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**Publication draft: Plant and invertebrate remains from Iron Age  
and Romano-British deposits at North Cave, East Yorkshire**

by

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**Summary**

*This report contains a publication draft dealing with plant and invertebrate remains from Iron Age and Romano-British deposits excavated at North Cave quarry, East Yorkshire (formerly N. Humberside) in 1985-6 and 1995.*

**Keywords:** NORTH CAVE; EAST YORKSHIRE; IRON AGE; ROMANO-BRITISH; PLANT MACROFOSSILS; INVERTEBRATES; INSECT REMAINS; MOLLUSCS

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## Publication draft: Plant and invertebrate remains from Iron Age and Romano-British deposits at North Cave, East Yorkshire

### 5.3 Plant and invertebrate remains

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#### Introduction

The following account considers the results of analyses of plant and invertebrate remains from those of the deposits that were known or thought to contain waterlogged or charred organic material. Particular attention is paid to the deposits from a large pit-complex of 2nd-3rd century date, where excellent preservation permitted a detailed consideration of local environmental conditions at the site. The two areas of the excavation were examined for biological remains some years apart and it should be noted that some references to the biota from North Cave in other publications refer only to the 1985-6 excavations, which differed in certain respects from the later material. The biological evidence from the 1985-6 excavations has been presented in the form of a detailed 'technical report' by Allison *et al.* (1990); analogous data from the 1995 analyses are given by Carrott *et al.* (1996).

#### Methods

Unless otherwise stated, all samples were examined by means of 1 kg subsamples which were disaggregated and subjected to paraffin flotation, following usual methods in the Environmental Archaeology Unit (Kenward *et al.* 1980). The 'flots' were examined for plant and invertebrate remains; the residues were checked either wet or dry for plant remains and molluscs and their content of other kinds of materials (such as iron slag, chalk and flint gravel and unidentifiable organic material) was recorded. For a few samples, subsamples of more than 1 kg were examined, primarily with the aim of discovering ecologically or climatically important insect taxa; plant remains from some of these were also listed. Two further samples were 'bulk-sieved'

(Kenward *et al.* 1980) to 1 mm to look specifically for charred cereal remains.

#### Plant macrofossils

Plant remains have been recorded on a four-point scale of abundance (from 1 - one or a few individuals or fragments, to 4 - abundant individuals or fragments). Inevitably there will be some difference in the scores attributed separately by BMcK and AH, who were both responsible for the palaeobotanical work. For up-to-date accounts of interpretative methods employed in the Environmental Archaeology Unit for plant macrofossil assemblages, see Hall and Kenward (1990) and Kenward and Hall (1995).

The results of the plant macrofossil analyses are presented in the two technical reports (Allison *et al.* 1990; Carrott *et al.* 1996) which includes lists of plant taxa and other components recorded from the samples and summary statistics for the ecological, vegetation and other groups. A complete species list is given in Table 2 of this volume, however, and some statistics for assemblages from one group of samples in Table 1(b). Wood determinations (both of artefacts and other pieces of waterlogged wood) are presented in the technical report. No further comment is necessary on this list, other than to note the identifications of elder, *Sambucus*, stems from two later Roman contexts; elderberry seeds were frequent in many of the biological samples examined and it seems likely that this plant was growing at or near the site of deposition as part of the advancing scrub vegetation for which - as will be discussed - there is a good deal of evidence. Most of the other identifications were of oak.

## Insects and other invertebrates

Insects were identified by comparison with modern reference material and using the standard works. The species lists in rank and taxonomic order are given in the technical reports, together with secondary statistics for the assemblages. A complete list of invertebrate taxa recorded is given in Table 2 in this volume and a summary of pertinent statistics sample by sample in Table 1(a). The habitats of most the 'outdoor' beetle and bug taxa are given in table 5 of Allison *et al.* (1990).

Parasite ova were checked for by BMcK from many samples in the pit-complex (pits 12 and 14, phase 3, below) but none were observed.

Molluscs from several samples from this pit-complex have been identified by Dr Terry O'Connor (formerly of the Environmental Archaeology Unit); the taxa are listed in Table 2. It is likely, however, that some molluscs were lost through fragmentation during processing. Some further mollusc identifications were made by JC from the 1995 material and these have been integrated into Table 2.

Vertebrate remains were studied by Roberta Gilchrist whose report appears on pp. 00-00; an archive report is lodged with Humber Archaeology Partners. The vertebrates are alluded to in this section where relevant.

It is unfortunate that for logistical and financial reasons a proportion of the contexts examined for plant remains were not investigated for invertebrates; some of these deposits may have been of particular interest in determining the abundance of synanthropic insects at the site.

## Results and interpretation

### Data archives

All data concerning the 1985-6 excavations were originally stored on the University of York VAX mainframe computers, using

systems written by AH (plants) and HK (insects). Latterly, these data have been transferred to PC databases, to which the data from the 1995 study have been added. Fossil remains retained from these samples are stored in the Environmental Archaeology Unit, University of York; unprocessed material and residues are stored at Humber Archaeology Partners, Kingston upon Hull.

The plant macrofossil and insect assemblages are discussed individually below but their general implications, particularly regarding the vegetation on and around the site, are brought together in the discussion of individual archaeological phases.

### Phase 1 Predominantly very late Iron Age

Roundhouses, some with enclosures, associated with several large pits or water holes. With the exception of pit P:100, a feature of 4th/3rd century BC date which lay far to the south of the main settlement, all of the pits sampled lay south of the roundhouses on the line of the later southern boundary ditch.

**Context 40**, fill of pit containing animal burial B:40

**Sample 38** (0.3 m depth) Light greyish-brown sand with a few orange flecks; residue mainly quartz sand and iron slag, with some charcoal, mammal bone and flint gravel.

No identifiable plant remains were recovered from this subsample, other than charcoal and a trace of wood. No beetles or bugs were recorded; the only insect recovered was perhaps a modern contaminant.

**Context 51**, fill of pit P:51

**Sample 43** (0.7-0.8 m depth) Dark grey-brown humic sand with abundant chalk gravel; residue predominantly of chalk gravel with some sand, and a

little flint and iron slag.

The plant remains from this subsample are effectively a depauperate assemblage of the kind seen in the subsample of 42 (see below) and provide no further interpretative information.

Insect remains were not abundant (N = 36, S = 32), and their preservation was rather poor. Allowing for the random variability introduced by a small fauna, the main statistics were essentially as for sample 42 and, while there were considerable differences in the species present and their relative abundances, these were well within what might be expected in deposits forming under essentially similar conditions.

**Sample 42** (0.6-0.7 m depth) Firm, dark grey-brown humic sand; residue small, with quartz sand and organic detritus moderately common, with some chalk gravel and flint and traces of wood fragments.

