

**Limitations of soil pollen analysis - an example from  
Mauley Cross, a mesolithic site on the North  
York Moors**

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Summary

This paper examines the problems of interpretation of pollen analyses of a soil profile which contains mesolithic flint waste flakes at two separate levels. It is argued that, because of the variety of processes that has affected both the pollen and the flints in the profile, very limited conclusions may be drawn from such analyses.

Introduction

The aim of this paper is to explore the value of soil pollen analysis carried out on material from Mauley Cross, a mesolithic site on the North York Moors in north-eastern England (Fig. 8). Although recently Dimpleby (1985) produced a wide-ranging discussion of the importance of palynology in archaeology, the Mauley Cross study summarises in a single site many of the difficulties of attempting to link pollen analysis with archaeology.

In 1971, Raymond Hayes discovered an area some 250 m north-west of Mauley Cross (National Grid Ref. SE 795945) in which Forestry Commission ploughing had revealed a substantial number of mesolithic flints. He collected the loose flints from the site (about 400 were recovered, amongst which were 12-14 rods and scalene triangles, one arrowhead and two round scrapers: R. Hayes, personal communication) and also took three monoliths of the soil profile at the site, all of which contained flints stratified at a range of depths. The monoliths were interesting because they initially appeared to offer the prospect of linking archaeological and palaeoecological data. Consequently, they were sent to the author for examination and the monolith with the greatest number of microliths exposed in its profile was sampled for pollen analysis, using standard preparation techniques (e.g Moore and Webb 1978). A pollen diagram (Fig. 9) was produced in 1973. The results were not published then, mainly because of the difficulties of interpretation, and it is this aspect which provides the focus for discussion in this paper.

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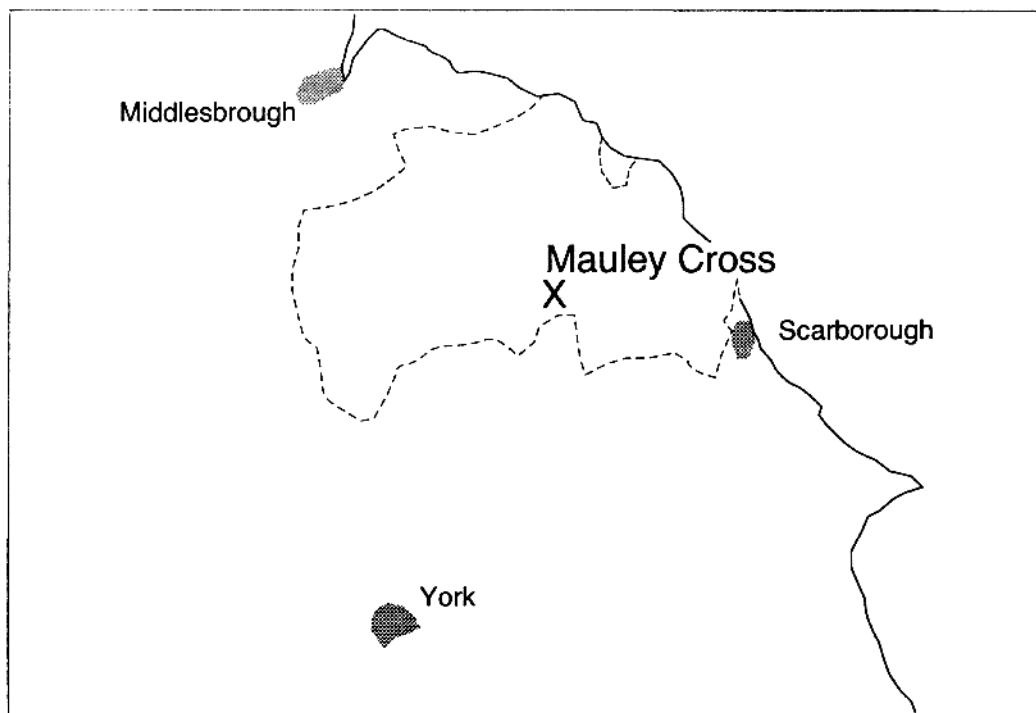


Figure 8. Location of Mauley Cross (the dashed line marks the North York Moors National Park Boundary).

