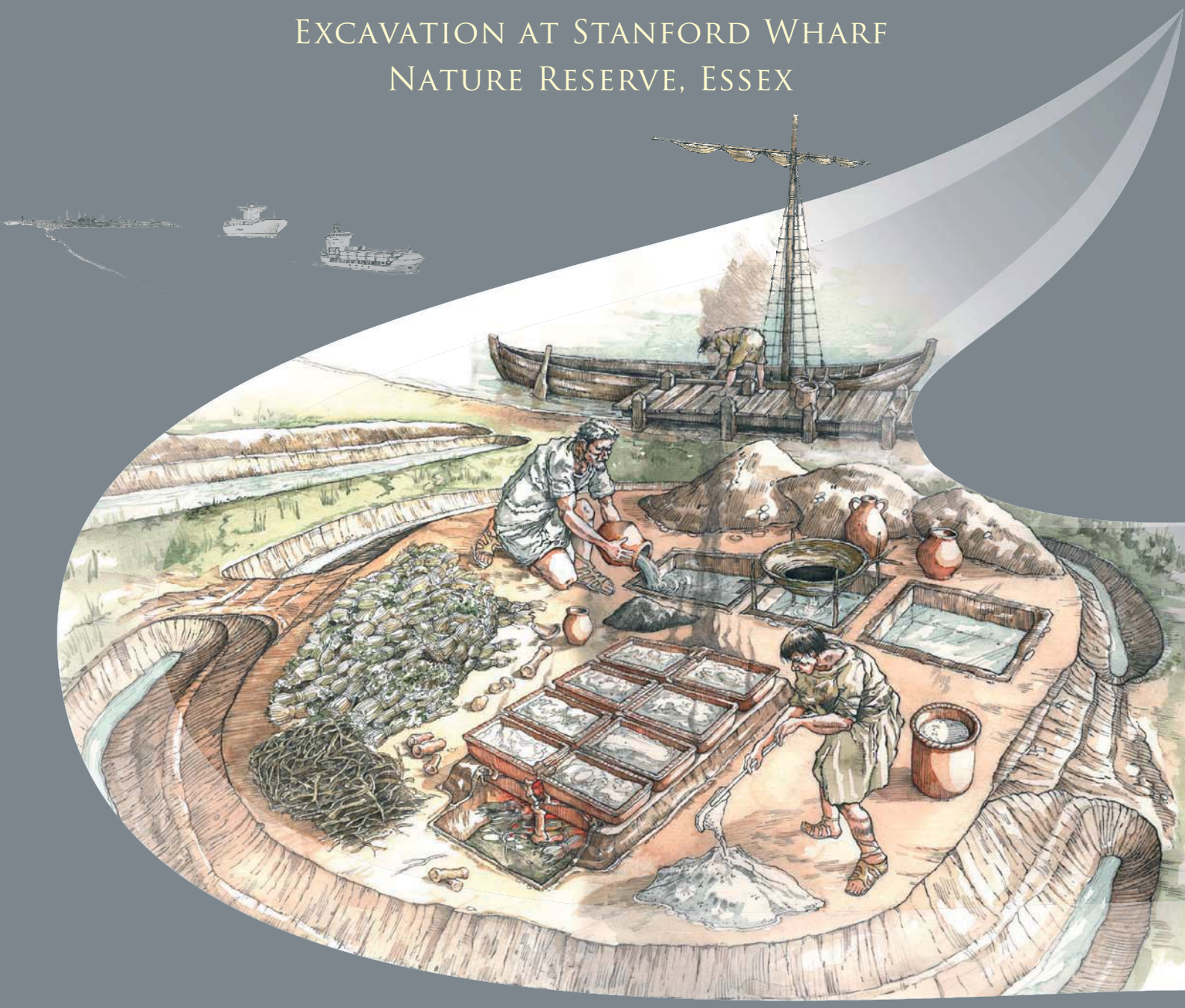
London Gateway

Iron Age and Roman Salt Making in the Thames Estuary

Excavation at Stanford Wharf Nature Reserve, Essex



Specialist Report 23

Pollen

by Sylvia Peglar

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Introduction

The aim of the palynological analyses from the various sequences sampled from the Stanford Wharf Nature Reserve was to help elucidate the history of the lower Thames estuary by assessing the variations in vegetation types and human impact over the Holocene period correlated with the archaeology.

