3.16 Palynological studies at Sand, Applecross | Fraser Green and Kevin Edwards

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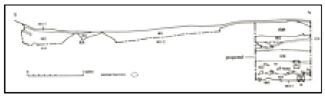
3.16.1 Introduction

Material collected by Dr Cressey in two small kubiena tins from Trench A during the excavation of Sand was examined for its organic and palynological content. The first of these, 'Sand 1' was of particular interest as it contained the transition from an inferred midden deposit (Context 28) to a minerogenic soil (Context 22). 'Sand 3' was taken from lower in the profile where the minerogenic soil (Context 25) graded into a friable sandstone unit (Context 3). Both samples originated from the east facing sections of the trench, excavated beneath a loose sandstone slab of obscure provenance (see Illustration 344, right).



Illus 344: East-facing section of Trench A showing location of kubiena tins

3.16.2 Description

Sand 1 consisted of a 10cm thickness of poorly consolidated material. The upper 3cm contained the inferred midden material and had numerous inclusions of shell in a sandy matrix. The lower 7cm, in terms of visibility to the eye and within the sieve retent, seemed to be composed entirely of very sandy soil.

Sand 3 consisted of very sandy soil throughout.

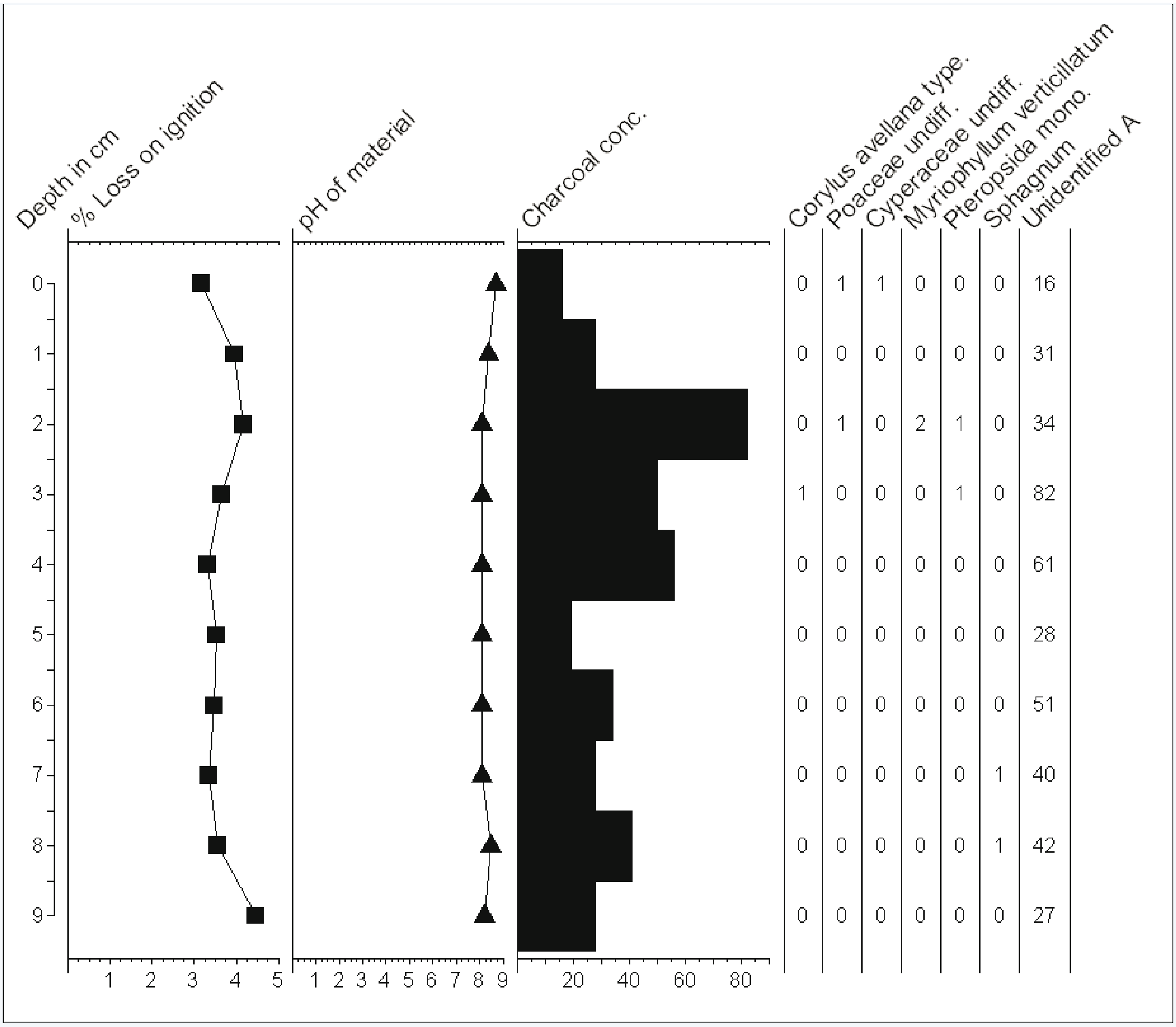
3.16.3 Methods and presentation of results

Both sections were sampled contiguously in 1cm thicknesses and prepared for pollen analysis using standard NaOH, HF and acetolysis techniques (Faegri & Iversen 1989) after sieving through a 180µm mesh. Carbonate tablets containing spores of *Lycopodium clavatum* were added at the start of sample preparation, to enable estimates of palynomorph and charcoal concentrations (Stockmarr 1971). Samples were then mounted on slides using silicone oil. Replicate samples for both sections were analysed for loss on ignition (LOI) for 16 hours at 360°C, and were mixed with deionised water for pH tests. The latter were performed because of indications of effervesence from HCl in the shelly samples (top 3cm of Sand 1).

