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THE VEGETATIONAL HISTORY OF PILE COPSE 'ANCIENT' OAK WOODLAND, DARTMOOR, AND THE POSSIBLE RELATIONSHIPS BETWEEN ANCIENT WOODLAND, CLITTER, AND MINING

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Studies of fossil pollen in flush bogs in the valley of the River Erme adjacent to the apparently "ancient" oak woodland of Piles Copse, Dartmoor, point to its almost total absence in the recent past. It was however preceded by another episode of oakwood, broadly similar in tree-species composition to the present woodland, except that it appears to have been associated with small numbers of beech and pine trees. Clitter may also have been present during all of the period represented by the pollen diagram. The species compositions of both the modern woodland and its precursor are sufficiently anomalous to suggest that both woodlands were deliberately planted. All the events identified must have occurred sometime in the last 2,500 years. Integrated studies of the relationships between such valley floor flush bogs, clitter fields, ancient woodlands, coppicing, mining and tanning are advocated.

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INTRODUCTION AND PREVIOUS WORK

This exploratory and speculative paper investigates the value of taking an essentially geomorphological and palynological approach to an enigmatic problem of Dartmoor biogeography - the origins and status of its apparently ancient oak woodlands. The paper focuses upon Piles Copse, which is a substantial oak woodland growing in clitter - scree - on the east bank of the River Erme in southern Dartmoor [SX 644 620; Figure 1]. This Woodland is one of five, broadly similar, "high level" woodlands which have been asserted to be natural remnants of the original Holocene forest cover of the Britain (see Pearsall, 1965; Pennington, 1969; Shorter *et al*., 1969; Tansley, 1965; 1968; Turrill, 1948). The others are Wistman's Wood and Black Tor Copse, both on Dartmoor, and Birkrigg and Keskadale in Cumbria. There are many primary and secondary sources of ecological information on these Dartmoor Woods which are summarised in Roberts (1983). Despite the frequent allusions to their relict and remnant status and to their escape from timber-harvesting by the past tinners and tanners of Dartmoor, there is minimal palaeoecological information that actually demonstrates their antiquity, or which clarifies their origins. In the absence of such information, discussions of their origins often have inevitably focused upon their survival in boulder-rich habitats, their anomalous species-composition, and their possible associations with "historically-dated" industrial activities, rather than their actual antiquity.

Their survival is usually explained by reference to an undoubtedly clear and demonstrable association between these Dartmoor Woods and the cobble- and boulder-fields which mantle the hillsides where they grow. These boulder-fields are known as clitter on Dartmoor and are held by most authors to preferentially favour trees by reducing the pressure from browsing, rubbing, tearing, and trampling by herbivores, by providing greater climatic shelter, and by creating favoured locations for the trapping, survival and germination of viable seed (for example see Barkham, 1978; Christy and Worth, 1922). The broken ground may have also assisted the deeper-rooting trees. However, it is never clear in the literature why a few clitter fields are associated with such woodlands, whereas the great majority of other Dartmoor clitter fields are not. Such screes may have developed in different ways on different occasions. Some boulder-fields were formed and released under Pleistocene periglacial conditions, particularly from exposed tors, to mantle hillslopes and perhaps enter as bed-load into rivers to become features such as alluvial terraces, or the alluvial fans at the edge of Dartmoor at Ivybridge (Gilbertson and Sims, 1974 and references therein). At Piles Copse, the clitter beneath the Wood is surrounded by, but not in any form of stratigraphic contact with, the ancient houses and huts likely to have used – variously – in the Bronze Age, Iron Age and the Medieval period for

