AML Rpt.

1983

Ancient Monuments Laboratory
Report 77/88

ANALYSIS OF WATERLOGGED PLANT REMAINS FROM CASTLE STREET, CARLISLE, CUMBRIA.

K Goodwin and J P Huntley

Ancient Monuments Laboratory Report 77/88

ANALYSIS OF WATERLOGGED PLANT REMAINS FROM CASTLE STREET, CARLISLE, CUMBRIA.

K Goodwin and J P Huntley

Summary

41 samples of waterlogged plant material from Roman deposits at Carlisle were analysed. Most were very rich in taxa and a total of 246 taxa were represented. There were periods of demolition/ dereliction which, botanically, are not diverse, and have a plant assemblage which is ubiquitous (the so-called 'background' assemblage).
Interspersed with these periods are highly active ones with substantial buildings. Botanically some of these were very clean but others, often adjacent, had accumulated thick, organic-rich deposits with strong indications of animal fodder/ bedding and foul waste. Little evidence of food plants was found and none for grain storage. There was, however, a suggestion that some crop processing was being carried out, although this could just have been the use of straw.
The Castle Street site is best regaarded as ancilliary and supportive to the Roman fort at the Annetwell Street site.

Author's address :-

Department of Archaeology
University of Durham
Science Laboratories (APII)
DURHAM
DH1 3LE

091 374 3642

CONTENTS

SECTION 1: INTRODUCTION

GEOGRAPHICAL SETTING AND HISTORICAL OUTLINE

The City of Carlisle is situated in north-west England towards the western end of Hadrian's Wall. It stands on a narrow tongue of land, open to the south, but hemmed-in to the north, west and east by the Rivers Caldew, Eden and Petteril. This position combines the strategic advantage of a defensible site with proximity to the lowest, natural crossing of the River Eden.

Within the city area, there is evidence for human activity dating back to the Neolithic. Pre-Roman agriculture is attested to by primitive plough marks buried beneath the earliest Roman levels. The earliest Roman activity dates to about AD 78 after which Carlisle became a focal point for Roman military activity, later developing into the largest Roman settlement in north-west England. At its height it must have been a thriving centre, embodying a wide range of administrative, commercial, industrial and, possibly, religious, functions.

Little is known of the period from the departure of the Romans, to Medieval times, since when settlement has been continuous. Indeed, until recent years the cramped street pattern of Carlisle, and the Lanes in particular, was a direct descendent from the Middle Ages.

SITE SEQUENCE

The earliest Roman activity on the site was dated to AD 78/79 [period 2]. Period 3 involved three structures, a building [1627] comprising four rooms, and two others [buildings 1632-3]. These are currently attributed to the late AD 70's or 80's, and were overlain by a destruction/levelling deposit of mixed soil, gravel and timber.

The next phase [period 4] consisted of a substantial timber building ([1090]) with a series of others ancillary to it. In [1090] oak posts were set in a construction trench, between the posts were alder and hazel wattle panels. A passageway contained peaty deposits, whilst nearby turf deposits were thought to have formed part of a collapsed structure. The other

buildings were of stake construction with the uprights being driven straight into the ground and with wattle panels between. Oval enclosures of stake construction could have been animal pens. This phase was overlain by a deep, organic accumulation containing foul, organic matter [period 5].

Period 6 is dated to the first half of the 2nd century and contained two buildings - [806] and [981]. The former was of massive sill-beam construction with upright oak posts and wattle panels in between. During the late 2nd/3rd century [period 9] these buildings were superceded by padstone structures - wood superstructure resting upon stone foundations.

The higher levels on the site are represented by soil build-up and Medieval features such as pits and wells [period 13].

Table 1: Archaeological information

Sample	Context	Phase	Description
4	588	6b	awaiting phase drawing
12	376	9	floor
13	448	9	floor remnant
16	158.5	13	bottom fill of timber-lined pit/well
17	500	8b	external soil accumulation
19	496	8b	soil accumulation
20	484	9	external soil accumulation
31	649	6/7	possible floor layer
38	795.2	6a	floor/trample layer
39	795.1	6a	floor trample
46	894	6a	accumulated/tipped soil deposit
48	964	6a	internal soil accumulation
51	996	6a	external trample deposit
52	963	5	extensive dereliction/dump deposit
55	1058	5	debris of minor, short-lived, industrial activity
61	1123	4a	collapsed wall/roof or levelling deposit
64	1134	4a/b	floor/trample deposit
65	1140	4a	floor/trample deposit
67	1141	4a	internal floor
72	1163	4a	trample/floor deposit in passageway
73	1232	4a	extensive organic soil accumulation
77	1260	4a/b	internal floor trample
78	937	5	soil accumulation
80	1232	4a	spot sample from 73 above
83	1283	4a	fill of shallow pit
84	1301	4a	external organic accumulation from curved fence/pen structure
91	1493	3b	extensive dump demolition deposit
92	1495	3a	fill of gulley/drain
93	1499	3a	internal trample/dereliction accumulation
94	1511	3b	dump/demolition deposit
100	1543	3a	internal floor/trample deposit
101	1546	3a	internal trample overlying hearth/kiln/oven
102	1560	3a	external soil accumulation
104	1559	3a	trample on floor
106	1572	3a	floor surface
107	1578	3a	internal trample deposit
109	1567	2/3	pit fill
110	1569	2/3	pit fill
114	1612	2	fill of shallow hollow or gulley
128	1697	2	pit fill
130	1747	2/3	internal pit fill underlying hearth

SECTION 2: METHODOLOGY

SAMPLE PROCESSING

Forty one samples (Table 1) from waterlogged, organically-rich material were analysed for their plant macrofossils. For comparative purposes they were chosen from contexts already analysed for their insect remains by the EAU at York.

1 kilogram of material from each sample was washed through a series of sieves of the following mesh sizes:- 3.35mm, 1.7mm, 1.0mm and 500µ. The residues on each sieve were then hand-sorted for fruits, seeds and vegetative fragments under a binocular microscope at a magnification of at least x12. The finest fraction always contained the most material and was therefore sub-sampled; in most cases between a half and one-eighth was analysed. Where possible at least 500 items were counted per sample which is, in theory, the minimum number to count for any statistically significant conclusions to be drawn (van der Veen and Fieller, 1982). The plant remains were identified by comparison with modern reference material held at the Biological Laboratory. The results were expressed as seeds etc. per kilogram of original material (Appendix I). Nomenclature of vascular plants follows Tutin *et al* (1964-1980) and bryophytes Smith (1978). The convention of "sp(p)" has been adopted where identification only to genus is secure but allowing for more than one species to be present; and "undiff." when identification could only be made to level of family. Latin names are used throughout but Appendix II lists their most commonly accepted English equivalents.

DIVERSITY OF THE SAMPLES

An indication of the diversity of the samples is presented in Figure 1 where the total number of taxa (a taxon being any one particular kind of plant remain) is plotted against sample number; the samples are arranged in phase order. Mathematically more sophisticated indices of diversity are not, on the whole, often used on palaeobotanical material. Many depend upon the number of fragments representing the number of organisms in a

simple relationship. This may be approximately true for animals when, for example, jaw or leg-bones can be counted, but is very unlikely to be true for plants when seeds are counted since differenet plants produce very different amounts of seed.

The numbers of seeds or plants are influenced by factors such as sample location (whether internal or external with respect to buildings) and cleanliness, as well as by factors of preservation. External contexts can be expected to show a varied floristic assemblage unless specifically kept clean for some purpose or when material was only accumulating for a very short time, say less than a year, thus preventing a seed bank from building up. On the other hand, although clean buildings will have low diversity, ones in which material is accumulating, or where usage has changed, may well show high diversity.

There is no great change in diversity through time. Although phases 8 and 9 have far fewer taxa recorded and hence appear very uniform they also have very few seeds in any sample. The exception is sample 17 which has, in any case, 40 taxa. The samples from phase 3 are themselves extremely diverse and this is considered to represent the wide range of features analysed. Phases 4 and 5 are reasonably even in diversity, perhaps indicating less varied features or a shorter time of deposition.

ECOLOGICAL GROUPINGS OF TAXA:

Initial inspection of the data generated four broad ecological categories and four other clearly-defined groups:-

group 1 - weeds of cultivated and disturbed ground
group 2 - wet/damp ground plants
group 3 - species of calcareous/base-rich soils
group 4 - acid soil/heathland species
group 5 - exotic/herb/food species
group 6 - Gramineae/Cerealia
group 7 - bryophytes and vegetative fragments
group 8 - widespread/interpretatively broad species

Plant species were allocated to these groups on the subjective basis of either ecological preference, "type" or economic usage.

These groups were used as the basis for the detailed smaple by sample interpretation (see Section 3 below).

Subsequently, classical Phytosociological techniques were applied to the data to remove this subjective element. In this case each taxon was assigned to only one of the following groups: (Appendix III lists the taxa allocated to each of these groups)

Weeds of cultivation - Secalinietea.

These plants, as their name suggests, are characteristic of cultivation although some will, opportunistically, appear on any disturbed ground. This immediately allows only a fine line to be drawn between this and the disturbed-ground group. The fine distinction lies in the ability of the disturbed-ground plants to tolerate more shade and competition, and their preference for heavier, damper soils.

Disturbed ground - Chenopodietea.

This group contains plants characteristic of any disturbed ground ranging, phytosociologically, from non-cereal crop fields and edges of garden plots to derelict and fallow ground.

Wet grassland/fen grassland - Phragmitetea and Molinio-Arrhenatheretea (Order: Molinietalia caeruleae).

Plants from this group are characteristic of areas that are, at least seasonally, waterlogged, such as wet meadows. They prefer a more organic soil than the next group and do not tolerate heavy grazing or trampling.

Wet muddy ground - Agrostietea stoloniferae and Bidentetea.

The communities represented include the edges of streams, ditches and ponds. The favoured substrate is mineral and some of the plants will grow in flowing water. They are all reasonably tolerant of nutrient-enrichment and a certain amount of trampling, and are consequently found in, for example, cattle-poached areas.

Trampled - Plantagineatea majoris.

The main community represented here is that to be found in and around gateways and along the edges of tracks. The plants are tolerant of moderate amounts of trampling although not heavy, regular traffic. It is a generally dry community and can grow on very stony, partially-metalled surfaces.

Dry heathland - Nardo-Callunetea (Order: Calluno-Ulicetalia).

This vegetation type is characteristic of strongly acid soils which may be either peaty or mineral podsols. A damper community is represented by the Ericetum tetralicis which will also link to the wet grasslands. Dry heathland, today, is found throughout the hills surrounding Carlisle although much of it is now heavily managed as grouse moor.

Acid grassland - Nardo-Callunetea (Order: Nardetalia)

Acid grasslands develop on strongly acidic, often sandy soils, but are rare on peats.

Bracken, although a characteristic plants of these grasslands, will vigorously compete with and invade heathland and dominate the grasslands, thus forming a monoculture.

Neutral grassland - Molinio-Arrhenatheretea (Order: Arrhenatheretalia) & Trifolio-Geranietea.

This rather ubiquitous group really covers all grasslands not discussed above! The soils upon which it is found are neutral to basic, but not strongly calcareous, they are not waterlogged and are usually mineral.

The communities found include those in pastures, meadows, along the edges of paths and roads, and are also a last stage in the colonisation of derelict ground following the adventitious annuals of the first two groups above.

Nitrophilous ground - Epilobietea angustifolii.

These are plants tolerant of high nutrient levels, particularly nitrogen and phosphorus. They are therefore frequently found close to habitation.

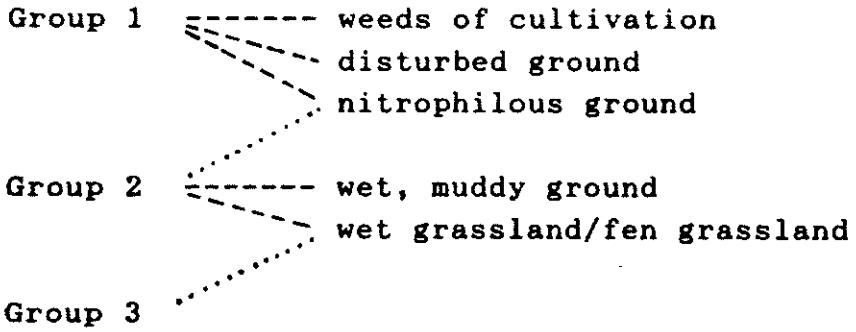
Wood/scrub and edges - Querco-Fagetea (Order: Prunetalia spinosae).

The communities represented here are not high-woods but rather a scrub/shrub vegetation with a variety of canopy shrubs and a rich and varied ground flora.

unclassified - plants of broad ecological tolerance or imprecisely identifiable taxa.

The habitats were distinguished on a broad, Continental phytosociological basis and the Classes, or in some cases Orders, to which they belong are given. The taxa were assigned on the basis of Oberdorfer (1977, 1978, 1983) and Runge (1973). Not all of the taxa could be assigned to a single habitat, either because of their broad habitat range or because the seeds were not able to be precisely identified, these are listed as "unclassified" and have not been used in the interpretation. These taxa generally form less than 20% of the total seeds in any one sample (see Figure 2).

The relationships between the ecological groups as defined by these two strategies are shown below:



Group 4 ------- dry heathland
- - - - - - acid grassland

trampled

wood/scrub and edges

Once the taxa had been assigned to an ecological group, the numbers of seeds in each were totalled for each sample. The proportion of each ecological group was then expressed relative to the total number of assigned seeds. These percentage data were used to produce pie-charts, using Microsoft CHART, (Figures 3-7) and summarised in Figure 8. Only samples with >100 assigned seeds are included, the data for the 13 omitted samples are presented in Table 3.

The results of these two approaches are used together in Section 4 where the interpretation of the site is considered period by period.

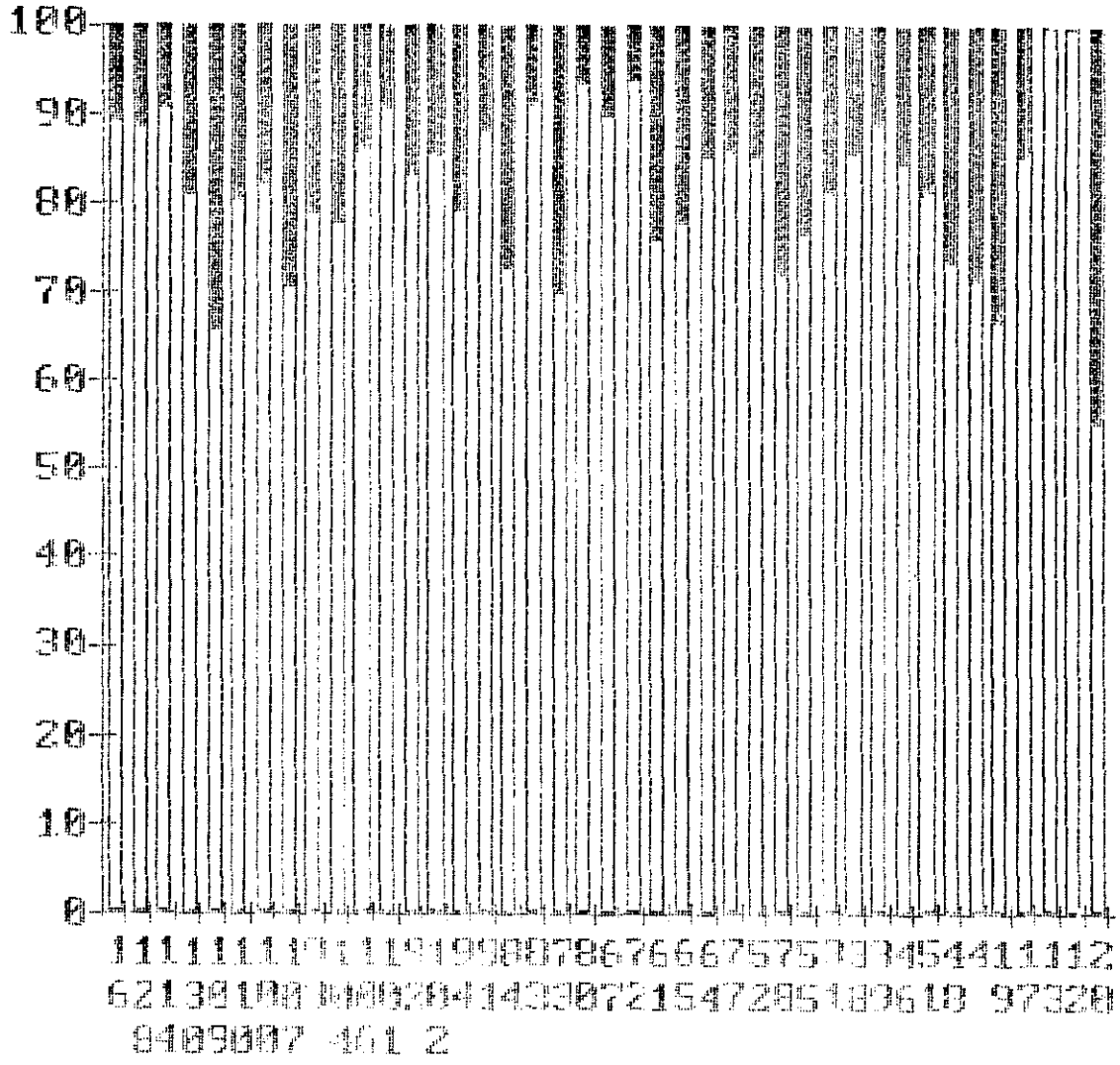
MULTIVARIATE DATA ANALYSIS

The data used for analysis were the counts of seeds etc. per kilogram of sediment. In a few cases where identification was problematic the counts were totalled - in particular this was carried out for the terrestrial buttercups whose seeds are notoriously variable; therefore *Ranunculus repens*-type includes seeds of *Ranunculus repens*, *R. bulbosus*, *R. acris* and combinations. The tables, however, have the original seed counts and not those for the amalgamated species.

CLASSIFICATION:

A classification was performed on the data, to give some structure to the positioning of the samples, using TWINSPAN, a divisive method. This program treats the samples as one group initially and splits them on a criterion of dissimilarity using indicator species. Each subsequent group is repeatedly split until each sample forms a group. The classification is purely based upon the presence/abundance of the plant species. Due to the

Figure 2: Unclassified seeds



Percentage total seeds

Percentage unclassified seeds

Sample number

large amount of computational time necessary to run TWINSPAN it is impossible to run the analysis using the absolute numbers of seeds. Some grouping therefore had to be carried out; 6 groups were defined - 1-5 seeds, 6-12, 13-20, 21-50, 51-100, >101. These are of a similar magnitude to the frequency scale adopted by the EAU at York. During analysis equal weighting was given to each of these groups. The groups thus formed can be compared with archaeological information to see if there is further coherence between samples. The dendrogram drawn from the TWINSPAN results is reproduced in Figure 9 (attached to Table 2). Where a particular cluster is delimited is rather arbitrary and depends purely upon the analyst. In practise a line is 'drawn' at about level 5, above which the samples which are very different from anything else have been extracted and below which the splits are being made on rare/locally-occurring species and probably have little ecological/archaeological relevance.

It must be remembered that the dendrogram may be likened to a mobile which can pivot about any division and that, therefore, although sample 13 appears at one side and samples 4, 12 and 20 at the other, and intuitively perhaps considered very different from each other, by pivoting at level 2 these samples may be brought adjacent to each other. Looking at their species' content, which is very low, this would seem a more suitable position of the mobile. Table 2 presents the results of the TWINSPAN classification with the taxa in order of abundance. To keep it to a reasonable size only taxa which have values of >10 or are in 5 or more samples have been tabulated.

ORDINATION:

Ordination seeks out axes of variation and will place a sample at one extreme of an 'axis', the sample most dissimilar to that one at the other end and arrange the other samples along that axis, again in an order based upon similarity/dissimilarity. With 41 samples there are theoretically 41 axes of variation but the first four usually demonstrate most of the variation present and are also easily visualised. De-Trended

Correspondence Analysis (DECORANA (Hill, 1979) was run on these data.