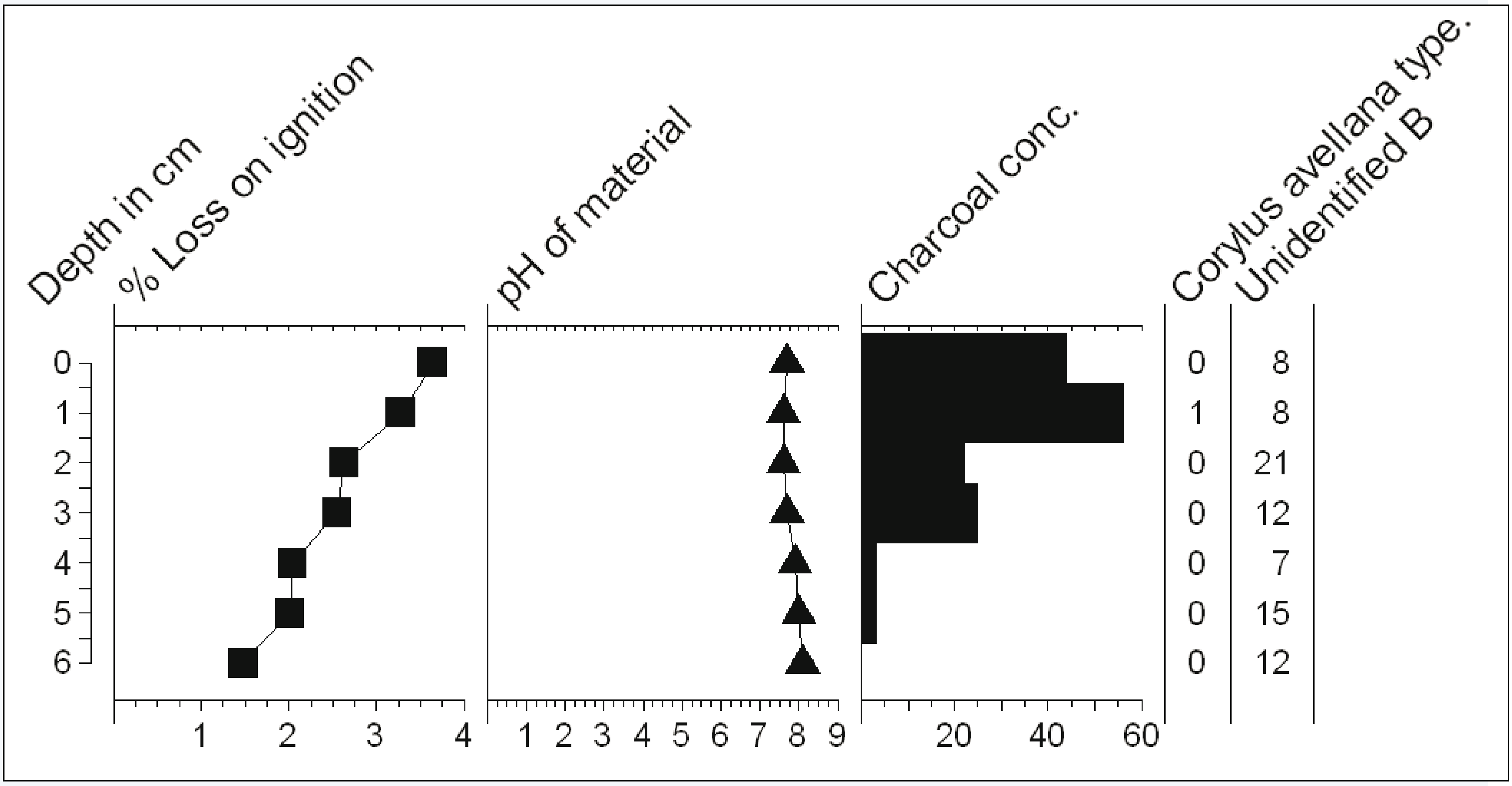
The pollen and spore content for both samples was negligible, while microscopic charcoal was more frequent. A large number of microscope slides was searched for each level. As a result of this sparseness, the palynomorphs were individually noted and identified (pollen type nomenclature follows Stace (1997), amended after Bennett (1994)). Microscopic charcoal was sufficiently abundant for counts of fragments greater than $400 \mu m^2$ size; this involved counting individual fragments in two dimensions using a microscope eyepiece micrometer. The values for charcoal are expressed as concentrations ($mm^2\ cm^{-3}$). With the exception of some shell fragments in the upper 3cm of Sand 1, the bulk of the sieve retent was minerogenic material. The data displayed in Illustrations 519 and 521 (below) was processed using TILIA and TILIA.GRAPH (Grimm 1991).

