18. BOTANICAL ANALYSES

David E Robinson

18.1 Samples

Five samples were submitted for botanical analysis.[23]

▸ 1. QAT

A block sample comprising fragments of turf of variable size, from the east side of the fortlet immediately south of the Antonine Wall. The sample had dried out during storage and had largely disintegrated in the absence of a supporting metal box. However, it was possible to discern the following layers, which appear to be repeated in each of the turf fragments remaining intact:

1. A thin (*c* 10mm) dark brown organic layer corresponding to the soil/turf surface.
2. A wider (*c* 20mm) dark grey layer of less organic silty material containing a small quantity of fine gravel and sand.
3. A layer of variable width (usually more than 30mm) of light grey leached silty material with sand and fine gravel.
4. An orange subsoil layer of indeterminate width containing small fragments of charcoal and mineralised plant material.

None of the turf fragments in the sample displayed all of the four layers in this order. Generally Layers 1, 2 and 3 were intact, with Layer 4 of another fragment being in sharp contact with Layer 1. The boundaries between the other layers were not sharp and there were signs of soil mixing which had apparently taken place prior to the turves being cut (see 18.3.3 and 18.4, below). Modern roots pervaded the sample.

▸ 2. QAW

A block sample comprised turf fragments, again of variable size, from the south side of the Antonine Wall *c* 1m east of the east wall of the fortlet. This sample had also dried out and disintegrated in storage. In the fragments of turf which remained intact the following sequence of layers was observed:

1. A thin (*c* 10mm) dark brown organic layer corresponding to the soil/turf surface.
2. A wider (*c* 20mm) light grey leached silty layer with some clay, sand and fine gravel.
3. An indeterminate darker grey silty layer with some clay, sand and fine gravel.
4. An orange subsoil layer of variable width containing small charcoal fragments and mineralised plant remains.

The layers were preserved in similar circumstances to those described for QAT. However, the boundaries between layers were much sharper than seen in the latter and there was little evidence for soil mixing. Modern roots again pervaded the sample.

▸ 3. QAR

A sample collected by the excavator from a layer within the infilled east ditch of the fortlet recognised as a fossil turf line. The sample appeared to be largely made up of material similar to that seen in Layer 1 of QAW and QAT. However other, less organic, material was present and this cannot be regarded as a pure sample from a turf line.

▸ 4. QAX

A sample from a soil and charcoal spread behind the Antonine Wall. It contained abundant charcoal ranging in size from twigs *c* 20mm in length down to dust-sized particles.