Figure 1: Diversity of samples

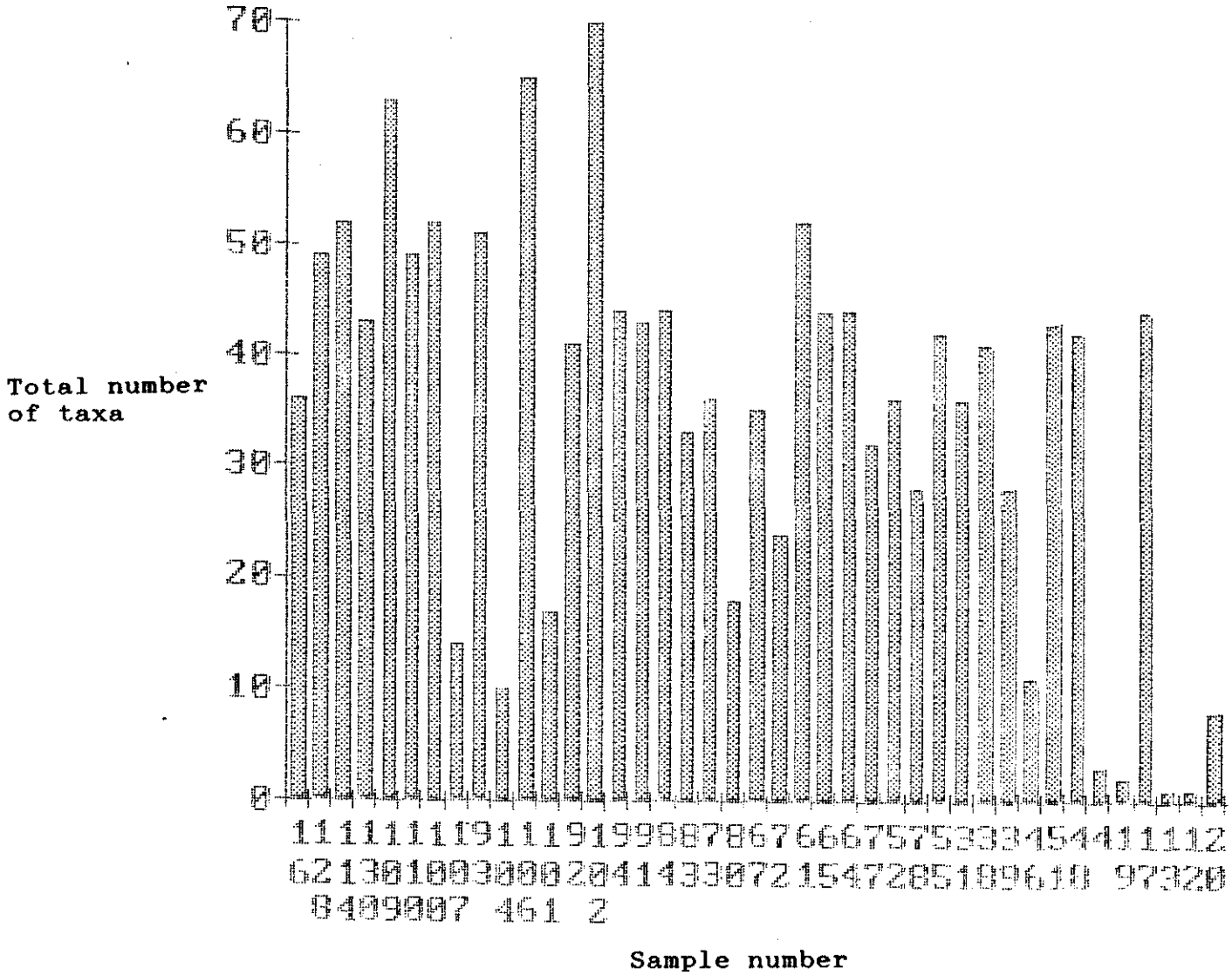


Table 3: Samples with <100 seeds in total

Sample	Total seeds	Ecological groupings of taxa Numbers of seeds: Weeds	Disturb	Wet grass	Mud	Tramp.	Heath	Acid grass	Neut grass	Nitroph	Wood	Cereal	Carb	Unclass
4	50	0	0	0	0	0	30	0	0	0	0	0	0	20
12	1	0	0	1	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	1	0	0	0	0
19	2	0	0	1	0	0	0	0	0	0	0	0	0	1
20	46	0	0	3	0	1	0	0	0	5	0	0	0	37
46	33	3	3	7	2	0	0	10	0	0	2	0	0	6
72	59	2	11	18	9	5	1	2	3	0	4	0	0	4
78	93	3	1	32	5	1	0	4	4	1	6	0	0	36
101	68	3	8	12	4	10	0	1	0	0	22	0	1	7
104	14	2	0	5	0	1	1	0	0	1	0	0	0	4
107	24	2	1	4	1	2	0	1	0	0	3	0	0	10
*** Total	*** 391	15	24	83	21	20	32	18	7	8	37	0	1	125

SECTION 3: SAMPLE BY SAMPLE INTERPRETATION

SAMPLE 128 is from a period 2 pit fill.

The botanical material present spans all of the ecological groups recognized. Group 1 is represented at a low level, the highest count being for *Polygonum aviculare*. Group 2 species are present at low levels - *Ranunculus flammula*, *Eleocharis* spp., *Juncus* sp., *Polygonum hydropiper*, *Montia fontana* ssp. *chondrosperma* and *Apium* sp., with higher values for *Carex* spp. In addition *Euphrasia/Odontites* is present. Plants of group 3 are only slightly represented. Group 4 is represented by the presence of *Pteridium aquilinum* frond fragments, *Rumex acetosella*, and a high count for *Vaccinium myrtillus*. Species present from group 5 are - *Papaver somniferum*, *Hyoscyamus niger*, *Mentha*-type, *Pyrus communis* and *Corylus avellana* (hazelnut fragments). From group 6 two cultivated cereal species are represented, together with undifferentiated Gramineae. There are no Bryophytes present. Group 8 is here well represented, as in most of the samples examined.

There is a wide range of species present in this deposit, most at low levels. All of the main ecological/use categories identified are represented. This suggests that the pit served no single specialised function. The presence of group 5 species and cultivated cereals, suggest this feature was in receipt of material of domestic/human-use origin. The high value for *Vaccinium myrtillus* would be accounted for in this way. Although the range of other species present is high, the actual values for each are low. If the pit had remained open for a lengthy period of time, one would expect greater numbers of weedy species, growing in the immediate vicinity, to have been incorporated into the fill. This suggests the feature was filled-in by processes more rapid than those of natural siltation and accumulation. Bearing in mind the cereal/domestic-use plants recorded, the most likely source of at least part of the infill is domestic refuse, possibly floor sweepings.

The insect assemblage from this sample was small, of low diversity, and with a small decaying matter element. Apart from the grain beetles present (which appear in most samples from Roman Castle Street), the remainder of the assemblage was of a background outdoor nature. The insect data offers no particular evidence as to the nature of the pit fill, but an interpretation has been made on the basis of the botanical material. Both lines of environmental enquiry agree that the pit was probably not open for very long.

SAMPLE 114 is from silty material filling a shallow hollow or gulley, period 2.

A wider range of group 1 species is represented here than in 128 above. Counts for *Polygonum aviculare* are again the highest in the group. The number of species from group 2 is less than in the previous sample from this phase. Group 3 contains *Linum catharticum* and *Rosa cf.pimpinellifolia*. Group 4 is again marked by high values for *Rumex acetosella* and *Vaccinium myrtillus*. Also recorded from this group were *Pteridium aquilinum* frond fragments, *Sorbus aucuparia* and *Erica* sp.. Group 5 is represented by Hazelnut fragments, *Prunus spinosa* and *Rubus fruticosus*. From group 6 there are only two undifferentiated Gramineae, one carbonised. There are two Bryophyte species present.

The suite of weed species from cultivated/disturbed habitats is more extensive than in sample 128 above, and recorded at higher values. Also the seeds of Birch are present. These seeds are wind-dispersed, and their presence, together with that of an augmented weed flora, suggests that the feature in question was undergoing a process of natural siltation. During this process seeds from a variety of sources would be incorporated into the deposit eg. seeds from adjacent weedy species carried in by windblow, rainsplash and waterflow, or on the feet of people, and the feet and coats of animals; tree seeds carried by wind (Birch), or in the guts of berry-eating birds (*Sorbus aucuparia*, *Rosa* spp.). Seeds from further afield could also be transported by the same processes. This appears to be the case with sample 114. In addition to weedy species, there are representatives of most of the other groups recognised : wet/damp ground species were probably growing fairly close by; both *Rosa* sp. and *Sorbus aucuparia* could have arrived on site by avian influence; *Corylus avellana*, *Prunus spinosa* and *Rubus fruticosus* could have grown nearby in either woodland edge or hedgerow habitats; presence of the Gramineae is ubiquitous; and records for *Alchemilla* spp. and *Sorbus aucuparia* from a site in N.E.Cumbria are quite within expectation. The high total for *Vaccinium myrtillus* may reflect local abundance of this species, or exploitation of a useful food source.

The insect fauna from this deposit contained a large outdoor component, and concurs with the botanical interpretation of a fill forming in the open.

SAMPLE 130 is from an internal pit fill underlying a hearth (in room 1534 of building 1627). It dates to period 2/3.

Group 1 species are well represented in this sample, with higher counts for *Raphanus raphanistrum*, *Polygonum* spp., *Rumex* spp., and *Cerastium cf.fontanum*. Group 2 species present include singles of *Eleocharis*

undiff., *Lycopus europaeus*, *Euphrasia/Odontites* and *Mentha aquatica*; *Ranunculus flammula* and *Lychnis flos-cuculi* are also present and there is a high count for *Juncus* sp. Ecological groups 3, 4, 5, 6, and 8 are all represented, but there are no Bryophytes present. Sample 130 contains a mixture of plant species of which no clear interpretation can be offered.

This sample yielded a very small number of insects resembling assemblages from other samples, and nothing further can be added by way of interpretation.

SAMPLE 109 is from a pit fill. It dates to period 2/3.

Group 1 species were well represented both in terms of number and variety. The group 2 component was varied and contained two species not previously recorded from the site. The calcareous component was represented. Group 4 was marked by a high count for *Calluna vulgaris* twigs (flowers were also recorded), and the presence of *Pteridium aquilinum* frond fragments. *Vaccinium myrtillus* was also present, but not in the quantities previously recorded. Only Hazelnut fragments were present in group 5, other food/domestic species were absent. Group 6 has very high values for Gramineae, associated with counts for Cerealia/large Gramineae and nodes from Monocot. stems. Bryophytes were present, as also was evidence for fungal growth on woody and Graminaceous material. Petalloid tissue was noted. *Achillea millefolium* was present in the form of seed and intact florets.

No definite function can be assigned to this pit, but the absence of domestic/food species is perhaps salient. Bracken and *Calluna vulgaris* (Ling) may have been utilised as bedding material/floor covering. The presence of fungal growth may suggest a reason for such material being discarded.

The insect assemblage from this sample was small, with a large outdoor component and quite large foul matter component. Presence of the outdoor component, and the varied nature of the weed flora of this deposit, both suggest that it formed in the open.

SAMPLE 110 is from a pit fill dating to period 2/3.

Weeds of cultivation and disturbed ground are well represented here. Seeds resembling *Cirsium arvense* were found in some quantity. Damp ground species are present, but not prominent. Of the base-rich group *Linum catharticum* and *Leontodon hispidus* are present, together with a single seed of *Sorbus aria*. In group 4, Bracken and *Rumex acetosella* are again prominent, with *Vaccinium myrtillus* and *Calluna vulgaris* present only. In group 5 Hazelnut fragments are present in quantity, and the following are also present : *Peucedanum* sp., *Rubus fruticosus*, *Coriandrum sativum*, and a single spine of *Prunus spinosa*. Gramineae and Cerealia/large gramineae are again marked in group 6, although not to the same extent as in sample 109. Two

Bryophyte fragments were recorded. Achillea millefolium was again present.

Setting aside differences in magnitude for Hazelnut-shell fragments and the Gramineae, this sample has much in common with 109. The variety of species recorded suggests that the deposit formed outside in the open.

This sample yielded a small insect assemblage. There were possible slight indications of decaying matter, the rest of the fauna being of a background nature. Nothing more can be added to this interpretation.

SAMPLE 100 is from an internal floor/trample deposit, in room 1532 of structure 1627. It is dated to Period 3A.

Weedy species of group 1 are varied, but mostly present at low levels. Damp ground species are also quite varied, and include a single specimen of *Hydrocotyle vulgaris* - the only record for the entire Castle Street site. In group 3, *Linum catharticum* and *Leontodon hispidus* are present. Group 4 contains *Rumex acetosella*, and a low count for *Calluna vulgaris* twigs. Group 5 is represented; and group 6 contains traces of cereals. Bryophyte fragments are present, as also were inflorescense bases, bud scales and petalloid tissue.

There is no indication of a build-up of vegetative matter on this floor surface. The assemblage is varied, and its constituents are present at relatively low levels. No function can be assigned to this structure.

The insect assemblage was small, with a small rotting matter component. Most were from elsewhere, ie. not breeding in the building. It was suggested that the room was relatively clean. This agrees with the botanical evidence.

Sample 101 is from a trample in room 1534 of structure 1627. It overlies a demolished hearth/kiln/oven structure.

Plant remains from this layer are sparse in comparison with other samples from Castle Street. The assemblage resembles others from this building, and the material present is well preserved. It would seem that this room was kept relatively clean.

The insect assemblage was also small, and in accord with the fauna in the rest of the building. No further interpretation can be added.

SAMPLE 107 is from an internal trample deposit, adjacent to three walls of room 1534 in structure 1627. It is dated to period 3A.

This sample also contains a very limited floral assemblage, which in species composition is in keeping with that from the rest of the structure. The room appears to have been kept relatively clean.

Very few beetles were recorded; those present were reported as random extracts from other assemblages.

SAMPLE 93 is from an internal trample/dereliction accumulation in room 1534 of structure 1627. It is dated to period 3A.

The weed component for this sample is diverse and well-represented, being an order of magnitude higher than for other samples from this structure. Group 2 is distinguished by the predominance of *Carex nigra* group, and *Carex* spp. generally. In group 3, *Linum catharticum* and *Leontodon hispidus* are present at elevated levels. The other obvious botanical features are very high counts for Gramineae, Cerealia/large Gramineae, and *Ranunculus* spp.

The floral assemblage from this sample is distinctly different to those from elsewhere in structure 1627. Conditions in this room were far from clean. All of the weedy species recorded could have grown on derelict or disturbed ground; there is no distinguished crop element (with the possible exception of *Spergula arvensis*). Decay and weathering of buildings and structural remains releases nutrients into the surrounding soil. These, and the physical niche-space created by collapse of an upstanding structure, are rapidly utilised by colonising weedy species. Foremost amongst these is the plant most commonly associated with nutrient-enhanced sites of human habitation, *Urtica dioica* (Common Nettle). This species is strangely under-represented in a deposit thought to have accumulated under conditions of structural decay. *Carex* spp., *Ranunculus* spp., Gramineae and Cerealia/Gramineae are present in numbers which are somewhat out of place in a scenario of dereliction and decay. It is more likely that they represent material which was gathered, and brought to the site for a specific purpose.

The insect assemblage was very large, of low diversity, and with only a small outdoor component. It contained quite a large rotting matter component, and a large foul matter component. Furthermore, there was a distinctive element of breeding grain beetles, and rotting matter insects (ie.breeding in situ, rather than arriving from elsewhere). The interpretation was of a fairly closed room, on the floor of which was an accumulation of fairly foul, close-packed, moist (but not wet), organic remains, rich in nutrients and in an advanced state of decay. The grain beetles were thought either to have bred in grain spilled on the floor, or to have arrived in spoiled grain used as animal feed. Certainly there were quantities of grain-like remains in the building. It was proposed that the deposit represented a change in use of the structure, possibly to that of a stable, rather than abandonment and decay. The botanical evidence would certainly support this interpretation. In this light, the high

counts for *Carex* spp. and the Gramineae may represent the remains of gathered fodder/bedding material.

SAMPLE 104 is from a floor trample, in room 1531 of structure 1627. It is dated to period 3A.

The floral assemblage from this sample is very restricted in both quantity and variety; it consists of elements which occur elsewhere in structure 1627. As the material present is well preserved, it would appear that this room was kept fairly clean.

No insect remains were found in this sample. Perhaps the room was kept tightly shut up for some reason.

SAMPLE 106 is from a floor in structure 1633. It is dated to period 3A.

The weed flora in group 1 is diverse and well represented. In addition to high values for members of the Polygonaceae, *Urtica dioica* is well expressed. There is a distinct crop-weed element present : *Agrostemma githago*, *Galeopsis tetrahit*, *Cerastium cf.fontanum*, and *Thlaspi arvense*. The damp ground element of group 2 is strongly evident : *Ranunculus flammula*, *Lychnis flos-cuculi*, *Carex nigra* group, *Eleocharis* undiff., *Juncus* spp., *Filipendula ulmaria*, *Polygonum hydropiper*, *Lycopus europaeus*, *Montia fontana ssp.chondrosperma*, *Scirpus setaceus*, *Potentilla palustris*, *Alisma plantago-aquatica*, and *Rorippa cf.islandica*. The latter two species were recorded only from this sample in Castle Street. There are high values for two species from group 3 : *Linum catharticum*, and *Leontodon hispidus*; *Galium verum* is present. In group 4 there are high values for *Rumex acetosella*. *Coriandrum sativum* (Coriander) is present from group 5. A high total was recorded for the Gramineae. *Ranunculus repens*-type, *Achillea millefolium* and *Veronica* spp. are well represented.

High numbers of weedy Polygonaceae, and Chenopodium/Atriplex, together with the presence of *Urtica dioica*, are suggestive of disturbed and nutrient-enriched soil conditions in the near vicinity. Such species could have been introduced into the building by trampling. The damp ground element is very marked, and dominated by *Carex nigra* group; a large number of lenticular *Carex* spp. are also present. The suite of accompanying species : *Ranunculus flammula*, *Lychnis flos-cuculi*, *Eleocharis* spp., *Juncus* spp., *Filipendula ulmaria*, *Polygonum hydropiper*, *Lycopus europaeus*, *Montia fontana ssp.chondrosperma*, *Scirpus setaceus*, and *Potentilla palustris*, may well represent the vegetation of a damp, species-rich meadow (possibly with some open water supporting *Alisma plantago-aquatica* and *Rorippa cf.islandica*). The high counts for Gramineae and *Ranunculus repens*-type seeds, may reflect collection of sedge and meadow grasses for bedding/fodder or

other uses. Such material may have been stored in this room.

The insect assemblage was large, of low diversity, and contained an abundant background fauna. Presence of the latter suggests that the room was moderately well-ventilated. This would be compatible with the storage function suggested above. Conditions in the room were further interpreted as being fairly dry and clean, with the possibility of grain beetles breeding in grain spoiling on the floor. Clean, dry conditions are necessary for sucessful storage of vegetative material, and it seems probable that at some stage structure 1633 fulfilled this function. No grain was found.

SAMPLE 102 is from a soil accumulation lying between structures 1633 and 1627. It is dated to period 3A.

The weed flora from group 1 is again varied, and dominated by Polygonaceae; *Urtica dioica* (Common Nettle) is present at a very high level. As in sample 106, *Agrostemma githago* is again present. The damp ground element of group 2 is well represented, although with much lower values for *Carex* spp. Species of base-rich soils are present at much lower levels than in the preceeding sample. *Vaccinium myrtillus* (Bilberry) is present at a very high level. Group 5 is variedly represented, with only *Corylus avellana* (Hazelnut) in any quantity. Gramineae are again prominent in group 6, and there are single records each of *Triticum aestivum* (Bread wheat) and *Hordeum* sp.(Barley), together with three grains of *Bromus* spp., one of which was carbonised. There were no Bryophytes present. *Ranunculus repens*-type, and capsules of *Veronica* sp. are both present, but at much lower levels than in sample 106. The floral assemblage of sample 102 has much in common with that of structure 1633, outside which it lies. Species such as *Ranunculus acris*, *R. bulbosus*, *Stellaria graminea*, and *Prunella vulgaris* occur in both. These are fairly common on this site as a whole, but other less common species also occur in both samples - *Heracleum sphondylium*, *Lapsana communis*, and *Achillea millefolium*. On the other hand, there are some species present in this sample which were not recorded from inside structure 1633 - *Viola* sp., *Betula* sp., *Senecio* sp., *Cirsium* sp., and *Rosa* sp.