The modest-sized assemblage of plant remains from this sample was dominated by weeds of waste places and disturbed (including cultivated) soils, only stinging nettle (*Urtica dioica*) and chickweed (*Stellaria media*) being present in more than very small numbers. A few other taxa are typical of shallow water or damp soils and are at first sight somewhat unexpected on the free-draining sands present over the whole of this site. The plant remains give no indication of the nature of the pit-fill - they may have originated in vegetation growing at or near the site of deposition or plant material deposited during clearance of a piece of weedy land.

Analysis for insect remains gave a moderately large assemblage of beetles and bugs (minimum number of individuals estimated at 85, with 60

taxa), together with a few adult flies and a single ant. A number of cladoceran (water-flea) ephippia ('resting eggs') and mites were also noted.

The beetle and bug fauna was diverse (alpha ( $\forall$ ), the index of diversity of Fisher *et al.* (1943), was estimated at 90, with a standard error (SE) of 20). This was probably a result both of the presence of abundant and varied habitats in the surroundings and of the lack of a strong autochthonous component in the pit. (Autochthones are, literally, those remains that 'originated' at the point of deposition; for the present purposes, this means insects attracted to and/or breeding in the deposit as it formed.) There were no obligate synanthropes, although some of the species recorded are probably favoured by human activity in disturbing vegetation. The insects certainly give no indication of the presence of buildings, from which a very characteristic fauna would be expected. This is surprising in view of the supposed association of these deposits with a roundhouse. The predominant ecological group were the 'outdoor' forms, which made up well over half of the assemblage (%N OB = 59, %S OB = 60). Diversity of the outdoor component was quite high (alpha OB = 57, but with a large SE of 17). Few species were at all numerous, only *Anotylus nitidulus* (6 individuals), *Amara apricaria* (5), *Calathus fuscipes* and *Longitarsus* sp. (both with 3) being represented by more than two individuals. *A. apricaria* and *C. fuscipes* are characteristic of rather dry soils with generally incomplete vegetation cover. *Longitarsus* species are plant feeders with a variety of hosts. *A. nitidulus* is found near water and in man-made accumulations of organic matter; it is probably best regarded as a generalised decomposer. Common in a variety of archaeological deposits, *A.*

*nitidulus* appears not to be generally very common today.

There is little evidence that the pit contained decaying matter; apart from *A. nitidulus*, known to fly in large numbers, no decomposer taxon was represented by more than two individuals, and together decomposers made up only a third of the assemblage (%N RT = 33). All may have been background fauna, derived from plant litter and dung in the surroundings.

The cladoceran ephippia indicate that the pit held (or received) water. The single individuals of four aquatic beetles provide an additional hint, but not clear evidence, for the presence of standing water.

#### Context 55, fill of pit P:55

**Sample 46** (0.6 m depth) Light yellow-brown sand with iron slag, charcoal and chalk gravel; residue of sand with some iron slag and a little chalk gravel.

Only a single seed of the mud rush, *Juncus gerardi*, was recorded from this subsample; it is a species characteristic of the upper parts of salt-marshes though it can extend its range well into adjacent grassland beyond the direct influence of saline conditions. Nevertheless, it is a somewhat unexpected taxon for a site so far from the nearest salt-marsh meadows - on the Humber estuary some 5 km to the south. It is possible that, before drainage, the brackish-water regime extended much further north than it does today, across the area known as Walling Fen, which lies between N. Cave and the Humber. *J. gerardi* is frequently recorded from Roman (and occasionally medieval) deposits in York, where its occurrence has always been somewhat enigmatic;

transport to the city in the guts of animals grazed on meadows within the range of influence of brackish water is one possible explanation.

Only single individuals of five beetle taxa were recovered. They perhaps represented a random extract from a fauna of the type seen in context 51 (above), but clearly no interpretation can be made.

#### Context 56, fill of pit P:56

**Sample 51** (0.9 m depth) Dark orange-brown slightly humic sand with chalk gravel and bone fragments; residue of sand and chalk gravel, with smaller amounts of flint gravel and organic detritus.

The small range of plant taxa provides very little information about the nature of the pit-fill; they are almost all weeds of some kind, though the modest numbers of toad rush (*Juncus bufonius*) seeds and traces of spike-rush (*Eleocharis palustris*) fruits and abundant water-flea (*Daphnia*) resting-eggs (ephippia) probably indicate impeded drainage and (perhaps only short-lived) standing water.

All but one of the 29 beetle and bug taxa recorded were represented by single individuals. In so far as a small assemblage can be interpreted the fauna was generally similar to that from sample 42 (context 51) in its implications, although the presence of three (typically associated) *Cercyon* species gave a small hint that foul matter was present.

#### Context 57, fill of pit P:57

**Sample 55** (0.8 m depth) Mid grey-brown sand with very abundant chalk gravel and pebbles; residue

predominantly chalk gravel, with some sand and traces of organic detritus.

A very small plant macrofossil assemblage was recorded from this subsample, with a character similar to that from the subsample from 53 (below), though mud rush, *Juncus gerardi*, was again recorded.

The assemblage of beetles (41 individuals of 33 taxa) and a single bug was much like that for sample 53, although with even stronger hints of aquatic deposition. Cladoceran ephippia were also present.

**Sample 53** (0.76 m depth) Mid orange-brown, slightly humic sand with chalk gravel; residue of chalk gravel, with sand and iron slag and small amounts of organic detritus.

The very small assemblage of essentially weed taxa is of little interpretative significance; all might have been growing in an area of human occupation or intensive disturbance.

A rather small group of beetles and bugs was recorded, 38 taxa being identified, the minimum number of individuals being estimated as 47. Diversity was estimated to be high ( $\alpha = 91$ ), but the standard error of the estimate was substantial ( $SE = 33$ ). As with all the previously described groups, over half of the individuals were from 'outdoor' taxa (which can very crudely be taken as a measure of the importance of species associated with natural/semi-natural conditions), and the decomposer component was small (%N RT = 32 in the present sample). There were, however, seven individuals of the waterside/foul matter staphylinid *Anotylus nitidulus*. Unfortunately the implications of this species are not clear (see above). Overall the fauna indicates conditions

in and around the pit to have been much as for all the previous samples. As in those deposits, aquatics were a little more abundant than would be expected unless there was some, at least temporary, open water. Three unidentified beetle larvae and several fly adults were also recovered.

**Context 69**, fill of posthole within Building S:3

**Sample 57** (0.2 m depth) Mid grey-brown sand with dark grey to black humic silt inclusions; residue predominantly iron slag and quartz sand with a little chalk and flint gravel.

