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FURTHER EVIDENCE FOR THE ENVIRONMENTAL IMPACT OF PREHISTORIC CULTURES IN SUSSEX FROM ALLUVIAL FILL DEPOSITS IN THE EASTERN ROTHER VALLEY

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The floodplain and valley fill deposits of the eastern Rother valley have been investigated by augering into the alluvium. The lithostratigraphy and biostratigraphy of the deposits are described and their palaeo-environmental significance evaluated. It appears that the inorganic component of these sediments has accumulated as a result of the impact of prehistoric cultures within the valley since at least the Neolithic period. The results demonstrate that this environmental impact was not site-specific but was widespread and at an apparently unprecedented scale. It is evident that the eastern High Weald was not therefore avoided by prehistoric man but was exploited in a manner hitherto largely unrecognized.

INTRODUCTION

Recent research into the valley fill deposits at sites in the Sussex Ouse and Cuckmere valleys (Scaife & Burrin 1983; 1985) has produced good evidence that prehistoric man was not only present in the High Weald, but also had a significant environmental impact. Palynological analyses of the fill deposits which now form the valley floors in these two river systems have demonstrated that the onset of agricultural practices was accompanied by the clearance of substantial parts of the former forest cover in the vicinity of these sites, which caused significant soil erosion. This altered the hydrological and sedimentological regimes markedly, resulting in substantial alluviation in the valley bottoms.

From the size of the alluvial thicknesses (up to *c*. 10 metres) at some sites within these two valleys it can be suggested that prehistoric man was probably a dominant force within the Sussex landscape from at least the Neolithic period. In order to test this hypothesis further, similar investigations have been undertaken in the eastern Rother valley. Although sub-surface coring has been undertaken throughout the length of the valley, this paper is concerned with the results of research in the vicinity of Mayfield and Robertsbridge.

THE VALLEY FILL DEPOSITS

The Rother is the principal catchment of the south-eastern Weald and drains an area of *c*. 700 sq. km. The age and probable causes of valley fill sedimentation have been investigated by augering into the alluvium using a gouge corer at two sites. The first is in the upper Rother valley where a cross-section has been constructed from twelve boreholes sunk across the valley floor from TQ 604255 to TQ 604253; the second is south-west of Salehurst from TQ 743242 to TQ 743238 where a further twelve boreholes were sunk.

The section to the south-east of Mayfield (Fig. 1) revealed a maximum fill of 5.8 metres overlying a polycyclic sub-alluvial surface cut into Lower Cretaceous Wadhurst clay with a minimum elevation of 39.6 metres O.D. Overlying and partly mantling the rockhead is a silty sand and gravel deposit which is irregular in thickness and extent. This is buried by fine-grained alluvium with a cross-sectional area of 422 square metres which has a significant loessic component (Burrin forthcoming), in which