High counts for Polygonaceae and *Urtica dioica*, point toward disturbed and nutrient-enriched soil conditions. The variety of weedy species present, and the occurrence of several which are absent from sample 106, reflect the outdoor nature of the deposit. Presence of *Vaccinium myrtillus* at a high level suggests something more than chance accumulation; this edible wild fruit would have provided a useful food resource. High counts for Gramineae in this external accumulation strongly echo those from inside the

adjacent structure, and may represent spillage of material carried there for storage.

Insect data for this sample had a high outdoor component, in which aquatic species were prominent. Although it was possible these latter had been attracted to puddles, it was also made clear that they could simply be part of the background assemblage. Certainly, damp/wet ground plant species are recorded, and although not in quantity their presence may indicate that a suitable insect habitat did exist in the near vicinity.

SAMPLE 92 is from a gulley/drain fill. It is dated to period 3A.

This sample contained a very interesting macroplant assemblage. The weedy component is completely dominated by *Polygonum* species, and a very large count for *Urtica dioica* (Common Nettle). The damp ground element is dominated by *Apium graveolens*, and *Carex nigra* group; with *Lychnis flos-cuculi* and *Montia fontana ssp.chondrasperma* also present. Species from group 3 are present. *Rumex acetosella*, and a single fragment of *Calluna vulgaris* twig represent group 4. The exotics/food-use group is distinguished by a large count for *Ficus carica*; also present are - Hazelnut shell fragments, *Apium graveolens* (which is included in this group also as it may have been cultivated), pips of *Rubus fruticosus/idaeus*, and spines of *Prunus spinosa*. There are again high values for the Gramineae. Two Rosaceous seeds were recorded.

For an external deposit, the weed flora is somewhat limited in terms of both quantity and variety. Either seed was in some way prevented from entering the ditch/gulley, or the area surrounding the feature was relatively clear. It was apparently not clear of *Polygonum* spp. and Common Nettle, seeds of which were present at high levels. Colonisation of the margin of this feature by *Urtica dioica*, may indicate locally high nitrogen levels (possibly influenced by the contents of the ditch); or it may indicate overgrowing of a feature once it had fallen into disuse. The damp ground component indicates that wetting took place on a regular basis. There is no evidence of a standing water habitat. The presence of the *Prunus spinosa* spine, *Calluna vulgaris* twig fragment, and Rosaceous seeds, together with the large numbers of Nettle seeds, suggest that the ditch was either entirely open, or at least uncovered for part of its length. As to the contents of the ditch, the presence of *Rubus fruticosus* pips, and particularly the seeds of the imported *Ficus carica* (Fig), together with those of *Apium graveolens* (Wild Celery, but possibly grown as a salad vegetable in the locality), indicate that the ditch was in receipt at least of food debris, and possibly also material of faecal origin. Examination of this sample for intestinal

parasites could add significantly to interpretation of this feature.

The insect assemblage contained a moderately high outdoor component; with quite a large aquatic element, indicating the presence of either open water conditions, or short-lived pools. There was also a considerable foul-matter element, including species associated with dung. This accords well with the botanical evidence, and lends weight to the suggestion that the gulley may have contained faecal material, in addition to other decaying matter. Work on any parasite remains present would establish whether this was of animal or human origin.

SAMPLE 91 is from an extensive dump/demolition deposit overlying part of structure 1627. It is dated to period 3B.

The weedy assemblage of group 1 is dominated by *Polygonum* spp., and *Chenopodium/Atriplex*. Two possible arable weeds, *Torilis nodosa* and *Anthemis cotula*, are also present. A damp ground element is represented, chiefly by lenticular *Carex* spp. and *Montia fontana ssp. chondrosperma*. In fact the assemblage appears to be a mixture of a little of everything, mostly at very low levels of occurrence. Singles each of Coriander and Fig are present, plus two *Prunus spinosa* fruit stones, three grains of Barley, and one of Rye. There appears to be no clear pattern to this assemblage. If the ground had lain derelict, one might expect the weed flora to be more diverse, and expressed at higher levels.

The insect assemblage was strongly suggestive of deposition in the open. The rotting matter component was quite substantial, and there was a possibility of the presence of foul rotting matter (perhaps animal dung). The seed suite could have been deposited in the open, but it resembles more a random background "fallout", than the flora of an area of derelict land. There did not appear to be any botanical evidence for the presence of foul rotting material, or for the nitrophilous flora such deposits might support. Interestingly, the insect record offered no evidence for the presence of any other type of habitat. Taxa normally associated with the type of vegetation likely to invade abandoned ground, were rare. This agrees very closely with the botanical information. It was postulated that the area in question had more probably undergone a change of use, rather than abandonment.

SAMPLE 94 is from a dump/demolition deposit. It dates to period 3B.

The weedy component of this assemblage is somewhat impoverished, *Atriplex/Chenopodium* and Polygonaceae being numerically dominant. Lenticular *Carex* spp. are reasonably well represented. Overall, the seed assemblage is a mixture of several ecological

groupings, reflecting both disturbance and (probably) varied origin. It is comparable with sample 91 above.

No insect information is available for this sample.

SAMPLE 84 is from an external organic accumulation, associated with a curved fence/pen feature. It is dated to period 4A.

This deposit has an extremely rich seed assemblage. All of the main ecological groupings are represented. Species of disturbed habitat are present at fairly high levels, with *Plantago major* and *Urtica dioica* suggesting a well-trodden, nitrogen-rich setting. The grain-crop weed, *Agrostemma githago*, is present at quite a high level. Damp ground species include *Ranunculus flammula*, *Juncus* spp., *Filipendula ulmaria*, *Polygonum hydropiper*, and *Bidens* sp. Frond fragments of Bracken (*Pteridium aquilinum*), are present at a very high level, and twig fragments of Ling (*Calluna vulgaris*) are also well represented. Over-shadowing everything else however, are counts for undifferentiated Gramineae, Cerealia/large gramineae, and glume bases of *Triticum*; present also, but at much lower levels, are *Triticum* rachis internodes, and waterlogged caryopses of *Hordeum vulgare*.

Given the setting, there are two possible interpretations of this distinctive assemblage. Firstly, the deposit may represent organic build-up beneath an animal pen, where Bracken and Gramineae were used as bedding/litter, and domestic surplus (including grain) formed part of the feedstuff. *Agrostemma githago* would have entered the deposit as a contaminant of the cereal. Secondly, the deposit could have been built up by continual dumping of domestic refuse inside a fenced enclosure, somewhat suggestive of a "compost heap" in form and content. Examination of this sample for the presence of intestinal parasites, would add significantly to interpretation of the feature.

The insect assemblage was small, of low diversity, contained a small rotting matter component, and a high percentage of outdoor insects. It suggested considerably disturbed, possibly rather dry, tussocky vegetation. There was little evidence for any kind of decaying matter, although Housefly puparia were quite abundant. The latter would fit either of the two proposed interpretations, and at present neither one can be regarded as definitive.

SAMPLE 83 is from the fill of a shallow pit, located within the fenced structure discussed above. It dates to period 4A.

The weed content of this sample is of a background nature, low in quantity, and relatively low in variety. The same is true of the other ecological groupings recognised. This sample does not appear to be related floristically to the organic-rich deposit

described above. The reduced nature of the seed assemblage suggests that the pit was not in receipt of material for any length of time. There is no indication of the function of this feature.

The insect assemblage recovered was small, and possibly all of a background nature. This may indicate a lack of rotting matter, or reduction of the fauna by trampling activity - it is not possible to say for sure. Indications are that the pit was not open for long, and this is in accord with the botanical interpretation.

SAMPLE 73 is from an organic soil accumulation covering some two-thirds of the site. It is dated to period 4A.

The weed flora is numerous, and fairly diverse; *Agrostemma githago* was recorded here at the highest level for any sample from Castle Street. The damp/wet ground element is well expressed, and distinguished by an extremely high count for Spike-rush (*Eleocharis* spp.). Twig fragments of Ling (*Calluna vulgaris*) are also present at a high level. The most numerous constituents of this assemblage, however, are undifferentiated Gramineae, Cerealia/large Gramineae, and glume bases of *Triticum*; present at much lower levels were culm nodes of Cerealia/large Gramineae. The assemblage from this sample has several features in common with that of 84 above - high count for *Agrostemma githago* (Corncockle); presence of Ling twig fragments; and extremely high counts for Gramineae, Cerealia/Gramineae and fragments of *Triticum* sp. It differs in having the high value for Spike-rush, and lacking the presence of Bracken frond fragments.

The marked cereal component, together with the presence of *Agrostemma githago*, a weed of cultivated cereals, strongly suggests that part of a grain crop was discarded on this site. It may have been in the form of domestic refuse. Alternatively, the high count for Gramineae, and the presence of culm nodes, may indicate that material used for animal fodder/litter formed part of this deposit. If this were the case, the cereal element could be either waste animal feed, or, perhaps, incorporated in horse dung. Work on parasite remains would assist interpretation of this deposit. Ling may have been utilised structurally, possibly as roofing material. High values for *Juncus* spp., and *Eleocharis* spp., may indicate persistant damp ground conditions in the near vicinity.

The insect assemblage was small, of low diversity, and low outdoor content. Grain beetles contributed one quarter of the total assemblage. The foul matter component was quite large, with indications of foul decaying matter and possibly dung. Presence of grain beetles may indicate that the cereal discarded was infested and spoiled. The low outdoor insect component may indicate that the material had an indoor origin,

and was moved out of doors specifically for the purpose of disposal.

SAMPLE 80 contained a cluster of pupae, and was taken from the organic soil spread discussed above.

The floral assemblage for this sample was quite restricted, and dominated by weeds of disturbed ground and nutrient enhanced soil - Polygonaceae, Chenopodiaceae, and *Urtica dioica*. Seeds of Fig and Birch are present. The indications are of a local concentration of nitrophilous species, probably utilising conditions of enhanced soil fertility such as would arise in proximity to decaying organic matter. Perhaps the Fig seeds were part of such organic material.

The insect assemblage contained a small outdoor component, foul matter species being prominent. Housefly pupae were abundant. It was concluded that the deposit had formed in the presence of foul or dung-like material. This agrees very closely with the botanical interpretation.

SAMPLE 67 is from a floor in-structure 1090. It dates to period 4A.

The floral assemblage contains a mixture of species from various ecological groups; all are present at comparatively modest levels. There are single records for Coriander (*Coriandrum sativum*), a small carbonised Legume, and carbonised *Hordeum* rachis internode. Most of the seeds present are of a background nature, and will have been carried in by the action of trampling. Some may have been wafted in by air currents. Low seed levels suggest the structure was fairly clean.

The insect assemblage was also modest; diversity was high, there was a high outdoor component, and a small rotting matter element. Most of the insects were accidental arrivals, either background, or trampled in with mud. There was a possibility of the presence of fairly dry mouldering matter, but the floor was thought to be reasonably clean. This accords well with the botanical record.

SAMPLE 65 is from a floor/trample deposit in structure 1090. It overlies the deposit described above, and dates to period 4A.

The botanical assemblage for this sample is more varied than that of the under lying floor layer. Even so, it resembles it in that most species are present at relatively low levels. Polygonaceae, *Chenopodium*, *Atriplex* and *Urtica dioica* are present - the type of weedy vegetation that would be growing in the near vicinity. There is nothing singular about the assemblage, and it would have accumulated in much the same way as that described above.

The insect fauna was mostly of a background nature, and included a species of spider beetle able

to tolerate quite dry conditions. Nothing further can be added to the interpretation.

SAMPLE 72 is from a trample/floor deposit in the passageway of structure 1090. It dates to period 4A.

The floral assemblage from this sample was neither numerous, nor varied, and was very much of a background nature.

The insect assemblage was small, poorly preserved, and not noticeably different from others at Castle Street. There was a suggestion that material from heath/moorland (possibly peat for burning) was at one time stacked in the passageway. The only botanical evidence found to support this was a single *Calluna vulgaris* twig.

SAMPLE 61 is from a collapsed wall/roof, or levelling deposit, thought to be of turf. It is dated to period 4A.

Species variety for this assemblage is high, but most are present as singles, or at very low levels. The most obvious component is a relatively high count for twig fragments of *Calluna vulgaris* (Ling). Species of disturbed ground are reasonably well represented - Polygonaceae, *Stellaria media, Chenopodium* spp., and *Atriplex* spp. A damp ground element is present. There is an admixture of economic/human-use elements ie. a seed of *Coriandrum sativum*; a few fragments of *Triticum* glume base, monocot. nodes, and a stem fragment. Bryophyte fragments are present. The general picture is of a background flora, with a disturbed weedy element. Presence of Ling fragments may indicate the origin of the turf material, but are perhaps more likely to have become incorporated on site, possible during collapse or levelling of a pre-existing turf structure.

The insect assemblage contained a very large number of species, was of high diversity, and had a large outdoor component. The fauna differed from any other on the site. The most abundant species were typical of mud by water, with decaying vegetation, but probably also bred on occupation sites in the past. A variety of other habitats were indicated - decaying matter; Juncus spp.; dung; rotting matter and plant litter; decaying plant remains; still or sluggish water; and not-too-dry rotting organic matter. It was felt that some of the species present could have been imported with the turf, possibly from grazing land of poor quality. Invading species were present. This suggests that the deposit was not rapidly dumped and sealed, but rather originated from collapsed structural material, possibly later used for levelling. This accords well with the botanical evidence.

SAMPLE 77 is from an internal floor trample in a room of structure 1090. It dates to period 4 A/B.

The total number of seeds present is relatively low, and the species range rather limited. Mixing of a range of ecological elements suggests a background origin, most having arrived via trampling activity, or as air-borne components. It would seem either that only fairly limited amounts of seed entered this structure, or that the interior was kept reasonably clean. A number of bud scales and tree buds were found, at least one of which appears to be from Ash (*Fraxinus excelsior*).

The insect assemblage was very small, and similar to others on this site. As preservation was quite good, paucity of material suggests either that the deposit formed rapidly, or that insect populations were in some way restricted (possibly by heavy trampling). Nothing further can be added to this interpretation.

SAMPLE 64 is from a floor/trample deposit in a room of structure 1090. It dates to period 4 A/B.

The weed flora is fairly diverse, but again species are mostly present at low levels. An interesting arable weed element was recorded - *Thlaspi arvense*, cf.*Matricaria* sp., and *Lepidium heterophyllum*. The damp ground element included *Lychnis flos-cuculi*, *Eleocharis* spp., *Juncus* spp., *Mentha aquatica*, *Galium palustre*, and *Myosotis cf.scorpioides*. A single seed of *Mycelis muralis* was present. Possible human-use/food species were represented by - Hazelnut fragments, *Peucedanum officinale*, *Ficus carica*, *Coriandrum sativum*, a fruit stone of *Prunus spinosa*, and a single *Rubus fruticosus* pip. Five Birch seeds were recorded.

The assemblage seems to be basically of a background nature, seeds from a variety of habitats having been incorporated into the deposit. Presence of wind-borne Birch seed suggests the room was not tightly sealed. An unusually high count for *Peucedanum officinale* may indicate that it was utilised for some purpose, possibly herbal. Presence of a fairly varied human-use/food element, may point towards accumulation of organic debris in this room.

The insect fauna indicated the presence of abundant mouldering organic matter, and infested timbers. There was again the possibility of insects from peat being present. Although the botanical assemblage is in line with the former, nothing was found to support the latter. A high background fauna indicated that the room was not tightly sealed - this also agrees closely with the botanical interpretation.

SAMPLE 52 is from a dereliction/dump deposit which covers three quarters of the site. It is dated to period 5.

Twigs and branches visible in this deposit were thought to reflect scrub clearance activity.

Both the numbers, and variety, of weedy species present in this sample are reduced. *Polygonum aviculare* is the most abundant member of this group. The remaining species present are something of a mixture. Interestingly, Bryophytes are quite well represented, and 85 tree buds were recorded.

The restricted nature of the flora from this deposit does not suggest accumulation under conditions of abandonment and dereliction. Were this the case, one would expect opportunistic weedy species to be present at much higher levels. The deposit appears to have been dumped, possibly as levelling material, and to have incorporated seeds from a variety of sources. The large number of buds may indicate the presence of trees/scrub/cut branches in the near vicinity, or close to the area from which the dumped material originated.

The most abundant insect species were indicative of moist rotting matter, possibly an accumulation of dumped plant refuse, including brushwood. It was thought unlikely that insects were exploiting rotting vegetation left after scrub clearance, as the fauna lacked species indicative of a stand of vegetation old enough for scrub development. This tends to support the interpretation of this context as a dumped layer.

SAMPLE 78 is from a soil accumulation deposit thought to indicate abandonment of the site. It is dated to period 5.

The botanical assemblage from this site is rather limited, and of mixed origin. No interpretation can be offered, beyond the fact that if this were indeed the product of gradual accumulation under conditions of abandonment, then one might expect the weed flora to be better represented.

The insect assemblage was very small, and it was felt that no interpretation could be offered.

SAMPLE 55 is from the debris of a minor, short-lived, industrial activity. It dates to period 5.

There is a fairly diverse weedy flora present, but it is represented at a relatively low level. *Stellaria media* and *Urtica dioica* are the most numerous species. Damp ground species are also fairly varied. There is a relatively high count for frond fragments of *Pteridium aquilinum*, and also for Graminaceous species. Three carbonised cereal grains were present - one *Triticum aestivum*, and two *Hordeum*. Bryophyte fragments were present.

The botanical evidence is too slender to afford an interpretation, as one might expect from an industrial setting. The cereal grains were probably carbonised by accident. The sample description sheet mentions burnt wood shavings and charcoal; if the industrial activity involved fire, was dried Bracken perhaps used for kindling ?.

The insect assemblage was small, of low diversity, and contained an undistinguished fauna.

SAMPLE 46 is from an accumulated/tipped soil deposit, in a room of sill-beam structure 806. It is dated to period 6A.

This assemblage is represented by only eleven species, and is extremely limited. In addition to a weedy disturbed ground element, there are indications of damp ground conditions - *Juncus* spp., and *Ranunculus (Batrachium)*. No interpretation can be offered.

The insect sample yielded was large, contained a very large outdoor component, and a high rotting matter element, with strong indications of the presence of foul matter also. Grain beetles, and species of drier habitats, were unusually rare. The indicatios were of damp grazing land, with water possibly pooled in small depressions. It is suggested that the deposit represents a dump of turf material laid down prior to construction, the urban fauna present having invaded after dumping, or become incorporated during dumping.

SAMPLE 38 is from a floor/trample layer in a room of structure 806. It is dated to period 6A.

The weedy element for this sample is varied, but mostly present at a very low level. It is dominated by *Chenopodium* spp, and *Atriplex* spp. The damp ground element is also well represented. Species from all of the ecological groups delimited are present, but none are distinguished. The assemblage appears to be very mixed, and of a background nature. The comparatively low levels of presence suggest that the room was kept relatively closed.

The insect assemblage was large, but of very low diversity. This probably suggests either rapid deposition, or closure of the room. Grain beetles were present, and possible use of the room as a food store or stable was put forward.
No botanical evidence was found to suggest either.

SAMPLE 39 is from a floor trample in sill-beam structure 806. It is dated to period 6A.

The weedy element is poorly represented; damp ground species similarly so. Economic/human-use species are slightly better represented, with a high count for Hazelnut fragments, and the presence of *Peucedanum officinale*, *Coriandrum sativum*, *Apium graveolens*, and the fruitstones of two species of *Prunus*. There are no Graminaceous species present, and no Bryophytes. It is probable that this assemblage is primarily of background origin. There is no evidence of the accumulation of plant debris, and it would appear that this room was fairly well sealed, and comparatively clean.

There is no insect information for this sample.

SAMPLE 4 : awaiting contextual information. Dated to period 6B. Structure 806.

This assemblage was represented by only three recorded elements - twig fragments of *Calluna vulgaris*, *Rumex* spp., and inflorescence bases. At present no interpretation can be offered.

There is no insect information for this sample.

SAMPLE 48 is from a soil accumulation in structure 981. It dates to period 6A.