Forty-five sediment samples were submitted from various sequences in Areas A, B and D and from a palaeochannel for a very rapid assessment of the state of preservation and concentration of the pollen and spores contained therein to determine whether full analyses would be feasible. Of the 45, 31 samples from seven sequences and the palaeochannel sequence were assessed as good or possible. Later, 11 of the original samples were submitted for full analysis together with 38 other, non-assessed, samples, a total of 49. It was only possible to analyse 24 of the unassessed samples as others were either too badly preserved and/or very low concentrations, making a total of 35 fully analysed samples.

Methods

Standard volumes of the sediment samples were prepared for pollen analysis using a standard chemical procedure, using HCl, NaOH, sieving, HF, and Erdtman's acetolysis to remove carbonates, humic acids, particles >170 microns, silicates, and cellulose, respectively. The samples were then stained with safranin, dehydrated in tertiary butyl alcohol, and the residues mounted in 2000 cs silicone oil (method B of Berglund and Ralska-Jasiewiczowa (1986)). Tablets containing a known number of Lycopodium spores were added to the known volume of sediment at the beginning of the preparation so that pollen and spore concentrations could be calculated (Stockmarr 1972). Slides were examined at a magnification of 400x (1000x for critical examination) by equally-spaced traverses across slides to reduce the possible effects of differential dispersal on the slides (Brooks and Thomas 1967). The aim was to achieve a count of at least 300 grains of land pollen and spores. Pollen identification,

where necessary, was aided using the keys of Moore *et al.* (1991) and a small modern pollen reference collection. Andersen (1979) was followed for identification of cereal-type pollen. Indeterminable and unknown grains were recorded as an indication of the state of the pollen preservation. Other identifiable palynomorphs encountered on the slides were also recorded – Sphagnum spores, fungal spores, dinoflagellate cysts, foraminifera, charcoal particles <180 microns, pre-Quaternary spores, algal remains, etc., the inclusion of which can add to the interpretation of the pollen analytical results. Plant nomenclature follows Stace (1997).

Results and discussion

The results are presented as pollen and spore diagrams with taxa expressed as percentages of the total land pollen and spore sum (sumP/calculation sum). Obligate aquatic taxa and other palynomorphs are presented as percentages of sumP + the sum of the category to which they belong. Calculations and diagrams were made using the programs TILIA and TILIA.GRAPH in TGView (Grimm 1990). +s represent <1% sumP.

When trying to interpret the palynological results from the sediments of a large estuary such as the Thames, it must be borne in mind that the pollen and spores in these mainly aquatic sediments may have originated from a vast area. Most pollen is waterlain although some will be derived from the air. The Thames with a length of 215 miles is the longest river in England, and flows across most of southern England from its origins in Gloucestershire. It has a vast catchment estimated at more than 6000 square miles and has some 38 main tributaries. The pollen and spores in the Stanford Wharf sediments may have come from any part of this catchment, most being derived from inwash into the river. As the river is tidal in this stretch, pollen may also be derived from the sea and may have travelled from a distance. This may result in over-representation particularly of coniferous pollen (pine, spruce etc.) which have airsacs allowing the pollen to float. There may also have been reworking of the sediments and hence their contained pollen. However, most pollen and spores will probably have been derived from local sources and therefore suggestions can be made as to the local vegetation types present when the sediments were laid down.