There was a surprisingly large assemblage of plant macrofossils - probably from the silt lenses - from this otherwise unpromising context; most were taxa of weedy vegetation. Only *Juncus bufonius*, a plant of waterside habitats and wet paths and tracks, was present in more than very small amounts; *Montia fontana* ssp. *chondrosperma* may have grown in similar habitats, in short turf on areas with impeded drainage. The rare leaves of the woodland and moorland moss, *Leucobryum glaucum* are quite at variance with the evidence from other taxa and cannot be interpreted in isolation. (A probable heathland component was recorded from the Iron Age context 100 and from some of the Roman contexts at this site - see below; it is possible that these moss fragments also represent exploitation of this kind of habitat.)

A MNI of 47 beetles and bugs was calculated, and 40 taxa were identified. The assemblage was broadly similar to the previous two, with hints of aquatic deposition. The presence of many *Daphnia* and two *Ceriodaphnia* ephippia offers clearer evidence of standing water. There was

no evidence for a fauna associated with a structure. This context may have pre- or post-dated the use of the building - both plant and insect assemblages being at variance with the archaeology.

**Sample 97** (0.2 m depth) Yellow-brown sand with iron slag inclusions; residue not examined.

Only fine charcoal was recovered from the 'flot' for the subsample from this sample. No insects or other invertebrates were present.

#### Context 100, fill of pit P:100

**Sample 60** (0.6-0.7 m depth) Unconsolidated mid-dark grey-brown (?humic) sand with much chalk gravel and some darker (?humic) silty material.

Only plant remains were recorded from the washover of a 1 kg subsample. There were common *Juncus bufonius* and *Chenopodium album* seeds (abundance score 3), and modest numbers of *Ranunculus* Subgenus *Batrachium* achenes, *Stellaria media* seeds and *Polygonum persicaria* nutlets. The remainder of the short list of taxa were mostly weeds, with some possible indicators of heathland (*Hylocomium splendens* and cf. *Calluna vulgaris*) and evidence for standing water in the form of caddis larva cases and *Daphnia* ephippia. The weeds may indicate disturbance in the vicinity of this pit; the *J. bufonius* could be consistent with trampled soils in an area with impeded drainage.

**Sample 59** (0.5-0.6 m depth) Dark brown humic silt to clay silt, in a matrix of orange-grey-brown humic silty sand; some lumps of light yellow-grey-brown clay sand to sandy clay.

Again, only the washover from a 1 kg subsample was examined, and only plant remains (and, incidentally, some other macrofossils) recorded. It gave a somewhat longer list of taxa, but as in the previous assemblage, *Chenopodium album* scored 3. *Juncus bufonius*, by contrast, was present in very small amounts. Other 'common' taxa were *Stellaria media*, *Polygonum lapathifolium*, *Bilderdykia convolvulus*, *Raphanus raphanistrum*, *Spergula arvensis*, *Sonchus asper*, *Hylocomium splendens* and *Ranunculus* Subgenus *Batrachium*, with *Daphnia* recorded at 3 and ostracods at 2. This increased component of arable weeds might be interpreted as indicating that the pit was used for disposal of crop waste, though there is no evidence of cereals to support this; clearly there was still a body of standing water in the feature at this time.

Heathland is more convincingly indicated by the records for *Calluna* (capsules, flowers and root/twig fragments), *Hylocomium splendens*, and perhaps also by *Leucobryum glaucum* -presumably deriving from material imported for some purpose. The pinnule fragment(s) of bracken (*Pteridium aquilinum*) might also be counted in this group.

**Sample 61** (0.4 m depth) Firm lumps of varicoloured (light brown to mid grey-brown to dark brown) humic sandy silt of a buttery consistency, in a humic sandy matrix.

For this 1 kg subsample, the residue was examined for plant remains alone. The assemblage was essentially similar in composition to that from sample 59, though with more *Leucobryum glaucum* (abundance score 2), and *Juncus bufonius* and *Ranunculus* Subgenus *Batrachium* (both at score 3). *Chenopodium*

*album*, *Stellaria media*, *Polygonum lapathifolium*, and ostracods continued to be common or abundant. Apart from *L. glaucum*, the heathland component was perhaps smaller than in sample 59, though *Pteridium* was once again represented by pinnule fragments. There was a single fruit of the saltmarsh plant *Triglochin maritima*, whose presence can probably be explained in the same way as the seeds of *Juncus gerardi* (see also samples from contexts 55, 57 and 154); it is a much more strict halophyte than *J. gerardi*.

### Context 102, fill of pit P:102

**Sample 63** (1.0-1.1 m depth) Pale yellowish-brown sand with abundant chalk gravel; residue dominated by sand and chalk gravel.

The list of plant remains from this subsample was rather small, comprising mainly plants of weedy vegetation. The presence of *Zannichellia* and *Ranunculus* Subgenus *Batrachium* perhaps indicates that water, with an aquatic flora, was present in the pit at some stage - it is difficult to see how they would have arrived in the pit-fill otherwise.

Only a small insect assemblage was recovered, with 32 taxa and 35 individuals. Bearing this in mind the main statistics have little meaning, although they and the species lists are subjectively much like those for most other samples from this site.

**Sample 62** (0.6-0.75 m depth) Mid grey-brown humic sand with abundant chalk gravel; residue dominated by sand and chalk gravel.

The subsample of this sample gave a small plant macrofossil assemblage of no interpretative value.

A small and somewhat poorly preserved group of beetles and bugs was present (N = 22, S = 18). Although the assemblage was too small for interpretation there were hints of the presence of more decaying matter than in any previously discussed sample (%N RT = 50, although swayed by *Anotylus nitidulus*, whose origin is uncertain). A single *Ptinus fur* was noted: this spider beetle is found in various natural habitats but is distinctly favoured by human dwellings.

### Context 437, fill of pit P:102

**Sample 437** (spot find of organic material) Black humic sand or sandy amorphous peat.

The 170 g sample yielded abundant evidence for a moorland/heathland origin for the material - essentially, it appeared to be a lump of natural 'mor' humus with vegetative fragments of heather (*Calluna vulgaris*), with the moss *Hylocomium splendens* and ?tormentil, (*Potentilla* cf. *erecta*). Both the latter-named taxa are frequently recorded from heaths and moors. Examination of pollen in a 'smear' from a small fragment of the undisaggregated residue revealed a preponderance of Ericales (including *Calluna*), *Betula*, and *Pinus*, consistent with this interpretation. The source of this material cannot be readily confirmed, though there are extensive areas of *Calluna*-dominated heathland to the west and north-west of the North Cave area today, in the lower Vale of York. It is not inconceivable that heathland might have developed on the very sandy area in which the site was located, especially where leaching at the surface reduced the influence of chalk gravel in the subsoil.