Problems of interpretation

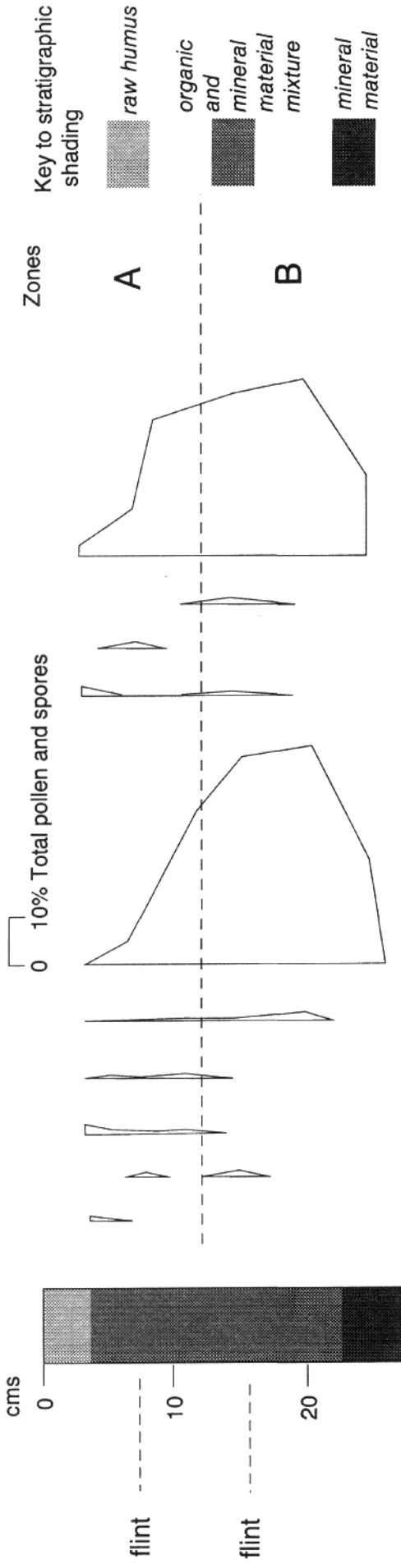
The pollen diagram may be divided into two 'zones':

A - with high Calluna pollen values, probably reflecting the relatively recent (i.e. late Flandrian) dominance of heath in the North York Moors area, although it is impossible to provide a date for the arrival of the heath. Some of the Calluna pollen may have moved down the soil profile.

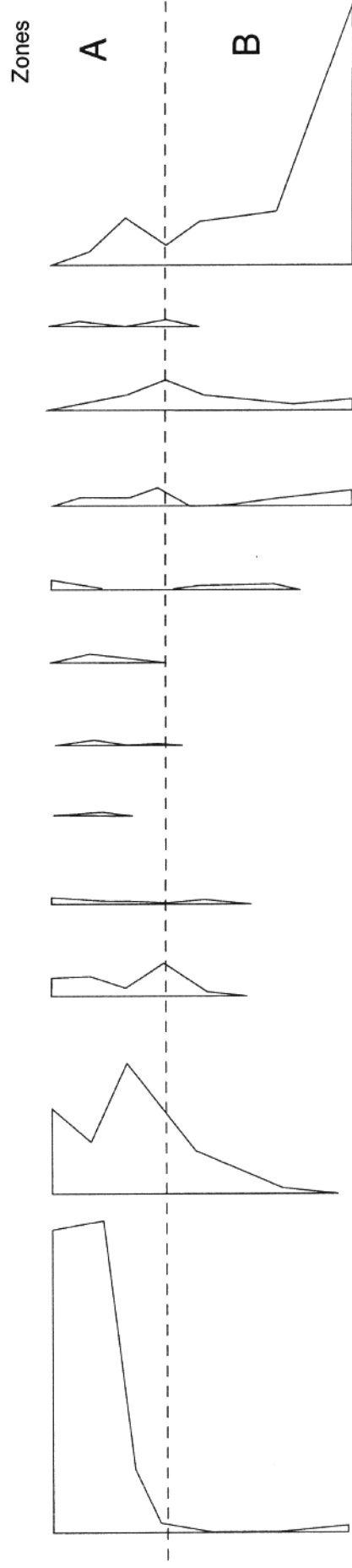
B - dominated by Alnus and Coryloid (?hazel) pollen, but with an increase in the proportion of fern spores (Filicales) towards the base of the profile. The presence of Alnus and Coryloid pollen indicates that the soils of the area were formerly much less acid. This suggestion is supported by the record of Tilia pollen. 'Zone' B may therefore indicate an early stage of vegetation development in which relatively base-rich soils existed, although this would have resulted in the mixing of the soil and the pollen by the soil fauna that would have been present.