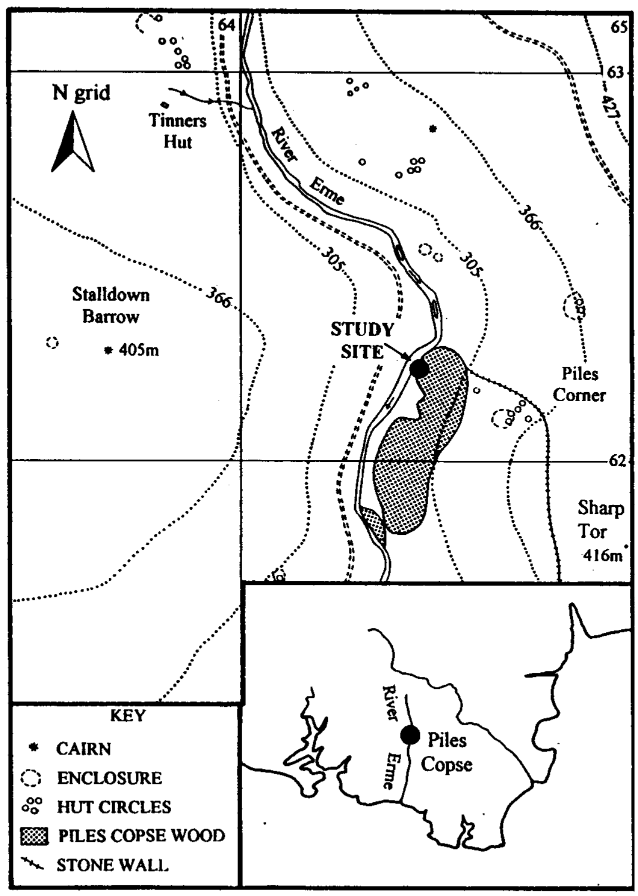

Figure 1. The location and setting of Piles Copse oak woodland in the valley of the River Erme on southern Dartmoor. The scale is given by the 1 km gridlines.

