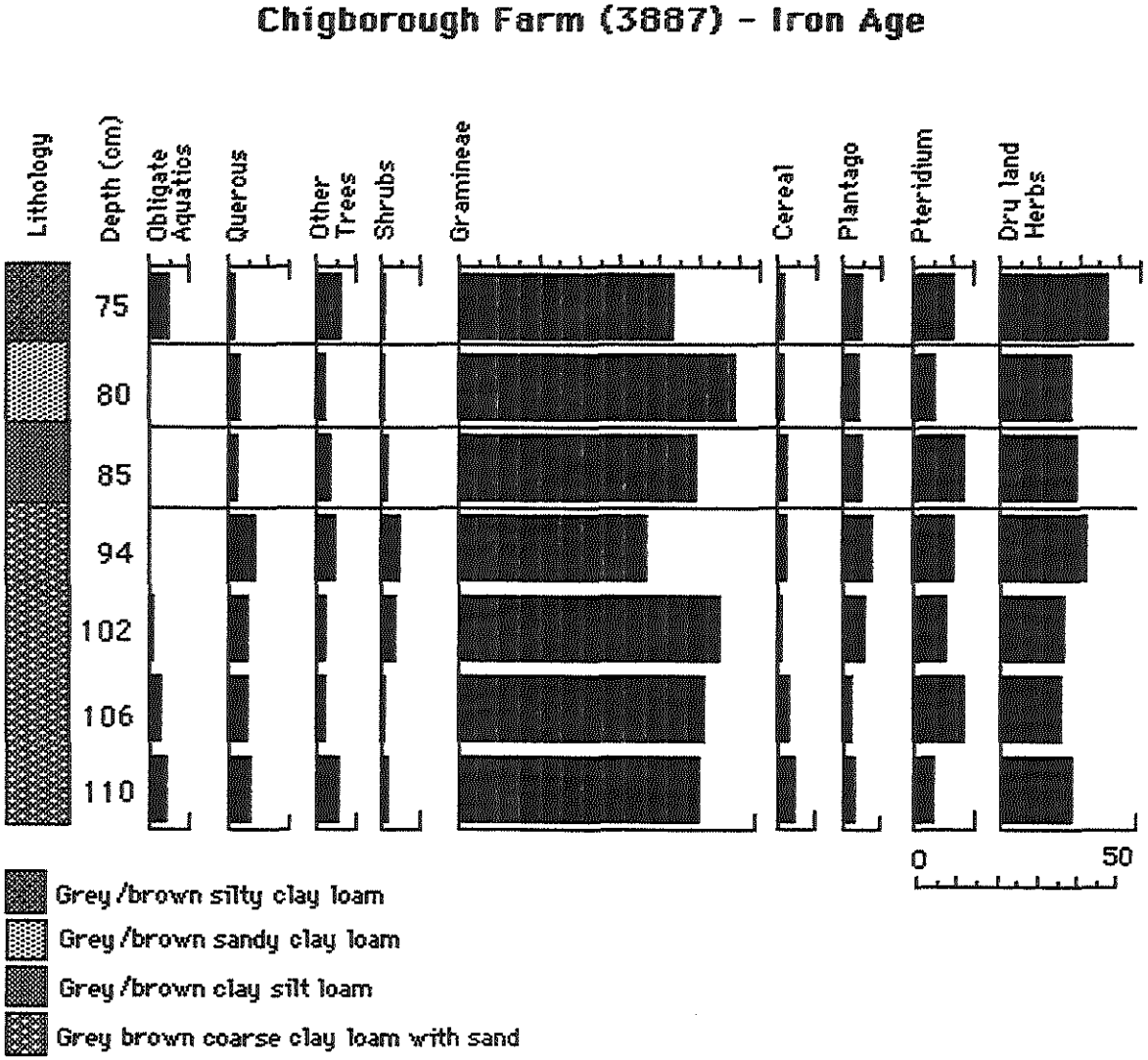

Chigborough Farm (F645) - Bronze Age
Lithology
Depth (cm)
Obligate Aquatics
Quercus
Other Trees
Shrubs
Gramineae
Cereal
Plantago
Pteridium
Dryland Herbs
75
80
85
94
96
98
102
106
110
0
50
Dark slightly organic sandy clay
Dark organic silty clay loam
Expressed as % Pollen Sum
Aquatics as % Pollen Sum + Aquatics