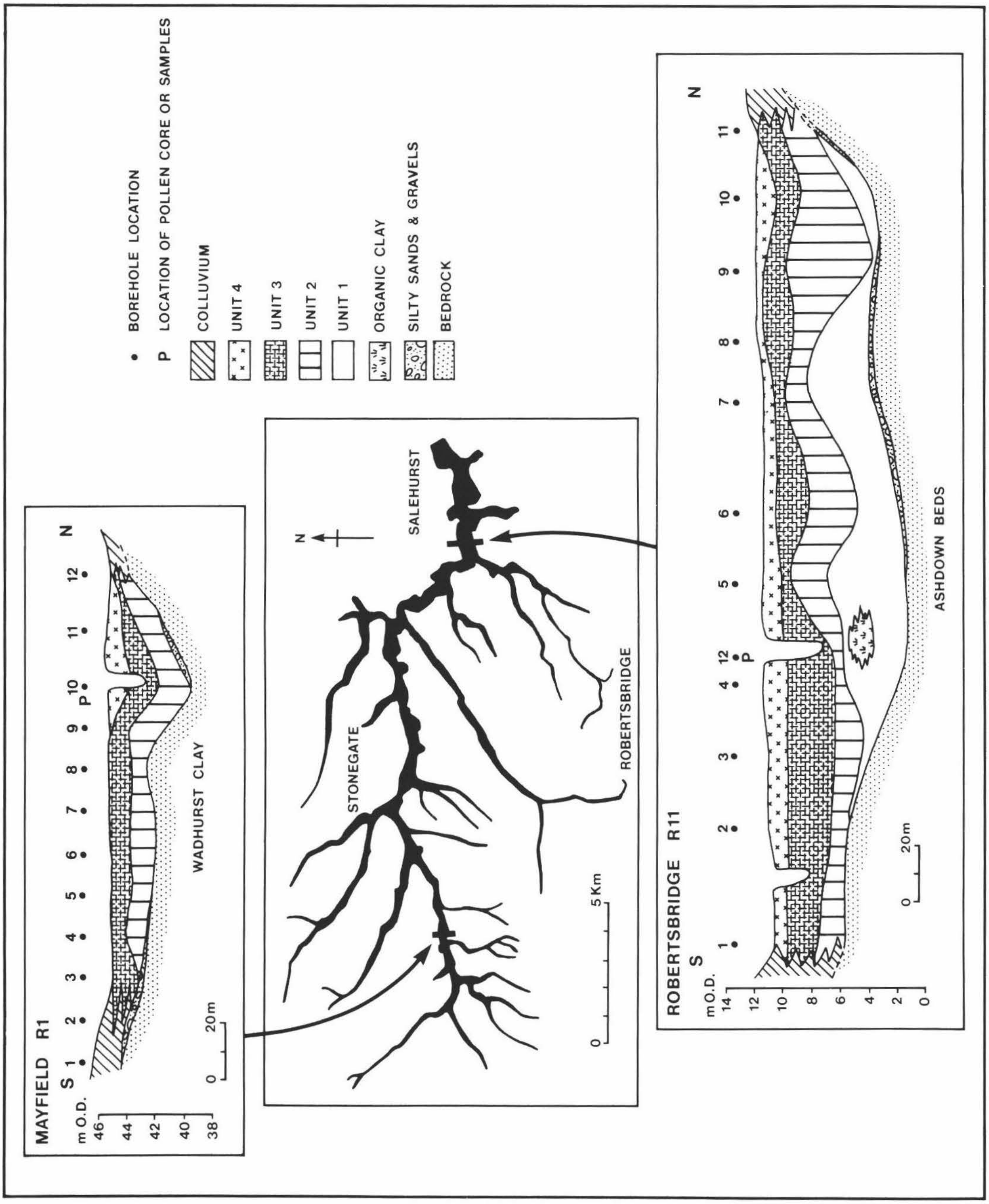

Fig. 1. Location of cross profiles and the valley fill lithostratigraphy.

three lithostratigraphic units can be identified. The deepest is an olive (5 Y 5/4), olive-grey (5 Y 4/2, 4/4) and olive-brown (2.5 Y 4/4) clayey silt which extends from 39.6 metres O.D. to 44 metres O.D. and in which burnt wood remains have been found. Above this occurs a mixed and variable unit which is usually a strong brown (7.5 YR 5/6) and/or light grey (2.5 YN 7/0) silty clay, mottled with dark brown (10 YR 3/3), dark yellowish-brown (10 YR 4/4, 4/5), pale yellow (10 YR 3/3) and reddish-yellow (5 YR 7/8). Sometimes these secondary colours dominate the matrix. This unit extends the full width of the valley floor and is found between *c.* 41.7 metres O.D. and 45.8 metres O.D., forming the contemporary floodplain surface south of the channel between Boreholes 3 and 8. The third unit occupies a smaller area than the two previously described. It is only found to the north of the present floodplain and has an elevation of between 44 metres O.D. and 45.9 metres O.D. As the valley sides are approached from the floodplain the alluvium becomes coarser, consisting of sands, silts and grits which are here classified as colluvium.