The botanical assemblage is extremely rich. *Urtica dioica* and *Plantago major* are well represented; *Agrostemma githago* and *Centaurea cyanus* (grain-crop weeds) are both present; and there is an extremely high value for species of Dock, which are common weeds of disturbed and waste ground. Damp ground, and other species of *Carex* are well represented, and the suite of damp ground species includes - *Ranunculus flammula*, *Lychnis flos-cuculi*, and *Eleocharis* spp. There was a uniquely high value recorded for *Rhinanthus* spp., the Yellow Rattles, plants of damp meadow and pasture. *Linum catharticum*, Purging Flax (a plant of base-rich soils) was present at high levels also. Overshadowing all else though, was an extremely large count for frond fragments of Bracken. Graminaceous species were very evident, and included quantities of Cerealia type, together with fragments of *Triticum* glume base. Ranunculaceae were generally well represented, adding weight to the meadow/pasture element.

Presence of grain-crop weeds, cereal caryopses and *Triticum* glume bases, indicate that part of a grain crop was for some reason incorporated in this deposit. The high *Rhinanthus* spp. record is extremely interesting and somewhat problematical. Taken together with the suite of damp ground species recorded, high Gramineae values, and the prevalence of Buttercup-type Ranunculaceae, it may suggest presence of a damp meadow/pasture element. This could have arrived on site in the form of gathered fodder/bedding for animals. In the context of this postulation, it is also interesting to note the very high level at which fragments of Bracken frond were recorded. Bracken is toxic to grazing animals, and so has no use as fodder. It is present at low levels in several samples, but in quantity from only one other at Castle Street. This is sample 84, the organic soil accumulation associated with a curved fence/pen structure. The flora of this latter sample has much in common with that for sample 48. Cut, dry, Bracken fronds may have been used as animal bedding/litter. Taken in conjunction with the presence of possible fodder, Graminaceous, and cereal elements, we may have here a build-up of stable/animal-stall material. Work on any parasite remains present would add significantly to interpretation of this deposit.

The insect fauna had a quite large outdoor component, of which half were phytophagous species. It was felt that the insects present could well be of background origin, and the floor surface was interpreted as being clean in comparison with others from the site. The botanical assemblage presents rather a different picture however, and the presence of spilled cereal, and quantities of Bracken frond, may suggest the floor of this building was far from clean. Alternatively, the absence of insects associated with foul matter and decaying organic material, may point towards this being an accumulation of relatively clean bedding/fodder material, from a well looked-after stable/animal stall.

SAMPLE 51 is from floor/trample deposits situated between structures 806 and 981. It is dated to period 6A.

The weed flora is quite varied, though mostly represented at low levels. A varied damp ground flora was recorded - *Ranunculus flammula*, *Carex nigra* group, *Eleocharis* spp., *Lycopus europaeus*, *Scirpus setaceus*, *Apium graveolens*, *Potentilla palustris*, *Crepis cf.paludosa*, *Scutellaria galericulata*, and a high count for *Montia fontana* ssp. *chondrosperma*. Economic/human-use species are present, but only at relatively low levels. This assemblage suggests a fairly rich background flora, much as would be anticipated in an external setting. The deposit appears to have accumulated in the open.

The insect assemblage was quite small, of low diversity, contained a moderate outdoor component, and was mostly of a background nature. It was concluded that the layer probably formed in the open, with not very much rotting matter present. The botanical results are in accord with this.

SAMPLE 31 is from a possible floor layer. It is dated to period 6/7.

The weedy component of this assemblage is relatively species poor, and present at a low level. *Calluna vulgaris* and *Erica tetralix* stem fragments are present, but only at a low level. The deposit also contained Hazelnut fragments, two spines of *Prunus spinosa*, and three small carbonised Legume seeds. Graminaceous node fragments were present, together with a single grain of carbonised Barley and a single carbonised *Triticum* glume.

The floral assemblage from this sample is relatively restricted, and probably formed indoors. Material of heathland origin was being utilised somewhere in the vicinity. The plant material present would have arrived mostly by accident, carried in by trampling activity, or borne on air currents.

The insect assemblage was small, with a small outdoor component; it consisted mostly of grain beetles and woodworm beetles. The latter may have bred

in the building, the former could have arrived as background, either by accident or in trampled material. It was considered probable that the deposit formed indoors. This agrees with the botanical interpretation.

SAMPLE 19 is from a soil accumulation in an open area. It is dated to period 8B.

This sample contained only two seeds. No interpretation can be offered. No useful insect remains were recorded either. It was suggested that sterile material had been dumped, or that the deposit had accumulated gradually under conditions in which beetle remains decayed rapidly. This could apply to the plant remains also. It was suggested that there was little organic matter present (the botanical results uphold this), and that the ground was unlikely to have been very moist.

SAMPLE 17 is from an external soil accumulation. It dates to period 8B.

The weedy component of this flora is fairly diverse. *Plantago major* is present; *Urtica dioica* and *Urtica urens* distinguished by high values. The most obvious element in this assemblage, however, is that of *Carex* spp., particularly *Carex nigra* group. Twig fragments of *Calluna vulgaris*, and seeds of *Empetrum nigrum*, introduce a heath/moorland element into the assemblage. Hazelnut shell fragments are present, together with a single *Ficus carica* seed, and two of *Coriandrum sativum*. Graminaceous seeds are present, but not at a high level. *Potentilla* spp. were recorded at a fairly high level.

This is basically a background flora of mixed origin. Presence of the two species of *Urtica*, and of *Plantago major*, suggest disturbed, nutrient-enriched soil conditions. It is probable that the *Calluna* and *Empetrum* here form part of the general background spectrum, having been derived from heath/moorland material utilised elsewhere on the site. The large *Carex nigra* element suggests either that damp ground conditions existed nearby, or that Sedge was being brought onto site for some purpose.

The insect assemblage was quite large, of low diversity, and with a low outdoor component; it was thought probably to be of background origin. The area was interpreted as being fairly clean.

SAMPLES 13 AND 12 are from two padstone structures (1776 and 1777), dating to period 9.

Both samples contained one seed only; neither contained any useful insect remains. Lack of insect evidence made it uncertain whether the layers formed gradually in situ, under conditions which did not favour preservation (ie.relatively clean and dry); or were of dumped, sterile material. Nothing can be added to this.

SAMPLE 20 is from an external soil accumulation. It dates to period 9.

The floral assemblage from this sample was too small to be of interpretive use. The same was true of the insect remains. Paucity of flora and fauna suggests, as above, either that conditions were not suitable for preservation, or that the deposit was of sterile dumped material.

SAMPLE 16 is from the bottom fill of a timber-lined pit/well. It dates to period 13, and is post Roman.

The majority of the assemblage appears to be of mixed origin, and background nature. Presence of Hazelnut fragments, *Prunus spinosa* fruitstone, *Malus/Pyrus* pip, and a large number of Bracken frond fragments, may indicate that the feature was in receipt of discarded, dumped material.

The insect assemblage was quite large, diversity fairly low, outdoor component moderately large, rotting matter component not very large, and foul matter component insignificant. Species associated with drier mouldering matter were well represented. It is suggested that the pit/well was used as a dump for mouldering plant remains, either first-hand, or for deposits cleaned up from elsewhere, possibly inside a building. Some of the insect species present were associated with Cruciferae, especially *Capsella bursa-pastoris*. No seeds of Cruciferae were recorded from this sample, although *Capsella bursa-pastoris* did occur elsewhere. Presence of grain beetles in this post-Roman deposit suggests either that they persisted, or that earlier Roman material had been re-deposited. Both botanical and insect information suggest that this feature contains dumped material, probably consisting largely of dry Bracken.

SECTION 4: BOTANICAL DISCUSSION AND INTERPRETATION

Discussion of classification results:

Using the subjective cut-off point between divisions 4 and 5, nine groups of samples have been defined. These will be discussed individually and whether, in each case, the level of cut chosen was appropriate. All conclusions drawn here are purely from the botanical results. They will be compared with archaeological information later.

Group A (samples 4 - 20)

There were few identifiable remains in any of these samples, the most abundant being *Calluna vulgaris* twigs and grass nodes. Nothing may be inferred botanically from them.

Group B (samples 100 - 31) Figure 3.

Between 11 and 52 taxa (average 29) were in these samples but only *Carex* (lenticular) in any abundance. Otherwise most of the seeds were from the disturbed ground and wood/scrub ecological groupings. Tree buds were particularly common in sample 52.

In general, the taxa are those found in many urban sites and have sometimes been called 'background' species. They include *Polygonum* spp., *Carex* spp., *Ranunculus repens* and Chenopodiaceae. The group of samples is therefore characterised by its lack of specific taxa rather than anything else.

There are no striking differences between groups formed from subsequent divisions except that samples 100, 52 and 77 have more of the woodland element.

The botanical grouping suggests relatively clean conditions with no deposits of refuse, etc.. The high levels of wood/scrub element could be remains of wattles, brushwood etc. and may therefore suggest external deposition.

Group C (samples 55 - 64) Figure 4.

Moderate amounts of *Pteridium aquilinum* and absence of many weed taxa characterise this group. There is an average of 38 taxa per sample (range 14-52) making it a slightly more diverse group than the above. Again the 'background' species are all present and more abundant

Figure 9

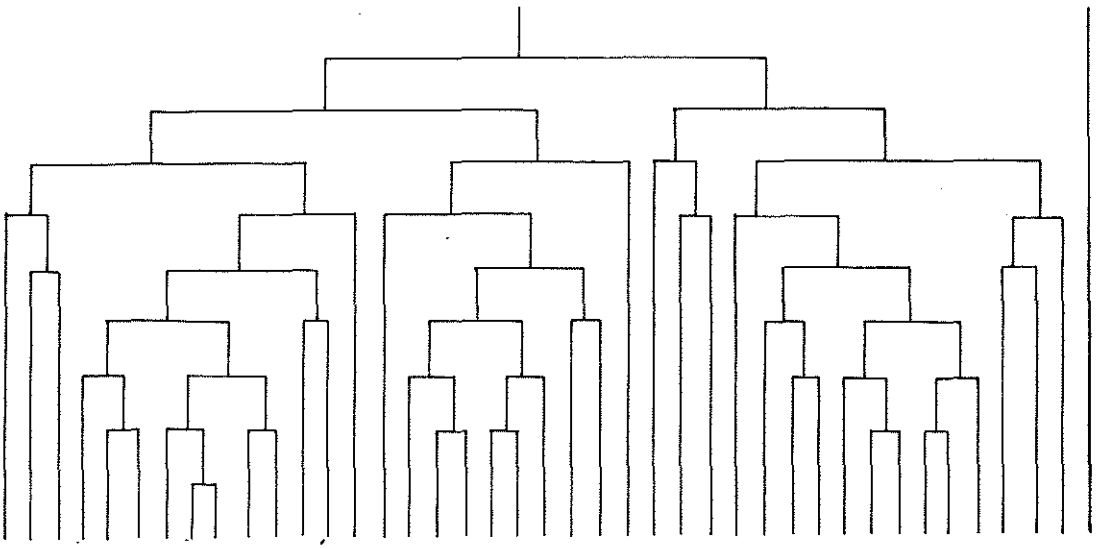


Table 2:

	A			B										C									D	E	F		G										H			I
Sample number	4	12	20	100	52	77	78	104	101	46	72	83	38	31	55	128	107	67	65	16	114	39	64	19	48	73	84	61	106	17	51	102	91	92	94	109	110	130	93	80	13
Phase/period	6b	9	9	3a	5	4	5	3a	3a	6a	4a	4a	6a	6/7	5	2	3a	4a	4a	13	2	6a	4	8b	6a	4a	4a	4a	3a	8b	6a	3a	3b	3a	3b	2/3	2/3	2/3	3a	4a	9
Polygonum aviculare				21	32	1	1	1	10		4	6		3		44	2	21	29		98		1		8	24	23	8	35	2	5	109	38	21	29	51	28	8	9	4	
Polygonum persicaria				1	4	3	1	2		3	2	7		2	2	1		6	4	1	4		1		8	18	88	9	22	2	3	11	10	99	5	3	16		63	24	
Rumex sp(p).	10		1	5	2	3	7	1	2			6	1			4		1	8	5	6	1	2		213	48	81	5	31	1	11	9	12	10	17	13	6	15	6	4	
Rumex acetosella				11	6	1	4		1	10	2	2	2	1	2	21	1	21	21	3	16	9	10		32	48	23	2	70	20	11	17	12	15	48	10	22	2	17		
Urtica dioica				6	6	5	1	1				6			11	1		14	9	7	6		9		24		6	1	34	40	3	194	1	299	6	6	2		4	4	
Corylus avellana nut fragment				8			3		22		1	6	9	21	2	15	3		3	11	3	31	4		2		13		19	8	8	18	10	2	6	12	59	9	7		
Prunella vulgaris				3	2	1	4	1				11	6	3	2	9	1	6	5	3	11	6	14		229		151	4	21	43	16	19	6	6	5	26	28	27	24		
Carex nigra group				5	9		8		2	2	3	2	17			3		2	3	1	4	16	5		24	6		6	367	279	21	7	3	15	10	4	4	12	56		
Carex (trigonous)		1	2	3	4	10	3		1	1	3	3	10	1		3		1	1	1	2	16	3		16	36	17		38	54	18	1	7	11	2	5	1				
Carex (lenticular)				30	20	15	14	2	8		4	14	8	24	11	22		20	18	1	38	13	28		63	42	87		220	33	34	55	50	47	59	56	41				
Chenopodium/Atriplex				9	1	8	1		4	3	10	96	17			4		9	13	7	8	9	6					17	221	8	7	25	58	13	14	20	19	6	26		
Potentilla sp(p).				4	1		11		1			12	1			3		4			6	2	6		63	24	52	3	5	67	13	10	13	7	4	10	9	4		2
Stellaria graminea				4	5	1	3	2	1		1		1			3		5	4	1	4	3	34		16	6	6	1	40	12	12	13	16	9	1	20	12	2	41	2	
Stellaria media				2	1	5						6	2	3	23	4	2	8	10	6	1		4		55	42	81	11	24	4	1	3	2	6		3	5	7	25	8	
Ranunculus acris				1								2		1	9	1					5	1	1		63		29	1	3	3	10	5	7	4		6	7				
Ranunculus bulbosus							3				2		2			8		5			9	4	4		8				3	8	3	6		24		5	8				
Ranunculus repens/cf. repens				13		2			3	1	1	1	2	1		3		4		1	10	2			71	6	81	2		4	15		9	6		5	8	1			
Ranunculus flammula/cf. flammula				2			4		2			4	4		3	4		2		1	7	1			32	48	35	1	17	1	5	11	5			1	4		2	
Aphanes arvensis				1	1		1		3					1	1	4					4		3		8	12			4	4	2	7	2	2	11	2	3	3	7		
Sonchus asper												1					1		1	7	2		1		8		35	1	10	1		1	1	1			1	3	2		
Eleocharis sp(p).			1		1								2			3				1	5	2	1		16	324			9	2	4	6			2	8	5	1	3	2	
Polygonum lapathifolium				5	2	3					1	2	1	11	2	3		8	17	2	25	2	1			36	52	8	91	1	2	11	16	78	9	9		66	16	
Calluna vulgaris twigs	30			2		1					1	9	4	4					4							72	46	25		10	5			1		54	2			
Juncus sp(p).										4	7		1			1			2	3	2	3	6			24	58		7			20				5		97		
Leontodon hispidus				1		1					1	5	1			1		2	3			1	3					2	60	2	9	1	2		1	2	13	2	16		
Lapsana communis						1			4			2			3	2			3	4								2	4	1		2	1			1	2				
tree bud				5	85	11				2									1			1				12			1		14		1	1						
Compositae undiff.																3		1	3	3	1	3			8		17		6			1			1		1	1		
Linum catharticum				3	7		4						3		4	2	1	2	2	3	2	3	3		221	12	6		69	36	16	7		6	5	4	9	2	44		
Pteridium aquilinum -frond frag															13	3		1	5	93	6				790		406		1		1		2			12	19	8			
Urtica urens				1	2	1										1		2		6	2		2				6			85		3								
Lychnis flos-cuculi													1				1						6		8				1			2		2		1		3		
Raphanus raphanistrum				1		2						11							1		3				8	18	63	1					8	2	1	2		20	16		
Montia fontana ssp(p). chondr.				5			1		2		5	2				3	1		2									2	5		27	1	12	5	4	4			1		
Capsella bursa-pastoris												2	2			1		3												20		1					2			
Coriandrum sativum													1		1			1				2	3					1	6	2	1	1	1				1			
Triticum glume base																									55	258	139	3												
Cerealia/large Gramineae				1																					55	156	203								12	2		74		
Leontodon sp(p).																									24	54	174													
Agrostemma githago																		2							24	60	52		24		4	26				1			
Luzula sp(p).																									8	12	12										1	1		
Atriplex patula/hastata																										36	128													
Galeopsis sp(p).																										12	46													
Plantago major											1		1					4	2	1	4				16	18	52		3	12			2							
Gramineae undiff.				3	3					4	1	4		1	28	2	1	1	7		1				490	316	679	12	189	26	2	82		69	13	370	7	19	161		
Fallopia convolvulus						1								4	2								1			18	29	1	1		2	4	2		1	1	1		3	2
Ranunculus sp(p).							2									2	1	3		1	3		1	1				1	9	2		7	11	13			23	143		
Papaver argemone				1								2	2								2								3		1	9	2	2	3	5	2	1		
Cerastium sp(p).																												2			2	27			2			2	17		
Carex sp(p).																	2							1				18	3									40	207	40	
Polygonum sp(p).								1							1													1			3						39	6		
Euphrasia/Odontites																9		3					3						15		4	6	1		5		1	2		
Mentha aquatica														1	1								6											2	1		1			
Galeopsis tetrahit							1					8				1				1	2							4	7	1		3		2		2	4	13	6	
Achillea millefolium				1															1	1									18		1	4			4	19	12	2	1	
Cerastium cf. fontanum				1		4	1					2									4								53					2		26	4	77		
Brassica sp(p).				1														1			2		1					2	2	1	1	4			3		2		
Ranunculus repens-type					6									1	9				30									24	52			6			34	5				
Vaccinium myrtillus									1							81					44								1			169	2			4	1			
Raphanus raphanistrum pod frag.															3	2													13	3		10				5				
cf. Cirsium arvense															1					6																40				
Ficus carica			1				1					1			1								2							1			1	54				1	2	
Apium graveolens					1								1						2			2									3	1		17	1					
cf. Rhinanthus sp(p).																									284															
Total number of taxa	3	1	8	52	36	32	28	10	17	11	24	33	41	36	42	49	14	35	44	36	52	28	44	2	42	36	44	52	65	44	43	70	43	41	44	63	49	43	51	18	1