Figure 2



Expressed as % Pollen Sum
Aquatics as % Pollen Sum + Aquatics

Figure 3

Comparison of Slough House & Chigborough Farms

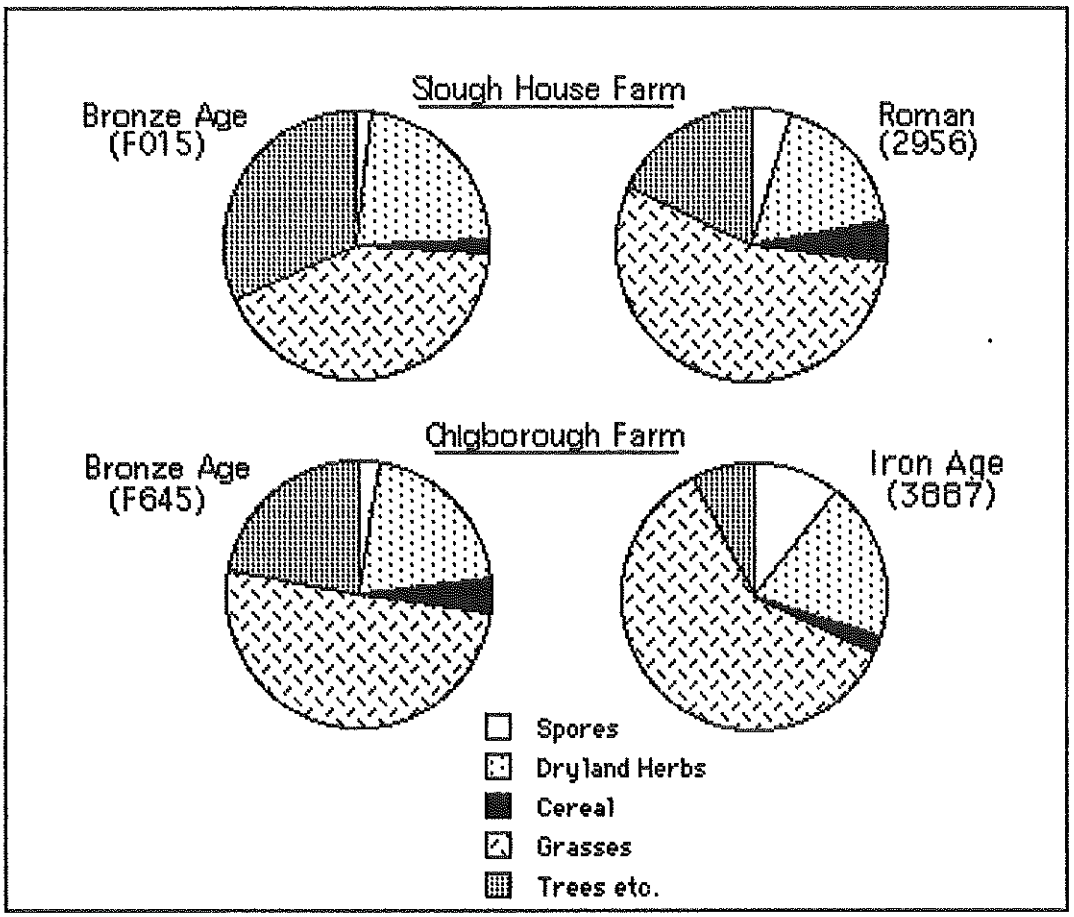


Figure 4

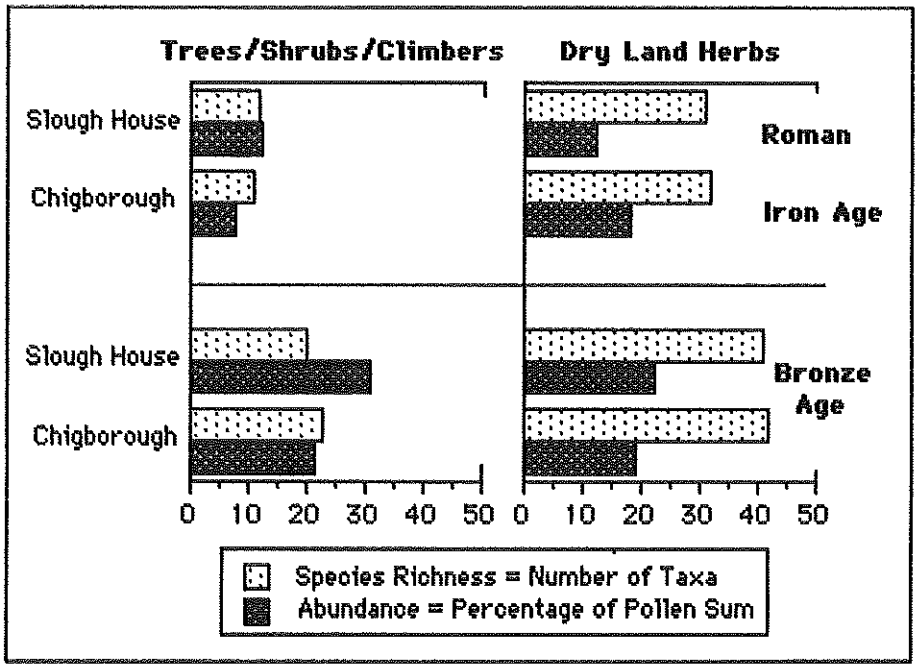

Trees/Shrubs/Climbers
Dry Land Herbs
Slough House
Chigborough
Roman
Iron Age
Slough House
Chigborough
Bronze Age
0 10 20 30 40 50
0 10 20 30 40 50
Species Richness = Number of Taxa
Abundance = Percentage of Pollen Sum

Figure 5

APPENDIX II

SLOUGH HOUSE FARM (F015) - BRONZE AGE

Depth (cm)	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35
Stratigraphy																		
Grey organic sandy clay	+	+	+	+														
Brown organic sandy clay					+	+	+	+	+	+								
Greybrown silty clay											+	+	+	+	+	+	+	+
Trees/Shrubs/Climbers																		
Acer campestre	0.6			0.2					0.2									
Alnus	1.7	0.5	0.7	1.1	0.4	0.8	1.3	1.3	1	3.1	1.4	1.7	1.5	0.3			0.5	2.4
Betula	0.6		0.7			0.8	0.4	0.7	0.4	0.4				0.3	0.4			
Corylus	1.1	1.3	1.5	2.7	2.4	2.1	2.7	3	1.8	0.4	0.7	1.2	2.1	1.3	1.2	1.2	1.4	2.4
Fagus				0.2														
