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FURTHER POLLEN ANALYSIS OF THE WESTWARD HO! SUBMERGED PEAT DEPOSITS

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INTRODUCTION

Subsequent to the pollen analysis of the 'midden deposits' and the overlying peats, it was necessary to investigate further sections in the outer peats and from the belt of inner peats. The original sequence (Scaife AML-4239) is here referred to as Sequence I and the new data from the outer peat as Sequence II. The inner peat is of a later date and is discussed separately.

Samples of 1ml were taken at 4cm intervals through the peat profiles which were obtained in galvanised monolith boxes. The sub-fossil pollen was concentrated using standard pollen extraction techniques (Mooore and Webb 1978). The pollen was in a large number of cases somewhat degraded but not seriously enough to negate identification. The raw data from which pollen diagrams have been constructed (as a percentage of various sums; see figures 1-6) are given in Tables 1 and 2. The peats in both monoliths was well humified dark brown to black comprising largely organic detritus with

silt laminations and monocotyledonous root and stem macrofossils. Wood was present in the outer peat but not evident in the inner peat sections.

WESTWARD HO! II-OUTER PEAT

Comparing the pollen data (Diagram 1) of this peat profile with that originally constructed from the midden sequence (Scaife AML-4239) now designated Westward Ho! I, it is clear that the overall vegetation elements are similar but that certain differences between the dominant elements is apparent.

Arboreal and shrub pollen are dominated by Quercus and Corylus but percentages are lower than in Westward Ho! I. This is perhaps a response to the higher values of other vegetation elements (Salix and Gramineae) which may also have had a depressing effect upon other percentages within the pollen sum. Inspection of the total pollen sum illustrates, however, that the arboreal pollen sum remains the same in both diagrams from the outer peat which are contemporaneous in date. It is, however, the shrub pollen (largely Corylus type) which is substantially reduced in relation to expansion of herb pollen (largely Gramineae and Cyperaceae). Other differences between the arboreal/shrub spectra of the two sequences are the minor increases in Pinus and the lower percentage values of Alnus and to some extent Betula. Gramineae (to 40%TP) and Cyperaceae (to 20%) are the dominant herbs. Notably, however, is the greater importance of a number of

types. Compositae types have a greater representation. Chenopodium type (including Atriplex) are present throughout but show slightly higher values towards in the upper and lower levels of the diagram.

DISCUSSION

A landscape in which Quercus and Corylus are important constituents is indicated. Ulmus and Fraxinus appear also to have been lesser elements. This was not, however, the autochthonous vegetation as was postulated for Westward Ho! I (Scaife AML-4239). From the relatively high values of Salix (to 15%) in SZ:I (from 16cm-38cm), it may be suggested that Salix (S. caprea was identified from leaves interleaved in the peats) carr was of local importance because Salix being entomophilous is usually under-represented in pollen spectra. The overall greater abundance of herbs and fewer shrubs in this profile may be suggestive of a more open area or perhaps clearing within a relatively dry open woodland community. Alternatively, the greater numbers of wetland taxa suggest that this area was of a wetter nature (see below). Evidence for local variability within the vegetation community also comes from the earlier pollen analyses of Churchill (1965,79) who records Alnus as 17% of total pollen in the peats overlying the section of midden he investigated.

The two pollen sequences of Westward Ho! I and Westward Ho! II are contemporaneous, both having been taken from the continuous outer peats at a distance of some 50 meters apart. Analysis of this second sequence was undertaken to provide data which may heve been missing

threough truncation of the uppermost peats above the midden section and to confirm/deny the existence of a phase of openesss and possibly '*Ulmus* decline' at the top of the pollen profile. Inspection of the two sequences indicates that only some 4-8cm of additional peat was present in this second sequence by virtue of protection from erosion by the overlying silts. This evidence is based upon comparison of the pollen frequencies of *Salix* and *Alnus*. It is interesting to note also that there is no further or real indication of an 'Ulmus decline' as postulated for Westward Ho! I (Scaife AML-4239 ; Girling forthcoming in Balaam *et al*), the presence of which was postulated (Scaife and Girling) prior to radiocarbon dating. The radiocarbon dating confirmed a date for the uppermost level of the peats overlying the midden as being 5430bp (HAR-4239) and therefore the possibility that the '*Ulmus* decline' might be present and that some opening of the environment occurred at this time.This has not been proved.