Inspection of the small number of insect remains recovered from this sample cast no further light on its interpretation; they were not recorded.

**[NC95] Context 263**, well fill in 283

**Sample 11** (GBA) Equal amounts of mid-brown, slightly mottled (redder and greyer), plastic silty sand and black, soft, sandy amorphous organic sediment, with traces of flint and chalk.

The 1 kg subsample examined gave a rather small residue of about 250 cm<sup>3</sup> of which about 80% by volume comprised organic debris, the remainder being sand and chalk. There was a rather large assemblage of identifiable plant macrofossils, mostly present in very small numbers. There were several heathland/moorland/bog taxa, including *Sphagnum*, *Erica tetralix*, *Calluna vulgaris*, the last of these represented by a variety of different plant parts. Some fragments of peat up to 10 mm in maximum dimension were also recorded; these consisted of herbaceous detritus with fine rootlets and sand grains and may represent mor humus from the uppermost part of a heathland soil profile (cf. sample 437, above). Other plant remains included bracken, some taxa typical of wet tracks, pond margins and damp short turf (*Montia fontana*, *Juncus bufonius*, *Scirpus setaceus*) and some weeds of waste and disturbed ground. The evidence from the insects suggests that the weeds may have been the vegetation of the site.

The identification of this deposit as including a component originating as a living soil is strongly supported by the very abundant cysts of a soil nematode resembling *Heterodera* as well as numerous earthworm egg capsules. However, some component of the

deposit was clearly of aquatic origin on the evidence of numerous resting eggs of water-fleas (*Daphnia* sp. ephippia) as well as proportionally quite large numbers of aquatic beetles. The insects gave no evidence of the acid land components seen amongst the plant remains, and were predominantly taxa likely to be found in places heavily influenced by human activity, including settlements with a fairly low density of occupation. There were some traces of a synanthropic component, perhaps from structures, but this component was no more than might accidentally become incorporated into the deposits from structures of the order of ten or more metres distant. It gave no evidence of the dumping of waste material and, indeed, all of these insects might have exploited small accumulations of litter in the open. No plant remains likely to have been used by the occupants of the area - other, perhaps than the heather, bracken and peat - were noted either.

The most abundant beetle from this sample was *Aphodius prodromus*, and there were single individuals of two other *Aphodius* species, giving a weak indication of the presence of livestock in the surroundings.

The interpretation of this cut as having held water appears to be sustained by the invertebrate remains. The plant remains indicative of damp soils are consistent with an area of trampled soil with impeded drainage around such a water-hole.

**[NC95] Context 265**, well fill in 283

**Sample 15** (GBA) Light to mid brownish-grey, crumbly, soft (working just plastic) sand with moderate numbers of flint and chalk clasts 2-60 mm; locally some slightly orange patches and hints of local layering at

mm scale; traces of plant fibres present.

The residue from the 3 kg subsample comprised about 400 cm<sup>3</sup> of chalk gravel and quartz sand, with about one-quarter of the volume being made up by organic detritus. Plant remains were numerous and well preserved, though no taxon was present in more than moderate amounts. As in sample 11, there was a component of plants from acid land (this time including the moss *Leucobryum glaucum*) with some wetland, weed and grassland taxa, the latter group a little more conspicuous than in the previous assemblage. Again, peat fragments were present.

The invertebrate remains included an appreciable aquatic component, with numerous *Daphnia ephippia* and 23 individuals of 11 aquatic beetle taxa. There were also some damp ground beetles and bugs. The remainder of the beetle and bug fauna appears to be a mixture of species likely to have lived on the occupation site, either in wholly artificial habitats or on or around weeds. There were six species of 'true' dung beetles, represented by 11 individuals, suggesting that herbivore dung existed in the environs - this may have been the origin of the grassland taxa amongst the plants. Species associated with structures and accumulations of organic matter resultant upon human activity were present in small numbers, but there were no insects strongly associated with occupation.

Although the evidence is only slight, it may be that this deposit included material dispersed from some kind of animal housing - perhaps of horses.

[NC95] Context 316, well fill in 315

**Sample 6** (GBA) Slightly mottled (at 10 and 1 mm scales), mid-dark grey, slightly brittle to soft (working just plastic), distinctly humic sand with plant fibres.

There was a small residue (about 200 cm<sup>3</sup>) from the 1 kg subsample, most of which was sand, with some charred fine organic detritus; only a little of this material was larger than 300 μm. There appeared to be no uncharred material apart from (?modern) rootlets but some of finest clasts might have been incompletely charred mor humus. The only plant remains were a tentatively identified charred root/twig fragment of *Calluna* and a charred ?wheat grain. Invertebrate remains were absent. If this deposit formed and remained below the level of the local water-table, the lack of uncharred organic material suggests that the fill of the feature consisted of well-oxidised surface sediments.

### Summary of Phase 1

There was no good evidence from the recorded biota for human dwellings immediately by the features whose fills were investigated bioarchaeologically. Although there were perhaps just sufficient synanthropic insects to suggest that at least humble structures such as might be used for livestock, no *communities* of synanthropic insects were recorded. Human influence had, however, disturbed the surroundings sufficiently to encourage weeds and associated open-ground insect fauna. Decomposer insects were relatively rare and offered no evidence of large accumulations of organic debris, or even of the materials, like straw, hay or brushwood, which might be expected to have been used in structures; only bracken and heather may have had such a role. Dung beetles were represented in the insect assemblages to a varying extent, but there were some clear hints of the presence of herbivore dung not too far away. There was

weak and essentially subjective evidence that the herbivores in question included horses stabled or penned on the site. Charred cereals (and indeed other plants likely to have been used as food for humans or domestic animals) were also, notably, effectively absent. It is possible that the formation of the deposits examined post-dates the structures, and represents re-use (although perhaps only small-scale) of an area recolonised by plants after the structures were abandoned. The excavator's view that the pits may have served simply to supply water and to have filled naturally after abandonment is thus at one with the biological evidence.

If the deposits were contemporaneous with the structures, they may have been occupied only briefly - perhaps seasonally - or have functioned for storage, the penning of animals, or as workshops rather than as established domestic dwellings.

*Phase 2* very late Iron Age to ?early 2nd century AD

Three successive stages of enclosures running north from a series of major east/west boundary ditches. No sampled deposits from this phase appeared worthy of analysis.

*Phase 3* 2nd to ?mid 3rd century

A complex of enclosure and boundary ditches with associated buildings. Evidence from the fills of four ditches is dealt with first below, but most of the analysis concerns the fills of two pits within Enclosure 3:280 - pits **12** and **14**; the latter comprised contexts **14** and **15**, the former, cut into **14**, had a wicker ?basket set into its base; its vertical sequence of fills (from the base) was **19**, **13**, **17**.