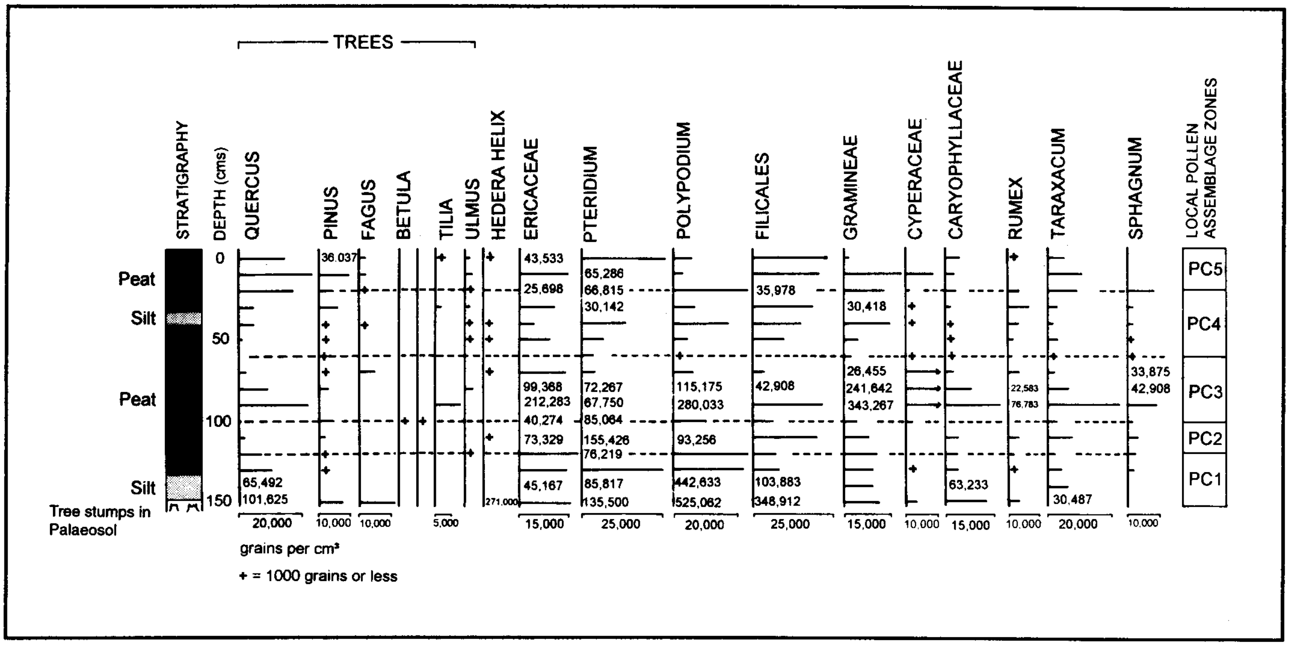

Figure 2. Pollen concentration diagram for a small flush bog on the valley floor adjacent to Piles Copse oak woodland, Dartmoor. All tree-pollen taxa are shown, together with selected non-tree pollen taxa.

various kinds of moorland exploitation and subsistence, as well as tin-extraction. Other forms of broken ground, immediately recognisable as the product of the hydraulic mining of "medieval" tin-streaming occur north of Piles Copse and might be relevant to an understanding of the wood. There is also a tinners hut (Figure 1), as well as a Tinworks at "Piles Corner" (Figure 1) which is known from documentary evidence to have been working in the early seventeenth century (see Roberts 1983; and the Archaeological Monuments Register of Devon County Council [n.d.] for discussion).

Three phases of tin-mining are recognised in historical times - early Medieval, Tudor and Elizabethan, and eighteenth and nineteenth centuries. In general, the first two appear to be the more important on Dartmoor. Prehistoric mining has proved difficult to locate, much evidence being destroyed by later tin-streaming. Fuel and oak-bark for tanning are two of many possible connections between woodland and mining at this site. Until the nineteenth century the bark of young oaks was used to tan leather (Rackham, 1980); typically the bark of young oaks was used for tanning and then the wood given to charcoal burners. Booker (1970) noted that a thirteenth century blowing house consumed no less than two tons of charcoal when smelting one ton of ore. Worth (1946) states that by the early nineteenth century, oak coppice in Devonshire was being cut every 10 to 20 years to sustain the tin and tanning activities.

Anomalous and uniform species compositions have also been argued to suggest a recent origin for the woods, probably through planting, and to be the result of these two industrial activities at and around them. In a sample survey of 165 trees in Piles Copse, Harris (1975) recorded 164 specimens of *Quercus robur* and one only one *Sorbus aucuparia*. All available palynological information suggests that the natural oak woodland of England was always far more diverse than this. The uncharacteristic presence of *Q. robur* rather than *Q. petraea* also prompted speculation. Typically it is the latter rather than the former that occurs on the wetter, base-deficient soils of upland Britain. Such ideas led Yapp (1953) to suggest the Cumbrian Woods were planted, and Simmons (1965) to conclude that the Dartmoor Woods were planted in historical times to supply timber for tin smelting. Direct evidence of antiquity is almost non-existent. Barkham (1978) mentions documents concerning the cutting of timber in Black Tor Copse in 1620. Rackham (1986) was suspicious of the relict status of Wistman's Wood, and there are no satisfactory historical or palaeocological evidence with which to assess the longevity of Piles Copse.

The palynological studies by Simmons (1964, 1965, 1969) on Dartmoor derive from blanket bog on the high moors and provide no relevant information to these valley-side woods. Dendrochronological determinations of the ages of individual trees at Piles Copse by Harris (1975) indicated that most were in the order of 80 to 100 years, that the wood was often rather even-aged, and that it had extended farther south in the twenty or thirty years before Harris's (1975) study. Whilst it is important to distinguish between the age of a tree and the antiquity of a wood, Harris (1975) concluded from the wood's demography and composition that Piles Copse was not natural and that the wood was comparatively young. He suggested it was planted to provide timber for industrial purposes at some time around the end of the eighteenth century A.D.

The great antiquity of these woods is therefore typically hinted at, asserted rather than demonstrated, and sometimes disputed. Much useful progress could obviously be made by a simple direct investigation of their actual vegetational history. The location of a small flush bog on an abandoned course of the River Erme adjacent to Piles Copse provided this opportunity (Figure 1).