COMPARISON OF THE POLLEN PROFILES I and II

As noted above, a second sequence of the outer peat was analysed to study in more detail the possibility of an open phase in the upper peat levels. It became clear, however, that although the site of the second core was in relatively close proximity to the midden site, there were some differences in the vegetation community present. These changes may be summarised briefly as being:

i) Fewer shrubs, especially *Corylus* which was shown to have been an important constituent of the vegetation during deposition of the midden and during subsequent peat

accumulation.

ii) Sporadic occurrences of Fraxinus in the midden profile are fewer in sequence II. Since pollen of this genus is poorly represented in pollen spectra, this possibly indicates a growth local to sequence I and perhaps on drier areas at this point.

iii) Herbaceous pollen is markedly more important being dominated by Gramineae and Cyperaceae throughout the sequence but also with peaks of Chenopodium type, Filipendula and Compositae types.

Since the monolith from which pollen counts are based was taken from the same stratigraphy their contemporaneity is likely. Given this, it is apparent therefore that the autochthonous pollen components highlight two slightly differing environments. Westward Ho! I has been shown to be a predominantly damp wooded environment dominated by Quercus, Corylus type and Salix. The quantities of Corylus pollen, Hedera and a little Ilex support the contention that this was of open canopy character to allow flowering. Profile II is, however, apparently more open as indicated by the herbaceous pollen percentages. It can be noted here also that this might have resulted in the slightly greater input of long distance transported elements such as the Pinus. If this openness had been due to human or animal factors, secondary woodland regeneration might have been expected to have occured considering the long temporal span of this peat accmulation. The increase in herbaceous diversity noted can, however, be seen to be to some extent from aquatic, semi-aquatic/marginals and Gramineae and Cyperaceae. There is no evidence of large areas of free standing water, but, however it seems likely that the area of profile II was one of wetter ground conditions with a conditions with a community of Salix carr (Salicetum) and ground flora of wetland taxa. This contrasts with the midden peats of sequence I, the pollen

of which indicates slightly drier conditions of Quercus-Corylus woodland with some Salix. This illustrates the value of multiple pollen profiles from apparently identical stratigraphical sequences especially in wooded environments where pollen transfer is more restricted.

THE INNER PEAT

Archaeomagnetic and radiocarbon dating brackets this peat sequence to between AD40-10 to 390AD. This is based upon the archaeomagnetic dating of the silt immediately underlying the base of the inner peats and the radiocarbon date of 350AD (HAR-) from wood at the top of the peat sequence and an archaeomagnetic date of 390AD for a channel which cuts into the peat.

Palynologicaly this sequence is somewhat different from the pollen spectra obtained from the outer peats as might be expected from its apparently substantialy later date. The principal differences in this pollen sequence are the higher values of Alnus pollen and of herbs indicative of open ground (Plantago lanceolata and cereal pollen are notable). Arboreal and shrub taxa are dominated by Quercus, Alnus and Corylus with only a minimal presence of Betula, Pinus, Tilia and Fraxinus. The latter-Fraxinus and Tilia- may, however, be somewhat

underrepresented in the spectrum due to their poor pollen production and dispersal characteristics. Gramineae is the dominant herb throughout with values of 25-45% TP. Cyperaceae are also important (20-35%). Chenopodium type (includes Atriplex spp.) is present in substantial quantity in the base of the diagram between 20cm and 34cm. Of the remaining herbs, Plantago lanceolata is evident in the middle of the diagram (12-24cm).