**Context 47**, fill of boundary ditch 3:47

**Sample 39** Mid grey-brown, moist, crumbly humic sand with flint and chalk gravel.

A rather rich assemblage of 35 plant taxa was recorded from the flot and washover from this sample. Although dominated by weed taxa (the first four 'vegetation' groups in rank order of AIV were weed communities), a wide range of other habitats was represented, including wetland. This last presumably reflects the nature of the environment of deposition. Unexpectedly, there were modest numbers of leaves of the bog moss *Sphagnum* (not identified to species, but not *S. imbricatum* or *S. papillosum*). There was also a single shoot fragment of heather (*Calluna vulgaris*); these taxa may have derived from heathland/moorland as a component of deliberately imported peat, turf or cut heather for some purpose (see above, Phase 1).

The flot was not very rich in insects and preservation less good than in, for example, most groups from the pit-complex in this phase. A wide range of habitats was represented, with a broad similarity to the aforementioned earlier faunas. There were many *Daphnia ephippia*, indicating the presence of standing water. Invertebrate remains were not recorded systematically from this subsample, however.

[NC95] **Context 151**, primary ditch fill in 150

**Sample 2** (GBA) Mottled/varicolored and heterogeneous (jumbled), mid grey, mid brown, light orange brown and pale yellow, slightly plastic slightly sandy clay, with a higher sand content in places; traces of stones 2-20 mm, including chalk, and of freshwater molluscs.

The 2 kg subsample produced a small residue (about 300 cm<sup>3</sup>), mainly chalk gravel and snails; identifiable plant remains and invertebrates other than molluscs were absent. Snails were

abundant, however. *Anisus leucostoma* was predominant (assuming the few specimens identifiable to species were representative); this is a snail of aquatic habitats, tolerant of fairly polluted waters including those subjected to periodic drying, and a component of Evans' (1972) 'slum' community. There were appreciable numbers of bivalve remains, all too damaged for ready identification but assignable to more than one species of *Pisidium* or *Sphaerium*, genera which include further slum species. There were only a few other molluscs, mostly representing waterside habitats.

This ditch clearly held water for most of the year when it was open, but has subsequently been too far above the water-table for the preservation of the more delicate organic remains. The jumbled nature of the sample may indicate that the deposit represented dumped sediment, although it is possible that local oxidation or layering was present and that this was destroyed during sampling.

[NC95] **Context 211**, ditch fill in 209

**Sample 3** Mid grey to grey-brown (with occasional lighter patches), crumbly, very stony, slightly silty sand with abundant flint and chalk 2-20 mm, and traces of wood and herbaceous detritus.

The washover from the 3 kg subsample examined was about 500 cm<sup>3</sup> and consisted of about 60-70% by volume chalk gravel and sand; the remainder was fine and coarse herbaceous detritus, mainly root fragments, with a little woody material. The only identifiable plant remains present in abundance were achenes of the water-crowfoots, *Ranunculus* Subgenus *Batrachium*, but there was a diversity of other taxa

present in small or moderate numbers, including plants of wetland, waste places and cultivated land, and grassland. No plants likely to have originated in dwellings as food or other useful materials were noted.

The invertebrates clearly indicated that the ditch held water, probably for much of the year. A quarter of the adult beetles and bugs were aquatics, and there were numerous *Daphnia* ephippia and some cases of caddis larvae. The most numerous aquatic beetles were *Ochthebius minimus*, *Haliphus* sp., a *Helophorus* sp. and *Tanysphyrus lemnae*, this last associated with duckweeds (*Lemna* spp.), indicating a further component of aquatic vegetation. There were modest numbers of molluscs, principally *Anisus ?leucostoma* but with several *Pisidium* or *Sphaerium* and a few remains of terrestrial species.

**Context 448**, fill of ditch of Enclosure 3:320 (earlier phase of 417, below)

**Sample 95** (0.3-07 m depth) Dark grey-brown sandy humic silt, rather sticky to buttery in consistency.

The residue from the 1 kg subsample processed comprised mainly plant detritus and sand, with traces of charcoal and wood. There were large numbers (abundance score 3) of *Sambucus nigra* seeds and *Urtica dioica* achenes, suggesting the presence close to the site of deposition of nitrogen-rich, disturbed soils. The *Juncus bufonius* seeds (abundance 2) may reflect areas of impeded drainage close by, though the fill at this stage seems not to have carried an aquatic flora, and there are only trace amounts of *Daphnia* ephippia and *Ranunculus* Subgenus *Batrachium* to suggest water in the ditch. Modest numbers of earthworm egg capsules perhaps

indicate inwash of soil into it. Unusually, there were remains of three umbellifers - *Anthriscus caucalis*, *Chaerophyllum temulentum* and *Torilis japonica*; together, they suggest the presence of a perennial nitrophile community (group ARTE, Table 3) - a community of field margins, less shaded hedge-banks and (typically, today), roadsides.

**Context 320**, fill of ditch of Enclosure 3:320

**Sample 320** (no description recorded).

A rapid 'scan' of the washover from this sample shows it to be dominated by *Sambucus nigra* seeds (abundance 3), with traces of charcoal and charred root/twig fragments of cf. *Calluna vulgaris*. The few scraps of insect were not examined further.

**Context 417**, fill of ditch of enclosure 3:320 (continuing context 320 to the east)

**Sample 94** (0.3-0.5 m depth) Dark brown silty detritus peat with abundant rootlets.

Despite its very high organic content, there was a surprisingly limited flora in the residue examined for plant remains; identifiable macrofossils were perhaps 'diluted' by the very large component of root/rootlet fragments (abundance score 4). As in sample 95, there were large numbers of elder seeds and stinging nettle achenes and a modest range of other 'weed' taxa. Intriguing finds were coriander (*Coriandrum sativum*) mericarps and dewberry (*Rubus caesius*) seeds, both were recorded at an abundance of 2; both might be foodplants, though the latter is a native plant and might have arrived accidentally though bird-droppings, for example. The only other record for coriander from the site is a single

mericarp from sample 10 (context 19, below), emphasising the unusually poor evidence for human activity, and in particular for domestic occupation, at this site at this period (although some primary butchery waste is indicated from the bone assemblage, p. 00).

**Context 14**, fill of pit P:14

**Sample 32** (depth not recorded) Dark brown, very humic material, almost an amorphous peat, with a buttery texture; molluscs present; residue of chalk gravel, sand and flint.