Fraxinus					0.4	0.4	0.5		0.2		0.4						0.2	
Pinus				0.2			0.2		0.6				0.3				0.2	
Quercus	58	48	37	35	40	42	34	23	25	24	22	7.5	9.2	7	11	9	11	11
Rosaceae c.f. Crataegus	1.1	0.5	1.1	0.4	2	2.1	2	0.3	0.2			0.2				0.4		
Rosaceae c.f. Prunus	1.1	0.8	1.5	0.2	2	1.3	2.2	1.3	0.2	0.4	0.4	0.2	0.5	0.3		1.2	0.5	
Rosaceae c.f. Rosa				0.2						0.9								
Rosaceae c.f. Rubus				0.9		0.4	0.2	0.7		0.4	0.7	0.2	0.3	0.3			0.2	
Rosaceae c.f. Sorbus														1				
Salix		0.3	0.2	0.2	0.4	0.4	0.2		0.2		0.7				0.8		0.5	
Sambucus nigra														0.3				
Taxus							0.2											
Tilia				0.9	0.4		0.2		0.2	0.4	0.4	0.4	0.5	0.5	2.8	2	0.5	
Ulex type								0.3					0.5			0.8	0.2	0.6
Ulmus			0.2										0.3				0.2	
Hedera													0.3	0.3			0.2	0.6
Dwarf Shrub																		
Calluna								0.3										
Spore Producers																		
Filicales		0.8							0.4									
Ophioglossum vulgatum														0.3				
Polypodium																0.2		
Pteridium	2.2	1.8	1.1	0.9	1.6	1.7	2.5	2	0.8	1.3	1.8	2.1	4.6	1.6	1.2	0.4	1.4	0.9
Sphagnum					0.2	0.2												