THE PALYNOLOGICAL STUDY

Full details of the site, the stratigraphy of the core, and preparation, taphonomic issues, counting techniques and a complete discussion of the complete pollen data are given in Roberts (1983). Pollen concentrations were obtained using the "marker pill" method of Stockman (1971). Coring produced birchwood (*Betula*) at the base of the core, and revealed the presence of two flood-silts, one above the basal birchwood, the second 40 cm below the top of the flush bog.

Brief Description and Interpretation

Summaries of the relative frequency and absolute concentration pollen diagrams produced are presented in Figures 2 and 3. All the tree taxa are included in these diagrams, but for the sake of brevity, only selected non-tree taxa are displayed. These are discussed very briefly below. The outline diagrams have been divided into a series of local pollen assemblage zones both for ease of description and to assist any subsequent research in the area requiring biostratigraphic correlation.

Local Pollen Assemblage Zone PC1
150 - 125 cms: *Quercus* Ericaceae *Pteridium Polypodium*

Tree pollen of *Quercus*, dominates with some *Pinus* and *Fagus*. Woodland ferns, especially *Polypodium* are abundant. There are significant numbers of heathland plants - Ericaceae, and a great variety of herbs and ferns suggesting a variety of shaded habitats (*Hedera*), or open habitats (*Taraxacum-type* and *Pteridium*) in the area. The abundances of *Pteridium*, *Polypodium* and Filicales evident on the concentration diagram have the effect of visually suppressing the importance of Fagus and Pinus in its tree pollen component, which as a group form 7 to 12% of the total pollen and spores present in the spectra. Interpretation: An oak woodland is nearby with some beech, birch and pine, rich in woodland herbs and ferns, possibly on broken ground, with mainly open-dryland moorland habitats in the area. Comparison with other pollen diagrams on Dartmoor (Simmons, 1964; 1969) suggests that the presence of *Fagus* at Piles Copse indicates the site is younger (perhaps much younger) than approximately 500 B.C.

Local Pollen Assemblage Zone PC2
105-125 cms: Ericaceae *Pteridium Polypodium*

Grains of open ground plants such as the heathers (Ericaceae) and bracken (*Pteridium*) dominate both pollen diagrams. *Polypodium* is significant. Tree pollen almost totally disappears. Both pollen diagrams demonstrate the near total loss of woodland at the site. The land appears to have been replaced by light-demanding herbaceous species such as *Rumex*, and *Pteridium* and *Calluna*, which favours light and better-drained land on Dartmoor. The continued importance of *Polypodium* indicates that a shaded and sheltered habitat must also have occurred nearby. This could have been provided by the shaded crevices of a diner field. Interpretation: almost total local loss of woodland, which has been replaced by moorland of *Calluna* and *Pteridium*, but woodland ferns continued in a clitter field.

Local Pollen Assemblage Zone PC3.
60 -105 cms: Gramineae Cyperaceae *Sphagnum* Ericaceae *Quercus*

Open ground plants continue to dominate the assemblage, with the grasses (Gramineae), *Polypodium* and sedges (Cyperaceae) important. Bog moss (*Sphagnum*) is abundant. *Quercus* returns, but its relative frequency is suppressed by the abundance of open-ground plants. Interpretation: a sustained recovery of the oak woodland which helps the woodland ferns and herbs. *Calluna* moorland is still present, and grasses flourish in the open and in the shade. The sedges and *Sphagnum* develop on an enlarging flush bog, which is perhaps sustained by enhanced runoff along routeways established in the earlier open episode.

Local Pollen Assemblage Zone PC4.
30 - 60 cms: *Quercus* Gramineae *Pteridium* Filicales.