The flot and washover from a subsample of this gave a rather small but diverse assemblage of plant macrofossils, representing a wide variety of habitats. Of particular interest is *Moehringia trinervia*, a species of nitrate-rich mull (woodland) soils, discussed in more detail below. Although many of the taxa recorded are indicative of disturbed soils and are typical of archaeological deposits formed under intensive occupation there are taxa like *Ranunculus* Subgenus *Batrachium* and *Alisma* which are aquatic or aquatic-marginal (the score of 2 for *Daphnia ephippia* probably indicates standing water in the pit). Large numbers of leaf fragments, some of them probably willow (*Salix* sp(p).) suggest that there were trees nearby - perhaps overhanging the pit, although fallen leaves readily collect in the dead space within negative features far from the nearest tree.

Insect remains in the flot were excellently preserved and abundant, and subjectively like the assemblages from pit 12 (see below); they could not be listed fully.

**Sample 33** (depth not recorded) Mid to dark brown, humic silt with chalk gravel; residue of chalk gravel with some flint and sand.

The flot and washover from this subsample gave another rather modest-sized assemblage of plant remains with large numbers of stinging nettle (*Urtica dioica*) and modest numbers of water crowfoot (*Ranunculus* Subg. *Batrachium*) achenes. The remaining taxa represented a range of habitats, the largest group being weeds of waste ground and cultivated and otherwise disturbed soils (vegetation group CHEN, cf. Table 3). Leaf fragments, presumably from deciduous trees, were again quite common.

The flot was quickly examined for insect remains. Some of the fossils were well decayed, others normally preserved - this may reflect periods of desiccation. The bulk of the fauna probably consisted of the same elements as seen in pit 12 (see below). There were abundant structures which appeared to be egg-masses of some invertebrate.

**Sample 22** (0.8 m depth) Interleaving lenses of grey-black humic silt and sand; plant material rather compressed and difficult to disaggregate.

A large subsample of 3 kg was processed for rapid examination of plant and insect remains. The plant list was rather similar to those for subsamples from pit 12, though with more evidence of willow - as fruits, leaf fragments, buds, and perhaps also twig epidermis fragments. Unusually, for the more richly organic parts of this sequence, there were few seeds of elder, though stinging nettle achenes were quite well represented.

A rapid review of the insect remains in the flot showed a fauna essentially

similar to those from the more richly organic parts of pit 12.

Three mollusc taxa were recorded from this sample (*Anisus vortex*, *Succinea putris* and *Vitrea crystallina*); though two are species not recorded from other samples to yield molluscs, they shed no further light on the interpretation of these deposits.

**Pit P:12**; a column of samples taken from this pit-fill was examined in detail (samples designated as 'column 1' below) with several other samples being examined more cursorily. The column was taken where the pit was deepest and passed through the fills of a wicker structure. Samples are discussed in stratigraphic order, from deepest to shallowest, where depth is known.

**Context 19**, fill of pit P:12 (from within the wicker structure)

**Sample 12** (column 1, 1.4 m depth) Yellow-brown sand with abundant chalk gravel, flint and inclusions of grey sand; residue predominantly sand and chalk gravel, with some flint.

Only trace amounts of stinging nettle and elder were recorded from this subsample, together with various unidentifiable plant fragments, including charcoal.

A very small group of beetles - single individuals of six taxa - was recorded. There were several *Daphnia* ephippia, indicative of aquatic deposition.

**Sample 11** (column 1, 1.3 m depth) Light yellow-brown sand with lighter and darker grey humic silt inclusions and some moss; residue not examined.

A very small assemblage of plant macrofossils was obtained - seven taxa, all in very small numbers; they

were all species found repeatedly through much of the rest of the sequence of samples from this pit-fill.

In contrast, this sample gave a quite substantial insect fauna (N = 106, S = 80) of very high diversity (alpha = 148, SE = 32). The most abundant taxa were the leafhopper *Agallia brachyptera* (9), a rare species associated with damp conditions, and the groundbug *Scolopostethus* sp. (4), probably one of the species found beneath nettle-beds on well-drained soils, and in similar habitats. Decomposers were poorly represented (%N RT = 20) and the rich and varied plant-associated species were the predominant group (%N P = 40). Most of the latter group was probably circumjacent background fauna from an area of herbaceous and scrubby vegetation such as is found in clearings and hedgerows, or in abandoned areas where recolonisation by natural plant communities has proceeded well but patchily. A few aquatic and waterside taxa may have been attracted to the pit and many *Daphnia ephippia* were recovered, so open water must have been present.

A single *Ptinus fur* (mentioned under sample 62, context 102, from phase 1) was recorded, but there were no other taxa which suggested structures nearby.

**Sample 10** (column 1, 1.2 m depth) Heterogeneous light brown sand and dark grey humic material with fragmentary plant remains visible; residue of chalk gravel with some sand and organic detritus, and traces of flint.

This subsample gave a rather longer list of plant taxa (37 in all), with large numbers of elder and nettle (signifying colonisation of disturbed, probably nitrogen-rich soils), and smaller

numbers (abundance score 2) of seeds of three-veined sandwort (*Moehringia trinervia*), this last a species favouring nitrate-rich mull soils, especially in woodland and hedgerows (Clapham *et al.* 1987). Rough chervil, *Chaerophyllum temulentum*, was also recorded from this sample. This umbellifer has a range that extends from woodland margins through hedges and scrub to rough grassy places - it is typical of perennial communities in these 'edge' situations between major vegetation types. It is likely to occur with *M. trinervia* in shaded woodland-edge habitats, perhaps in a hedgerow or clearing. Indeed, weed and woodland vegetation are the best represented groups in the analysis of this assemblage - suggesting the encroachment of scrub or woodland into an area previously disturbed by man. Neither of these plants has been recorded often from archaeological deposits: *M. trinervia* was noted from a deposit interpreted as a Roman buried soil and from a Roman well-fill at Skeldergate, York (Hall *et al.* 1980), and from a medieval site at Oakwell Hall, West Yorkshire, in a deposit with much evidence of woodland or scrub (Allison *et al.* 1988). *C. temulentum* was recorded (as 42 mericarps) from a Roman stone-lined feature interpreted as a water-hole from Farmoor, Oxfordshire (Lambrick and Robinson 1978), in an assemblage rich in remains of stinging nettle, greater celandine (*Chelidonium majus*) and blackberry (*Rubus fruticosus* agg.), these taken together suggesting strongly the presence of hedgerow or abandoned areas turning to scrub.

The single mericarp of coriander (*Coriandrum sativum*) recorded from this sample may be a relic of cultivation, though (with the exception of traces of charred cereal grains, which are possibly residual) it is

almost the only record of a plant likely to have been imported or cultivated from the entire sequence of samples in pit 12.