Sequence 1: Area A - Early Holocene sequence (Fig. 23.1)

Seven samples were submitted for analysis. This sequence is comprised of sediments laid down from the Early to the Middle Holocene (Romano-British) periods. Unfortunately it was not possible to analyse the basal 2 contexts (1145 (G3) and 1077 (G4a)). The 5 samples higher in the sequence (contexts 1144 (G4), 1143 (G5), 1136, 1135 and 1132) were counted.

Context 1144 (G4): a Bronze Age palaeosol. This sample is dominated by tree and shrub pollen (nearly 60% total pollen (TP)) particularly oak and hazel, with birch, pine, elm and lime. Other trees and shrubs represented include alder and willow, trees of wet soils such as are found along river banks and in fens and marshes. This assemblage suggests that there was possibly mixed deciduous woodland growing on drier soils within the local area of the site at this time. The very low elm value suggests that the sediments are of post elm-decline age (approximately 5000 years before present (yrs BP). The occurrence of 15% grass pollen together with herbs such as common sorrel-type (*Rumex acetosa*-type), daisy-type (Aster-type), umbellifers (*Apiaceae*), ribwort plantain (*Plantago lanceolata*) and dandelion-type (*Taraxacum-type*) are characteristic of grassland, possibly pasture, but may also be indicative of waste places and habitation sites. There is no evidence of any crops being grown close by. Pollen of the goosefoot family, which includes that of glasswort (*Salicornia*) and oraches (*Atriplex*) species (spp.), together with odd grains of thrift and/or sea lavender (*Armeria/Limonium*) and sea plantain (*Plantago maritima*) suggest that some lower salt marsh was present in the area. A few remains of dinoflagellate cysts and foraminifera were also found. These are indicative of animals living in salt water, but are in such low quantities that they may have been derived from reworked sediment.

Context 1143 (G5): alluvium. Herb pollen dominates this assemblage and there is a concomitant decrease in tree and shrub pollen. Oak, hazel and alder pollen is at considerably lower values than in the context below, with types characteristic of grassland (pasture?) remaining at similar values. There are large increases in the pollen of sedges and dandelion-type. Dandelion-type includes many genera characteristic of waste ground and waysides, including nipplewort (*Lapsana*), oxtongues (*Picris* spp.), goat's-beards (*Tragopogon*), sow-thistles (*Sonchus* spp.), lettuces (*Lactuca* spp.), dandelions (*Taraxacum* spp.), hawk's-beards (*Crepis* spp.) and hawkweeds (*Hieracium* spp.). Many taxa associated with grassland/pasture (as noted above) are also present. The high dandelion-type value may also come from this vegetation type but it could also be from a piece of anther getting incorporated into

the sediment before preparation. The quite high sedge value together with rush pollen, suggests that marsh or fen was also growing in the area. There is also some evidence of salt marsh.

Context 1136. The pollen assemblage from this context is dominated by goosefoot family pollen suggesting that salt marsh was prominent in the local area at this time probably as a result of a rise in sea level. The presence of thrift and/or sea levender and daisy-type would support this suggestion. Daisy-type includes sea aster (*Aster tripolium*) an important constituent of salt marsh vegetation. A higher value of foraminiferal remains would also infer that marine conditions were local at the time of this sedimentation. Pine pollen also increases, possibly signifying the tidal nature at this time with input from the sea. There is also evidence for grassland/pasture with grasses and many herbs.

Contexts 1135 and 1132. Similar pollen assemblages were found in these contexts as in 1136 providing evidence of the continued growth of salt marsh locally, with marine sedimentation. Context 1132 does show some increase in tree and shrub pollen with a decrease in salt marsh types, and may indicate that the marine influence was waning with a lowering of sea level..

Sequence 5: Area A - Pre-Roman alluvium (Fig. 23.1)

Only 1 sample was submitted for analysis from this sequence (context 5981). The pollen and spores contained were well preserved, better than in any other sample. Herb pollen dominates the assemblage with very little tree and shrub pollen, evidence of widespread woodland clearance by this time. A date of 980-820 cal. BC (95.4%; 2755 ± 30 BP, OxA-24899) was obtained. Two grains of cereal-type pollen were also found but this type also includes several wild grasses (Andersen 1979). Thirty-eight per cent of the assemblage is grass and there are also many pollen types associated with grassland and pasture. There is very little evidence of salt marsh occurring locally, or of any marine influence.

