Environmental report

Botanical remains *by B Moffat and C Smith*

1 Pollen analysis of charred cereal residues from a corn-drying kiln at 13–19 Roxburgh Street, Kelso

Three samples were taken from the interstices of the floor-stones of the kiln from Phase 2 at 13–19 Roxburgh Street, Kelso and were prepared for pollen analysis by standard methods. Analysis of macroremains was not undertaken due to the compacted, agglutinated state of the samples.

Pollen grains, fern spores and septate fungal hyphae were identified in the samples. Amorphous charred matter was abundant.

Table 6 Pollen Types from the kiln at 13–19 Roxburgh Street, Kelso

Species	n	%
Grass and Cereal Pollen:		
Gramineae, undifferentiated	38	2.5
Hordeum type (barley)	781	52.3
Triticum type (wheat)	390	26.1
Avena fatua (wild oat)	21	1.4
Cerealia, undifferentiated	156	10.5
Total Cerealia	1348	90.3
Total Gramineae	1386	92.8
Herb Pollen:		
Plantago lanceolata (ribwort plantain)	3	
Plantago major (rat-tail plantain)	2	
Caryophyllaceae (campion family)	7	
Chenopodiaceae (goosefoot family)	8	
Compositae (Liguliflorae)	13	
Compositae (Tubuliflorae)	2	
Polygonum sect. persicaria	9	
Rumex sect. *rumex* (dock)	14	
Rumex sect. *acetosa* (sorrel)	5	
Ranunculus sp. (buttercup)	21	1.4
Labiatae, undifferentiated (mint family)	3	
Teucrium scorodonia (wood sage)	7	
Total Herb Pollen	94	
Tree Pollen:		0.8
Alnus (alder)	5	
Betula (birch)	7	
Total Tree Pollen	12	

n = number present

Discussion

The pollen assemblage complies well with the interpretation of the structure as a corn-drying kiln, since the adherence of cereal pollen grains to harvested cereals has been widely recorded. There is no evidence that plants other than cereals were dried in the kiln. The range of cereals processed in the kiln is shown in Table 6. The use of the category 'undifferentiated cereal' was made necessary because of the presence of granular charred material irremovable from the microscopic slide, which precluded further identification of the pollen grains. The ratio of barley to wheat in the samples is broadly in the proportions 2:1. However this ratio may not directly represent the proportion of grains imported to the kiln, since the activities of the kiln workers (dumping, heaping, trampling, dowsing) would have dispersed the grains on the kiln floor.

The abundance of charred material (fragments of grain, husk, and stalk) indicates that drying of the grain may have progressed too far, allowing scorching to take place on the kiln floor. The scale of such an incident cannot be known.

The other, 'contaminant' pollens largely represent an array of weeds of field, field-edge and waste places. A few may have been harvested along with the cereals, in particular, wild oats, persicary, docks, goosefoots and composites. The remainder may have been introduced during storage of the grains. Wild oats and persicary are still considered nuisance species and are prime targets for herbicide advertisements in, for instance, 'Farmers Weekly', today.

2 Environmental Analysis of samples from 13–19 Roxburgh Street, Kelso

Wood and organic samples were subjected to environmental assessment. Of the wood samples, fragments from the following species were identified: birch (*Betula* sp.), hazel (*Corylus* sp.), oak (*Quercus* sp.), elder (*Sambucus* sp.) and ivy (*Hedera* sp.). Unidentified charcoal and ash (probably from coal) were also noted. Apart from occasional phytoliths of Festucoid type, that is, from grasses of the genus *Festuca* (fescue), and fragments of heather, no other plant macrofossils were identified in the samples (Table 7).

Table 7 Environmental Analysis of samples from 13–19 Roxburgh Street, Kelso

Phase	Context	n	Weight	Description and findings (pieces 5 × 2 × 2 cm are fully described) 'Loss upon ignition' = organic content (Org), see note*.
	1516			Org 1.59%/1.65%.
1	1065			Org 2.37%.
1	1349	3		Birch.
1	1470		0.25 kg	Org 2.01%.
2	343			Org 1.89%
2	351			Org 7.82%
2	371			Org 12.73%. Ash, wood (not identifiable) and charcoal. Fire residue.
2	378			Org 2.58%.
2	381			Org 2.99%.
2	382 628			2 birch. Org 4.13%.
2	409			Org 3.16%.
2	416			Org 2.36%.
2	1398		0.25 kg	Charcoal, coal, ash, mortar as dust.
2	1400A		0.1 kg	Org 4.62%.
2	1400B		0.1 kg	Org 5.33%.
2	1400C		0.1 kg	Org 3.57%. By weight all were 65–70% separable charcoal.
2	1415 559	1		Birch.
2	1416		0.15 kg	Wood charcoal and sand.
2	1416		0.15 kg	Org 0.7%.
2	1495			Org 1.09%.
2	1499		0.25 kg	Org 1.42%.
2	1526			Org 10.61%. Wood ash and charcoal. Fire residue.
2	1541 (106)			Rejected due to contamination.
2	1542			Org 2.72%.
3	1123 43	1		Oak.
3	1434 564			Birch.
3	1466		0.05 kg	Org 17.07%. Imported river shell sand. Shell too fragmented for identification.
3	1515			Org 0.61%.
3	1518 (71)			8 minute slivers of birch. Probably of a piece.
4	100	14		5 birch; 3 hazel; 3 ivy; 3 elder.
4	100 525	4		2 birch; 2 hazel.
4	300A		0.15 kg	Charred wood, comminuted and intermixed with clay. 2 sampled pieces were of birch.
4	1242	5		Fragments. All wood was birch. Posthole? Finer material charred. Fire residue.
4	1335		0.3 kg	Sand, wood and heather macrofossil charcoal.
4	1359 572	8		6 oak; 2 birch.
4	1372	3		Birch.
4	1374	5		3 hazel; 2 birch.
4	1438			Org 6.41%.
4	1464		0.25 kg	Wood charcoal and clay.
5	284 489	1		9 × 8 × 2 cm. Birch.