The modest amounts of a species of *Drepanocladus*, together with traces of *Scorpidium scorpioides* probably point to the presence of shallow water in this feature - these mosses seem unlikely to have been placed there deliberately. Most *Drepanocladus* species are found in fens, bogs, marshes and wet flushes; *S. scorpioides* is a plant of similar habitats and rather rare in lowland Britain today (it is, however, quite widely recorded as a fossil from natural and archaeological deposits and has presumably become restricted in its range through drainage of wetlands).

Beetles and bugs were abundant (198 individuals of 129 taxa) and preservation good. The clover weevil *Apion (Protapion) dissimile*, known to breed on *Trifolium arvense* and perhaps *T. pratense*, was the most numerous species (9 individuals), followed by a *Corticaria* species (6; probably living in litter), and *Meligethes aeneus* (5; a 'pollen beetle' associated with crucifers). There were four *Gymnetron labile*, which breeds in seed capsules of *Plantago lanceolata* (ribwort plantain), and the same number of an unidentified aleocharine (eurytopic as a group), *Atomaria* sp. (probably in litter) and *Agallia brachyptera* (see sample 11 above). Although the relative abundance of taxa differed somewhat, the assemblage was essentially like the previous one, with a small decomposer group, most of it probably derived from plant litter, and abundant and varied phytophages. Again, there were many *Daphnia ephippia*.

**Sample 9** (column 1, 1.1 m depth) Heterogeneous dark grey sand and very dark brown organic material with plant stem fragments visible; residue mainly of organic detritus, with some chalk gravel and a little sand.

The plant macrofossil assemblage from this subsample was rather larger (46 'taxa') than that from 10 (the sample immediately below it in column 1), but with the same vegetation groups (CHEN, ARTE, SECA and QUFA) the best represented. With *Moehringia* and *Chaerophyllum* again recorded, the AIV for the ARTE group stood at 26, the second highest value for the pit 12/14 samples. The two moss taxa recorded in 10 were also present, both scoring 2. Evidently there was no major change in the nature of the vegetation or conditions of deposition obtaining, though alder (*Alnus*, presumably *A. glutinosa*) was recorded as fruits and male and female catkin fragments (albeit all in small numbers), suggesting that alder trees were becoming established in the vicinity. The trace of buds/bud-scales of *Populus* sp(p). (poplar or aspen) may also indicate further development of woody vegetation. Both *Alnus* and *Populus* can be rapid colonisers with fast growth.

Together with a trace of charred barley (*Hordeum*) grain, there was a rather larger component of charcoal in this sample than in the others from this sequence. It is possible that this derived from ash from domestic or industrial fires, though it was probably not sufficiently abundant to suggest the deliberate disposal of quantities of ash into the pit.

This sample gave an even larger insect assemblage than sample 10: there were 238 individuals of 148 taxa. Subjectively, the fauna was extremely similar to that from sample 10 in its



nature and implications. The most abundant species was, again, *Apion dissimile* (13 individuals), and there were 8 *Acrotrichis* sp. (decomposer habitats), 6 each of *Nargus anisotomoides* (present in several pit 12 samples, and found in moss and leaf litter), Aleocharinae sp. (eurytopic) and *Meligethes aeneus* (crucifers), and 5 each of *Megasternum obscurum* (a very eurytopic decomposer), *Atomaria* sp. (probably in litter) and *Scolopostethus ?affinis* (generally, but not always, beneath nettle-beds).

### Context 13, fill of pit P:12

**Sample 8** (column 1, 1.0 m depth)  
Very dark grey humic sand with inclusions of organic material, including moss; residue mainly organic detritus with traces of chalk gravel and sand.

The plant remains from sample 8 were very much the same as in sample 9 and demand no further comment, other than to observe that *Chaerophyllum temulentum* was recorded at an abundance score of 2 and *Moehringia* at 1.

The beetles were not listed, but subjectively the assemblage appeared to be very similar to the previous ones.

**Sample 14** (column 1, 0.9 m depth)  
Dark grey sandy organic material with plant stem fragments and pale brown sandy inclusions; residue of organic detritus with some chalk gravel and a little sand.

The plant remains from the subsample of sample 14 were essentially similar to those from the main sequence at a similar depth, though with rare charred cereal grains perhaps suggesting human activity or

reworking of older deposits. The large number of marsh pennywort (*Hydrocotyle vulgaris*) fruits (abundance score 3) and the modest amounts of wetland moss (*Drepanocladus* and *Scorpidium*) are probably the primary vegetation of the wet area where deposition and preservation took place; in addition to alder and aspen/poplar, willow (*Salix* sp(p)., represented by buds) may be added to the list of trees that are thought to have been growing at or near the site at this time.

Insect remains were, again, numerous (N = 255, S = 149) and broadly similar to the assemblages from other richly organic samples from this context. The more abundant species were *Oxytelus fulvipes* (9 individuals; notable for its rarity at the present day, found in carr-like conditions, e.g. at Askham Bog, near York (Kenward 1978)), *Ochthebius minimus* (8) an Aleocharinae sp. (7), *Apion dissimile* (6) and a *Tachyporus* species (5; typically in litter and around the base of plants). There were also four *Hydraena riparia*, three *Chaetarthria seminulum*, and two *Hydrochus elongatulus* and *Laccobius* sp., together with single individuals of eleven other aquatic taxa, so the evidence for weedy open water in the pit at this stage of infilling is very strong. The main statistics and ecological implications accorded closely with other samples from this context.

Puparia of flies *?Sphaerocera* sp. and *?Spilogona* sp. were recorded, a single individual of each being noted. *Spilogona* spp. are associated with moss. When found in urban pits, moss-associated insects like this are generally taken to have been imported in moss used for hygienic purposes, but in the present case mosses appear to have grown actually within the pit.

**Sample 7** (column 1, 0.8 m depth)  
Very dark brown sandy organic material, with orange-brown mottling; residue mainly of organic detritus, with some chalk gravel and a little sand.

The assemblage of plant macrofossils was rather more restricted in this subsample, though essentially similar to those from previous samples in this sequence. The ARTE component, including *Moehringia* and *Chaerophyllum*, was again important, in fact achieving its highest AIV (29) for the entire site. A suggestion of renewed human activity is perhaps to be made from the records of trace amounts of indeterminate charred cereal grains and grain and glume-base material of spelt wheat, *Triticum spelta*.

The material was not examined for insect remains.

**Sample 6** (column 1, 0.7 m depth)  
Very dark brown, highly organic sand; residue mainly organic detritus, with some sand and a little chalk gravel.

With 41 taxa, this is uppermost sample from this sequence to provide a useful assemblage of plant remains. The dominant vegetation types represented are, again, weed vegetation (both annual and perennial communities: groups CHEN and ARTE in the list in Table 3), with cornfield weeds less common. Woody vegetation - primarily deciduous woodland (QUFA) - is also quite well substantiated and wood fragments were abundant in the residue, though alder is the only actual tree taxon to have been identified from macrofossils.