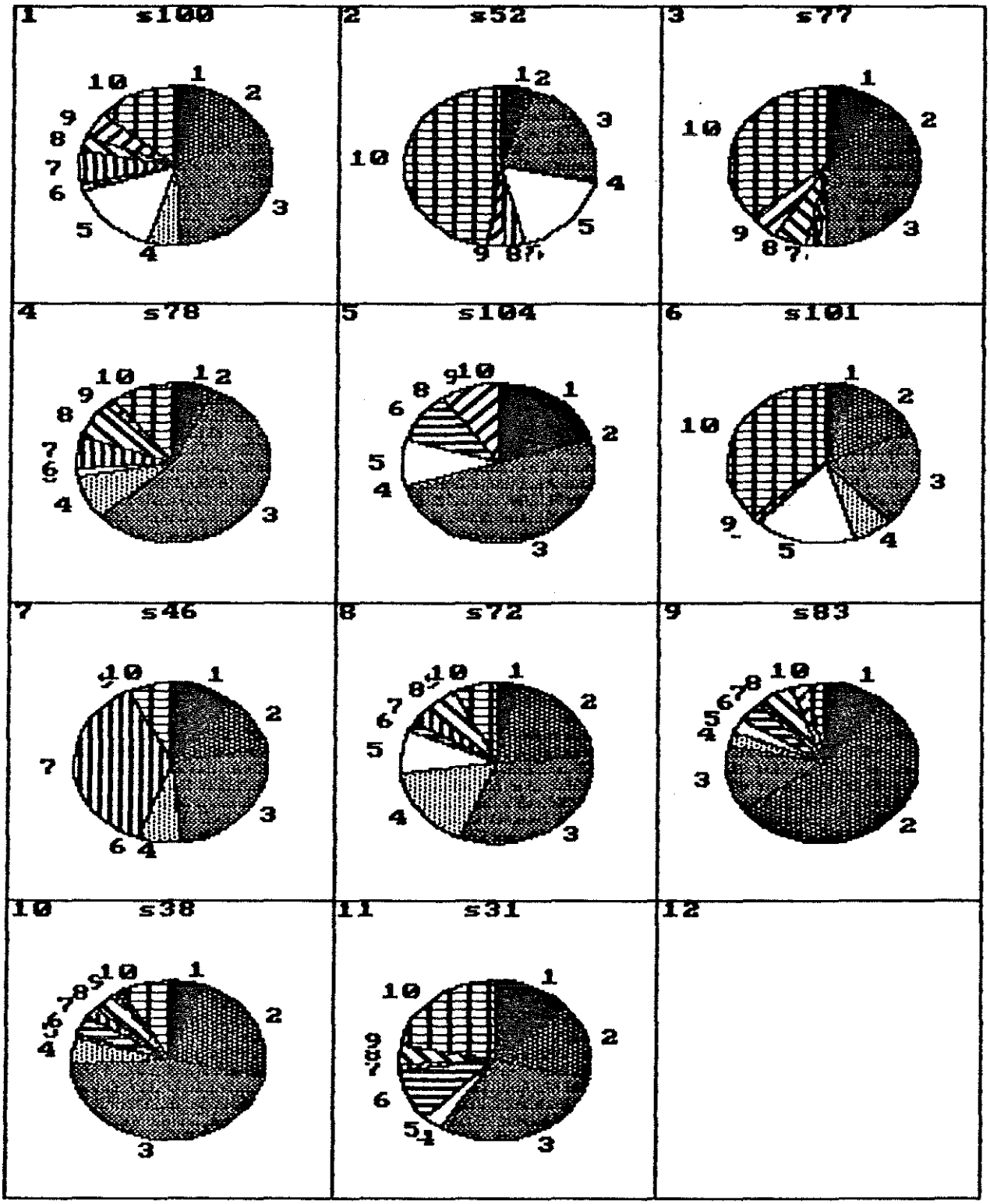


Figure 3: Samples and their ecological groupings
TWINSPAN group B

1 - cultivated ground 2 - disturbed ground
3 - wet/fen grassland 4 - muddy ground 5 - trampled
6 - heathland 7 - acid grassland 8 - neutral grassland
9 - nitrophilous ground 10 - wood/scrub and edge

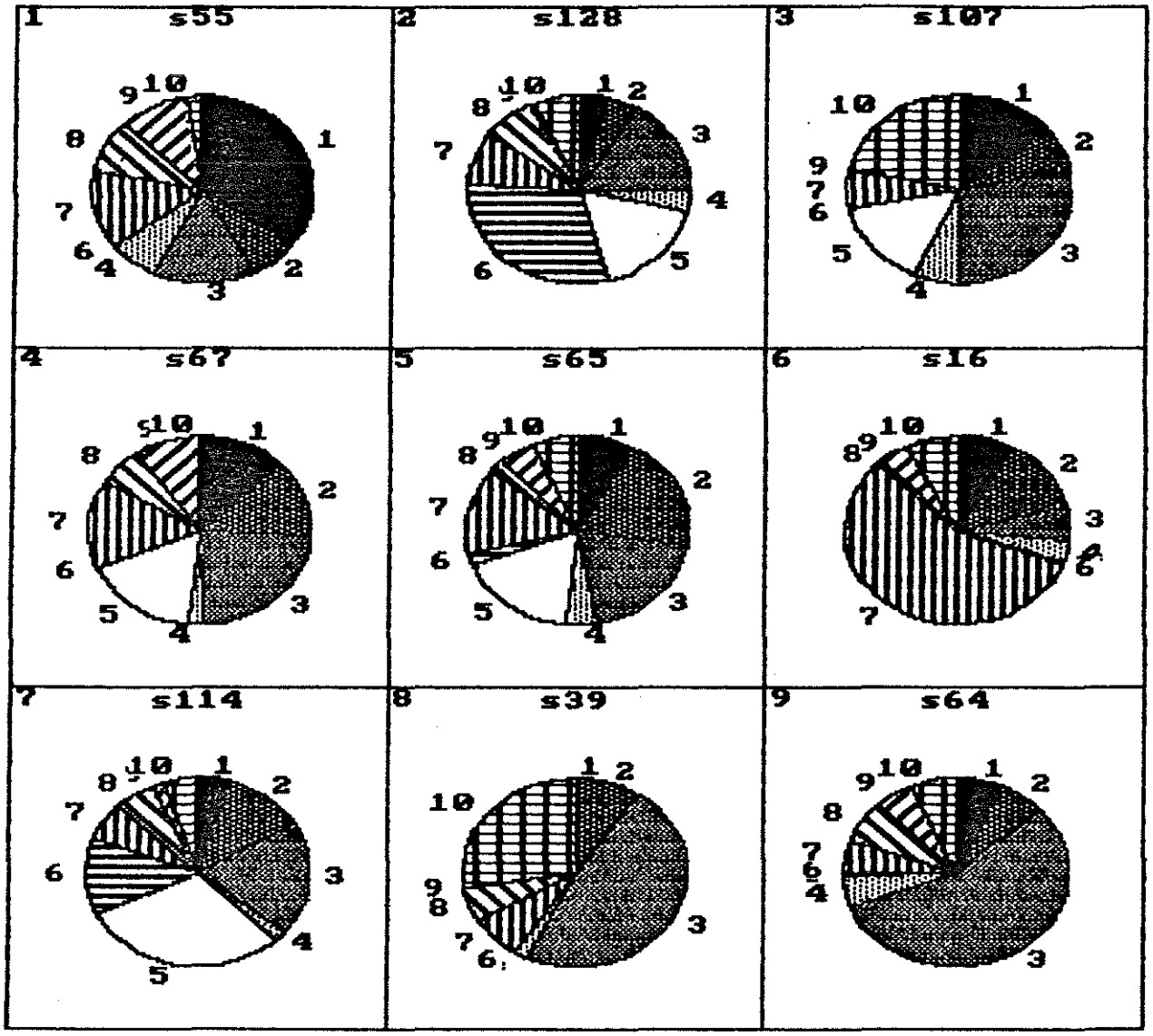


Figure 4: Samples and their ecological groupings
TWINSPAN group C

1 - cultivated ground 2 - disturbed ground
3 - wet/fen grassland 4 - muddy ground 5 - trampled
6 - heathland 7 - acid grassland 8 - neutral grassland
9 - nitrophilous ground 10 - wood/scrub and edge

than in group B samples. *Linum catharticum* and Compositae (undiff.) are constant but only in low numbers. Samples 128 and 114 have moderate quantities of *Vaccinium myrtillus* seeds, an edible plant (bilberry).

Subsequent divisions are insignificant.

The higher species diversity and seed numbers suggests either better conditions for preservation or less regularly cleared/cleaned features. The high disturbed-ground element with more nitrophilous plants also suggests a higher level of eutrophication.

Group D (sample 19)

Only two taxa present

Group E (sample 48) Figure 5.

This is a very species-rich sample with 42 taxa. It is clearly linked to the following group with its high values of bracken frond-fragments and large numbers of grass-caryopses but has been separated from them by having abundant seeds of *Rhinanthus*, a plant of meadows.

The assemblage here strongly suggests the remains of hay or bedding material but not cereal-type fodder/bedding.

Group F (samples 73 and 84) Figure 5.

These two samples are very seed rich and have an average of 40 taxa (range 36-44). In addition to the large numbers of 'background' species they are characterised by an abundance of *Triticum* glume bases, Gramineae (undiff.) and Cerealia/large-grass caryopses.

The assemblage in this group suggests straw debris rather than hay since the associated grassland species are absent but there are large amounts of cereal remains. There is probably a bedding/flooring element given the bracken fronds which are in sample 84.

Group G (samples 61-110) Figure 6.

Fifty one taxa (range 41-70) on average are found in this group which is thus the most diverse.

It is characterised by high values of Gramineae (undiff.) caryopses but lacks the vast amounts of cereal fragments of group F. There is also a high proportion of the 'weed' element.

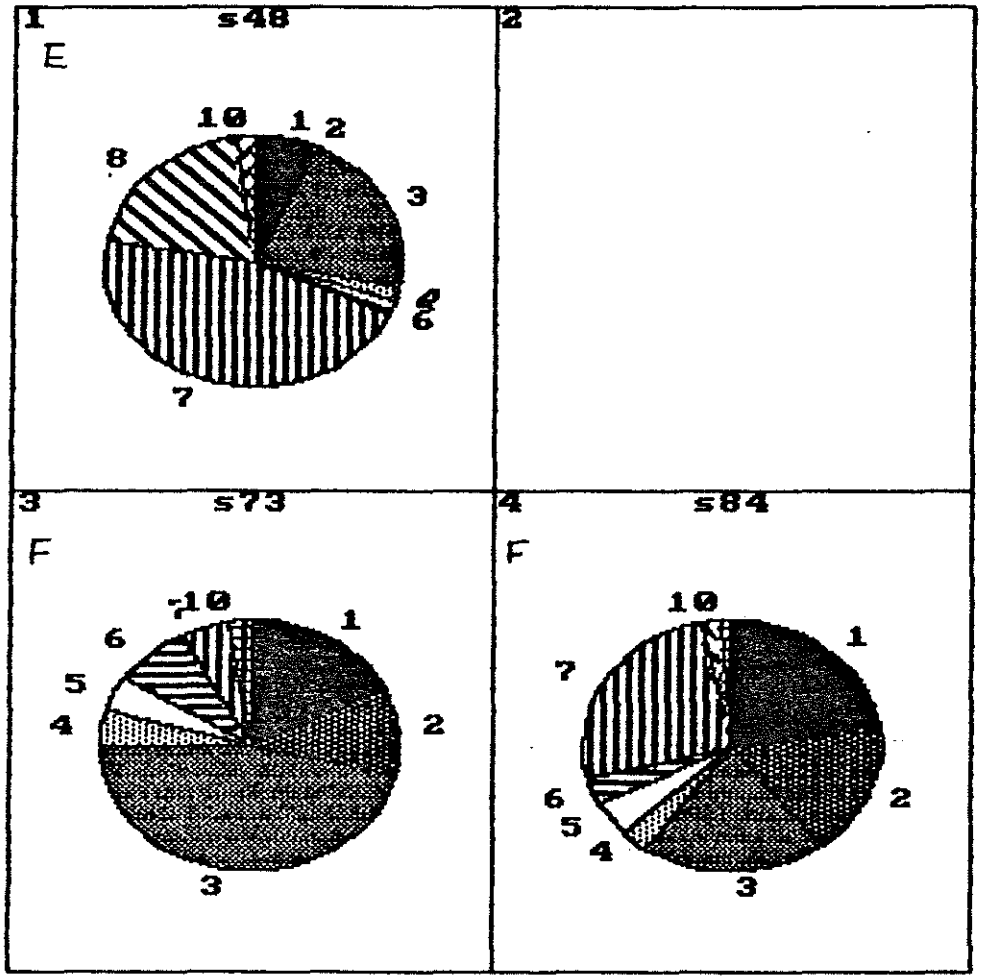


Figure 5: Samples and their ecological groupings
TWINSPAN groups E and F

1 - cultivated ground 2 - disturbed ground
3 - wet/fen grassland 4 - muddy ground 5 - trampled
6 - heathland 7 - acid grassland 8 - neutral grassland
9 - nitrophilous ground 10 - wood/scrub and edge

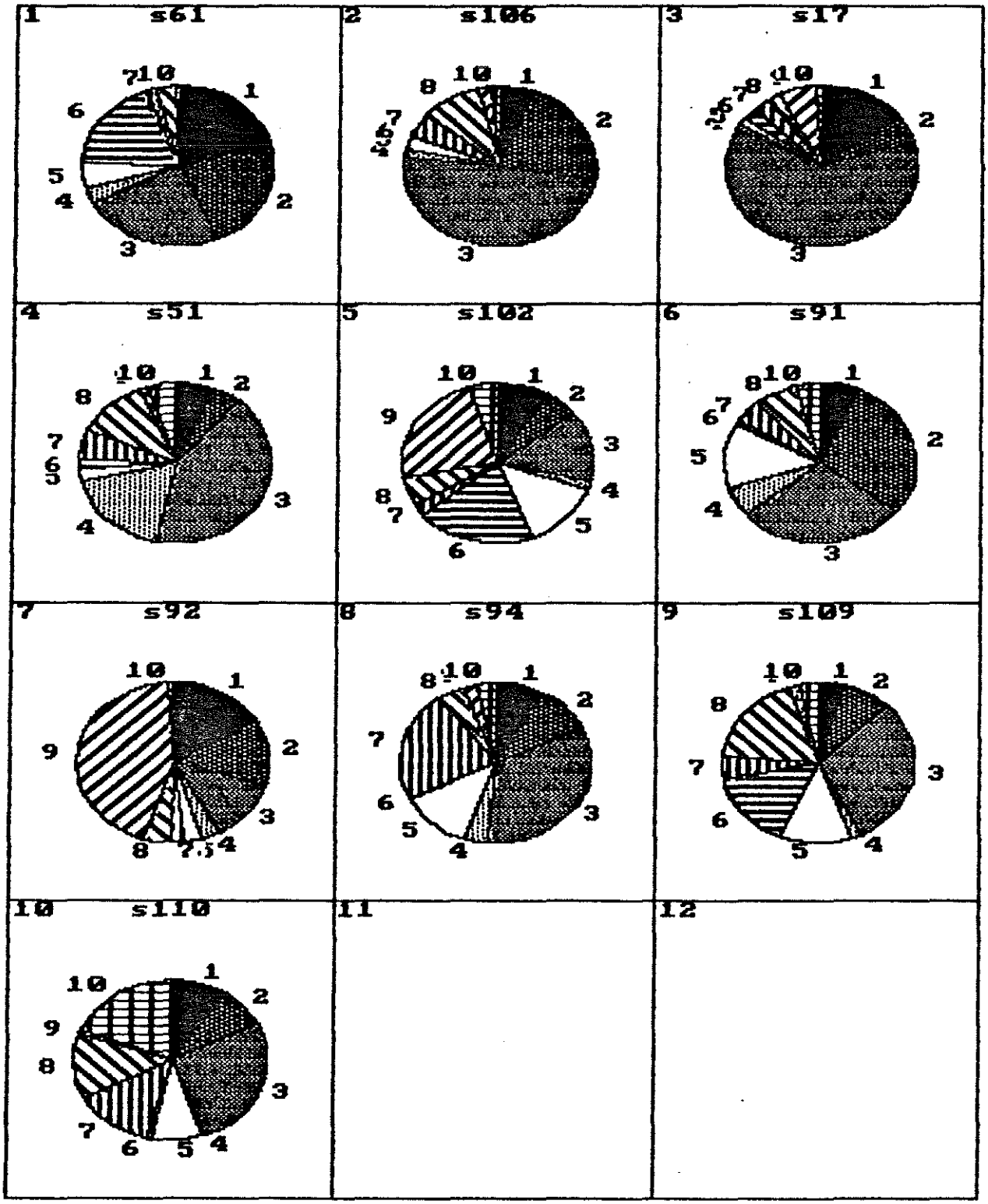


Figure 6: Samples and their ecological groupings
TWINSPAN group G

1 - cultivated ground 2 - disturbed ground
3 - wet/fen grassland 4 - muddy ground 5 - trampled
6 - heathland 7 - acid grassland 8 - neutral grassland
9 - nitrophilous ground 10 - wood/scrub and edge

The plants here strongly suggest remains of hay/bedding or flooring material but no cereal straw. The large wet element could suggest external deposition.

Group H (samples 130, 93, 80) Figure 7.

This group is characterised by high values of *Carex* sp(p). but is otherwise very similar to group C. This distinction is considered to be purely an artefact of identification and therefore the two groups may best be considered together.

Group I (sample 13)

One seed of *Galium aparine* only in this sample.

In general, the classification is grouping samples on the basis of a few taxa but not on particular ecological groups. This is clear when looking at Figures 3-7 which show a wide variety of patterns. It initially separates samples with very few seeds and subsequently those which exhibit the 'background' assemblage from thsoe which have groups of taxa indicating particular functions, such as hay, straw etc..

Results of the Ordination.

Axis 1 simply puts sample 13 at one end and superimposes all of the other samples at the opposite end. Axis 2 similarly separates off sample 20 and tightly arranges the rest. Both samples 13 and 20 are botanically species-poor and nothing may realistically be inferred from these axes.

Axis 3 (Figure 10) has samples 16, 17, 12, and 48 at one end and 80 plus 19 at the other, whereas axis 4 has samples 52, 77, 4 and 12 at the positive extreme and samples 64, 110, 38 and 59 at the negative extreme.

Botanically, the first two axes of the ordination are therefore first separating the species-poor samples from the more diverse ones. Thereafter, axis three then reflects a gradient from samples 80 and 19, with fewer species mainly representative of open, drier conditions, to samples 16 etc., with greater numbers of species especially including indicators of wetter habitats. The gradient extracted by axis four is from samples 52 etc., with a species assemblage which includes a variety of

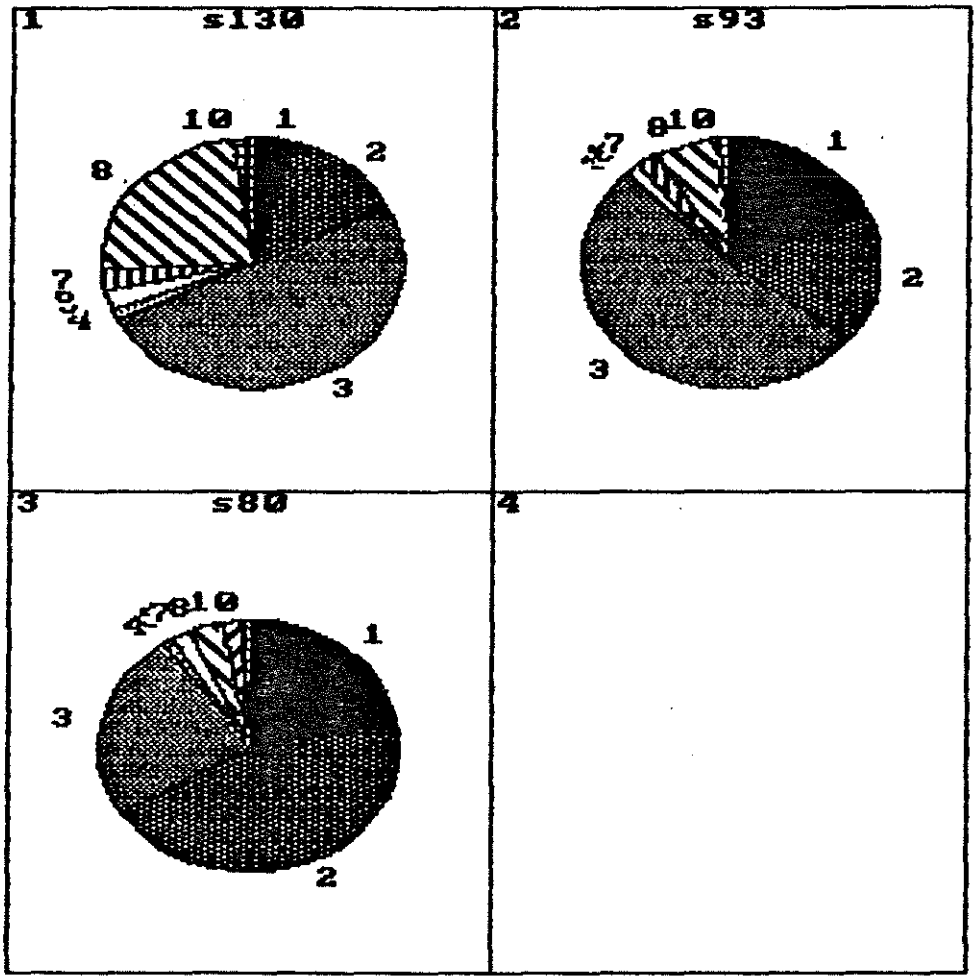


Figure 7: Samples and their ecological groupings
TWINSPAN group H

1 - cultivated ground 2 - disturbed ground
3 - wet/fen grassland 4 - muddy ground 5 - trampled
6 - heathland 7 - acid grassland 8 - neutral grassland
9 - nitrophilous ground 10 - wood/scrub and edge