Illustrations 519 & 521

This data can be obtained from pp6–7 of the final report.



Illus 519: Palynological, loss on ignition and pH data from Sand 1. Charcoal concentrations are in values of $mm^2 cm^{-3}$ and palynomorph numbers represent raw counts



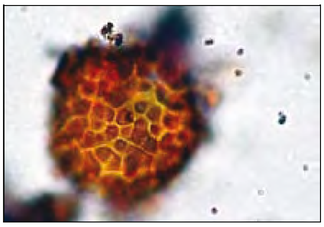
Illus 521: Palynological, loss on ignition and pH data from Sand 3. Charcoal concentrations are in values of $mm^2 cm^{-3}$ and palynomorph numbers represent raw counts

3.16.4 Discussion

The results for Sand 1 (see Illustration 519, above) illustrate the highly minerogenic nature of the material, the organic content remaining consistently low and generally less than 4% LOI throughout the profile. Even though effervesence in HCl was evident only during the pretreatment of the shelly samples, the pH of all samples was remarkably high throughout, perhaps as a consequence of the leaching of dissolved shell material rich in $CaCO_3$, or from the lime-rich superficial deposits found locally (the country rock is acid Torridonian Sandstone). These very alkaline conditions would explain the lack of palynological evidence, given that pollen is typically only preserved when the pH is less than 5.5 (Dimbleby 1985). In spite of this, it was decided to persist with pollen and spore analysis because the method has produced interpretable results in some calcareous contexts (Dimbleby & Evans 1974). Microscopic charcoal, though of significant concentration, varies greatly throughout the section, although the supposed midden segment has enhanced charcoal values. If this is a result of the inclusion of hearth waste, the lack of macroscopic charcoal is surprising and would argue against the presence of an immediately adjacent domestic fire. Microscope analysis of the larger shell fragments from the top 3cm suggested a mix of cockle and limpet.

The palynological data were extremely limited and only *Corylus avellana*-type (*cf* hazel), *Poaceae* (grasses), *Cyperaceae* (sedges), *Myriophyllum verticillatum* (whorled water-milfoil), *Pteropsida* (monolete) indet (undifferentiated ferns) and *Sphagnum* (bog moss) were present. All these plants save one are part of the flora today. *Myriophyllum verticillatum*, an aquatic plant of basic fresh water, seems to be absent from Scotland now (Perring & Walters 1990) but was perhaps not so in the recent past, as it is still to be found in England (Godwin 1975).

Unidentified spore A (see Illustrations 519, above & 520, right) was relatively abundant. This spore is spherical in all views, well preserved, inaperturate, and 35–45µm in diameter. The exine is very thick (5µm) and is dominated by strong sculptural elements – a network of high relief ridges forming a chaotic web. The lumina between the ridges occupy 40–60% of the grain surface and are of irregular shape. The grain appears to be tectate (in that it possesses a foot layer) but lacks columellae. Its absence from the pollen and spore keys suggests a possible pre-Quaternary origin with derivation from local drift materials. It is interesting to note however, that spore A is not present in the upper levels of Sand 3, despite this deposit reportedly representing the bottom part of the minerogenic material described in Sand 1.



Illus 520: Sand – unidentified spore A

Illustration 521 (above) shows the results for Sand 3. The organic content in the upper part of the profile matches that of the lower section of Sand 1, but quickly reduces as the transition to an even sandier matrix takes place. This is reflected in the charcoal curve which decreases significantly in the basal 4cm. As seen in Sand 1 the pH is consistently high, despite the lack of shell material in these samples, with a corresponding lack of palynomorphs. This would again suggest that the parent material for the soils was highly alkaline.

Sand 3 is of even less palynological interest than Sand 1, producing only one identifiable grain of *Corylus avellana*-type pollen. Unidentified spore B (see Illustration 522, right) is very different from the example in Sand 1. It too is spherical and inaperturate, but is half the size (18–25µm) and relatively featureless. The exine is thin and almost universally psilate, though some palynomorphs show a faint ridging pattern on their surface, producing sunken areas of a polygonal pattern, visible only under 1000× magnification. An estimated 10–16 of these polygons cover the entire grain surface, if present at all. It has been suggested to us that these relatively featureless palynomorphs may be the spores of a liverwort or obscure moss (Dr Andrew McMullen, *pers comm*).

Illus 522: Sand – unidentified spore B

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- … > Images > Plans and sections > SFS_FD18.jpg [Illustration 344]
- … > Images > Specialists > Sand Pollen > Sand_pollen_sandsporeA.jpg [Illustration 520]
- … > Images > Specialists > Sand Pollen > Sand_pollen_sandsporeB.jpg [Illustration 522]