Tree taxa, mainly *Quercus*, become increasingly dominant, with *Pinus* grains abundant in the upper part. Grasses, bracken and Filicales fern spores are particularly important. Interpretation: the oak woodland and the surrounding heathland continue. The main change is the diminution of wetland and bog-forming taxa. A number of explanations are possible, the most conservative would be that the route, or flooding, of the River Erme was now being managed at this location.

Local Pollen Assemblage Zone PC5.
0 - 30 cms: *Quercus* Ericaceae *Pteridium* Filicales

This assemblage zone is dominated by tree pollen of *Quercus* and *Pinus*, the latter dominant in the uppermost surface sample. *Calluna* and Gramineae are abundant, as are ferns (*Pteridium* and Filicales) variously indicative of open or sheltered ground. Interpretation: This uppermost sample serves as a taphonomic calibration to relate the pollen trapped at the bog surface to the modern vegetation at and around the site. Oak woodland and heather- and grass-dominated moorland occur, as today, in an area that is now drier with abundant bracken. The influx of *Pinus* reflects the planting in the Dartmoor region, from the 1930s on.

DISCUSSION

The pollen diagram provides some minimal information on the antiquity of the woodland. The present core might reach back to about 2,500 years, or only a short part of that period. Recent afforestation in conifers is detectable in the uppermost levels. Optimists might regard the rise in pine from 40 cms as dating from the first stages of tree planting on Dartmoor from about A.D. 1700 on.

Several critical pieces of palaeoecological information emerge from this preliminary analysis. The abnormal composition of the present wood - totally dominated by Quercus - can also be traced back into the very recent past, to a period pre-dating the extensive planting

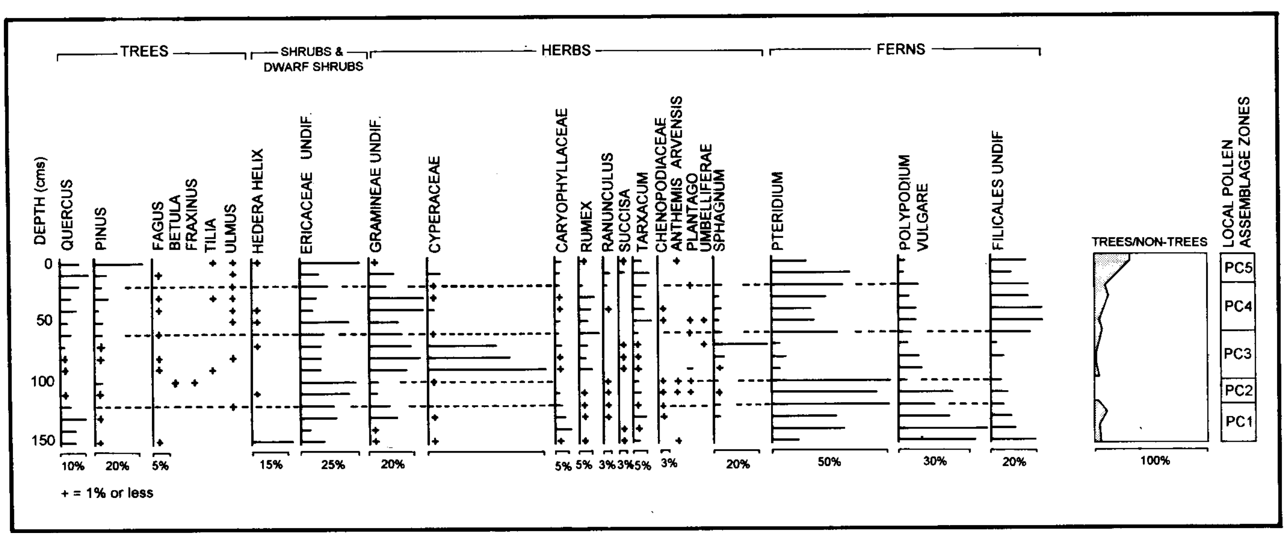

Figure 3. Relative frequency pollen diagram for a small flush bog on the valley floor adjacent to Piles Copse oak woodland, Dartmoor. All tree-pollen taxa are shown, together with selected non-tree pollen taxa.

of pine on Dartmoor. "Natural" woodland at this site might reasonably be anticipated to have been associated with *Betula, Corylus* or *Alnus.* This anomalous situation supports the view that the trees of the present woodland were deliberately planted.