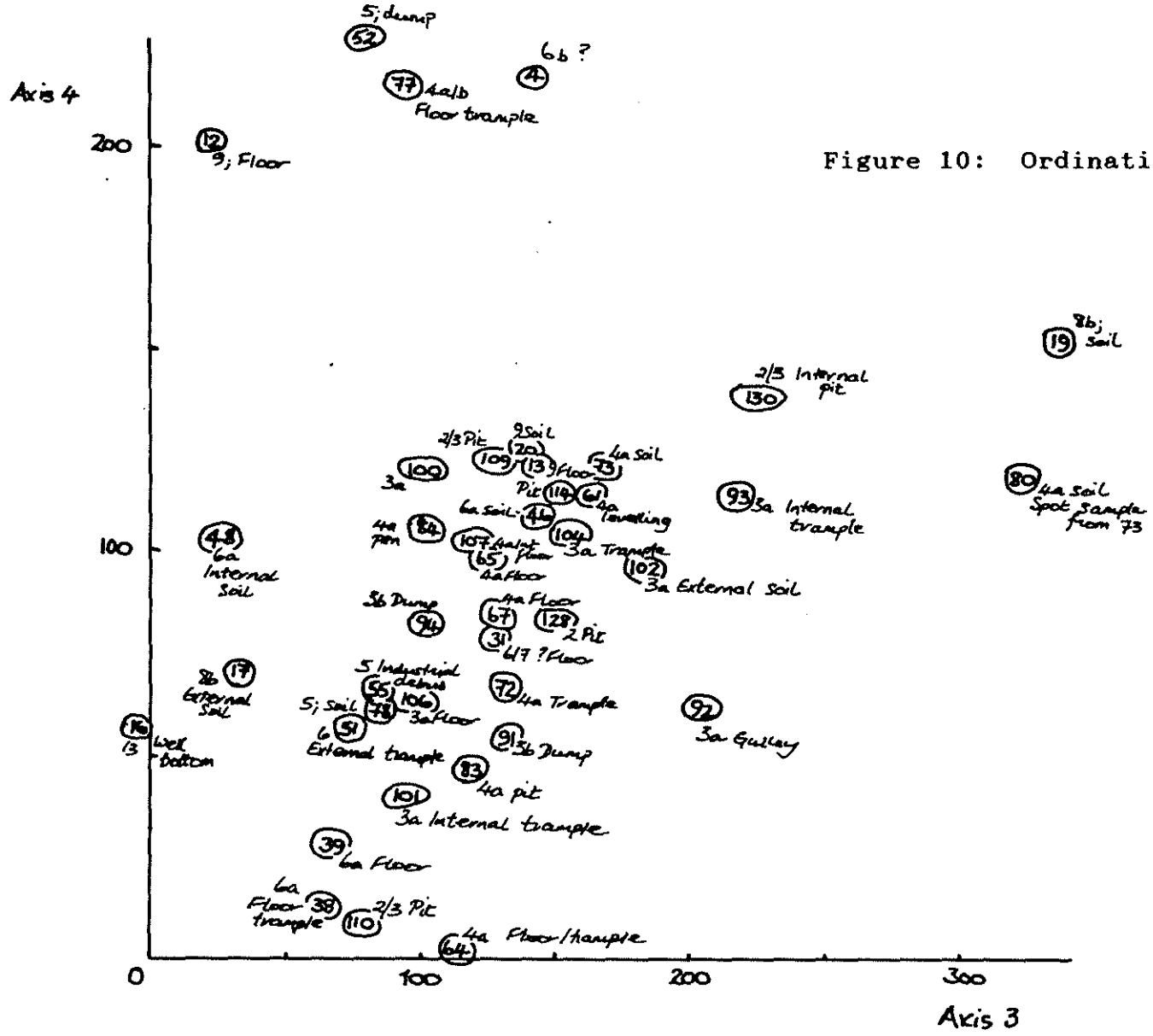


Figure 10: Ordination axes 3 and 4

bryophytes, and tends to reflect shady, closed vegetation with humid conditions, to samples 44 etc., with a diverse species assemblage including indicators of closed wetland, grassland and woodland habitats. Superimposing the archaeological information upon this ordination (Figure .10) shows that samples from later phases, and predominantly soil-dump features, tend to be at the ends of the axes, whereas samples from the internal features of periods 3 and 4 are nearer the centres of the axes. The fact that the negative ends of axes three and four are somewhat similar to each other, as were the negative ends of axes one and two, coincides with the isolation of several individual samples or very small clusters by the TWINSPAN. Together these results suggest a dataset of a heterogeneous character, with few of the samples analysed really being sufficinetly alike for strong clusters to emerge. The analysis of a greater number of samples might have improved this situation, although this cannot be inferred with any certainty from the present dataset.

RELATIONSHIP BETWEEN CONTEXT TYPE AND ECOLOGICAL GROUPING

The phytosociologically-based ecological groups form the basis for this discussion.

Weeds of cultivation *and* disturbed ground:

These occur in every context from this site. The numbers of seeds present are influenced by factors such as relative location, ie. whether internal or external to a structure, and cleanliness. Unless they are kept clean external surfaces generally exhibit a more varied floristic assemblage, unless they are kept clean, than internal ones since enclosing structures tend to exclude a certain amount of background. Organic material and debris accumulating in the open will be rapidly colonised by opportunistically weedy species and, if foul, then species tolerant of eutrophic soil conditions will be prominent. Where deposits internal to a structure contain a strong weedy element this may relate to some specific use of that structure or may indicate that the deposit accumulated during decay and collapse of the structure.

Species in this ecological group would have grown on site wherever conditions permitted, much as in present-day urban settings. Their seed forms part of the background fall-out which has found its way into virtually every Castle Street context.

Modes of transport for this component include windblow, rainsplash, carriage on the coats of animals, and also the trampling by animals and man. Some weeds of cultivation would have grown on disturbed areas in and around the site, whilst others may have been brought in from surrounding agricultural land by the processes listed above.

Wet grassland/fen grassland

This group is generally present across the site and in all phases. However, it is most abundant in contexts from organic-rich deposits which are associated either with a possible storage structure or with material containing animal dung. The latter are considered to have accumulated under conditions in which stabled or penned animals were present. Under these circumstances it seems that species of this ecological group may have arrived on site amongst material gathered from a location in which they formed part of the natural vegetation. This may have been fodder collected from an area of species-rich damp meadow.

In addition to being a component of this group *Linum catharticum* is also characteristic of dry, calcareous substrates. It is possible that the continuous presence of buildings in various states of decay, particularly those with lime-based plasterwork or mortar, created and maintained highly-localised conditions in which this plant was able to thrive. Release of base-rich compounds, by weathering, may have opened up a new niche and sustained an urban enclave of a species normally found elsewhere on outcrops of calcareous rocks. Its regular occurrence, but at low values, would indeed suggest such an urban enclave. On the other hand, the occasional high values recorded could indicate localised arrival of seed in hay or dung.

Wet, muddy ground

Occurrence of this group in internal floor and trample contexts suggests arrival of material on muddy feet, either animal or human.

It is also found in widespread external dump/accumulation deposits. Here it could simply indicate areas with a periodically raised water-table. Given that Carlisle is bounded by rivers such conditions would be expected to pose a problem, particularly during the winter. The dump/accumulation deposits may then represent attempts to ameliorate this problem.

Trampled

The presence of this group on the site suggests that there were areas of fairly frequent traffic which compacted the surface preventing colonisation by plants of the disturbed ground group. Such areas include paths, roads and thoroughfares. Given the military nature of the site such conditions could also be maintained on a parade or exercise ground used on a regular basis.

Dry heathland *and* acid grassland

The acid grassland component was very sparse and cannot usefully be used in any interpretation.

However, the dry heathland species *Calluna vulgaris* is represented at high levels in some internal contexts where it might indicate that it was used as either flooring or roofing material.

High levels of *Vaccinium myrtillus* occur in a few external contexts. These have been interpreted as deposits containing faecal material since the fruit is the edible bilberry. The species grows in the vicinity today and is likely to have been utilised as a food source or dietary supplement.

Neutral grassland

Typically, this community occurs in organic-rich contexts. It can represent material deliberately collected and brought onto the site as hay for fodder, or bedding. However, there is a less direct route by which

this material may arrive on site. In its natural situation the community would form rich grazing land. Animals pastured there during the day and brought back to the site each night would transport such material in their guts. Excreted dung would be incorporated into bedding material of byres and pens.

Nitrophilous

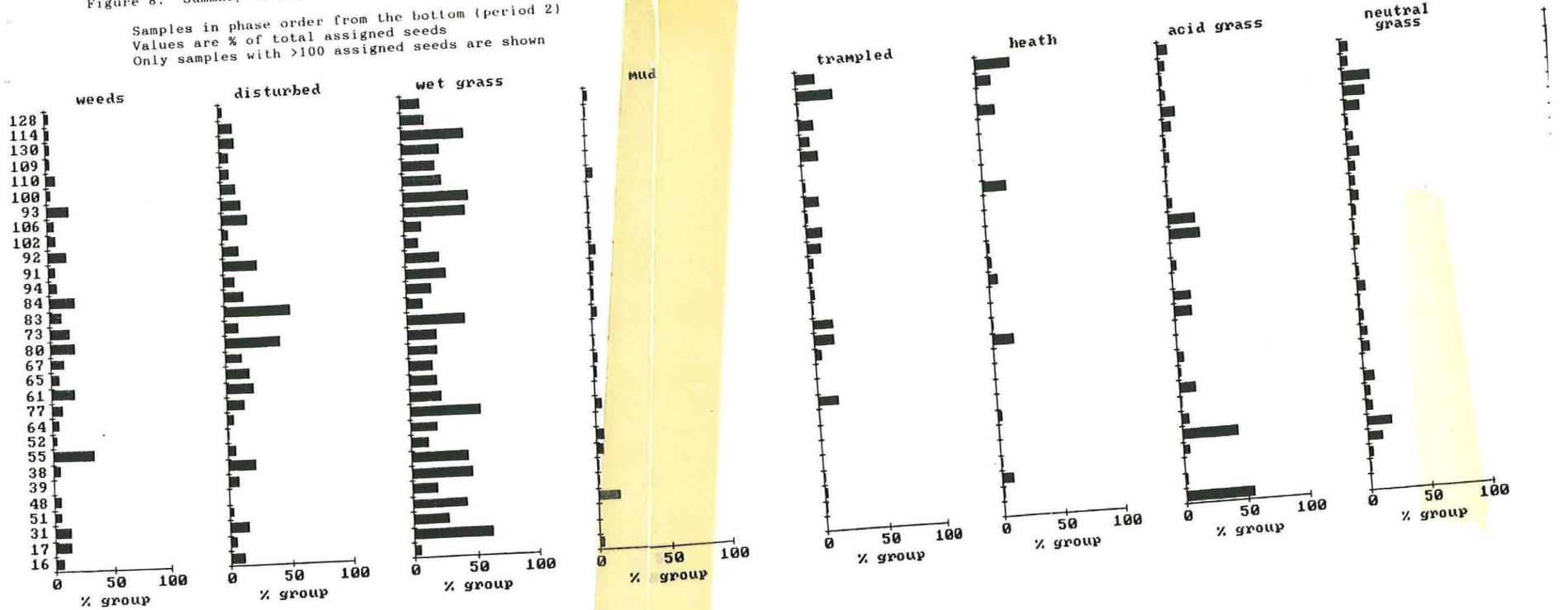
Presence of this group indicates nutrient enrichment in the form of dung, urine, stable sweepings etc..

Wood/scrub and edges

These communities would have formed thickets close to the site but are generally poorly represented in the material examined.

Figure 8: Summary of phytosociologically defined ecological groupings

Samples in phase order from the bottom (period 2)
Values are % of total assigned seeds
Only samples with >100 assigned seeds are shown



SECTION 5: ARCHAEOLOGICAL INTERPRETATIONS AND CONCLUSIONS

PERIOD BY PERIOD SYNTHESIS

This discussion will consider the site period by period showing how samples can be related, what may be inferred from them using the analytical results from above, and how the environmental conditions on the site have changed through time.

There is a wide but similar range of taxa in samples 128, 114, 109 and 110, all of which are from period 2 and 2/3 pits. The diversity of the botanical material suggests that these pits served no single function. Sample 110 has a similar suite of taxa to 109, although with fewer remains. The two were classified together by TWINSPAN. There was evidence of fungal growth on material from 109 which also had large amounts of heather twigs and grass caryopses in it. Bilberry seeds were the most abundant items in 128 and were also common in 114, the two samples were both classified into TWINSPAN group C. This could indicate human refuse deposits but probably casually rather than as a specific cess-pit. The pits contain remains of a wide variety of taxa including several woodland species, as well as others of open conditions. This suggests that at least some of the seeds were incorporated through natural processes; for example, seeds from adjacent plants would be carried in by wind, rain and water, other seeds could be brought in from further afield on feet and clothing, through the actions of berry-eating birds, etc.. Such a mixed assemblage, with taxa of woodland and open conditions, is most likely to accumulate in this way in an open situation.

The site was relatively clean since accumulations of organic debris and general rubbish are usually attended by a rich weed flora.

Linking periods 2 and 3 is another pit (sample 130, TWINSPAN group H) underlying a floor in building 1627. It has a very similar species content to the above pits. Since it is an internal pit it is interesting to note that the most abundant seeds in it are from the wet

ground element, it could therefore have been acting as a 'sump' in the room, although not necessarily deliberately. One could also speculate that it contains floor-sweepings from a floor which was covered with rushes etc. cut from areas of damp ground.

The samples from period 3 are associated with two buildings:

Samples 101, 100, 107, 93 and 104 from [1627], 106 and 92 from [1633] and 102 from a soil spread between them.

Looking first at [1627], the four samples from floors are species-poor and have few seeds. This suggests that either conditions for preservation were poor or, more likely since there are plenty of remains in adjacent, contemporary contexts, that the floors were kept clean. There is no evidence of what the rooms were used for. 100, 101 and 104 were from TWINSPAN group B although 107 was classified into group C mainly because of the presence of *Linum catharticum*.

Sample 93 is from a dereliction layer in room 1534 of [1627] and was classified into TWINSPAN group H along with sample 130 discussed above. It has a large proportion of wet ground plants and grass caryopses, suggesting either local waterlogging of the derelict site or the presence of a rich grassland community. The latter could have arrived on-site in the form of fodder/bedding. Cereal fragments were common, perhaps indicating spilled animal feed.

Taken as a whole, this context may represent change of usage to, for example, stabling rather than a period of dereliction or disuse.

Cutting across one corner of room 1534 [1627] was a gulley, (sample 92). As well as a wet-grassland element the most abundant species represented was *Urtica dioica*. This strongly indicates high levels of nutrients and is often associated with outflows from byres, and there is evidence that the room did at one time function as a stable/byre. Fig pips were also abundant and this suggests at least some human waste.

In comparison with [1627], [1633] was, at this time, of a more diverse nature. Large numbers of seeds of sedges, plants demanding wet conditions for growth, were present. The high seed values of grasses and grassland

plants could suggest a store for hay or, perhaps more likely, grass and sedges cut for bedding. The high diversity of taxa, many of which are of the local background type, could be accounted for by relatively free ventilation of the room. Alternatively, the room may have been visited on a regular basis, and seeds of nitrophilous species, such as *Urtica dioica* which would have been growing around the adjacent ditch and byre, would have been brought in on feet.

Sample 102 was taken from a soil accumulation lying between these two buildings and had a floral assembalge similar to that of 93 but lacking the fig pips. They were classified into different TWINSPAN groups but the two concerned, G and H, have been discussed above as probably being artefacts of identification practices rather than reflecting a real difference. Sample 102 had a wide range of the general, wet ground and disturbed elements suggesting that the deposit formed in an area with little trampling or regular traffic. There are moderate amounts of *Agrostemma githago* seeds, a plant associated with cereal crops, and this is echoed in sample 106 from a floor in the adjacent [1633]. Perhaps, if 106 was a storage area/stable, then some of the material was dropped as it was being brought into the building.

This group of samples draws a very clear contrast between the two buildings with [1627] initially being clean and [1633] much less so; suggesting that the former was either a human habitation or well-kept store and the latter a byre. The gulley may indicate nearby habitation, for which it served as a drain, since it contains fig pips.

Overlying these features were dumps of soil from which samples 91 and 94 were taken. The botanical assemblage is similar in the two samples and not very diverse. This is somewhat surprising in an external context and suggests that either the material was sterile, perhaps being brought in from elsewhere and deliberately spread, or that the area did not lie waste long enough to be colonised by weedy species. Both samples were classified into TWINSPAN group E.

Period 4 is represented by samples from [1090] and environs.

Sample 84 was from an oval pen and has an extremely rich flora which is dominated by grass caryopses, wheat glume-bases and bracken fronds. This suggests usage as an animal pen with remains of bedding and hay. There is very little nettle seed, perhaps indicating that the pen was in frequent use thus preventing nettle growth; although nettles require high levels of nitrogen and phosphorus they are intolerant of trampling. Alternatively the deposit could have been built up by continual dumping of domestic refuse inside an enclosure, somewhat like a present-day compost heap. Size of the pen may indiacte one or other of these theories since animals presumably would require a considerably larger area. The pen could also have been a protected place for drying/storing hay or bedding similar to a rick. Investigation of parasite eggs might help determine whether faecal material was present thus suggesting one of the first two hypotheses.

Sample 83 comes from a pit within this structure and from the same period. Its flora, however, is totally different and impoverished. It may have been regularly cleaned for some reason, perhaps to provide a water/feed trough for the encumbents.

Three other samples are associated with [1090] during this phase; 67 and 65 from floor deposits in rooms, both classified into TWINSPAN group C, and 72 from a floor deposit in an adjoining passageway (TWINSPAN group B). The former two have a very similar flora and botanically could well be from the same floor. No plant is in any abundance and neither sample is rich. It therefore appears that these floors were clean. The adjoining passageway is less diverse again and therefore was also clean. All of these samples have a moderate trampled ground element, seeds of which plants could have been carried into buildings on feet.

During this period there was a widespread accumulation of material over the site from which two samples, 73 and 80, were taken. Sample 73 (TWINSPAN group F) has an abundance of grass and cereal fragments, particularly *Triticum* glume-bases). *Eleocharis* sp(p). seeds are also very common. The large amount of cereal as well as more corn-cockle than in any other sample analysed, suggests deposition of straw either in the form

of manure/bedding or as part of a grain cleaning process. It would be extremely useful to see if parasite remains were in this material because, if not, this could be the first indication that cereal processing was being carried out on an urban site. Sample 80, although also taken from this soil , was totally different from 73. It was much less diverse and contained far fewer seeds. It contains the ubiquitous background flora but little else. Although apparently a spot sample, taken because it contained a cluster of pupae, it is suggested that it is more typical of a widespread accumulation of soil. 73 may thus represent local dumping of material.

Stratigraphically above these samples, two others (77 and 64) were taken from a floor level in building [1090] and one from a wall collapse feature (sample 61). The floor samples were moderately diverse but, like many floor deposits, had few seeds in total, again suggesting relatively clean conditions. *Stellaria graminea* is the most abundant type in sample 64; this little stitchwort is a common plant in damp grassland and flowers rather late in the summer. The wet/fen grassland element is well represented perhaps, therefore, the floor was strewn with this material in the form of late-cut hay or just to make the floor more pleasant to live with if, indeed, the room was inhabited. Sample 61 was thought to be a turf deposit. Its floral assemblage is the rather usual background one with the addition of a moderate amount of heather twigs. It could be the remains of a heather thatched roof upon which sods of grass had been lain for extra weather protection (very much as traditionally done on crofts in the Orkneys).