Table 1a

SLOUGH HOUSE FARM (F015) - BRONZE AGE

Depth (cm)	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35
Herbs																		
Cereal	1.1	0.8	0.7	0.4	2	1.3	0.7	2	2.8	1.3	1.4	1.5	2.1	1	1.2	2.5	1.7	1.2
Gramineae	23	31	31	36	28	30	36	40	44	39	46	56	35	59	53	59	60	63
Alchemilla type							0.4	0.7					0.3					
Anthemis type		1	0.2	0.4	0.8	0.4	1.3	0.7	0.4	1.3	0.4	2.7	2.1	1.3	0.8	1.6	1.4	
Artemisia		2.5	6.9	7.7	5.2	3.8	2.3	2	5.8	2.6	2.9	3.3	2.6	1.6	1.6	0.4	0.5	
Aster type		0.5		0.2					0.4			0.4	2.1	0.3	0.8	0.4	0.5	0.3
Caryophyllaceae	0.6		0.4				0.4	1		0.9		0.4	1	0.5			0.2	
Centaurium												0.4		0.3				
Centaurea nigra type													0.3					
Cerastium type				0.2														
Chenopodiaceae	1.1	1.5	2.6	0.7	3.6	1.7	1.3	2.3	2	0.9	1.4	1.7	2.6	1.6	2	3.3	1.9	1.5
Cirsium			0.4	0.2				0.3						0.3		0.4		
Cruciferae				0.2			0.2					0.2		0.8			0.2	
Fallopia convolvolus												0.2					0.2	0.6
Galium type		0.3	0.4		0.4				0.2						0.4			
Hypericum perforatum type		0.3																0.9
Lactuceae	0.6	0.8	1.8	0.4	0.8	1.7	0.4	2.3	1.2	1.7	2.9	2.7	3.6	2.6	2.8	2.3	2.6	2.4
Lamium type								0.3								0.4		
Leguminosae		0.3								0.4	0.2	0.4				0.2	0.2	
Lotus type		0.3									0.4		0.3	0.8			0.9	0.6
Melampyrum			0.4										1		0.4			
Mercurialis				0.2					0.2									
Papaver						0.4	0.2					0.4	0.3				0.2	0.6
Plantago lanceolata	4.4	5.1	7.7	4.4	9.1	0.8	4.7	7.3	6.2	12	7.5	11	15	10	13	9.8	6.8	2.4
Plantago major				0.2			0.4	0.3	0.2		0.4	0.6		0.8			0.2	0.6
Plantago maritima type														0.3				
Polygala											0.4							0.3
Polygonum aviculare			0.4	0.2	0.4	0.4	0.4	0.7	0.2			0.2	0.5	0.5		0.4	0.5	0.6
Potentilla type	0.6	0.3		0.2		0.8	0.9		1			0.4		0.3				0.6
Ranunculus type		0.8				0.4	0.9	0.3	0.6	0.9	0.4	0.4	1	0.8	0.4	1.6	1.2	
Rhinanthus type		0.3		0.2				0.3					0.5	0.8	0.8	0.4		
Rosaceae undiff		0.5																
Rumex obtusifolius type				0.7			0.2			0.4	0.2		0.3					
Rumex undiff.	0.6		0.7	0.7		1.7	0.5	0.7	0.8	0.4	1.1	0.8	0.3	1	1.2	0.8	1.9	0.9