Table 7 (*cont.*) **Environmental Analysis of samples from 13–19 Roxburgh Street, Kelso**

Phase	Context	n	Weight	Description and findings (pieces 5 × 2 × 2 cm are fully described) 'Loss upon ignition' = organic content (Org), see note*.
5	315		0.15 kg	Charred wood, comminuted and intermixed with clay. Sampled pieces were: 2 hazel, 2 birch.
5	320 630			4 birch; 1 oak; 1 hazel.
5	330A			Org 0.66%.
5	340 596	4		4 birch.
5	356 576	1		Birch.
5	1042 439	1		Sliver of birch.
5	1077 2 (1 on bag)			Both hazel.
5	1463			Org 1.65%.
6	245		0.5 kg	No pollen or macrofossil assemblage. Org 4.0%. 'Sterile sub-soil'.
6	282		0.6 kg	No pollen or macrofossil assemblage. Occasional phytoliths of Festucoid type, 30% Org and abundant particulate charcoal. No indication of sewage. 'Dark soil'.
6	299		0.4 kg	Wood, well charred and decomposed, with few identifiable pieces. All 9 were birch, and probably of a piece.
6	353			Coal dust and ash included in clay.
6	1041		0.1 kg	Org. 2.7% No macrofossil, microfossil or charcoal assemblage. 'Sterile sub-soil'
6	1060		0.05 kg	Mixture of granular mortar, charcoal, coal and ash. Dust from rubble?
7	69 178	12		Rough slivers, largest 11 × 3 × 1 cm. All birch.
7	387 574	1		Birch.
8	22 167	1		1 planed and painted piece of wood, 3 × 2.5 × 1 cm. Oak. Coats: buff, under, and mid-brown.
8	57 199	4		Slivers, larges 4 × 1 × 0.5 cm. All hazel.
8	208 159	2		Birch. Some bark adhering. Largest 5 × 2 × 1 cm

n = number present

* General guide to significance of Organics values from this site:

Under 2%	sterile
c 2–5%	negligible
c 5–10%	minor
over 8%	worth intensified examination

3 Report on plant remains from Building A, Wester Kelso/Floors Castle Trench 2

Organic material, although generally scarce at this site, was found embedded in the floor levels of the cellar at Wester Kelso/Floors Castle Trench 2. Three lenses of agglutinated, blackened organic material (each providing samples of 6 g dry weight) from the cellar were subjected to examination. All residues which were found to be greater than 90% 'loss on ignition', and which, therefore, contained a significant amount of organic materials, were separated and examined. Pollen and spores were concentrated, and macroremains were disaggregated, using standard methods.

Both macro- and microremains consisted largely of bracken (*Pteridium aquilinum*). Eleven entire bracken fronds were separated, and on three of these, sori were observed in a collapsed form on the underside of the fronds. (A sorus is defined as a small area on the abaxial surface of a fern lamina, concerned with the production of sporangia, the structures in which the spores are formed). In total 923 spores were noted. Four of these were from *Dryopteris filix-mas* (male fern); the remainder were all broken spores of *Pteridium*. In addition, seven pollen grains were identified: three from *Plantago lanceolata* (ribwort plantain), two from Gramineae (grasses), one from Cyperaceae (sedges) and one from Chenopodiaceae (goosefoot family).

Ferns found in these three lenses, from subterranean floor levels of the excavations, could not have grown and developed sori *in situ*, since the soil at and below the levels of the lenses was sterile and inorganic (less than 5% 'loss on ignition').