Period 5 is a period of widespread soil and dump accumulation over the whole site. Samples 52 and 78 (TWINSPAN group B) and 55 (TWINSPAN group C) are neither diverse nor seed-rich. This suggests that, rather than abandonment, material was deliberately spread to clear/tidy the site prior to re-use, probably over a relatively short time. 52 has the highest values of tree buds in the samples analysed and consisted of many twigs. It was perhaps brushwood used to rapidly fill in areas and allow soil to compact within it thus providing a solid surface for re-building upon. Sample 55 is from a short-lived industrial activity during this period. It

too has a typical assemblage of Chenopodiaceae, Polygonaceae and Cyperaceae but has several carbonised cereal grains and other seeds, presumably accidently burnt during the industrial process which, since the original material contained both burnt wood shavings and charcoal, probably involved fire. It is interesting to speculate whether the bracken found in the sample was used as kindling, as part of the process or was discarded material from elsewhere.

Samples from period 6a are associated with the sill-beam buildings, [806] and [981]. All of the samples from [806] (samples 46, 38, 39 and 4) are species-poor and have only the 'background' taxa; they are, however, classified into different TWINSPAN groups. The building was thus clean, the floors from which 46 and 4 were taken particularly so. In comparison, sample 48 was from a floor in [981] and is very diverse with a strange mixture of taxa. Bracken frond fragments are by far the most abundant and there are very large numbers of grass caryopses, docks and yellow rattle seeds - these suggest animal bedding and hay. The high values of *Prunella vulgaris* (self-heal) could also be accounted for in this way. It is a little more difficult to account for the very abundant seeds of *Linum catharticum* (purging flax). This short, c. 10cm, annual is found on open-ground, often lime-rich, such as on the edges of disused railway lines on the clinker ballast, but it is also common in damp, fen-type short grasslands. If, in this sample, it was part of the grassland flora then the hay must have been cut very close to the ground. However, such material could also be dung from animals pastured on local grassland but housed at night. The sample was classified next to sample 84 which was from the enigmatic, curved pen. A small amount of cereal fragments and weeds could suggest dropped/excreted animal feed and, again parasite egg investigations would be useful.

Sample 51 represents a floor deposit between the two buildings. It has clear links to 48, with a very similar suite of taxa but all much less abundant, as well as to the floor samples from [806]. It must have been used fairly regularly because organic rubbish was obviously not accumulating to any great extent.

An interesting parallel can be drawn between this group of samples and those from period 3a. In both cases there are two buildings, one of which was kept very clean, at least initially, but in the other there is strong evidence for build-up of animal fodder/bedding/manure. Were these units of mixture of human habitation or store of clean dry material and adjoining animal housing?

Sample 31 is an archaeologically somewhat unknown quantity being a period 6/7 ?floor; and its botanical assemblage is likewise uninformative being impoverished with mostly disturbed-ground plants and hazel nut fragments.

Of the remaining six samples three are from external soils (samples 17 and 19, period 8b; sample 20, period 9), two are from the padstone structures [1776] and [1777] (samples 12 and 13) and one (sample 16) from a post-Roman well. Samples 16 and 17 are the only two with enough botanical remains to make any speculations about.

Sample 17 (period 8b) has a high wet-ground element, being dominated by sedges. It also has high values of *Urtica urens* and *Capsella bursa-pastoris* both of which are weeds of rich soils but tolerant of some compaction. This soil was perhaps cultivated and may have formed a 'garden plot' on the site. It has a varied suite of weeds typical of present-day plots of nutrient-rich but not well-cultivated soils.

Samples 19 and 20 only have three seeds in them. Whilst the material may not have been suitable for seed preservation it could also have been more or less sterile and brought onto the site deliberately; it may have been a very short-lived feature; or the area may have been so well used that plants could not grow.

Sample 16, the bottom of a post-Roman well has quite a diverse assemblage but most seeds are at very low levels (<5). The exceptions are bracken frond fragments in quantity and a few hazel nut shells. These may have all been thrown in to start closing the well or may have been deposited naturally. Alternatively, the bracken may have been deliberately thrown there to cover the base of the well and prevent the sediment being stirred up into the water, if it was shallow, when the buckets fell into

it. This, of course is sheer speculation! Bracken occurs in several other contexts from this site, all possibly associated with penning/stabling. It is perhaps most likely that the material in this well was, in fact, a dump deposit from such a context.

SPECIFIC ARCHAEOLOGICAL CONSIDERATIONS

Does the plant material show change with time ?

No systematic changes are apparent. This may reflect the actual state of affairs or it may be an artefact of sampling with the number of samples analysed too small for any pattern to have become apparent. Addition of results from nearby Annetwell Street may result in some trends being discovered.

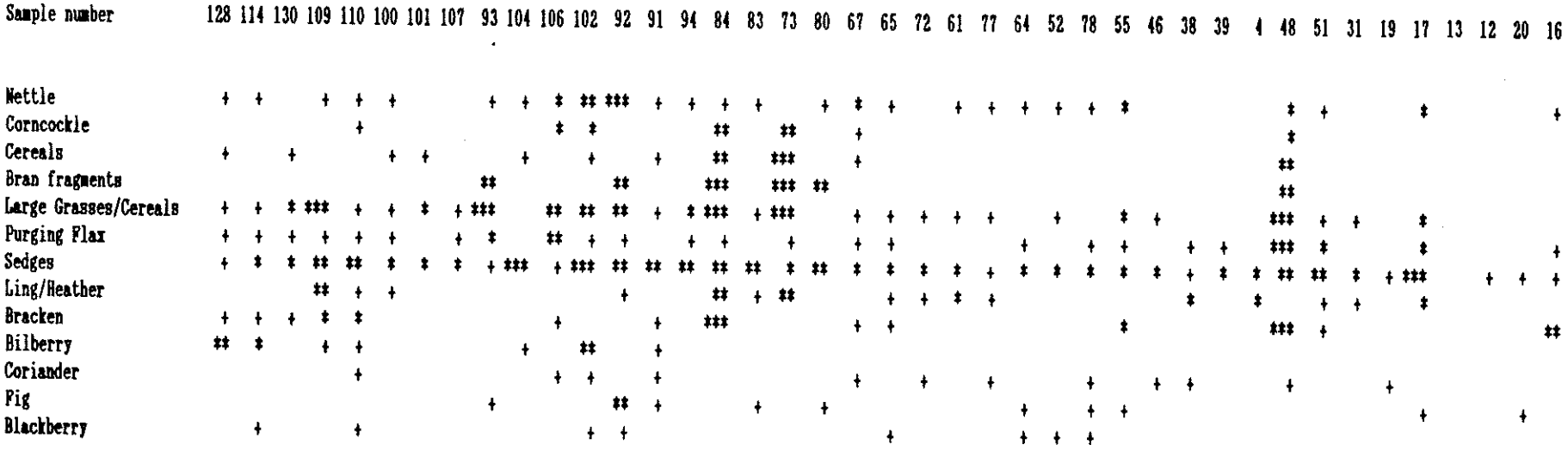
Were there any vacant building plots ?

There have been several periods when areas of land were thought by the archaeologists to have lain derelict or un-used. However, the floral assemblages from these contexts are sparse and certainly lack the species that, today, would be present in such areas, eg *Epilobium spp.*, *Verbascum spp.*. It is therefore suggested that, rather than abandonment, the areas were levelled quickly perhaps in a deliberate attempt at tidying up, or even that they may have been regularly and heavily used thus preventing colonisation by such species. The "parade-ground" hypothesis would fit into this category.

Why is there a persistent damp-ground element ?

Given the riverine setting of Carlisle it is not surprising that seeds of the damp-ground element are present in its deposits. However, they are abundant in both external and internal contexts, and, whereas it may be easy to visualise wet ground outside, inside poses more of a problem. It is suggested that sedges, rushes etc. were being gathered and brought into buildings for animal bedding and/or strewing on domestic floors. In

Figure 11: Summary of economic plant remains



Key to symbols used :
(no. seeds per Kg/sample)

+	1 - 9
*	10 - 49
**	50 - 199
***	200 plus

these cases the presence of the element simply says that it was growing locally but says little about the conditions on-site.

Economic usage of plant material: (Figure 11)

The site has produced evidence for a range of species but none were present in any great quantity.

Fig was the most abundant exotic and would have been imported presumably for food, or maybe medicinal purposes. The plants could have been grown in a sheltered situation locally but are unlikely to have been very common. The fruits preserve well in the dried state and are most likely to have arrived in this form.

Coriander is not native to Britain and must therefore have been imported in the first place. Subsequently it could have been grown as a pot-herb. Its strongly aromatic seeds are a popular Eastern and Mediterranean flavouring and its leaves can be used as a salad green.

Wild celery was present but it is not possible to say whether it was utilised in any way.

Native wild fruits such as plum, sloe, blackberry, pear and apple were occasionally found.

Bilberry seeds were abundant in a few samples. These plants grow locally in the area today and could have formed a valuable dietary supplement for a short period each year when they fruit in early July. They do dry well but are extremely time-consuming to pick.

Hazel nuts are common over the site and hazel was no doubt growing in the vicinity. There were no hoards and no evidence for large-scale harvesting. It is suggested that they were eaten as and when they ripened and their shells casually discarded. Some of

the nuts were very large, much more so than those found in the area today, and could have been from cultivated nuts akin to the Kentish Cob, or from the eastern Mediterranean taxon, *Corylus maxima*.

Grapes were transported in the dried state as raisins, sultanas and currants, and well-known from other Roman sites although absent from the material sampled here.

As a whole, the evidence for human food elements is sparse and strongly suggestive of casual consumption and disposal. It is therefore unlikely that people were living on this site.

On the other hand, the evidence for use of plant material as flooring/roofing is more abundant.

Bracken fronds seem to have been used for animal bedding/litter much the same way as in contemporary Lakeland farmsteads. Its fronds would have been dried first and then stored for use during the winter, assuming that livestock was kept outside during the summer months.

Both twigs and flowers of heather/ling were abundant in a few contexts. The abundance of flowers suggests that the material was cut in the early autumn/winter since the plant flowers in August and few dried flowers remain following the winter.

The plant was commonly used as thatching in the north of England as is evident from one or two remaining, but derelict, buildings (see also Emery, 1986). It is likely to have been used in a similar way at Castle Street, although it may also have been used as a bedding material.

Turf and peat have both been recorded by the archaeologists. Although supportive botanical evidence is lacking it is considered unlikely that such a locally common commodity would have been overlooked.

Waterlogged periderms of predominantly wheat/rye, but some barley and oat, were present but grain was apparently not stored in any quantity. The material may be the remains of animal fodder; some of it was beetle-infested and possibly also mouldy. Other graminaceous material, originating from species-rich damp meadows, would have been used for animal fodder or bedding.

Carbonised seeds, mainly cereal grains, were found in several samples but not in any abundance. They are likely to have been burnt accidently and to represent odd bits of material lying around on floors, floor sweepings etc.. They are not abundant enough in any context to represent a grain store.

STATUS OF THE SITE

Castle Street lay outside the walls of the Roman fortress. It is therefore not surprising that we have found no evidence of, for example, grain storage or the preparation of food for human consumption. Such activities are perhaps most likely to have been undertaken within the comparative security of the fort itself. We therefore anticipate that evidence for these activities may be discovered at the Annetwell Street site, which lies within the fort.

It is evident that some animals were housed and fed on the Castle Street site and that fodder was stored nearby. Foul matter is present in extensive external contexts, suggesting that the area may, at times, have functioned as a dumping ground. Such material may have been from on-site byres/stables; or could have been "mucked-out" from, possibly cavalry, stabling within the fort.

Castle Street is therefore best regarded as an ancillary area of supportive nature.

REFERENCES

Emery, N. (1986) Fell Close Farm and the use of 'Black Thack'. *Durham Archaeological Journal*, 2, 91-96.

Hill, M.O. (1979) TWINSPAN

Hill, M.O. (1979) DECORANA

Oberdorfer, E. (1977, 1978, 1983) *Süddeutsche Pflanzengesellschaften*. Teils I, II and III. Gustav Fischer.

Runge, F. (1973) *Die Pflansengesellschaften Deutschlands*. Aschendorff.

Smith, A.G. (1978) *The Moss-Flora of Britain and Ireland*. Cambridge University Press.

Tutin, T.G. *et al.*(1964-80) *Flora Europaea*. Vols 1-5. Cambridge University Press.

van der Veen, M. and Fieller, N. (1982) Sampling seeds. *Journal of Archaeology Science*. 9, 287-298

ACKNOWLEDGEMENTS

We gratefully acknowledge Shaun Doran for the processing and initial sorting of the material, and our thanks go to friends and colleagues in the Carlisle Archaeological Unit and Departments of Archaeology, Botany, and Zoology, University of Durham for useful discussion during the work and critical reading of the manuscript. Thanks also go to Harry Kenward of the EAU, York, for making available the text of insect reports on Castle Street.

Appendix II
Latin/English names

Latin	English
Achillea millefolium	Milfoil, Yarrow
Agrostemma githago	Corn cockle
Alchemilla vulgaris	Ladys Mantle
Alisma plantago-lanceolata	Water-Plantain
Anthemis cotula	Stinking Mayweed
Aphanes arvensis	Parsley Piert
Apium graveolens	Wild Celery
Apium nodiflorum	Fool's Watercress
Arenaria serpyllifolia	Thyme-leaved Sandwort
Aster tripolium	Sea Aster
Atriplex patula	Common Orache
Betula pubescens	Birch
Brassica nigra	Black Mustard
Bromus sp.	Brome grass
Calluna vulgaris	Heather
Capsella bursa-pastoris	Shepherd's Purse
Carex divulsa	Grey Sedge
Carex nigra	Common Sedge
Carex panicea	Carnation-grass
Carex pilulifera	Pillheaded Sedge
Carex riparia	Great Pond Sedge
Centaurea cyanus	Cornflower
Cerastium arvense	Field Mouse-Ear-Chickweed
Cerastium fontanum	Mouse-ear Chickweed
Chamaemelum nobile	Chamomile
Chenopodium album	Fat hen
Chenopodium bonus-henricus	Good King Henry
Chenopodium filicifolium	Fig-leaved Goosefoot
Chrysanthemum vulgare	Ox-eye Daisy
Cirsium arvense	Creeping Thistle
Cirsium palustre	Marsh Thistle
Conium maculatum	Hemlock
Coriandrum sativum	Coriander
Corylus avellana	Hazel
Crepis paludosa	Marsh Hawks-beared
Eleocharis palustris	Common Spike Rush
Empetrum nigrum	Crowberry
Epilobium angustifolium	Rose-bay Willow-herb
Erica tetralix	Cross-leaved heath
Euphorbia exigua	Dwarf Spurge
Fallopia convolvula	Black Bindweed
Ficus carica	Fig
Filipendulua ulmaria	Meadow Sweet
Fraxinus excelsior	Ash
Galeopsis tetrahit	Hemp Nettle
Galium verum	Lady's Bedstraw
Galum aparine	Goosegrass
Galum palustre	Marsh Bedstraw
Geranium columbinum	Long-stalked Cranesbill
Heracleum sphondylium	Hogweed
Hordeum vulgare	Barley (6 row)

Hydrocotyle vulgaris	Pennywort
Hyoscyamus niger	Henbane
Isolepis setaceus	Bristle Scirpus
Juncus	Rush
Lapsana communis	Nipplewort
Leontodon autumnalis	Autumnal Hawkbit
Leontodon hispidus	Rough Hawkbit
Leontodon taraxacoides	Hairy Hawkbit
Lepidium heterophyllum	Smith's Cress
Linaria vulgaris	Toadflax
Linum catharticum	Purging Flax
Luzula	Wood Rush
Lychnis flos-cuculi	Ragged Robin
Lycopus europaeus	Gipsy Wort
Mentha aquatica	Water mint
Montia fontana	Blinks
Mycelis muralis	Wall Lettuce
Myosotis scorpioides	Water forget-me-not
Origanum vulgare	Marjoram
Papaver argemone	Long Prickly-headed Poppy
Papaver dubium	Long-headed Poppy
Papaver hybridum	Round Prickly-headed Poppy
Papaver rhoeas	Field Poppy
Papaver somniferum	Opium Poppy
Peucedanum officianale	Sulphur-weed
Picris hieracioides	Hawkweed Ox-tongue
Plantago lanceolata	Ribwort Plantain
Plantago major	Great Plantain
Plantago media	Hoary Plantain
Polygonum hydropiper	Water-pepper
Polygonum lapathifolium	Pale Persicaria
Polygoum aviculare	Knotgrass
Polygoum persicaria	Willow Weed, Red Shank
Potentilla anglica	Trailing Tormentil
Potentilla anserina	Silverweed
Potentilla argentea	Hoary Cinquefoil
Potentilla erecta	Common Tormentil
Potentilla palustris	Marsh Cinquefoil
Potentilla reptans	Creeping Cinquefoil
Potentilla sterilis	Barren Strawberry
Prunella vulgaris	Self Heal
Prunus domestica	Plum, Damson
Prunus padus	Bird Cherry
Prunus spinosa	Sloe
Pteridium aquilinum	Bracken
Pyrus communis	Pear
Ranunculus acris	Meadow Buttercup
Ranunculus bulbosus	Bulbous Buttercup
Ranunculus flammula	Lesser Spearwort
Ranunculus repens	Creeping Buttercup
Ranunculus sardous	Hairy buttercup
Ranunculus sceleratus	Celery-leaved Crowfoot
Raphanus raphanistrum	Wild raddish
Rorippa islandica	Marsh Yellow Cress
Rosa pimpinellifolia	Burnett Rose
Rubus fruticosus	Blackberry
Rubus idaeus	Raspberry

Rumex acetosella	Sheeps Sorrel
Rumex hydrolapathum	Great Water Dock
Rumex obtusifolius	Broad-leaved Dock
Sambucus nigra	Elder
Scutellaria galericulata	Scullcap
Secale cereale	Rye
Silene alba	White Campion
Silene vulgaris	Bladder Campion
Solanum nigrum	Black Nightshade
Sonchus asper	Sow-Thistle
Sorbus acuparia	Rowan
Sorbus aria	White Beam
Spergula arvensis	Corn Spurrey
Stachys arvensis	Field Woundwort
Stellaria graminea	Lesser Stitchwort
Stellaria neglecta	Greater Chickweed
Stellaria nemorum	Wood Stitchwort
Stelleria media	Chickweed
Taraxacum officinale	Common Dandelion
Thlapsi arvense	Field Penny Cress
Torilis nodosa	Knotted Hedge-parsley
Tripleurospernum maritium ssp. inodorum	Scentless Mayweed
Triticum aestivum	Bread Wheat
Urtica dioica	Stinging Nettle
Urtica urens	Annual Nettle
Vaccinium myrtillus	Bilberry
Veronica arvensis	Wall Speedwell
Veronica officinalis	Common Speedwell
Viola hirta	Hairy Violet

APPENDIX III
Ecological groupings and their associated taxa

WEEDS OF CULTIVATION

Stellaria media
Polygonum persicaria
Aphanes arvensis
Fallopia convolvulus
Agrostemma githago
Papaver argemone
Galeopsis tetrahit
Urtica urens
Spergula arvensis
Galeopsis sp(p).
Chenopodium album
Thlaspi arvense
Papaver rhoeas
Papaver dubium
Centaurea cf. cyanus
Brassica nigra
Fumaria sp(p).
Anthemis cotula
Chenopodium cf. filicifolium
Tripleurospermum inodorum
Veronica arvensis
Papaver cf. hybridum
Euphorbia cf. exigua
Cerastium arvense

DISTURBED GROUND

Polygonum lapathifolium
Chenopodium/Atriplex
Sonchus asper
Raphanus raphanistrum
Raphanus raphanistrum pod frag.
Lapsana communis
Potentilla reptans
Capsella bursa-pastoris
Silene alba
Chenopodium sp(p).
Atriplex patula/hastata
Potentilla sterilis
Mycelis muralis
Epilobium cf angustifolium
Lepidium heterophyllum
Arenaria serpyllifolia
Atriplex cf. patula
Chenopodium bonus-henricus
Silene cf. vulgaris
cf. Picris hieracioides
Stachys arvensis
Sonchus cf. arvensis

Rumex obtusifolius-type

WET GRASSLAND/FEN GRASSLAND

Prunella vulgaris
Stellaria graminea
Carex nigra group
Carex (trigonous)
Carex (lenticular)
Eleocharis sp(p).
Juncus sp(p).
Lychnis flos-cuculi
Carex sp(p).
Polygonum hydropiper
Filipendula ulmaria
Lycopus europaeus
Potentilla palustris
Carex pilulifera
Acrocladium cuspidatum
Cirsium cf. palustre
Hydrocotyle vulgaris
Carex cf. divulsa
Carex panicea
Cyperaceae undiff.
Scutellaria galericulata