Sequence 6: Area A - Sequential anthrosols (Fig. 23.1)

All 5 samples that were submitted were analysed (contexts 1837, 1793, 1747, 1746 and 1588).The assemblages show a gradual decrease in woodland trees and shrubs through time with increasing grasses and other herbs, particularly those characteristic of grasslands and pastures. Evidence for local salt marsh is high throughout, with

pollen of the goosefoot family dominating. Remains of foraminifera and dinoflagellate cysts are present and suggest evidence of marine conditions locally. The presence of four grains of emmer and/or spelt (*Triticum*) from contexts 1747 and 1746 suggest that either it was being grown or processed locally. These are definitely cereal grains as they are much larger than any wild grass pollen (Andersen 1979).

Sequence 8: Area A - Post-Roman alluvium (Fig. 23.2)

Three samples were submitted but only two from contexts 1995 and 1997 could be analysed. Assemblages have about the same percentages of tree and shrub pollen (mainly oak, hazel and alder) as grass and other herbs pollen. These assemblages suggest that mixed deciduous woodland was growing in the area at this time with an understorey including ferns (Dryopteris-type and polypody (*Polypodium vulgare* agg.), with open areas of grassland/pasture. Odd grains of cereals including those of rye (Secale) and oats/wheat-type (*Avena/Triticum*-type) are present together with taxa which may be associated weeds of arable fields (eg mugwort (*Artemisia*), daisy-type (*Aster*-type), dandelion-type (*Taraxacum*-type), cabbage family (*Brassicaceae*), knotgrass-type (*Polygonum aviculare*-type) and goosegrass family (*Chenopodiaceae*) which includes taxa characteristic of arable fields (goosefoots *Chenopodium* spp.), as well as those characteristic of salt marsh). It is interesting that there appears to be a higher representation of deciduous woodland than found earlier (eg the pre-Roman alluvium sequence 5 above), perhaps as a result of abandonment and regrowth. There is also some evidence of salt marsh, but with characteristic taxa at quite low values suggesting the existence of salt marsh at some distance from the site.

Sequence 12: Area A – Romano-British outer enclosure ditch (Fig. 23.2)

Six samples were submitted but the basal two (contexts 1381 and 1612) were uncountable and only four could be analysed (contexts 1350, 1352, 1283 and 1198). The pollen assemblages are quite variable, those of 1350 and 1283 being dominated by grasses and other herbs characteristic of grassland/pasture and arable fields, and include cereal grains, while those of 1352 and 1198 have higher values of taxa characteristic of deciduous woodland. This probably reflects that the different contexts are not natural but have been dumped into the ditch. Evidence of salt marsh is quite strong and suggests its occurrence quite close by.

Sequence 14: Area A – Romano-British roundhouse outer ditch (Fig. 23.2)

Five of the six samples submitted could be analysed, from contexts 5418, 5414, 5428, 5429 and 5430. The basal context (5418) is dominated by herb taxa particularly grasses and herbs characteristic of arable fields and has nearly 5% emmer and/or spelt pollen which is high for cereal grains which are heavy and do not travel far. This either means the wheat was being grown close by or that it was being processed and, which is more likely, the waste was being dumped into the ditch. Evidence of arable fields appears to decrease towards the top of the sequence while taxa characteristic of deciduous woodland increase, perhaps suggesting the gradual abandonment of fields and the regrowth of scrub/woodland. The high values of dandelion-type pollen and other taxa of waste ground and habitations attest to these habitats occurring locally. Quite high values of salt marsh taxa, particularly in context 5414, are evidence of the occurrence of some salt marsh locally.