DISCUSSION

As in the two profiles from the outer peat area, it is apparent that the local arboreal vegetation, where it remained, comprised Quercus and Corylus. Although small, pollen representation of Tilia, Fraxinus and Ilex may indicate that these genera may have been of importance at some distance from the sample site and on better soils inland. Alnus appears as one of the dominant arboreal taxa, but in view of its high pollen productivity and often over-representation in pollen spectra, the percentages of up to 15% of total pollen here are unlikely to represent its growth close by. It is likely that an Alnetum existed in a similar habitat but at some other point in the Westward Ho! bay. Turner in Kerney (1976) has also noted high values of Alnus and the presence of Carr woodland at Minehead but which has been dated to the Atlantic (6730+-150BP-Q1343) and therefore pre-dates the sequencebut which is contemporaneous with the outer peat sequences of I and II discussed here. The peat macro-stratigraphy and the pollen record suggest that the autochthonous vegetation comprised a Cyperaceae and possibly Gramineae fen carr community. Chenopodium

type at the base of the sequence is of interest. It seems likely that this taxon which includes Chenopodium and Atriplex, the latter beng dominant in maritime halophytic plant communities may have resulted from the influence of such nearby ecology. Pollen of this group of plants being anemophilous is high and is a phenomenon encountered in pollen spectra from coastal and estuarine peat and sediment sequences. The decline in its importance from the base of the sequence here may tentatively be suggested as being due to eustatic changes and declining sea levels with the consequent distancing of such halophytic communities from the sample site. The relative increases in herbaceous diversity and the increases of Plantago lanceolata may be interpreted as perhaps evidence of anthropogenic activity during this period. This is also evidenced by the presence of cereal pollen. Alternatively, many of the herbaceous types might reflect a coastal dune, short-turf graminaceous plant community.

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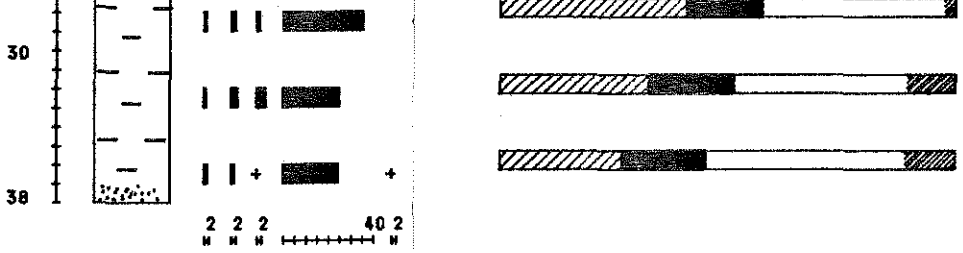
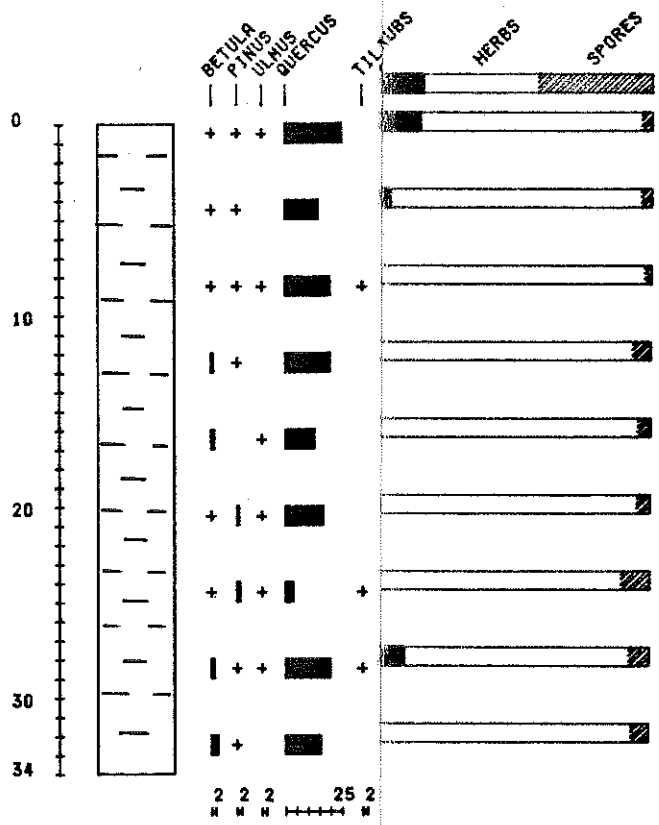
WESTWARD HOI COLUM