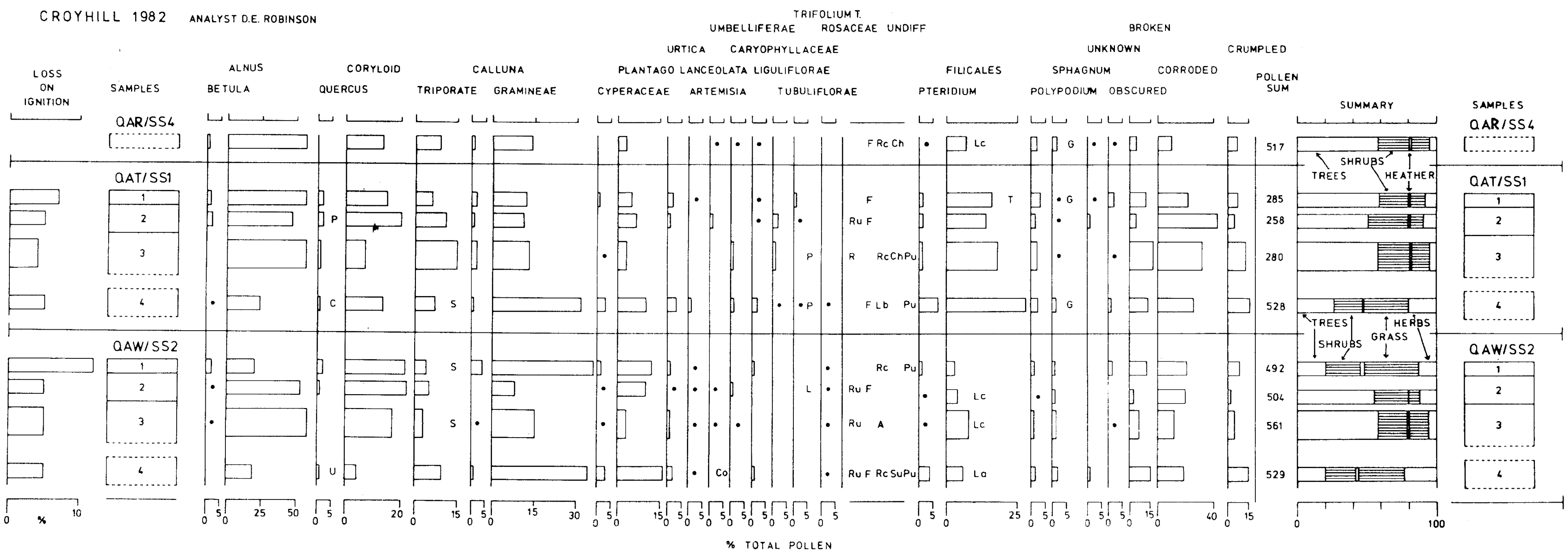
▸ 5. QAS

A sample from the duckboarding immediately behind the Antonine Wall. It contained abundant pieces of charcoal of varying size.

18.2 Methods

18.2.1 Pollen analysis

Pollen analysis was carried out on samples QAT, QAW and QAR. The desiccated nature of samples QAT and QAW made sampling in situ impossible. The successive layers were shaved from a representative fragment using a scalpel. Pollen slides were prepared from 1g sub-samples using standard techniques (Birks & Birks 1980: 157). The high mineral content of the samples required the use of hydrofluoric acid in the preparation. The pollen was stained in safranin and mounted in silicone oil. A pollen sum of 500 total land pollen (TLP) was adopted, although 250 TLP was used when poor pollen preservation made counting excessively difficult and laborious. The results of the analysis are expressed as percentages of TLP and are presented in Illus 18.1.



Illus 18.1 Pollen diagram and loss on ignition for samples QAT, QAW and QAR from Croy Hill; pollen values are expressed as a percentage of the total land pollen. The closed circle represents values of less than 1% (drawn by Myra Lees). ***Abbreviations:*** P = Pinus, C = Carpinus, U = Ulmus, S = Salix, Co = Conopodium type, P = Papilionaceae, L =Lotus, R = Rubiaceae, Ru = Rumex, F = Filipendula, Rc = Ranunculus, Lb = Labiatae, A = Allium type, Su = Succisa, Pu = Plantago undifferentiated, Ch = Chenopodiaceae, Lc = Lycopodium clavatum, La = Lycopodium annotinum, G = Gelasinospora, T = Tilletia

18.2.2 Plant macrofossil analysis

Plant macrofossil analysis was carried out on the sieve washings produced during the preparation of pollen slides from samples QAT, QAW and QAR and also on a sieved subsample of QAX. The material was examined using a low-power (to ×250 for charcoal) binocular microscope. The results are presented in Table 18.1.

18.2.3 Loss on ignition analysis

Loss on ignition analysis was performed on samples QAT and QAW. The results are presented alongside the pollen diagram (Illus 18.1).

18.3 Results

18.3.1 Pollen analysis

▸ QAT

Layers 1–3: Values of *Alnus* (alder) and Coryloid (hazel or bog myrtle) are high, other tree species are poorly represented. Gramineae (grass) and Filicales (fern) values are modest, but levels of *Plantago lanceolata* (ribwort plantain) pollen are substantial and other indicators of pastoral agriculture, such as *Trifolium* (clover) type are in evidence. *Calluna* (heather) pollen is virtually absent and no other heath species are represented. The incidence of degraded pollen is high.

Layer 4: Values of *Alnus* and Coryloid are lower than those seen in the above. Pollen of Gramineae and *Plantago lanceolata* and spores of Filicales are more abundant and pastoral agriculture indicator species are more common. *Calluna* values are again low.

