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MICROSCOPIC ANALYSIS OF FLANDRIAN VALLEY SEDIMENTS EXPOSED DURING THE CONSTRUCTION OF THE NEW CHELMER BRIDGE, CHELMSFORD BY-PASS, ESSEX.

Patricia E. J. Wiltshire BSc.

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Summary

During the construction of the Chelmsford By-Pass in 1984-85, samples were taken from two exposed sections from the main Chelmer Valley (Section 1 and Section 2). Samples for Pollen analysis were taken only from Section 1 while macrofossil analysis was carried out in both sections by Peter Murphy (see Ancient Monuments Laboratory Report 120/87).

Micro fossils were exceedingly sparse and in poor state of preservation so that a detailed description of vegetation was impossible. However, the site appears to have been an abandoned river channel which was prone to periodic inundation, and there was evidence of human activity throughout the sediments.

The very marked changes in the micro fossil assemblage at the transition from detritus mud to silty clay might indicate a drastic change in land use. The pollen assemblage also suggests that the sediments in Section 1 are not contemporaneous with those of Section 2.

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Introduction

A monolith of 30cm length (from 165-195cm) was taken by Peter Murphy in 1984 for palynological investigation. This monolith was taken in the area of Section 1, referred to in Murphy's Ancient Monument Laboratory Report 120/87. Whilst Murphy analysed from 180-195cm of Section 1 for macrofossils, this brief palynological report covers analysis from 166-195cm.

Methods

Samples were taken at 2.0cm intervals and the matrix removed by standard techniques (acetolysis and hydrofluoric acid extraction). The concentrated remains were stained with safranin and mounted in glycerol jelly. Two slides were made for every sample and the total area of each slide was scanned for pollen, spores, charcoal and microbial remains. No attempt was made to quantify the findings.

Results

The results are shown on the attached schedule. Pollen was absent in many of the samples and, even where present, was in a very poor state of preservation so that very few grains could be identified with any degree of confidence. The only grains which were present consistently in the fossiliferous samples were those of *Pinus* and Cyperaceae.

There was a marked change in the microfossil content of the sediments at 180cm; to the naked eye, there was little, if any, difference between the sediment at this depth and those above. However, this depth was probably part of the transition from silty clay to the detritus mud.

The sediments from 166-178cm were devoid of pollen although bacterial filaments were present. Angular charcoal fragments were also sparse but charcoal spherules were relatively abundant, especially in levels 176 and 178cm.

Pollen and fungal remains were confined to, and charcoal was more abundant at, between 180-195cm - in other words to the detritus mud and in its transition to the upper, silty clay.

Discussion

With such paucity of evidence, it is very difficult to draw any detailed conclusions as to the environment represented by these sediments. However, there are some points of interest in the findings. There was obviously a sudden and marked change in the pattern of sedimentation above 180cm and the distribution of microfossils shows this quite clearly.

The bacterial filaments were probably of Cyanobacteria and/or a '*Sphaerotilus*' type bacterium. Cyanobacteria are not dependent upon an external source of carbon but respond markedly to mineral eutrophication; and they are often abundant on the surface of muds prone to periodic drying. *Sphaerotilus* type bacteria respond to carbon eutrophication.

The hyphae of both Phycomycetes and Ascomycetes/Deuteromycetes were abundant in the detritus mud at the base of the section. These fungi were probably aquatic forms and, indeed, the elongated and curved spores which are characteristic of aquatic Hyphomycetes were in evidence. These fungi are usually to be found on decaying plant litter and large numbers are often found where there is a high input of leaves and seeds to a body of water. Some species also require a considerable flow of water before sporulation will occur so that the presence of their spores might indicate a considerable throughput of water during the period of deposition of the detritus mud. This flow might be maintained only during periods of flooding so that Murphy's idea, of an abandoned channel subject to periodic flooding, would still be tenable.

A periodic flow of water might, at least in part, be an explanation for the paucity of both microfossils and macrofossils in the sediments from Section 1. Murphy believes that Section 1 was taken from the middle of a channel, and a considerable scouring effect might be expected from flood water in such a location. He obtained more productive samples from Section 2 which he interprets as being at the edge of a channel. It is, perhaps, fairly easy to envisage plant debris collecting and being deposited at a shallow edge.

The presence of charcoal spherules has recently been noticed in other lowland sites which are near bodies of water, or which appear to have been prone to flooding. It is possible that they represent charcoal fragments that have spent a considerable time in water and may be derived from distant locations, whilst the angular charcoal fragments (which are usually less dense and more fragile-looking) might be derived from more local (or more recent) fires, and by aerial input.