Table 1b

SLOUGH HOUSE FARM (FO15) - BRONZE AGE

Depth (cm)	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35
Herbs continued																		
Sinapis type											0.7		0.5	0.3	0.4	0.4		
Spergula type		0.3																
Stachys sylvatica type											0.2	0.2	0.5		0.8			
Stellaria holostea				0.2														
Trifolium type	1.1		0.4	0.2			0.9		0.4	1.7	0.7	1.2	3.1	1.6	1.2	1.8	1.4	
Umbelliferae undiff.	1.1	0.8	0.4	0.7		0.8	0.7	0.3	0.8		0.4	0.6	2.1	0.3	0.4	0.8	0.7	
Umbelliferae (Anthriscus sylvestris type)															0.2			
Urtica type	1.1	0.5	1.8	2.9	1.6	1.3	2.3	1.3	4.2	3.1	2.1	1.2	1.3	0.8	1.8	0.4	1.2	0.9
Viola (c.f. riviniana)															0.2			
Obligate Aquatics																		
Hippuris															0.2			
Lemna											1.4	0.8	1	0.5	1.2	2.2	0.7	1.2
Potamogeton														0.3				
Plants of Wet Soil																		
Caltha type													0.3					
Cyperaceae									0.4						0.4			
Filipendula								0.7		2.6	1.1	0.2	0.3					1.2
Mentha type													0.3					
Trollius europaeus							0.2											
Umbelliferae (Apium inundatum type)												0.2						1.8
Valeriana													0.3					
Iron Sulphide Spherules										3.5	3.9	3.1	17	6	15	4.1	5.7	9.7
Trichuris												+						
Pollen concentration x 1000	110	136	178	130	119	106	118	139	107	127	23	75	78	74	85	79	102	26

Table 1c

CHIGBOROUGH FARM (F645) - BRONZE AGE

Depth (cm)	75	80	85	94	96	98	102	106	110
Stratigraphy									
Dark slightly organic sandy clay	+	+	+						
Dark organic silty clay loam				+	+	+	+	+	+
Trees/Shrubs/Climbers									
Acer	0.2								
Alnus	3.5	5.4	1.5	2.8	5.3	3	2.8	2.2	4
Betula	0.9	0.3		0.3	1		1.7	1.2	
Coryloid	2.2	2.1	3.2	1.1	1	1.8	3.3	0.9	1.5
Fagus					0.3				
Fraxinus	0.2	0.8			0.3	0.9	0.3		
Hedera	0.4		0.3	0.3		0.3			
Ilex		0.3		0.3					
Ligustrum								0.3	
Lonicera								0.3	
Pinus	0.2	0.5							
Prunus	0.7	1.1				0.3		0.6	0.9
Quercus	11	14	12	13	14	15	10	15	15
Rosaceae undiff.				0.3	0.3				
Rosaceae c.f. Crataegus	0.7	0.3				0.3	0.3	0.3	0.3
Rosaceae c.f. Rosa				0.3					
Rosaceae c.f. Rubus								0.6	
Salix	0.9	0.8	0.3	0.8	0.3	0.9	0.6	0.9	0.6
Sambucus nigra		0.3							
Taxus							0.3		
Tilia	0.2	0.8	0.3	0.6	1		0.3	0.6	0.6
Ulex type	0.4	0.5							0.3
Ulmus		0.3					0.3	0.3	
Spore Producers									
Filicales	0.4					0.3			
Polypodium	1.1			0.6		0.3		0.3	
Pteridium	2.4	3.2	2.1	3.6	2	2.1	0.6	0.6	0.6
Herbs									
Cereals	4.2	1.9	5	5	6	3.6	4.7	3.4	2.4
Gramineae	44	39	51	52	51	45	57	48	45
Alchemilla type		0.3		0.3				0.3	
Anthemis type	1.5	2.1	1.2	1.1	2.3	1.2	0.6	0.9	2.1
Artemisia			0.6	0.3		0.3	0.3	0.3	0.3
Aster type	0.4		0.6	0.6		0.3	0.8	0.9	
Campanula type							0.3		
Capsella type	0.7						0.3		
Caryophyllaceae		0.5	0.3						0.3
Centaurium	0.2								
Chenopodiaceae	0.9	1.1	0.6	0.6	0.7		1.7	0.9	1.8
Cirsium		0.3			0.3	0.6	0.6	0.3	0.6
Cruciferae						0.6			
Galium		0.3							0.3
Geum	0.2								
Geranium				0.3					
Hypericum perforatum type								0.9	