WET, MUDDY GROUND

Ranunculus flammula/cf. flammula
Montia fontana ssp. chondr.
Apium graveolens
Mentha aquatica
Montia fontana ssp. fontana
Isolepis setaceus
Apium sp(p).
Alisma plantago-aquatica
Bidens sp(p).
Ranunculus sceleratus
Drepanocladus revolvens
Rumex cf. hydrolapathum
Myosotis cf scorpiodes
Rorippa cf. islandica
Carex cf. riparia
Ranunculus (Batrachium)
Galium palustre
Eleocharis palustris
Ranunculus sardous/parviflorus.
Apium nodiflorum

TRAMPLED

Polygonum aviculare
Plantago major
Plantago media
Potentilla anserina

DRY HEATHLAND

Calluna vulgaris twigs
Calluna vulgaris flowers
Vaccinium myrtillus
Erica tetralix leaf/shoot
Erica sp(p).
Empetrum nigrum

ACID GRASSLAND

Rumex acetosella
Pteridium aquilinum -frond frag.
Potentilla erecta-type

NEUTRAL GRASSLAND

Ranunculus bulbosus
Ranunculus acris
Leontodon hispidus
Achillea millefolium
Euphrasia/Odontites
Cerastium sp(p).
Cerastium cf. fontanum
Plantago lanceolata
Solanum nigrum
Alchemilla cf. vulgaris s.l.
Galium verum
Torilis nodosa
Anthriscus/Chaerophyllum
Veronica officinalis
Leontodon autumnalis
cf. Rhinanthus sp(p).
cf. Origanum vulgare
Viola hirta
Linaria vulgaris
Achillea millefolium - flower
Chrysanthemum vulgare
Leontodon cf. taraxacoides

NITROPHILOUS GROUND

Urtica dioica
Heracleum sphondylium
Sambucus nigra
Conium maculatum
Galium aparine

WOOD/SCRUB AND EDGES

Corylus avellana nut fragment
tree bud
Rubus fruticosus
Rosaceae undiff.
Prunus spinosa
Betula sp(p).
Prunus cf. padus
leaf scar tissue
Rubus fruticosus/idaeus
Prunus cf. domestica
bud scales - undiff.
Stellaria cf. nemorum
Sorbus aucuparia
Hyoscyamus niger
Malus/Pyrus
cf. Fraxinus excelsior bud
Orthotrichum sp(p).
Pyrus communis
Betula cf. pubescens
Rosa cf pimpinellifolia
Prunus sp(p).
Rosa sp(p).
Sorbus aria
Nutshell fragments

UNCLASSIFIED

Ranunculus repens/cf. repens
Linum catharticum
Potentilla sp(p).
Rumex s(p)p.
Compositae undiff.
Gramineae undiff.
Indeterminate
Ranunculus repens-type
Ranunculus sp(p).
Polygonum sp(p).
Brassica sp(p).
Umbelliferae undiff.
Ficus carica
Hypnum cupressiforme
inflorescense base
Amblystegium serpens

Papaver somniferum
Stellaria sp(p).
Leontodon sp(p).
cf. Cirsium
Luzula sp(p).
Veronica sp(p).
Monocot. nodes
Anthriscus caucalis/Torilis sp(p).
Coriandrum sativum
Compositae (immature)
Viola sp(p).
Cerastium/Stellaria
Caryophyllaceae undiff.
Arenaria sp(p).
Potentilla cf. anglica
Alchemilla sp(p).
Galium sp(p).
Chamaemelum nobile
cf. Viola
Peucedanum/Pastinaca
Eurhynchium cf. praelongum
Atriplex sp(p).
Potentilla cf. argentea
Bryophyte fragments
Polygonum/Rumex
Verbascum/Scrophularia
fungal fruiting bodies
Eurhynchium sp(p).
cf. Pohlia sp(p).
Amblystegium sp(p).
Cruciferae undiff.
Rumex sp(p). perianth
petalloid tissue
cf. Amblystegium varium
cf. Primula sp(p).
Brachythecium sp(p).
Stellaria cf. neglecta
Stachys sp(p).
Mentha-type
Veronica sp(p). capsule
cf. Cirsium arvense
Peucedanum sp(p).
Taraxacum officinale agg.
Peucedanum officinale
Geranium cf columbianum
Silene sp(p).
Gramineae node
Aster cf. tripolium
cf. Matricaria
Senecio sp(p).
Isopterygium elegans
Cirsium sp(p).
Hypericum sp(p).
Bromus sp(p).
Centaurea sp(p).

CEREAL REMAINS (WATERLOGGED)

Cerealia/large Gramineae
Triticum glume base
Culm nodes - cereal/large Gram
Triticum rachis internodes
Hordeum vulgare
Triticum stem frag.
Cereal embryo

CARBONISED REMAINS

Hordeum undiff.
Triticum aestivum grain
Gramineae undiff.
Secale cereale grain
Hordeum hulled
Hordeum twisted hulled
Hordeum rachis internode
Legume <4mm
Hordeum straight
Rumex acetosella
Bromus sp. grain
Hordeum straight hulled
Triticum glume

VEGETATIVE FRAGMENTS																																									
wleaf scar tissue											1						12				2																					
wtree bud					5					1	14	1		1	13				1		11		85			2		1													
wbud scales - undiff.					4		26																																		
winflorescense base				2		3					3			4				1	1				10			4				1											
wpetalloid tissue				3		1																																			
wNutshell fragments				1																																				
wfungal fruiting bodies				2				3																																	
wIndeterminate	5	2		21	1	4	1	6	20	2	5	8	2		4	215		44		1	4	1	1	3		5	3	2				166	3							
Number of Species (246)	49	52	43	63	49	52	17	14	51	10	65	70	41	43	44	44	33	36	18	35	44	24	52	32	44	36	28	42	11	41	28	3	42	43	36	2	44	1	1	8	36

Key to symbols : w = waterlogged
c = carbonised

wPrunus spinosa -spine									1								2				1													2										
wPrunus sp.						1																																						
wSorbus aucuparia						1																			1																			
wSorbus aria									1																																			
wPyrus communis					1																																							
wMalus/Pyrus																1																			1									
RUBIACEAE																																												
wGalium verum															1								1																					
wGalium palustre	1																																											
wGalium aparine														1																														
wGalium undiff.													1																															
SCROPHULARIACEAE																																												
wVerbascum/Scrophularia				1																																								
wLinaria vulgaris																			1																									
wVeronica arvensis								1																																				
wVeronica officinalis													1																															
wVeronica sp. capsule					6										27	6													2															
wVeronica sp.																						18					6																	
wcf. Rhinanthus undiff.											254																																	
wEuphrasia/Odontites					9		1	5					2		15	4	1	6						3			3																	
SOLANACEAE																																												
wHyoscyamus niger					2													2																										
wSolanum nigrum								4					1						1		2								1	1														
UMBELLIFERAE																																												
wHydrocotyle vulgaris										1																																		
wAnthriscus/Torilis								1		1																																		
wAnthriscus/Chaerophyllum																		1			1																							
wTorilis nodosa						1												2																										
wConium maculatum							1																																					
wApium graveolens																1	17		1						2				1				1	2			3							
wApium nodiflorum																		3																										
wApium sp.					3										1		1																											
wPeucedanum officinale															4			17					8	5																				
wPeucedanum sp.									4																			1																
wcf. Peucedanum										1			1																															
wPeucedanum/Pastinaca	1																																											
wHeracleum sphondylium					1										1	1											11				1													
wCoriandrum sativum									1						6	1		1						1	1		3			1		1	2			1			2					
wUmbelliferae undiff.						1							2		1										2								4					1						
URTICACEAE																																												
wUrtica dioica					1	6		6	2	6			4	1	34	194	299	1	6	6	6		4	14	9	1	5	9	6	1	11					24	3			40				7
wUrtica urens					1	2				1						3				6				2		1	2	2											85				6	

wPolygonum aviculare				[illegible]																																								
wPolygonum persicaria				1	4		3	16	1			63	2	22	11	99	10	5	86	7	18	24	6	4	2	9	3	1	4	1	2	3				8	3	2		2				1
wPolygonum lapathifolium				3	25		9		5			66		91	11	78	16	9	52	2	36	16	8	17	1	8	3	1	2		2		1	2			2	11		1				2
wPolygonum convolvulus							1	1				3		1	4		2	1	29		18	2		1	1	1			2						2	4								
wPolygonum hydropiper				1										1					17				1	1		1							1											
wPolygonum undiff.						39						6	1		3		1					1																						
wPolygonum/Rumex	3	2																																										
wRumex obtusifolius-type													1																															
wRumex acetosella				21	16	2	10	22	11	1	1	17		70	17	15	12	48	23	2	48		21	21	2	2	1	10	6	4	2	10	2	9		32	11	1		20				3
cRumex acetosella				1																																								
wRumex cf. hydrolapathum												1																																
wRumex sp. perianth							1																																					
wRumex sp.				4	6	15	13	6	5	2		6	1	31	9	10	12	17	61	6	46	4	1	8		5	3	2	2	7			1	1	10	213	11			1			1	5
PORTULACACEAE																																												
wMontia fontana ssp. fontana															1	2																												
wMontia fontana ssp. chondr.				3			4		5	2	1	1		5	1	5	12	4		2				2	5	2											27							
PRIMULACEAE																																												
wcf. Primula sp.									1																																			
PTERIDOPHYTA																																												
wPteridium aquilinum -frond frag.				3	6	8	12	13						1			2		406				1	5							13					790	1							93
RANUNCULACEAE																																												
wRanunculus acris				1	5		6	7	1					3	3	4	7		29	2				1			3					63	10	1		3								
wRanunculus bulbosus				8	9		5	3						3	6	24							3	2			4		3			3	4		8	3			6					
wRanunculus repens/cf. repens				1	10	1	5	8	13	3						6	9		81	1	6		4	1	2	2					1	2	2		71	15	1		4				1	
wRanunculus repens-type							5							52	6			34						30		14			6		5							1						
wRanunculus flammula/cf. flammula				4	7	4		1	2	2				17	11		3		35	4	48	2	2		1				4	3		4	1		32	5			1				1	
wRanunculus sardous/parvi.																			2																									
wRanunculus sceleratus 1														4																														
wRanunculus (Batrachium)						2																																						
wRanunculus sp.				2	3	23					1	143		9	7	13	11						3		1		1		2									1	2				1	
ROSACEAE																																												
wFilipendula ulmaria														27					12									2							4									
wRubus fruticosus					4			2							3	4				1		2																						
wRubus fruticosus/idaeus																								5					1															
wPotentilla sterilis					1				3		1	2																																
wPotentilla cf. anglica												2												2			1				2													
wPotentilla anserina				1				1																			1																	
wPotentilla reptans						2											1			2									1							4								
wPotentilla erecta-type																		7																										
wPotentilla cf. argentea																		1					1																					
wPotentilla palustris														2					1								1																	
wPotentilla undiff.				3	6	4	10	9	4	1				5	10	7	13	4	52	12	24	2	4		3		6	1	11			1	2		63	13			67					
wAlchemilla cf. vulgaris s.l.			1				1																																					
wAlchemilla undiff.					2							1																																
wAphanes arvensis				4	4	3	2	3	1	3		7		4	7	2	2	11			12				3	1	1	1					8	2	1		4							
wRosa cf pimpinellifolia					1																																							
wRosa sp.															1																													

HYPERICACEAE																																						
wHypericum sp.								1																														
JUNCACEAE																																						
wJuncus sp.		1	2	97	5						7	20				58		24			2	7			6				4	1	3							3
wLuzula undiff.				1					1							12		12												8								
LABIATAE																																						
wMentha aquatica				1	1										2			6				1							1									
wMentha-type		1									1																											
wLycopus europaeus				1							4				1	1						1																
wcf. Origanum vulgare												1																										
wPrunella vulgaris		9	11	27	26	28	3	1	24	1	21	19	6	6	5	151	11			6	5		4	1	14	2	4	2		6	6	229	16	3	43			3
wStachys arvensis														1																								
wStachys undiff.																					1																	
wGaleopsis tetrahit		1	2	4		2			13		7	3	2				8		6	4					1									1			1	
wGaleopsis undiff.																46		12																				
wScutellaria galericulata									1																													
LEGUMINOSAE																																						
cLegume <4mm																				1													3					
LINACEAE																																						
wLinum catharticum		2	2	2	4	9	3	1	44		53	7	6		5	6		12		2	2				3	7	4	4		3	3	221	16		36			3
MORACEAE																																						
wFicus carica									1				34	1			1		2				2		1	1								1		1		
OLEACEAE																																						
wcf. Fraxinus excelsior bud	1																																					
ONAGRACEAE																																						
wEpilobium cf angustifolium			2																																			
PAPAVERACEAE																																						
wPapaver somniferum		1										1			1												3											
wPapaver argemone			2	1	5	2	1				3	9	2	2	3		2									2				1								
wPapaver cf. hybridum												1								1																		
wPapaver rhoeas												4																										
wPapaver dubium											2																											
PLANTAGINACEAE																																						
wPlantago major			4								3			2		52		18		4	2	1								1		16			13			1
wPlantago lanceolata		1		1	1										1														1									
wPlantago media				1																																		

CYPERACEAE																																									
wEleocharis palustris			2																																						
wEleocharis undiff.		3	5	1	8	5				3		9	6			2			324	2				1	1				2	2		16	4			2		1	1		
wScirpus setaceus							1			1		1	1			2					1	4	1												2						
wCarex pilulifera																2		1																							
wCarex cf. divulsa																						1																			
wCarex nigra group		3	4	12	4	4	5	2		56		367	7	15	3	10		2	6		2	3	3	6		5	9	8		2	17	15		24	21		279				1
wCarex panicea	2																																								
wCarex cf. riparia		1																																							
wCarex (trigonous)		3	2		5	1	3	1				38	1	11	7	2	17	3	36		1	1	3		10	3	4	3		1	10	16		16	18	1	54		1	2	1
wCarex (lenticular)		22	38		56	41	30	8			2	220	55	47	50	59	87	14	42		20	18	4		15	28	20	14	11		8	13		63	34	24	32				1
wCarex undiff.				40					2	207		3								40	18														1						
wCyperaceae undiff.							8																																		
EMPETRACEAE																																									
wEmpetrum nigrum										6																															
ERICACEAE																																									
wCalluna vulgaris flowers					2												5		6												8										
wCalluna vulgaris twigs					54	2	2							1			46	9	72			4	1	25	1						4		30		5	4	10				
wErica tetralix leaf/shoot											6																														
wErica sp.			2																																						
wVaccinium myrtillus		81	44		4	1					1	1	169		2																										
EUPHORBIACEAE																																									
wEuphorbia cf. exigua			.																																						
FUMARIACEAE																																									
wFumaria undiff. 3				1																																					
GERANIACEAE																																									
wGeranium cf columbinum					1																																				
GRAMINEAE																																									
wBromus sp.													2																												
cBromus sp. grain													1																												
wHordeum vulgare							1										4																								
cHordeum undiff.		1						1							1																										
cHordeum hulled													1		2																										
cHordeum twisted hulled															1																										
cHordeum straight		1																																							
cHordeum straight hulled										1																															
cHordeum rachis internode																					1																				
wTriticum glume base																	139		258	3											55										
wTriticum stem frag. 1																																									
cTriticum aestivum grain		2											1							1																					
cTriticum glume								1																																	
wTriticum rachis internodes																	23																								
cSecale cereale grain															1																										

CHENOPODIACEAE																																					
wChenopodium bonus-henricus											2																										
wChenopodium album				1												81							6							1						
wChenopodium cf. filicifolium					1						2																										
wChenopodium sp.				12															24	66																	
wChenopodium/Atriplex		4	8	6	20	19	9	4		26		221	25	13	33	14		96			9	13	10	17	8	6	1	1		3	17	9		7		8	7
wAtriplex cf. patula	1																																				
wAtriplex patula/hastata																123		36																			
wAtriplex sp.									1										6																		
COMPOSITAE																																					
wBidens undiff.																12																					
wSenecio sp.						1							1																								
wAster cf. tripolium									1																												
wAnthemis cotula															1																						
wChamaemelum nobile			2							1																											
wAchillea millefolium				2	19	12	1			1		18	4			1						1												1			1
wAchillea millefolium - flower					6																																
wTripleurospermum inodorum					1						2																										
wcf. Matricaria	1																																				
wChrysanthemum leucanthemum										3																											
wcf. Cirsium arvense						40							1													6											
wCirsium cf. palustre					1																																
wCirsium sp.													2																1								
wcf. Cirsium					2												8																				
wCentaurea cf. cyanus								3																													
wCentaure sp.	1																																				
wLapsana communis		2		2		1		4				4	2		1			2				3		2	1				3							1	4
wLeontodon hispidus		1		2	2	13	1			16		60	1		2	1		5			2	3	1	2	1	3					1	1		9		2	
wLeontodon cf. taraxacoides																				6																	
wLeontodon autumnalis										1																											
wLeontodon undiff.																174		54													24						
wcf. Picris hieracioides														1																							
wMycelis muralis	1								1																												
wSonchus asper			2	3		1			1	2		10	1	1	1		35	1				1		1		1							8			1	7
wSonchus cf. arvensis					1																																
wCrepis cf. paludosa					1													1																			
wTaraxacum officinale agg.																1																					
wCompositae (immature)	1																																				
wCompositae undiff.		3	1	1	1					1		6	1				17				1	3										3	8				3
CORYLACEAE																																					
wCorylus avellana nut fragment		15	3	9	12	59	8	22	3	7		19	18	2	10	6	13	6				3	1			4		3	2		9	31	2	8	21	8	11
CRUCIFERAE																																					
wBrassica nigra										1																											

APPENDIX I: Raw Data table, samples in period order, taxa in order of botanical family

Sample number		128	114	130	109	110	100	101	107	93	104	106	102	92	91	94	84	83	73	80	67	65	72	61	77	64	52	78	55	46	38	39	4	48	51	31	19	17	13	12	20	16
Period		2	2	2/3	2/3	2/3	3a	3a	3a	3a	3a	3a	3a	3a	3b	3b	4a	4a	4a	4a	4a	4a	4a	4a	4	4	5	5	5	6a	6a	6a	6b	6a	6a	6/7	8b	8b	9	9	9	13
ALISMATACEAE																																										
wAlisma plantago-aquatica											4																														
BETULACEAE																																										
wBetula cf. pubescens			6																																						
wBetula sp.										1			2							2				5																		
BORAGINACEAE																																										
wMyosotis cf scorpiodes	3																																									
BRYOPHYTA																																										
wAmblystegium serpens							1	1												1																						
wcf. Amblystegium varium					1																																					
wAmblystegium sp.	1																																									
wEurhynchium cf. praelongum						1		2		1																																
wEurhynchium sp.	1																																									
wHypnum cupressiforme			1													1	1	1		1			1							1												
wDrepanocladus revolvens			1		1																																					
wAcrocladium cuspidatum			1						1																																	
wIsopterygium elegans						1																																				
wOrthotrichum sp.		1																																								
wBrachythecium sp.							1																																			
wcf. Pohlia sp.	1																																									
wBryophyte fragments					4		10							9		1						1					4															
CAPRIFOLIACEAE																																										
wSambucus nigra							1																			5																
CARYOPHYLLACEAE																																										
wSilene cf. vulgaris	1																																									
wSilene alba							1											1									3							1								
wSilene undiff.			1																																							
wLychnis flos-cuculi				3	1				1			1	2	2			6						1			8																
wAgrostemma githago						1						24	26				52		60		2												24	4								
wCerastium arvense									2																																	
wCerastium cf. fontanum			4	77	26	4	1					53		2				2		4				1																		
wCerastium undiff.				2						17			27			2	2												2													
wCerastium/Stellaria										2																																
wStellaria media		4	1	7	3	5	2		2	25		24	3	6	2		81	6	42	8	8	10		11	5	4	1		23		2			55	1	3		4				6
wStellaria graminea		3	4	2	20	12	4	1		41	2	40	13	9	16	1	6		6	2	5	4	1	1	1	34	5	3			1	3		16	12			12				1