▸ QAW

Layer 1: Values of *Alnus* and Coryloid are modest. The spectrum is dominated by Gramineae, Filicales and *Plantago lanceolata*. There are minor presences of the pollen of agricultural indicator species. *Calluna* is less than 5% of total pollen.

Layers 2 and 3: The pollen spectra from these layers are almost identical to those described from Layers 1, 2 and 3 of QAT. The main differences which do occur are in the levels of Filicales spores and open-habitat herb pollen, which are lower and higher respectively in this sample. This may be a function of differential pollen preservation as the values of degraded pollen in all the layers from this sample are substantially lower than those seen in QAT. Filicales values tend to be higher in samples where differential preservation has occurred.

Layer 4: The pollen spectrum from this layer is similar in most respects to that from the corresponding layer in QAT.

▸ QAR

This sample, corresponding to the upper layer(s) of an individual turf, has a pollen spectrum which bears a striking resemblance to those of Layers 1, 2 and 3 of QAT and Layers 2 and 3 of QAW. However, the incidence of degraded pollen is lower in this case.

18.3.2 Plant macrofossil analysis

▸ QAT, QAW, QAR

The plant macrofossils recovered from these samples were neither abundant nor varied. They were confined to charcoal fragments of variable size, small fragments of mineralised plant remains

Table 18.1 Plant macrofossil analysis. ***Abundance key:*** + present; rare (1) – very abundant (5)

	QAT	QAW	QAR	QAX
Macrofossils	1 1 3 4	1 2 3 4		
Charcoal (unidentified)	2 1 2 3	2 + 1 1	3–4	
Salix				5
Corylus			+	5
Calluna/Vaccinium myrtillus				+
Mineralised plant remains	2 3 1 1	2 2 1 2	2	
Potentilla sp. (achene)	+		+	

and an occasional achene of *Potentilla* sp. (probably *Potentilla erecta*, tormentil). The latter may indicate the presence of grassy heath.

18.3.3 Loss on ignition analysis

▸ QAT, QAW

In both cases this analysis confirmed that Layer 1 was the most highly organic and therefore most likely to represent the upper layer of the turves.

In Sample QAW, Layer 1 contained 12% organic material, whereas in QAT the organic content of Layer 1 was only 7%, only marginally more than the lower layers. This adds weight to the suggestion that there had been more soil mixing in the upper layers of QAT than in QAW.

18.3.4 Analysis of charcoal

▸ QAX

Charcoal was abundant in this sample, the majority of it resulting from the burning of twigs and slender branches. The immature nature of the material made identification difficult. Of those fragments identified, the majority were of *Corylus* (hazel) and *Salix* (willow). Two fragments were referable to *Calluna* (heather) or *Vaccinium myrtillus* (blaeberry). Difficulties in finding examples of medullary rays in tangential longitudinal section prevented identification to species levels.

These findings are consistent with the sample representing the remains of a *Corylus/Salix* wattle hurdle or the like which may also have been intertwined with *Calluna* or *Vaccinium myrtillus*.

▸ QAS

Charcoal was abundant in this sample. The larger pieces were almost exclusively *Quercus* (oak). The smaller pieces of twigs and branches were not identified.

18.4 Interpretation

▸ QAT

As already stated, it appears from the stratigraphy of this sample as if there had been soil mixing in the upper layers prior to the turves being cut. This idea is supported by the high levels of degraded pollen in the samples. Soil mixing by an agency such as earthworms would increase soil aeration and accordingly promote pollen degradation (particularly corrosion) by micro-organisms. There are also relatively minor differences in loss on ignition between the layers (see 18.3.3, above).

As might be expected, the result of the mixing has been to give the upper layers more or less similar pollen spectra. These pollen spectra suggest that the landscape in a period prior to the turves being cut was one of fairly open *Alnus* woodland with hazel or bog myrtle in abundance. The separation of *Corylus* (hazel) and *Myrica* (bog myrtle) pollen is difficult (Edwards 1981). For this reason the category Coryloid, covering both *Corylus* and *Myrica*, has been used. It seems likely that at least some of the pollen in the Coryloid category represents hazel, as *Corylus* charcoal was present in QAR and QAX. There would also have been substantial areas of grazed grassland. Woodland trees such as oak and elm appear to have been rare, having been cleared away in the course of earlier human activity. Layer 4, the orange subsoil with flecks of charcoal, may have a pollen spectrum representing one of these earlier clearance phases when the tree cover was markedly less.