WESTWARD HOI INN



WESTWARD HO! COLUMN 2

DEPTH	0	4	8	12	16	20	24	28	32	36
BETULA	4	1	2	8	5	4	10	3	2	5
PINUS	9	2	9	3	7	6	5	5	6	5
ULMUS	6	7	3	6	6	5	5	4	9	2
QUERCUS	52	73	92	70	43	117	106	74	48	74
TILIA	0	1	0	0	0	1	1	0	0	1
ALNUS	5	3	12	13	4	2	5	1	4	3
FRAXINUS	3	2	1	0	0	0	0	0	0	0
CORYLUS	35	43	42	28	15	41	56	19	35	50
FRANGULA	0	0	0	0	0	1	0	0	0	0
SALIX	0	0	1	2	19	20	40	17	5	11
PRUNUS TYPE	0	0	1	0	0	0	0	0	0	0
VIBURNUM	0	1	1	0	0	0	0	0	0	1
CALTHA TYPE	0	0	1	0	0	0	0	0	0	0
RANUNCULUS TYPE	1	0	1	0	1	0	1	0	0	0
HORNUNGIA TYPE	0	0	0	0	2	2	0	2	0	0
SINAPIS TYPE	1	0	0	0	1	0	0	0	0	1
cf ELATINE	2	0	0	0	0	0	0	0	1	19
DIANTHUS TYPE	1	0	0	0	3	0	1	1	3	0
CHENOPODIUM TYPE	0	17	17	6	6	4	10	5	9	1
GERANIUM	0	1	0	0	0	0	0	0	0	0
PAPILIONACEAE	0	0	0	0	0	1	0	0	0	0
FILIPENDULA	9	2	0	0	3	0	6	4	10	41
ROSACEAE	23	1	1	0	0	1	0	0	0	0
cf CALLITRICHE	0	0	0	0	1	0	0	0	0	0
VISCUM	0	0	0	0	1	1	0	0	0	1
HEDERA	0	0	0	0	0	2	0	0	0	3
UMBELLIFERAE	0	2	3	3	0	1	1	1	4	1
POLYGONUM PERSICARIA	1	0	0	0	0	0	0	0	0	0
RUMEX	0	2	3	2	0	2	1	3	0	0
URTICA TYPE	0	0	0	0	1	0	1	0	0	0
LYSIMACHIA	0	0	0	0	0	0	0	1	0	0
MYOSOTIS	0	0	0	0	0	0	0	1	0	1
SCROPHULARIACEAE	1	0	0	0	0	0	0	0	0	0
MELAMPYRUM	0	1	0	0	0	0	0	0	0	0
LABIATAE	0	0	1	0	0	0	0	0	0	0
MENTHA TYPE	0	1	0	0	0	0	0	0	0	1
PLANTAGO LANCEOLATA	0	2	1	7	2	3	1	1	0	0
CAMPANULA	0	0	0	0	0	1	0	0	0	0
GALIUM TYPE	0	0	0	0	0	1	0	0	0	0
SUCCISA	1	0	0	0	0	0	0	0	0	0
BIDENS TYPE	1	1	1	1	14	5	2	0	3	8
ANTHEMIS TYPE	0	0	0	0	2	0	1	0	0	0
ARTEMISIA	0	0	0	0	0	0	1	0	1	0
CENTAUREA NIGRA TYPE	0	0	0	0	0	0	0	1	2	0
TARAXACUM TYPE	3	1	0	7	97	4	0	0	3	0
ALISMA TYPE	0	1	0	1	0	1	0	0	0	1
IRIS	0	0	0	0	1	0	1	0	0	0
SPARGANIUM	0	0	0	0	0	0	0	1	0	0
GRAMINEAE	62	73	97	83	51	60	35	44	21	26
LARGE GRAMINEAE	1	0	1	0	0	0	0	0	0	0
CYPERACEAE	3	2	4	51	9	16	11	15	20	39