The valley fill at Robertsbridge overlies an undulating polycylic sub-alluvial surface in the Lower Cretaceous Ashdown Beds, with a minimum elevation of 1.7 metres O.D. The rockhead is also partly covered by a thin (0.25-metre) silty sand and gravel (Fig. 1). This is usually buried by a bluish- and greenish-grey (5 Y 4/1; 5 GY 4/1, 5/1) silt which extends from 1.7 metres O.D. to 8 metres O.D. In Borehole 12 a dark grey clayey silt with inclusions of fine sand and grit, as well as interbedded greenish-grey clayey silt, peat, decomposing wood, charcoal and other organic inclusions, was found between 5.8 metres O.D. and 7.6 metres O.D. within this unit. Overlying this lower deposit is an olive, olive-grey and olive-brown silt which ranges in elevation from 4 metres O.D. to 9.9 metres O.D. and which is buried in turn by a light grey and strong brown mixed and mottled silt with occasional charcoal and manganese inclusions from 6.1 metres O.D. to 11.4 metres O.D. The uppermost fill deposit recognized is a pure brown silt which ranges in elevation from 9.8 metres O.D. to 12.4 metres O.D.

PALYNOLOGY OF THE FILL SEQUENCES

Standard pollen analyses were undertaken on a core from the Mayfield site and the organic peaty clays interbedded within the lowest unit at Robertsbridge (Fig. 1). Samples of 3–4 g. were subjected to normal pollen preparation procedures (Faegri & Iversen 1974; Moore & Webb 1978) although micromesh (10u) sieving was also undertaken in order to remove a remaining clay residue. Absolute pollen frequencies were calculated by using the addition of known quantities of exotic pollen (*Garrya*) and were found to be generally high throughout, ranging from 60,000 to 370,000 pollen grains per gram. A sum of 400 pollen grains was counted at each level (excepting the uppermost and lowest levels where 300 and 200 respectively were counted) excluding modern spores and Lower Cretaceous palynomorphs. Pollen diagrams have been produced for the peaty clay at Robertsbridge (Figs. 2 and 3) where pollen has been calculated as a percentage of their total at each level and spores as a percentage of the sum of total pollen plus spores.

The pollen spectra of the organic clays at Robertsbridge are dominated throughout by arboreal and shrub pollen in approximately equal proportions (45% TP). Pollen of herbs is present but in much lower proportions from 1.8% TP at 795 cm. to 13.5% TP at 765 cm. Arboreal pollen is dominated by *Tilia*, *Quercus* and *Alnus*, with lesser quantities of *Betula*, *Pinus*, *Ulmus* and *Fraxinus*. Pollen of *Tilia* and *Fraxinus* is likely to be under-represented in the pollen sum because of their comparatively poor pollen production and dispersal with respect to the other arboreal taxa present. Examination of well preserved *Corylus* type has shown that this group, although possibly containing *Myrica*