The pollen assemblage presented on the table of results is rather peculiar, probably because of the periodic flooding which could bring pollen from a number of origins. It is, of course, also possible that the pollen had been secondarily derived, or redeposited.

Pine and sedges are the only plants to be recorded consistently in the detritus mud. The presence of pine in all the levels containing pollen leads to the conclusion that there were pine trees growing within a few miles of the site. Long distance transport is usually indicated by the occasional pollen grain whilst, in these sediments, pine was certainly one of the most abundant to be found. Murphy found an abundance of alder at the base of Section 2 whilst no alder pollen was found in the area of Section 1. This presents a dilemma since Alder pollen is produced in

vast quantities, is exceedingly distinctive, and is relatively resistant to decay. So, even though the fossil evidence from Section 1 is poor, one might expect to find at least some alder pollen deposited from an alder carr only 40m downstream. If periodic flooding did indeed occur, one would expect flood water mingling with that upstream, carrying alder pollen with it, and depositing at least some grains in the sediments of Section 1.

What is very obvious from the data presented here is that some agency, possibly local clearance and farming, caused erosion and the deposition of minerogenic material over the detritus mud. If the charcoal spherules are indicative of flooding, then the site continued to be periodically inundated for some time, the surface clay being colonised by the filamentous bacteria described above.

The base of the detritus mud at Section 2 was dated to 1760 ± 80bc and the top dated to 1250 ± 70bc, and Murphy has interpreted a change from alder woodland to an open, weed-dominated habitat at about 1250bc, this being related to the establishment of the Late Bronze Age enclosure at Springfield Lyons. He also envisages the valley floor being kept open for grazing.

The results in this report do not refute any of Murphy's findings in that some agency caused soil erosion and that the site was kept open, probably by grazing. The latter might be indicated by the very obvious presence of the filamentous bacteria in the silty clay since, if heavy grazing did persist near to the channel, there is every chance of the sediments and any standing water becoming polluted with animal excreta. This would enhance both the bacterial forms mentioned above. But Murphy's interpretation of the field evidence might now need to be modified. There is no doubt that the pattern of events at Section 1 reflect those of Section 2 but the consistent presence of pine pollen and the complete absence of alder would suggest that the deposits from Section 1 are not contemporaneous with those of Section 2. Furthermore, it is exceedingly difficult to ascertain which is the earlier.

Conclusions

The sediments analysed here show evidence of human activity throughout. The site appears to have been an abandoned river channel which was prone to periodic inundation and which received considerable amounts of plant debris, as evidenced from the microbial remains. The lack of preservation of plant remains might have been due to a scouring effect of flood water.

A sudden change in the environment is evidenced by the deposition of a silty clay over the detritus mud containing the pollen, fungal, and most abundant charcoal remains. This would indicate soil erosion through some form of land management. However, It would appear that the sediments in Section 1 are not comtemporaneous with those of Section so that the events recorded

here may not be related to the establishment of the Late Bronze-Age enclosure at Springfield Lyons. It is not possible to determine the relative age of the sediments at Section 1 from the evidence presented here.

References

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CHELMER BRIDGE (TL74387/06547)

Depth (cm)	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194
STRATIGRAPHY															
Grey Silty Clay	+	+	+	+	+	+	+	+							
Transition Layer									+						
Black Detritus Mud										+	+	+	+		
Humic Clay														+	+
POLLEN															
Betula														+	
Pinus								+	+	+	+	+	+	+	+
Corylus															
Salix								+					+		
Prunus type											+				
Cyperaceae								+	+	+	+	+	+	+	
Gramineae								+	+		+			+	
Filipendula								+			+				
Caryophyllaceae												+			
Geranium												+			
Liguliflorae								+							
Filicales							+	+							
Other Pollen								+	+	+	+	+	+	+	
MICROBES															
Bacterial Filaments	+	+	+	+	+	+	+	+	+	+	+				+
Phycomycete									+	+	1	2	3	2	+
Asco/Deuteromycete										+	1	2	3	2	+
CHARCOAL															
Angular Fragments	+	+	+	+	+	+	+	+	+	+	3	3	3	2	2
Spherules	+	+	+	+	+	1	2	2	1	1	2	3	2	2	3
+ = Present															
1 = Frequent															
2 = Abundant															
3 = Very Abundant															