Table 2a

CHIGBOROUGH FARM (F645) - BRONZE AGE

Depth (cm)	75	80	85	94	96	98	102	106	110
Herbs continued									
Lactuceae	2.7	2.7	2.6	1.4		2.4	1.4	1.5	3.4
Leguminosae		0.3	0.3			0.3	1.1	0.3	
Lotus		1.3	0.3			0.3		0.3	
Melampyrum	0.4							0.3	
Papaver			0.3						
Plantago lanceolata	12	12	9.4	5.3	6.3	4.2	3.6	7.1	8.3
Plantago major	0.4					0.3		0.3	0.3
Plantago maritima					0.3				
Polygonum aviculare	0.2	0.5	0.6			0.3		0.3	
Potentilla type		0.5	0.9		1	0.6		0.9	0.3
Poterium		0.3							
Ranunculus type	1.3	0.8		1.4	1	0.3	1.1	0.3	0.6
Rhinanthus type				0.6					
Rumex acetosella	0.4				0.3				
Rumex obtusifolius type	0.4		0.3						
Rumex undiff.	0.4	0.5	1.8	0.8	0.3	2.7	0.8	0.9	1.2
Silene vulgaris type					0.3				
Sinapis type	0.2		0.3						
Solanum undiff.				0.3			0.3		
Spergula type	0.4							0.3	
Stachys type	0.2							0.3	0.9
Stellaria holostea	0.2	0.5					0.3		0.3
Trifolium type	1.3	1.9	1.2	1.1	0.3	1.8		0.6	2.1
Umbelliferae undiff	0.7	0.3	0.3	0.6			1.1		
Urtica type	0.4	0.3		0.8	0.3			0.3	
Obligate Aquatics									
Elodea							0.3		
Lemna	1.1	1.6	0.9	1.9	2.6	1.8	1.4	0.3	0.9
Polygonum amphibium			0.3						
Potamogeton	0.2								
Myriophyllum spicatum						0.9		0.3	
Plants of Wet Soil									
Caltha type						0.3			
Cyperaceae				0.3				0.3	
Filipendula						0.9			
Mentha type						0.3			

Table 2b

CHIGBOROUGH FARM (3887) - IRON AGE

Depth (cm)	74	94	106	114	126	134	146
Stratigraphy							
Grey/brown silty clay loam	+						
Grey/brown sandy clay loam		+					
Grey/brown clay silt loam			+				
Grey/brown coarse clay loam with sand				+	+	+	+
Trees/Shrubs/Climbers							
Alnus	1.5	0.45	1.11	1.28	1.57	0.9	1.52
Betula	0.37	0.23	0.74	0.32			0.76
Coryloid	3.75	1.58	0.74	1.6			1.77
Fraxinus			0.37	0.64	0.31		
Pinus				0.32		0.6	
Quercus	1.12	2.7	2.22	6.41	4.72	4.8	5.3
Rosaceae undiff.						0.3	
Rosaceae c.f. Crataegus				0.32			
Salix	0.37	0.45	1.48	4.17	3.14	0.3	1.26
Sambucus nigra							0.25
Tilia			0.37	0.64	0.31	0.6	1.26
Dwarf Shrub							
Calluna						0.3	
Spore Producers							
Anthoceros						0.3	
Filicales	0.75	0.23	0.37	5.13	0.94	0.3	1.52
Ophioglossum		0.23					
Polypodium		0.68	0.74			0.3	0.25
Pteridium	10.1	5.41	12.2	9.62	7.86	12.6	4.8
Sphagnum	0.37						