▸ QAW

Soil mixing does not appear to have been as prevalent in the upper layers of this sample. The layers appear to be more sharply defined, the incidence of degraded pollen is lower and the difference in organic content between Layer 1 and the other layers is greater. There are also more obvious differences between the pollen spectra of the layers. It may be that this set of turves was cut from a slightly wetter area than those of QAT, and the waterlogged conditions reduced the amount of mixing by soil invertebrates. Layers 2, 3 and 4 of this sample have similar pollen spectra to the corresponding layers of QAT and almost certainly represent similar landscapes; Layers 2 and 3 suggesting open alder/hazel woodland with areas of grazed grassland and Layer 4 an earlier clearance phase where alder and hazel were less abundant.

The major difference is seen in Layer 1, where *Alnus* and Coryloid levels are reduced to the levels of Layer 4 and Gramineae and *Plantago lanceolata* rise accordingly. This probably represents renewed clearance of the woodland immediately prior to the turves being cut.

▸ QAR

The similarities between the pollen spectrum from this sample or layers within samples QAT and QAW have already been commented upon. A similar landscape of alder/hazel woodland and grazed grassland is inferred.

▸ QAS

Large pieces of charcoal characterise this sample and oak is consistently recorded as the preferred timber for structural features in Roman military construction (Hanson 1978).

18.5 Summary

The interpretation of pollen spectra from soils is fraught with difficulties such as pollen deterioration, differential preservation, downwash and vertical mixing by soil invertebrates (Birks & Birks 1980: 188). Accordingly any interpretation is, of necessity, tentative. It is still possible, however, to make some interesting observations about the environment at the time the turves were cut and to speculate about events preceding this action.

Two main vegetation types are represented in the pollen spectra from the Croy Hill samples:

1. Alder woodland with hazel (and/or bog myrtle).
2. Grazed grassland.

The major difference between turves and layers within the turves is in the relative proportions of these two vegetation types as influenced by successive clearance episodes and land use. It is obvious that the vegetation had been seriously interfered with prior to the episodes recorded in these samples. *Betula* (birch) and *Quercus* (oak), which might be expected to dominate the natural vegetation of the Croy Hill area (Birks 1977), are poorly represented and must have been almost totally cleared from the surrounding landscape. Human populations must, therefore, have been present in the vicinity for a considerable period prior to the construction of the Wall and the fortlet.

With regard to the turves themselves, those from the Wall (QAW) appear to have been cut from a different, perhaps wetter, location than those from the fortlet (QAT). This is inferred from the differences seen in the pollen preservation; the degree of vertical mixing; and the distribution of organic material within the soil layers of the two turf samples. This could easily be explained in terms of local differences in soil type, topography and drainage within the areas stripped of turf. Similarly, the evidence for clearance of alder and hazel, which is seen in Layer 1 of QAW but which is absent from Layer 1 of QAT, may be explained by very local activity and need not imply any time difference in the cutting of the turves.

18.6 Comparison with nearby Antonine Wall sites

Pollen analysis of fossil turves from Antonine Wall sites at Bearsden (Dickson & Dickson 2016), Wilderness West (Newell 1983) and Bar Hill (Boyd 1985) all revealed a more or less similar picture of secondary alder/hazel woodland with areas of pastoral grassland. As at Croy Hill, there are isolated presences of possible arable indicators, but not in sufficient numbers to indicate that farming in proximity to the Antonine Wall was other than pastoral.

There is one major difference between the pollen spectra from the above sites and those from Croy Hill. This concerns the amount of *Calluna* pollen present. *Calluna* is well represented at Bearsden, Wilderness West and Bar Hill, but is almost absent from the Croy Hill turves. It may be that the heavy clay soils in the vicinity of the site proved unsuitable for the growth of *Calluna*. It is hard to believe that differences in grazing regimes between Croy Hill and the other sites would be such as to prevent the colonisation by, or effect the elimination of, *Calluna*.