Table 8 Environmental analysis of samples from a stone-lined pit at Wester Kelso/Floors Castle Trench 3
Species present in samples

Species	Common name	n	%
Wetland taxa			
Lemnaceae	Duckweed family	1	
Nymphaea sp.	Water lily	1	
Potamogeton sp.	Pondweed	2	
Phragmites sp.	Reed	2	
Cyperaceae	Sedge family	58	
Salix sp.	Willow	33	
Alnus sp.	Alder	536	
Sub Total		633	38.6
Dryland and riparian taxa			
Calluna sp.	Heather	76	
Ericaceae, undifferentiated	Heather family	16	
Linaceae	Flax family	2	
Cerealia, undifferentiated	Cereal family	2	
Umbelliferae	Carrot family	10	
Rosaceae	Rose family	3	
Filipendula sp.	Meadowsweet	6	
Rumex acetosa	Sorrel	15	
Plantago lanceolata	Ribwort plantain	94	
Plantago major/media	Greater/hoary plantain	16	
Labiatae	Mint family	6	
Compositae (Ligulate)	Daisy family	92	
Compositae (Tubulate)		11	
Artemisia sp.	Mugworts	4	
Caryophyllaceae	Campion family	13	
Gramineae	Grasses	526	
Pinus sp.	Pine	24	
Ulmus sp.	Elm	1	
Coryloid	Hazel	26	
Betula sp.	Birch	57	
Quercus sp.	Oak	6	
Sub-total		1006	61.4
Total		1639	
Faunal remains			
cf Fasciola hepatica (ova)	Sheep liver fluke	19	
Trichoptera (larvae)	Caddis fly	2	

n = number of pollen grains

Table 9 Coal Samples from 13–19 Roxburgh Street, Kelso

Phase	Context	Sample	Condition	Age/Potential Age Range
1	1470	521	Poor	Middle Coal Measures
1	1336	640	Good	Lower, Middle & Upper Limestone Group
2	1528	557	Poor	Middle Coal Measures
2	1416	624	Barren	Unknown
2	1127	627	Fair	Scremerston Coal Group to Millstone Grit
2	332	628	Poor	Lower, Middle & Upper Limestone Group
3	1538	590	Almost Barren	Coal Measures
3	1097	613	Good	Lower, Middle & Upper Limestone Group
3	1103	638	Barren	Unknown

There is an abundance of field observation and ecological data on bracken, relevant in many respects to this site, namely its general distribution (Page 1982), the prolificacy of spore production (Rymer 1976) and bracken's status as a very extensive, aggressive and abundant, weedy species (Page 1982). An ethnobotanical review shows the diverse uses to which bracken has been put in historical times (Rymer 1976). Importation of bracken to this unnatural, sterile site, indicates an intended end-use; for example, conversion to potash, use as fuel, thatch, litter or floor covering, food or medicament (ibid). However this evidence is mainly anecdotal, highly uneven in quality and geographical cover, and difficult to quantify.

The presence of abundant frond and reproductive material and the absence of rhizomatous and burned material allow an appraisal of the probability of these end-uses at this site. Only fuel (unused), thatch or roofing (though without supports, and not of sod or turf), litter or floor covering (in this case, unused since no associated plant and animal species were evident) and packing (of some indeterminate stored commodity) need be considered. Since potash manufacture leaves a burned residue, which is absent at the site, this use can be discounted. Similarly, use as a food or medicament, while possible, cannot be proven. The purity of the plant material in the lenses indicates careful gathering for one of these specific purposes.

4 Environmental analysis of samples from a stone-lined pit at Wester Kelso/Floors Castle Trench 3

A total of 18 samples was obtained from the fills of a stone-lined pit from Phase 2 at Wester Kelso/Floors Castle Trench 3. Pollen analysis revealed the presence of a variety of plant species from both wetland and dryland taxa, as shown in Table 8. The nature of the deposits containing the wetland species indicated the presence of flood debris, either deposited naturally or dumped. Faunal remains consisting of two possible larvae from caddis flies (Trichoptera) also indicate a freshwater habitat.

The remainder of the species represented in the samples were of grassland plants, typical of a low-growing sward. The incidence of ova, probably from the sheep liver fluke, *Fasciola hepatica*, indicates the presence of the host animal in the vicinity. These samples therefore indicate pastureland grazed by livestock, as well as, perhaps, waste ground, with no clear indicators of settlement.

Palynological Analysis of Coal Samples from Phases 1, 2 and 3 of the excavations at 13–19 Roxburgh Street, Kelso by G Armstrong (British Coal Scientific Services)

Upon maceration, the state of preservation of the spore assemblages was seen to vary quite considerably. Two of the samples were completely devoid of spore material, and another was almost barren. This may be because the rank of the coal is of a magnitude, which renders the spores unrecognisable, or that the coal has been burnt or subjected to weathering prior to burial. The variation in the state of preservation of the spore assemblages of the remaining samples may be the result of the inclusion, in the sample, of coal affected by one or more of the factors given above.

Samples from Contexts 1336 and 1097 comprise a single piece of coal so those species present in the spore assemblage with a range in time will enable the age of the coal to be precisely determined. The overlap in time, however, of long ranging species with short ranging ones means that some of the coal in the composite samples may be of an age equivalent in time to the upper or lower limits of the longer ranging species. In the case of one of the composite samples, therefore, a potential age range is given.

The table (Table 9) gives the age of the coal considered to be present in the samples, and it appears that in each phase coal may have been derived from the same sources.

Coal from the Scremerston Coal Group in the Middle Coal Measures is known to occur in the Northumberland Coalfield. All the coal excavated at Kelso may, therefore, have been derived locally if it outcrops at an accessible site.