Sequence 19: Area A – Red hills

Seven samples from 'red hills' were submitted, although the one sample originally submitted for rapid analysis showed that it was barren of pollen. None of the samples contained any pollen. Pollen is normally preserved because its outer shell (exine) is composed of sporopollenin, a complex polymer which is one of the most resistant organic compounds known. The only way in which it is destroyed is by oxidation. The lack of pollen in the 'red hills' suggests that they are composed of material which has been burnt, a process which requires oxygen.

Sequence 25: Area B - Salt-making sequence (Fig. 23.3)

Seven of the eight samples submitted were analysed. Only the pollen from the top context (4630) was too sparse to count. The pollen assemblages from the sequence are very varied and difficult to interpret. They may suggest that the different contexts are either from dumps or that they have become mixed. Most are dominated by herb pollen particularly grasses and taxa characteristic of both grassland/pasture, arable fields (including cereal types) and waste ground and waysides. Evidence for salt marsh is quite low, although context 4641 has a high value of goosefoot family pollen and the remains of dinoflagellate cysts. Values of pollen of taxa of deciduous scrub/woodland are low and suggest little woodland extant in the area apart from context 4548.

Sequence 26: Area B - Pre-Roman alluvium (Fig. 23.3)

Only one sample from context 4210 was submitted. Herb pollen predominates with grasses and herbs associated with grassland/pasture. There is some evidence for deciduous woodland with oak, hazel and alder being extant. Quite a high value of goosefoot-family pollen suggest the occurrence of salt marsh close by.

Borehole OA3

Five samples were analysed from borehole OA3 taken from a palaeochannel close to the excavated area from 3.97, 3.05, 2.32, 1.85 and 1.05m depth. The pollen assemblages found are similar throughout. They are dominated by tree and shrub pollen, including oak, hazel, elm and lime. Elm (*Ulmus*) and lime (*Tilia*) produce little pollen compared with oak and hazel, and thus the quite small values found in these sediments show that these taxa were a considerable component of the deciduous woodland growing in the area. Elm pollen values dropped dramatically all over northern Europe at about 5000 yrs BP probably as a result of disease aided by human interference in the woodland (Peglar 1993) and so the sequence analysed here is probably older than this. Lime pollen values also drop but at varying ages and probably had an anthropogenic cause (Turner 1962). Most sites analysed in the Thames area show that lime was cleared during the Iron or Bronze Ages and the sequence is therefore probably older. Many herbs including grasses and taxa which may be associated with grassland/pasture are present and two grains of emmer/spelt wheat were identified from the 2.32m depth. There is little evidence for salt marsh in the local area in the lower levels, but there is increasing evidence for salt marsh encroaching in the upper 2 samples with goosefoot family and sea plantain.