There seems little else of a straightforward nature that may be interpreted from the pollen evidence simply because there are a number of processes which could have influenced

Figure 9 (opposite). Relative pollen diagram from Mauley Cross, showing major pollen types only. Analysis: P. Cundill 1973.



Pinus Quercus Tilia  
Betula Ulmus Alnus  
Fraxinus Coryloid  
Ilex Salix



the distribution of pollen in the soil profile. There are, for example, indications of two common soil pollen phenomena in the pollen data:

(i) there seem to be greater concentrations of pollen nearer the surface. The evidence for this may be seen in (a) the higher pollen counts in the upper layers of the soil; (b) the greater number of pollen per traverse of the pollen slides for the upper samples (although other factors, such as the quantity of mounting medium added to the sample, may have influenced the concentration of pollen); and (c) the greater range of taxa in the upper layers (although this is influenced by the reduced pollen counts in the lower soil layers). Table 2 illustrates these points.

(ii) there is evidence in the lower horizons of the profile for greater numbers of those pollen grains and spores that are commonly regarded as more resistant to the processes of degradation (e.g. *Tilia*, Filicales; see Havinga 1964; 1984), although this may be a misleading impression, because total counts in the lowermost two samples were below the 200 minimum recommended by Dimbleby (1985).

The flint waste flakes were found at various depths in the soil in this monolith: one at 8 cm and the others at between 15 and 17 cm. How they became buried at depth beneath the present surface is a matter for conjecture. If the matrix in which the flints are located had been accumulating gradually, it would be acceptable to interpret the flint horizons as former land surfaces. There may be some evidence to support this suggestion because, according to the pollen per traverse figures (Table 2), there are higher pollen concentrations at the flint levels. Certainly Dimbleby (1985) has frequently found flint horizons associated with buried soils, with the soils having become buried through the accumulation of wind-blown sand. In other cases, where buried soils cannot be demonstrated, Dimbleby has argued that soil fauna such as worms may have moved objects such as flints down the soil profile. While there may be a hint of buried soils at Mauley Cross, the evidence is equivocal and processes based on the presence of soil fauna seem more feasible, especially if such activities took place in the period when there was a forest soil with a higher pH than that in evidence at the present day.

Depth (cm)	Total count of pollen and spores per level	Mean number of pollen and spores per traverse	Number of taxa per level
5	776	20	20
8	519	47	19
10	691	28	17
12	602	18	17
15	356	40	15
20	177	4	10
24	109	1	8

Table 2. Pollen and spore count data from analyses of the soil profile at Mauley Cross. 46

## The value of the Mauley Cross analysis

The speculation regarding the displacement of flints within the profile and the inherent difficulties of interpreting soil pollen data mean that no simple and direct connexion between the flint horizons and the pollen record can be inferred. It is recognised that, from a number of points of view, the pollen analysis of the material is less than perfect because nowadays it is routine to carry out pollen concentration counts (using, for example, Lycopodium spore tablets: Stockmarr 1972) and to assess the state of preservation of pollen and spore exines (using, for example, the scheme of Gushing 1976) as well as ensuring that a statistically acceptable count is achieved. These improvements to the technique, together with mineral analysis of the soil material, might have clarified the situation with regard to the presence of buried soils, but even if these steps had been taken, the level of interpretation of the pollen results would only have been enhanced marginally. The difficulties of marrying two distinctly different sets of data - archaeological and botanical - each influenced by different sets of interacting forces, makes for complex and highly speculative interpretations at best. While Dimbleby (1985) argued that valuable results can be obtained from soil pollen analysis, it is apparent that analyses of the kind described here could be summarised as 'high effort for low return'<sup>1</sup> and this point should be borne in mind in any attempt at such analyses.

### References

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