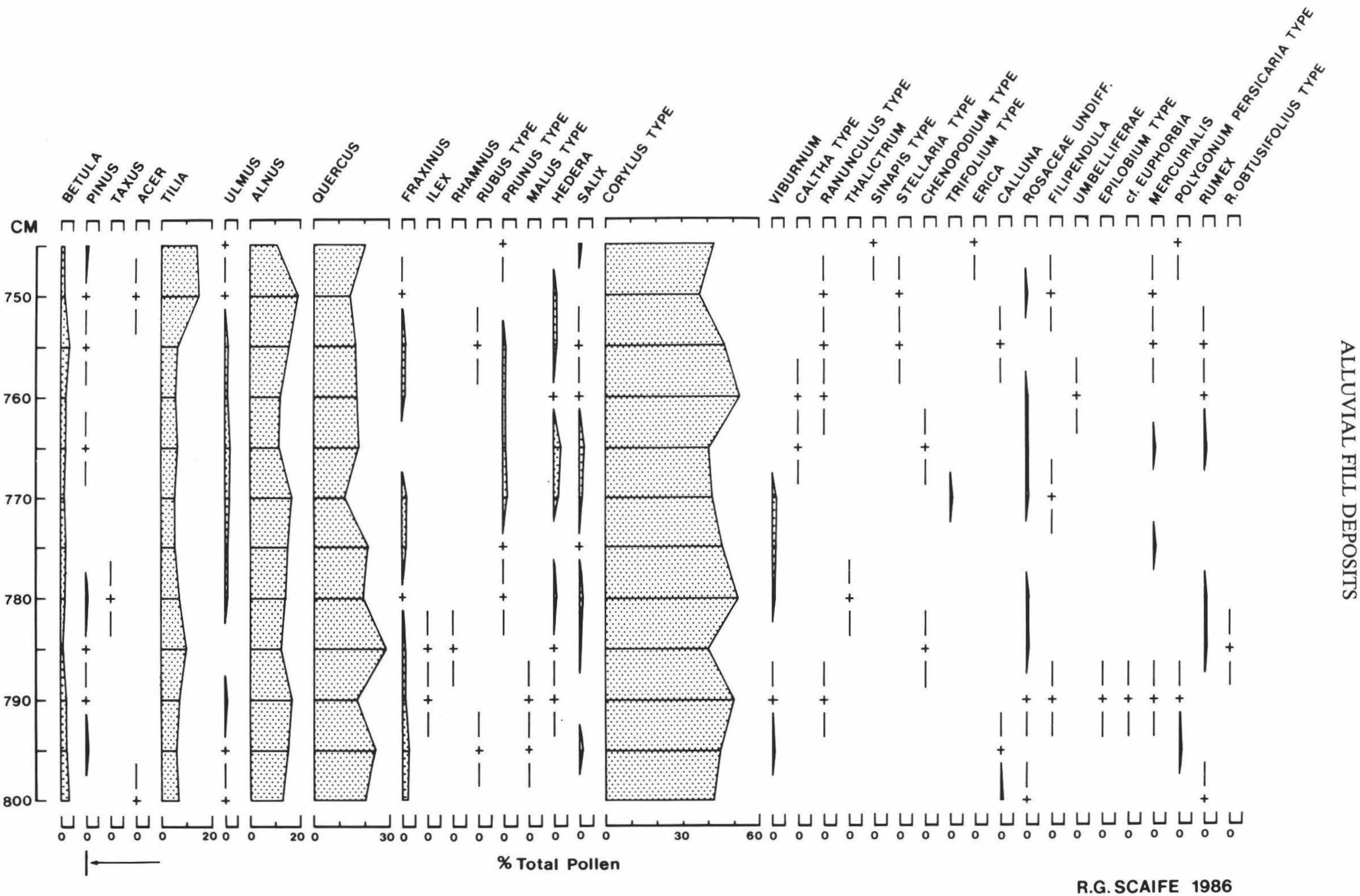

Fig. 2. The palynology of the peaty clay at Robertsbridge: trees and shrubs.