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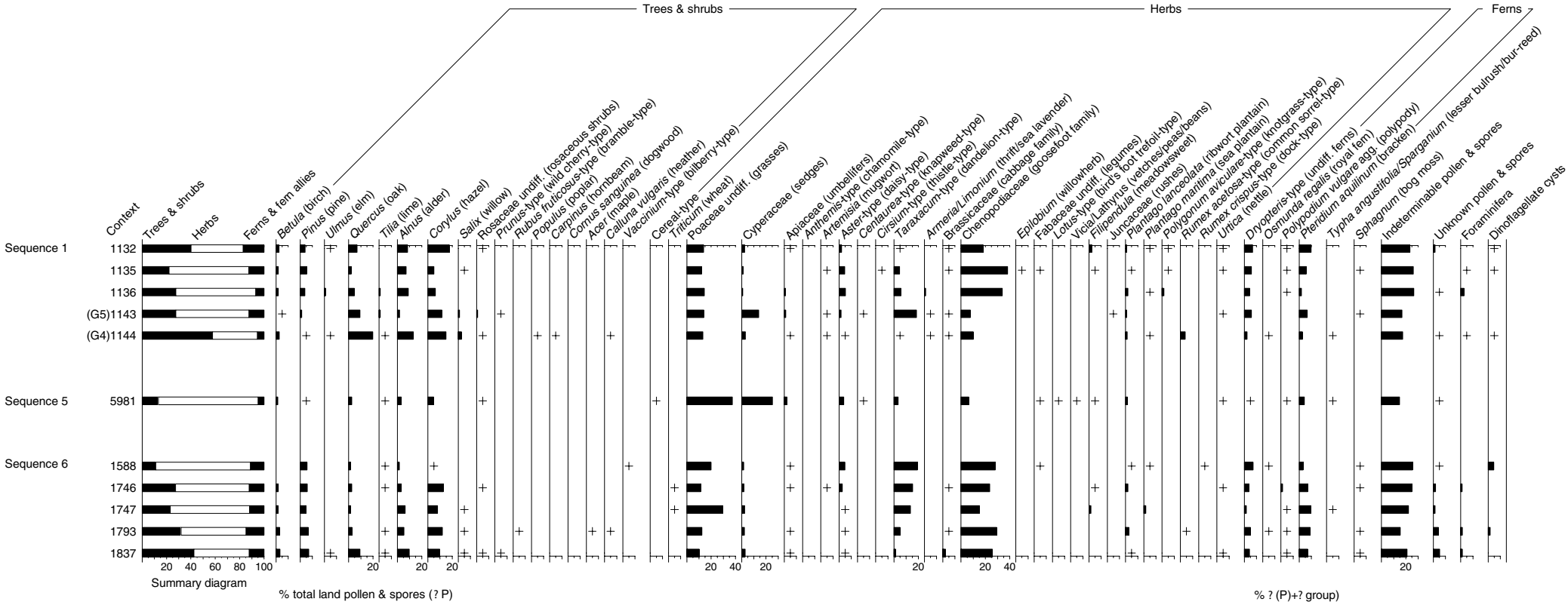

Figure 23.1: Pollen and spore percenatges diagram (a)