Table 3a

CHIGBOROUGH FARM (3887) - IRON AGE

Herbs							
Cereals	1.5	1.58	2.22	1.92	0.94	2.7	3.79
Gramineae	53.2	68.9	58.5	46.2	64.5	60.7	59.6
Anagallis c.f. tenella							0.25
Anthemis type	0.75	0.45	1.48	0.64	0.94	1.5	0.51
Artemisia							0.25
Aster type	0.37	1.35		1.6	0.94	0.3	0.76
Capsella type	0.37	0.23		0.64			1.01
Caryophyllaceae	1.5	0.45	0.74		0.63	0.6	0.25
Centaurea nigra type	0.75		0.74		0.31		
Chenopodiaceae	2.62	2.25	1.48	1.28	0.63	0.6	0.51
Cirsium	2.62		0.37	0.32	0.31	0.6	0.51
Galium							0.25
Geum				0.64			
Lactuceae	3.37	4.5	4.44	4.81	4.09	3.6	2.53
Lamium type	1.12				0.31		
Leguminosae		0.45	0.37		0.94	0.3	
Lotus	0.75						
Melampyrum	0.37						
Papaver		0.45					0.25
Plantago lanceolata	4.49	3.6	4.81	7.37	2.52	1.8	2.78
Plantago major	0.75				0.63		0.51
Potentilla type				0.32			
Ranunculus type	0.75	1.13	0.37	1.92	0.31	1.5	2.53
Rhinanthus type	0.75			0.32			
Rumex undiff.		0.68	0.74	0.32	0.94	0.9	0.76
Sinapis type	0.75	0.68			0.31		0.51
Spergula type	1.87		0.74	0.32			
Stachys type	0.37						
Stellaria holostea		0.45				0.3	0.25
Trifolium type	1.5	0.23	0.74		1.26		0.51
Umbelliferae undiff	0.37	0.23	0.37	0.64		0.6	0.76
Urtica type	0.37	0.45	0.37			0.9	1.26
Aquatics							
Lemna	3.93			0.32	0.63	2.34	3.88
Polygonum amphibium						0.29	
Potamogeton	0.71						
Plants of Wet Soil							
Cyperaceae	0.37		1.11	0.32	0.63	1.5	1.01
Filipendula						0.3	

Table 3b

Chigborough (Ch) & Slough House (SI) Farms	Site	Ch		SI		Ch		SI
	Feature	645		015		3887		2956
Trees/Shrubs/Climbers								
Acer		0.02	B	0.05			I	
Alnus		3.38	R	1.09		1.19	R	0.66
Betula		0.59	O	0.26		0.35	O	1.09
Coryloid		1.92	N	1.69		1.35	N	2.01
Fagus		0.04	Z	0.01				
Fraxinus		0.28	E	0.12		0.19	A	0.53
Hedera		0.15		0.08			G	0.82
Ilex		0.06					E	
Ligustrum		0.03	A				/	
Lonicera		0.03	G				R	0.09
Pinus		0.08	E	0.08		0.13	O	0.28
Quercus		13.2		25.1		3.9	M	5.21
Rosaceae undiff.		0.07		0.18		0.04	A	
Rosaceae c.f. Crataegus		0.24		0.58		0.05	N	0.55
Rosaceae c.f. Prunus		0.4		0.78				0.41
Rosaceae c.f. Rosa		0.03		0.06				
Rosaceae c.f. Rubus		0.07		0.24				0.94
Rosaceae c.f. Sorbus				0.06				
Salix		0.68		0.21		1.6		27.6
Sambucus nigra		0.03		0.01		0.04		
Taxus		0.03		0.01				
Tilia		0.49		0.51		0.46		
Ulex type		0.14		0.14				
Ulmus		0.09		0.04				
Dwarf Shrub								
Calluna				0.02		0.04		0.19
Spore producers								
Anthoceros						0.04		
Filicales		0.08		0.06		1.32		2.62
Ophioglossum				0.01		0.03		
Polypodium		0.25		0.01		0.28		
Pteridium		1.91		1.66		8.95		0.81
Sphagnum				0.02		0.05		
Obligate Aquatics								
Elodea		0.03						
Hippuris				0.01				
Lemna		1.38		0.5		1.59		0.11
Polygonum amphibium		0.03				0.04		
Potamogeton		0.02		0.01		0.1		0.6
Myriophyllum spicatum		0.13						0.11
Plants of Wet Soil								
Caltha type		0.03		0.04				0.11
Cyperaceae		0.07		0.34		0.71		0.18
Filipendula		0.1		0.01		0.04		
Mentha type								
Scrophularia type		0.03		0.01				0.09
Trollius europaeus				0.11				
Umbelliferae (Apium inundatum type)				0.01				
Valeriana				0.3				
Total trees/shrubs/climbers excl. Salix		21.3		31.1		7.7		12.5
Gramineae		47.9		42.7		58.8		39.2
Cereal		4.03		1.42		2.09		3.32
Total herbs minus grass/cereal		19.4		22.5		18.4		12.5
Total spore producers		2.25		1.77		10.7		3.43
Total plants of wet soil		0.23		0.83		0.75		0.37
Total aquatics		1.59		0.53		1.73		0.81