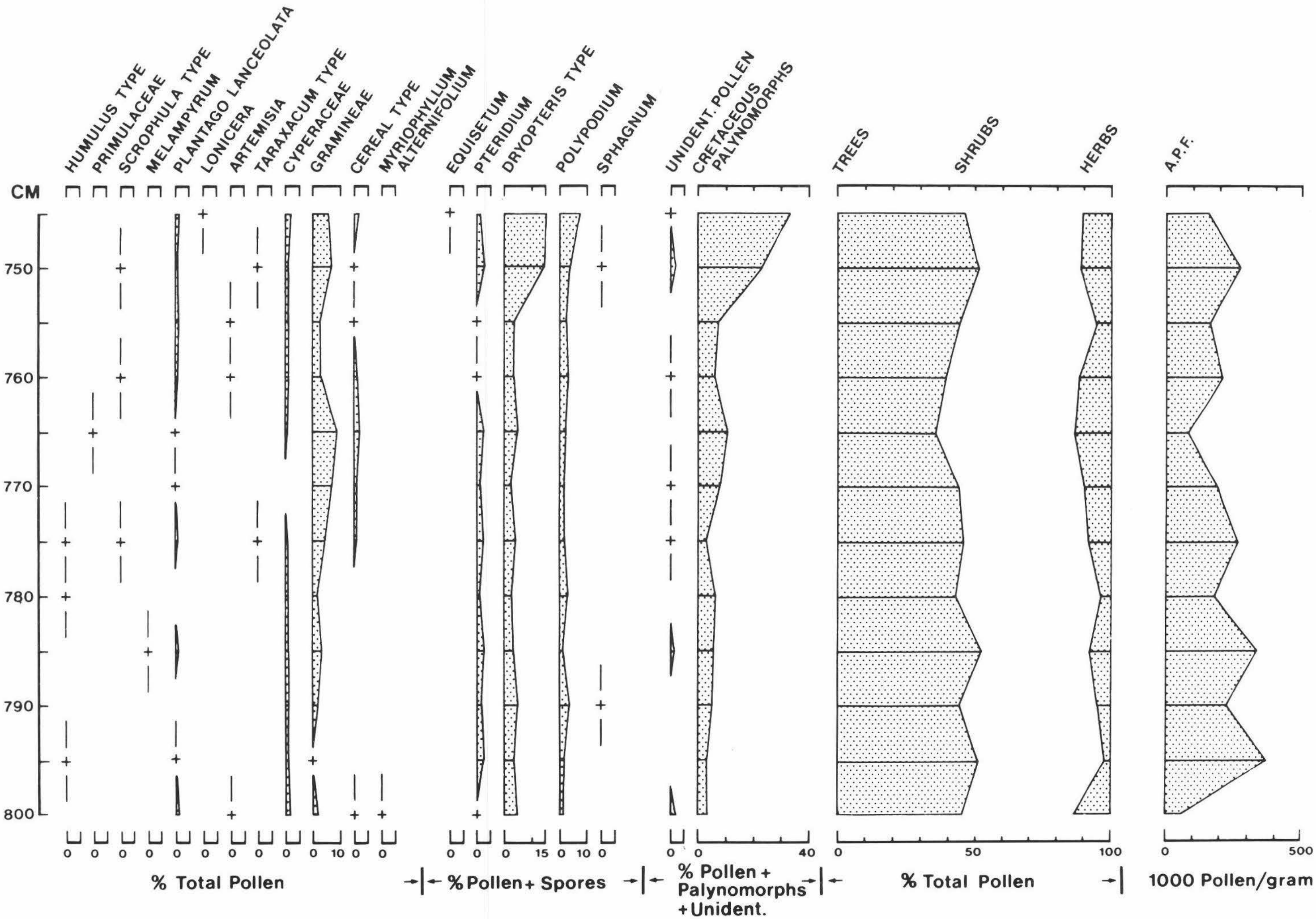

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Fig. 3. The palynology of the peaty clay at Robertsbridge: herbs and summary.

gale, is dominated by *Corylus*. This is substantiated by the finding of macrofossils. Lesser quantities of rosaceous taxa, *Hedera*, *Salix* and *Viburnum*, are present which are regarded as being under-represented in the pollen spectra for reasons of entomophily and lesser pollen production. Herbaceous pollen are relatively diverse although percentages are low, with most taxa occurring only sporadically. *Plantago lanceolata* (to 1% TP), Gramineae (to 15% TP) and cereal type (to 1.5% TP) are the predominant types. Spores of *Pteridium*, *Dryopteris* type (to 15% TP+ spores) and *Polypodium* are consistent. Considerable numbers of Lower Cretaceous palynomorphs were also recorded, attaining their highest values of 22–3% TP+ palynomorphs between 745 and 750 cm.

Pollen is poorly preserved in the samples taken from the Mayfield section. At present satisfactory results have only been obtained from the basal 10 cm. of the profile (3.8 metres). First indications show that the pollen spectra of these levels are broadly similar to the organic clays at Robertsbridge and have a mid-Holocene assemblage comprised of mixed deciduous woodland taxa, including *Quercus*, *Tilia*, and *Alnus*.

DISCUSSION

There are now a substantial number of pollen data available from southern England with which to compare the analysis presented here (for reviews see Scaife 1980; 1982; forthcoming; Waton 1982). These studies have, however, tended to concentrate upon valley mire organic peat sequences. Pollen analyses of inorganic valley fill sequences in Sussex, although problematical in their interpretation, have yielded valuable information (Scaife & Burrin 1983; 1985). The apparent lack of pollen in the inorganic deposits at Mayfield is disappointing in that it has been shown (Scaife & Burrin 1983; 1985) that pollen data can be derived from such materials. The reason for the apparent deficiency here may reflect oxidation and destruction of the former pollen content or be the result of very rapid sedimentation of inorganic deposits at this site.