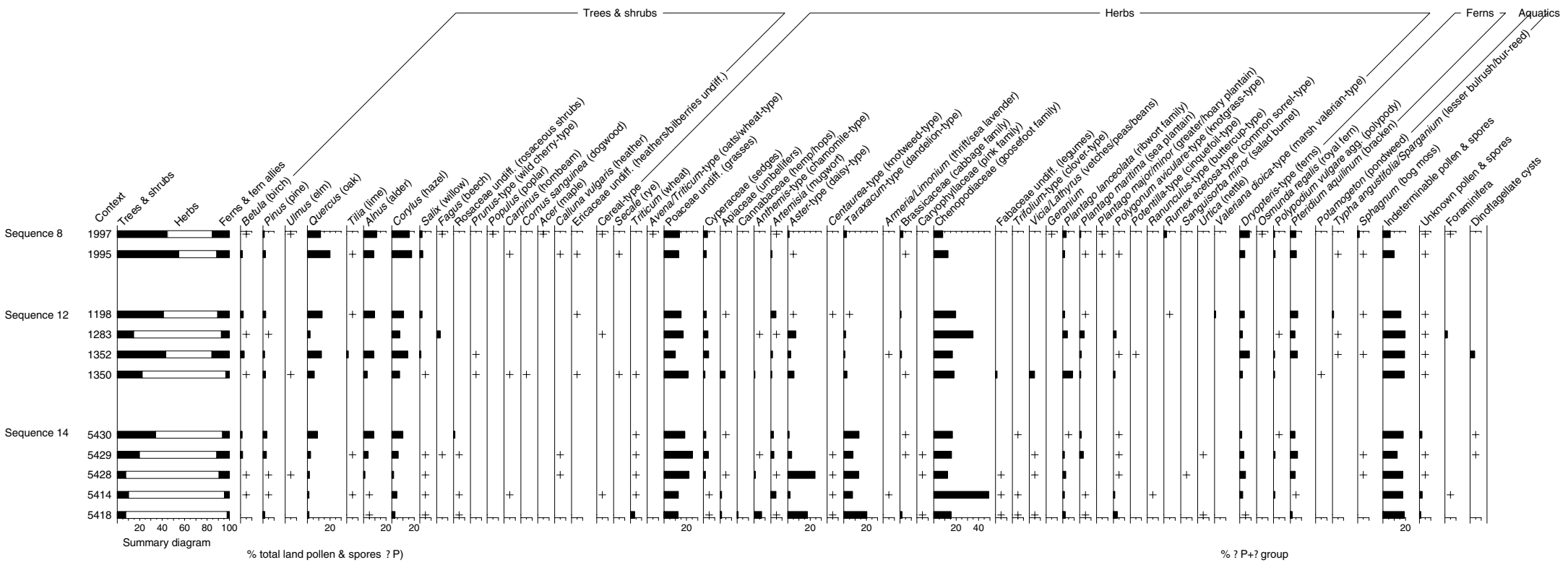

Figure 23.2: Pollen and spore percenatges diagram (b)

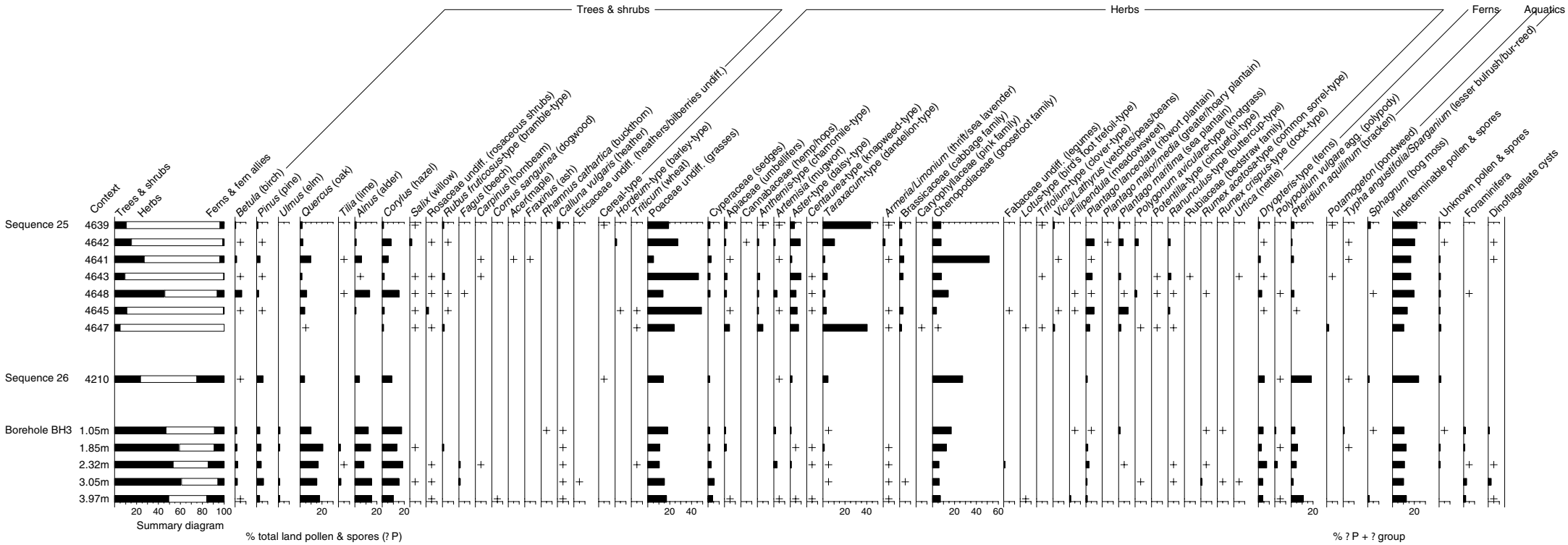

Figure 23.3: Pollen and spore percenatges diagram (c)

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