Table 4a

Chigborough (Ch) & Slough House (SI) Farms	Site	Ch		SI		Ch		SI
	Feature	645		015		3887		2956
Herbs								
Cereals		4.03	B	1.42		2.09	I	3.32
Gramineae		47.9	R	42.7		58.8	R	39.2
Anagallis c.f. tenella			O			0.04	O	
Alchemilla type		0.1	N				N	0.09
Anthemis type		1.46	Z	0.07		0.9		1.36
Armeria			E				A	0.09
Artemisia		0.23		0.93		0.04	G	0.09
Aster type		0.41	A	2.87		0.76	E	0.37
Campanula type		0.03	G				/	
Capsella type		0.1	E			0.32	R	
Caryophyllaceae		0.13		0.32		0.6	O	0.17
Centaurium		0.02		0.3			M	
Centarea nigra type				0.04		0.26	A	
Cerastium type				0.01			N	
Chenopodiaceae		0.91		0.01		1.34		0.76
Cirsium		0.3		1.86		0.68		0.28
Cruciferae		0.07		0.09				0.09
Fallopia convolvolus				0.09				
Galium		0.06		0.06		0.04		0.37
Geum		0.02				0.09		
Geranium		0.03						
Hypericum perforatum type		0.1		0.09				
Lactuceae		2.01		0.06		3.91		1.08
Lamium type				1.86		0.21		0.09
Leguminosae		0.25		0.04		0.29		
Lotus type		0.25		0.1		0.11		0.18
Melampyrum		0.08		0.18		0.05		
Mercurialis				0.1				
Papaver		0.03		0.02		0.1		0.11
Plantago lanceolata		7.56		0.12		3.91		2.18
Plantago major		0.15		7.62		0.27		
Plantago maritima		0.04		0.21				
Polygala				0.01				
Polygonum aviculare		0.22		0.04				0.17
Potentilla type		0.47		0.3		0.05		
Poterium		0.03						
Ranunculus type		0.76		0.28		1.22		0.27
Rhinanthus type		0.06		0.54		0.15		
Rumex acetosella		0.09						
Rumex obtusifolius type		0.08		0.03				0.74
Rumex undiff.		1.07		0.1		0.62		0.46
Silene vulgaris type		0.04						
Sinapis type		0.06		0.78		0.32		0.3
Solanum undiff.		0.06						0.63
Spergula type		0.08		0.13		0.42		0.17
Stachys type		0.16		0.01		0.05		0.11
Stellaria holostea		0.15		0.09		0.14		0.21
Trifolium type		1.15		0.01		0.6		0.26
Umbelliferae undiff		0.32		0.88		0.42		
Umbelliferae (Anthriscus sylvestris type)								0.09
Umbelliferae c.f. Conium maculatum type								0.26
Umbelliferae c.f. Pimpinella major type				0.6				0.09
Urtica type		0.24		0.01		0.48		1.41
Viola (c.f. riviniana)				1.66				

Table 4b