The sequence from Robertsbridge falls between the two extremes of organogenic accumulation and inorganic sedimentation. The relatively high organic content here has resulted in higher absolute pollen frequencies than found within the inorganic fills both at Mayfield and in other Wealden valleys (Scaife & Burrin 1983; 1985). The relatively high silica content and the presence of Lower Cretaceous spores and pollen (e.g. *Cicatricosisporites brevilaesuratus*, *Classopollis torosus*, *Concavisporites* sp., *Todisporites* sp., *Abietinaepollenites* sp., and *Parvisaccites radiatus*) attests to a substantial secondary input from surrounding lithologies. Nevertheless, the generally fine preservation of the Holocene pollen indicates that the greater proportion of the pollen is undoubtedly of sound stratigraphical position.

The dominance of *Corylus* pollen (occasionally in clusters) and its macrofossil presence in these deposits suggests that hazel was locally present and possibly growing on the floodplain in damp but open woodland conditions. *Alnus* might also be expected to be growing in such floodplain environments as found in other past and contemporary situations in southern England (Scaife 1980; 1982), and as indicated at 3.8 metres at Mayfield. The relatively high values of alder at Robertsbridge (up to 19% TP at 750 cm.) illustrate this to some extent but pollen percentages are usually considerably higher when alder carr woodland is locally dominant. Thus, it is more likely either that *Alnus* was only sporadically present locally, or that the pollen represents more substantial growth at some distance from the site. *Alnus* pollen is readily transported aerially but consideration must also be given to pollen derived from floodwaters during overbank flows (Peck 1973). *Salix* may also have been a floodplain constituent here or upstream. Hence, the vegetation community appears to have been dominated by *Corylus*, with *Alnus* and *Salix*, located within a relatively dry floodplain habitat. This view is further supported by the presence of *Humulus* type pollen and the macrofossil evidence of *Corylus* nuts, leaves and twigs (currently being studied).

The significance of *Tilia* and its subsequent decline in south-east England during the middle Holocene has long been known (Godwin 1940; Birks *& al*. 1975) and numerous pollen data now illustrate the generality of this phenomenon (Scaife 1980). This has also been found in the analysis of other Sussex floodplain peats and inorganic deposits (Thorley 1981; Brooks 1983; Scaife & Burrin 1983; 1985; Waller *& al.* forthcoming). At Robertsbridge, and probably for the period represented by the basal part of the sequence at Mayfield, similar domination of the interfluves by *Tilia* also occurred. From the relatively high pollen percentages seen here it can be suggested that *Tilia* formed dominant or at least co-dominant woodland with *Quercus* and *Fraxinus* close to the floodplain. Pollen analyses of peat sequences adjacent to, or on, Lower Cretaceous sandstone lithologies elsewhere (Scaife 1980) have shown that soils developed on these bedrocks were ideally suited to its growth and possibly dominance. Conversely, the low frequencies of *Betula* and herbs (notably Gramineae) indicate the relative absence of non-wooded areas either of natural or anthropogenic origin at least close to this site. The presence, however, of *Plantago lanceolata*, cereal type and Gramineae is significant and suggests the probable impact of anthropogenic activity within the pollen or fluvial catchment. Furthermore, the minerogenic nature of the bulk of the valley fill sediments and similar lithostratigraphy to sites in other Sussex valleys where palynological research has demonstrated the role of man in causing or exacerbating sediment inwash to valley floors, suggest that the deposits probably have a similar genesis, i.e. are the result of anthropogenic activity within the catchment by prehistoric communities. The finding of burnt wood remains in the valley fill at Mayfield indicates that fire may have been used to assist the clearance of the vegetation cover. Similarly, the presence of charcoal in the organic sequence at Robertsbridge also attests to the use of fire by these later prehistoric communities.