DEGRADED	6	7	5	9	6	5	1	6	4	5
UNIDENTIFIED	0	1	0	0	0	0	0	0	0	0
PTERIDIUM	12	6	4	4	5	8	2	3	2	2
DRYOPTERIS	4	8	1	3	1	3	2	2	8	31
POLYPODIUM	13	8	13	2	7	12	9	0	13	5
SPHAGNUM	0	0	0	0	0	1	0	0	0	0

WESTWARD HO! INNER PEAT

DEPTH	0	4	8	12	16	20	24	28	32
BETULA	1	2	1	4	7	3	1	6	9
PINUS	1	1	1	1	0	4	4	3	1
ULMUS	2	0	1	0	1	1	1	2	0
QUERCUS	76	44	72	59	50	51	10	60	46
TILIA	0	0	1	0	0	0	1	1	0
ALNUS	30	31	15	25	35	42	36	43	20
FRAXINUS	3	1	0	0	2	1	1	0	0
CORYLUS	37	53	30	16	18	19	18	31	36
ILEX	0	0	0	0	0	1	0	1	0
SALIX	2	0	1	1	2	1	1	0	3
CALLUNA	0	0	0	0	0	1	0	0	0
ERICA	0	0	0	0	0	2	3	0	2
ANEMONE TYPE	0	0	0	0	1	0	0	0	0
RANUNCULUS TYPE	0	0	0	0	2	0	0	0	0
HORNUNGIA TYPE	0	1	0	0	0	0	0	1	0
SINAPIS TYPE	0	0	1	1	1	0	0	0	0
DIANTHUS TYPE	0	0	1	0	0	0	0	0	0
CHENOPODIUM TYPE	4	1	5	4	8	20	23	21	22
TRIFOLIUM TYPE	0	0	0	1	0	0	0	0	0
ROSACEAE	0	0	0	0	0	0	1	1	0
SORBUS TYPE	0	0	0	1	0	0	0	1	0
MALUS TYPE	0	0	0	0	0	0	0	1	0
FILIPENDULA	2	2	4	3	4	6	6	5	3
CORNUS	0	0	0	1	0	0	0	0	0
HEDERA	0	2	1	1	1	1	0	4	2
UMBELLIFERAE	0	1	0	0	2	1	2	0	5
RUMEX	0	1	0	4	1	3	2	2	2
URTICA TYPE	0	0	1	0	0	0	0	0	0
ARMERIA 'A' TYPE	0	0	3	1	1	0	1	0	1
LABIATAE	0	0	0	0	0	0	0	1	0
PLANTAGO LANCEOLATA	2	0	2	13	18	12	6	1	0
PLANTAGO MAJOR TYPE	0	0	0	0	0	1	0	0	0
CAMPANULA	0	0	0	1	0	0	0	0	0
GALIUM TYPE	0	0	0	1	2	1	2	0	0
BIDENS TYPE	4	0	1	0	1	2	3	6	7
ANTHEMIS TYPE	0	0	0	0	0	1	1	0	0
ARTEMISIA	1	0	1	0	0	0	0	2	2
TARAXACUM TYPE	9	4	1	5	7	2	1	0	3
ALISMA TYPE	0	1	0	0	0	0	0	0	0
SPARGANIUM	0	0	0	4	1	1	2	0	0
GRAMINEAE	114	145	90	53	137	66	66	62	67
LARGE GRAMINEAE	1	1	1	1	4	0	0	0	2
CYPERACEAE	8	7	124	95	83	60	65	40	58
DEGRADED	3	2	5	3	3	1	3	6	7
PTERIDIUM	1	1	1	4	5	2	6	1	5
DRYOPTERIS TYPE	0	4	0	4	4	2	11	10	5
POLYPODIUM	6	2	4	4	2	5	0	3	2