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The assessment of diatoms from waterlogged sediments at Parsonage Farm, Westwell, Kent (ARC PFM98)

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1 INTRODUCTION

A total of 16 subsamples were taken from Sample 43 and 25 subsamples from Samples 38 and 39. From these two sequences, nine subsamples were selected for diatom analysis from the former and seven subsamples from the latter.

The purpose of carrying out diatom analysis is to investigate the potential record of water quality within the moat. This technique provides a means of reconstructing the aquatic environment including factors such as nutrient concentrations, water flow and variations in water levels. The evaluation reported here is to determine if diatoms are present and the potential for percentage analysis of the diatom assemblages with the aim of more detailed environmental reconstruction. Diatom valve concentrations, the quality of diatom preservation, the diversity of taxa, the types of diatom assemblage are evaluated.

2 METHODS

Diatom preparation followed standard techniques: the oxidation of organic sediment, removal of carbonate and some clay, concentration of diatom valves and washing with distilled water. Two coverslips, each of a differing concentration of the cleaned solution, were prepared from each sample and fixed in a mountant of suitable refractive index for diatoms (Naphrax). Slides were scanned under phase contrast illumination at magnifications of x400 and x1000. Tables 1 and 2, located at the end of the report, summarise the results of diatom assessment.

Diatom floras and taxonomic publications used to assist with diatom identification include Hustedt (1930-1966) and Krammer & Lange-Bertalot (1986-1991). Sources of diatom ecological data include Van Dam *et al.* (1994)

3 RESULTS AND DISCUSSION

3.1 Sequence ARC PFM 98 <38> and <39>

Of the nine subsamples prepared for diatom analysis from Samples 38 and 39 only the two uppermost samples from 1 cm and 13 cm depth contained diatom assemblages. Diatom assemblages are absent from the remaining samples.

The diatoms present in the two uppermost samples are non-planktonic species. These diatoms live attached to submerged surfaces such as the leaves of aquatic macrophytes, or they are benthic diatoms that live within the surface of submerged mud. The species present include *Cocconeis placentula, Amphora veneta, Fragilaria construens* var. *binodis, Fragilaria construens* var. *venter, Navicula* spp. and *Pinnularia* sp. (*including P. abaujensis*). The absence of planktonic diatoms, along with the abundance of attached or benthic species which, if the water was clear may have been able to colonise the whole of the moat, may

reflect the relatively small size and shallow nature of the water body. This observation is supported by the relatively low species diversity compared with lakes and rivers.

It is significant that the diatom assemblages do not show any evidence for very high levels of nutrients in the water. These would be associated with the discharge of large amounts of organic waste into the moat as has been observed at other moated sites or pools associated with human habitation (unpublished diatom data) and in ponds and lakes in the catchment of human settlement. The effects of such eutrophication would be seen in the types of diatom assemblage present, perhaps with blooms of planktonic diatoms adapted to high nutrient levels, shading macrophytes and benthic algae and thus dominating the fossil assemblage.

The water body appears to have been a permanent one during the period in which the uppermost sediments in 38 (1 cm and 13 cm depth) accumulated. The diatoms present are properly aquatic and relatively well preserved. However, the occurrence of aerophilous diatoms (*Hantzschia amphioxys, Pinnularia* spp.) represent material from bank or soil erosion or partial drying-out of the water body. High concentrations of resistant chrysophyte cysts, that are usually found as a result of prolonged dry periods, were not found.

3.2 Sequence ARC PFM 98 <43>

A sequence (ARC.PFM <43>) was provided for diatom assessment/analysis. This sequence is composed of two monolith samples. The lower monolith cuts into two units, the lower unit C is equivalent to context [1093] and the upper unit B is in context [11066]. Three diatom samples were taken from this monolith (see table). The lower part of the upper monolith also cuts into unit B context [11066] whilst the upper part of this monolith is in unit A context [11065].

A total of 13 samples taken at 4 cm intervals between 58.26 m O.D. and 58.75 m OD was supplied from the upper monolith and 3 samples from the lower monolith between 58.04 m OD and 58.24 m OD. Of these 13 samples seven were selected for diatom analysis/assessment. With the exception of a few diatom fragments in unit B, diatoms are absent from the sequence. The poor recovery of diatoms from water-lain sediments is likely to be the result of taphonomic processes, such as silica dissolution caused by factors such as high sediment alkalinity or prolonged dry periods (see Flower 1993).

4 CONCLUSIONS

Overall the preservation of diatoms in the two sequences is poor. The almost complete absence of diatoms from the greater part of the sequences must be related to a high level of silica dissolution. However, quite well preserved assemblages were found in the two uppermost samples from Sample 38. The value of making full percentage counts on these

samples, and for the adjacent samples (5 cm, 9 cm; and possibly 17 cm and 21 cm depth) should be considered in the light of the archaeological value of water quality reconstruction for the period represented (dates?) and from evidence from other bio- and geoarchaeological sources. Further, some of the common diatom species present such as the *Fragilaria construens* (& var.) have wide total aquatic phosphorus ranges (TP) although the overall assemblage suggests only moderate levels of aquatic phosphorus.

5 ACKNOWLEDGEMENTS

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Table 1: ARC PFM 98 upper <38> and lower <39> monoliths

Diatom Sample No.	Monolith	Unit/ Context	Sample Depth in Monolith (cm)	Sample Depth (m) OD	Diatoms present	Diatom valve concentration	Quality of preservation	Diversity	Assemblage type	Potential for percentage counting
1	<38>	A	1	57.64	present	moderate high	moderate to poor	moderate	epiphyte, benthic, & aerophile	good
			5							
			9							
2	<38>	B	13	57.52	present	high	moderate to poor	moderate	similar	good
			17							
			21							
3	<38>	B	25	57.40	none	-	-	-	-	none
			29							
			33							
4	<38>	C	37	57.28	none	-	-	-	-	none
			41							
			45							
5	<38>	C	49	57.16	1 fragm.	-	-	-	end *F.constr*.v.*binodis*	none
	<39>	A	1							
			5							
6	<39>	B	9	57.26	none	-	-	-	-	none
			13							
			17							
7	<39>		21	57.14	none	-	-	-	-	none
			25							
			29							
8	<39>		33	57.02	none	-	-	-	-	none
			37							
			41							
9	<39>		45	56.90	none	-	-	-	-	none

Table 2: ARC PFM 98 <43> upper and lower monoliths

Diatom Sample No.	Monolith	Unit/ Context	Sample Depth (m) OD	Diatoms present	Diatom valve concentration	Quality of preservation	Diversity	Assemblage type	Potential for percentage counting
10	<43> upper	A[11065]	58.75	none	-	-	-	-	none
			58.71						
			58.67						
11	<43> upper	A[11065]	58.63	none	-	-	-	-	none
			58.59						
			58.55						
12	<43> upper	B[11066]	58.51	fragments	very low	very poor	-	2 indet. pennate fragm.	none
			58.47						
			58.43						
13	<43> upper	B[11066]	58.39	fragments	very low	very poor	-	3 indet. pennate, one c.f. *Synedra ulna*	none
			58.35						
			58.31						
14	<43> upper	B[11066]	58.26	fragments	very low	very poor	-	2 indet. fragm., c.f. *Synedra ulna*	none
15	<43> lower	B[11066]	58.24	none	-	-	-	-	none
			58.12						
16	<43> lower	C[1093]	58.04	none	-	-	-	-	none