This site therefore, along with that at Mayfield, Sharpsbridge in the Ouse valley (Burrin & Scaife 1984) and Stream Farm in the Cuckmere valley (Scaife & Burrin 1985) have yielded pollen spectra which show that considerable inorganic sediment accumulation took place during the middle to late Holocene (F III). This appears to have been in response to prehistoric anthropogenic processes with resultant valley side erosion and sediment inwash to the valley bottoms. These findings demonstrate that the previous and long-held belief that the central Weald was covered by virgin forest and was avoided as such by prehistoric man would appear to be totally unfounded. The fossil pollen record and inorganic inland fill stratigraphies found throughout the Ouse, Cuckmere and Rother valleys testify to at least the eastern High Weald being utilized by prehistoric man in a manner that caused serious environmental degradation and which has hitherto been largely unrecognized (see also Scaife & Burrin 1985).

These fill sequences have yet to be dated by radiocarbon dating and the results of such tests for the plant macrofossils are awaited. While pollen analysis is no longer accepted as a dating technique in late Quaternary studies, there are sufficient data now available to state that the pollen sequence described here is at its earliest of middle Holocene (Atlantic) or later date. This probability is based on the prevalence of mixed deciduous woodland and/or dominance of *Tilia*. The peaty clay at Robertsbridge must therefore pre-date the decline of *Tilia*, which has been dated to *c.* 3700 b.p. in this part of the Weald (Waller *& al.* forthcoming). Furthermore, the presence of cereal pollen (a single grain at 800 cm. but consistently from 775 cm.) and *Plantago lanceolata* throughout, allows a Neolithic (*c.* 5500 b.p.) or post-Neolithic date to be postulated. Although some current debate has been focussed upon the presence of pre-*Ulmus*-decline cereal pollen (Edwards & Hirons 1984), such occurrences have been sporadic where they have been thought to occur. Here, continuous cereal pollen upwards from 775 cm. to 745 cm. may be regarded as resulting from Neolithic or post-Neolithic agricultural activities. This is almost certainly corroborated by the relatively low *Ulmus* pollen frequencies recorded here. Pollen percentages of *Ulmus* prior to its decline (at 5040 ± 80 b.p. in the Brede tributary: see Waller *& al.* forthcoming) usually attain values of 10–15% throughout southern England during the Atlantic (F II) (Scaife forthcoming). Here, *Ulmus* values are significantly lower throughout, suggesting a post-*Ulmus*-decline date for the basal pollen spectra (Figs. 2 and 3). The peaty clay at Robertsbridge is therefore almost certainly late Atlantic or early Sub-boreal in age.

It is also pertinent to note that the organic materials at Robertsbridge overlie *c.* 2 metres of inorganic deposits. Whilst the age of these underlying sediments remains enigmatic, they pre-date the organic inclusions and are therefore presumably of a Neolithic or earlier (Mesolithic?) age.

CONCLUSIONS

It can be concluded therefore from the pollen data of the relatively organic sequence at Robertsbridge that the local environment was characterized by mixed deciduous woodland (*Quercus*, *Tilia*, *Fraxinus* and some *Ulmus*) with areas of dominant *Tilia* on the interfluves. The floodplain ecosystem was dominated by *Corylus*, but with areas of *Alnus* and *Salix* (carr woodland) of damp character (but dry in comparison to more usual valley mire situations). From the presence of woodland of this character and of some anthropogenic indicators it can be suggested that the date of this 55-cm. organic clay sequence can be attributed to a Neolithic or later phase. The pollen from the basal levels at Mayfield would appear to indicate a similar age. The peaty clay at Robertsbridge indicates a valley-side woodland vegetation community growing within a relatively stable environment, with peat accumulation in the valley bottom. The subsequent burial of this organic material by 7.45 metres of inorganic alluvium is almost certainly the result of widespread deforestation. This activity caused environmental instability with significant inputs of sediment to the valley floor, thereby reflecting the apparent impact of prehistoric man in this part of the eastern Weald. The similarity of the pollen assemblages from the basal levels at Mayfield to the organic clay at Robertsbridge suggests that the valley fill sequence in the upper Rother has also accumulated as a result of such anthropogenic activity. This demonstrates that the environmental impact was not just site-specific; on the contrary, prehistoric man appears to have caused widespread degradation within the Sussex Weald, not only throughout the Rother valley, but also within other valleys in this area.

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