It is similarly evident that the present Piles Copse was preceded by a period when woodland appears to have been almost totally absent, and that there may have been clitter present at that time. Although we do not, as yet, know how to recognise the impact of coppicing in such pollen diagrams, there is no reason to suppose that the loss of tree pollen reflects the suppression of flowering by one episode of especially intense, past coppicing. Coppicing is likely to have been practised for millennia at such sites (see Gilbertson, 1984), and there is no reason to suspect it only occurred once. The combination of relative frequency and pollen concentration diagrams (Figures 2 and 3) demonstrate that this loss of trees was a genuine absence and not an artifact of a superabundance of non-woody taxa at that point. These same data similarly confirm that the inferred earlier woodland was "real" and not only the result of minimal numbers of non-tree pollen. The origins of this open stage are unclear. The present palynological information presents no firm evidence, supportive or against, the idea that the woodland was deliberately cleared for cultivation, or timber-harvesting for mining or tanning. It does, however, appear unlikely that such an apparently major loss of trees was the result of an extreme event such as a storm. Trees or scrub ought to have survived in larger quantities than is implied in the pollen diagrams. Neither is the present evidence able to establish that the present woodland is the result of deliberate replanting. It is similarly unclear how or why damage from grazing animals did not prevent regeneration. Did the large walls around the woodland once have such a function?

The pollen diagrams point clearly to the presence of earlier oak woodland at the site. The earlier wood was richer in herbs than its replacement, possibly suggesting a more open canopy. In some respects the tree composition of this earlier woodland appears to have been essentially similar to that of the present wood - it was dominated by *Quercus*. The tree composition, however, of this earlier woodland does present substantial problems of interpretation. Two sets of questions arise from the pollen data. Why are grains of *Fagus* and *Pinus* present in significant quantities in this earlier woodland? And why are grains of *Alnus, Corylus* and *Betula* so conspicuously absent? There do not appear to be satisfactory ecological answers to explain these features. They are not the result of errors of identification. Neither are there any satisfactory pollen-taphonomic explanations for these peculiar presences and absences. In brief, the composition of the earlier woodland at Piles Copse is as unexpected as that of the present woodland. The most obvious explanation is that it, too, was planted?

It would be unusual if past settlement, mining and tanning had not had significant impacts upon these woodlands at Piles Copse, given the proximity of the location to these activities in the past. Our understanding of the relationships between this particular oakwood might benefit from examination of not only its association with clitter, but also of the composition of the clitter. At Piles Copse, the clitter is very rich in mineral veins. This eastern hillslope beneath the woodland, immediately downstream of bog, contains one gully [SX 644 622] which may have been worked for metalliferous ores in its upper parts. Perhaps this clitter and gully have themselves been quarried for tin and other ores?

CONCLUSIONS

The real messages of this exploratory paper are clear. The history of this Piles Copse oakwood is far more complicated than suspected - it has antecedents. The anomalous species compositions recognised for both the present woodland, and its precursor, suggests that they were both planted. It is not possible at present to relate the available contemporary ecological information, or the minimal historical and archaeological information, to the present pollen diagrams. Neither can speculations on the ecological and geomorphic impacts of tinning and tanning be supported or rejected. However, these studies point the way forward. There is evidence in the silt layers recovered in this peat core of ancient flood episodes, as well as in floodplain geomorphology. Future radiocarbon-calibrated, integrated investigations of the pollen-taphonomy, peat-stratigraphy and geochemistry of cores from such insignificant flush bogs in valley bottoms may well also provide exactly the detailed and coherent information needed to address many of the ecological, historical, archaeological and geomorphological questions associated with Dartmoor's "ancient" oak woodlands.

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