The beetles were not listed, but a superficial examination showed that, subjectively, the assemblage was very

similar in character to those from other samples from pit 12.

**Sample 30** (depth not recorded) Dark grey to grey-brown, crumbly, slightly sandy amorphous organic material with some plant detritus, with the appearance of a slightly indurated peat.

Only a rather small amount of the washover from the 1 kg subsample of this sample was examined (along with the entire flot) for plant remains; a list of taxa of rather modest length was recorded - including *Moehringia* and *Chaerophyllum*, which were characteristic of the more richly organic parts of pit 12. Leaf fragments (perhaps from deciduous trees) were also recorded, as in the majority of samples from the pit-complex with good preservation.

The flot was examined rapidly for insect remains, which were moderately abundant, well preserved and (subjectively) ecologically close to the material from pit 12. The shieldbug *Thyreocoris scarabaeoides* was recorded from this sample. It is a xerotherm (requiring dry, hot environments) found in chalky and sandy places, generally amongst litter or short mosses (Southwood and Leston 1959, 29). It has a southerly distribution in Britain and Scandinavia (Masse 1955; Coulianos and Ossianilsson 1976); in England and Wales it has a scattered distribution in southern and central counties, and like many other thermophiles has outlying locations in Lancashire. It appears not to have been recorded from Yorkshire, although it has been found in Lincolnshire (Masse 1955). Its occurrence at North Cave is probably indicative of summer temperatures at least a degree or so higher than was normal during the period up to the mid 1980s.

**Context 17**, upper fill of pit P:12

**Sample 5** (column 1, 0.6 m depth)  
Dark grey sand; residue predominantly sand with chalk gravel and a little flint)

The number and diversity of plant taxa decreased with this subsample, only 14 taxa being recorded. This is scarcely an interpretable assemblage, except in the light of assemblages from lower levels in the pit-fill, of which it is clearly a heavily depleted representative.

A very small assemblage of poorly preserved beetles and bugs was present, and single individuals of 13 taxa were recorded. As with the plant remains, these seem to be a random extract of the range of taxa seen in the levels below.

**Sample 4** (column 1, 0.5 m depth)  
Heterogeneous dark grey to pale brown sand with charcoal inclusions; residue mainly sand with chalk gravel and a little flint and traces of charcoal.

The few plant macrofossils in this subsample evidently represent the last traces of organic preservation; they are a very much depauperate selection of the taxa present at lower levels.

The concentration of insect remains was also very low, with only 9 individuals of 8 taxa recovered.

**Sample 3** (column 1, 0.4 m depth)  
Very heterogeneous dark grey sand with very extensive orange-red mottling, and inclusions of chalk and charcoal; residue mainly of sand, with chalk gravel, and a little flint and charcoal.

Charcoal was the only plant material recorded. The only insect recovered

was an unidentifiable weevil.

**Sample 79** (column 1, 0.3 m depth)  
Pinkish-grey to greenish sand with chalk inclusions; rather cohesive; residue of sand with some chalk gravel and a little organic detritus.

Apart from a modest amount of charcoal, this sample from very near the uppermost layer of the pit-fill yielded only traces of charred grass and cereal grains.

**Sample 2** (column 1, 0.2 m depth)  
Brownish-grey sand, extensively mottled orange, with charcoal and chalk inclusions; residue of sand, with chalk gravel, and a little flint and charcoal.

Plant remains other than small amounts of charcoal were lacking in this subsample. No insect remains were recorded.

**Sample 1** (column 1, 0.1 m depth)  
Brownish-grey sand, mottled orange, with charcoal inclusions; residue of sand with small amounts of chalk gravel and flint and traces of charcoal.

Apart from two charred ?rye (cf. *Secale cereale*) grains and a little charcoal, the only plant remains in this subsample were worked wood fragments - some quite large pieces with clear facets due to working with an axe or similar tool. Again, no insect remains were recorded, with the exception of a single sepsid puparium, probably *Nemopoda* sp..

Thought to have been taken from the fill of the wicker structure (context 19), the following samples were also examined:

**Sample 25** (1.17 m depth) Not

described but broadly similar to samples from similar levels within pit.

The subsample of 6 kg gave - perhaps not surprisingly - the largest assemblage of plant macrofossil taxa (64) for the site, though none was recorded at an abundance score of more than 2. Weed taxa of various kinds were the most frequent (the score of 60 for the AIV for group CHEN was the highest for the samples as a whole, though this is partly a function of sample size). Both *Moehringia* and *Chaerophyllum* were recorded again in this sample, and contributed to the second highest AIV of the vegetation group ARTE (see Table 3) for the pit 12 samples.

A component not recorded in the smaller subsamples from pit 12 was remains of heather, *Calluna vulgaris* and cross-leaved heath, *Erica tetralix*. Charred shoot and root/twig fragments of the former and leaves of the latter were found in trace amounts. Heathland/moorland taxa were also recorded from other contexts at the site, though always in small amounts (except for the spot find of organic material from context 437, phase 1, which appeared to be a large fragment of heathland turf).

The modest-sized group of molluscs from sample 25 represented a mixture of habitats; some were taxa of freshwater (e.g. *Anisus vortex*), others more commonly found in shaded terrestrial habitats (e.g. *Oxychilus alliarius*). A single frog (*Rana temporaria*) tarsus was also recorded from this sample.

The insect fauna from this sample was large and well-preserved and (subjectively) essentially similar to others from the more richly organic parts of pit 12; it was examined rapidly and not listed.

**Sample 28** (1.16 m depth) Mid grey-brown humic sand with chalk gravel and inclusions of very dark brown pan-like concreted sand, and a some twig fragments.

A subsample of 5 kg was processed for rapid examination of plant and insect remains. The list of plant macrofossils is very similar to that from the previous sample, with about half the taxa in each in common. *Calluna* was present again, this time as shoots and flowers and charred shoot and root/twig fragments. *Epilobium* seeds were scored at an abundance of 2 in this sample; there are rather few published records for this taxon from archaeological deposits (Tomlinson and Hall 1996), although it includes many very common weeds of cultivated and waste places at the present day. It was recorded at an abundance of 1 in sample 25 from pit 12, and also at 1 in sample 62 from context 102 (a large Iron Age pit) at this site. Unfortunately it is not possible to determine whether these are seeds of rosebay willow-herb (*Epilobium (Chamaenerion) angustifolium*, which was probably mainly a plant of woodland clearings and other edge communities before it expanded into a wide range of wasteland situations in recent decades) or one of the several more or less weedy species of lightly shaded or unshaded habitats. Evidence for (presumed tree) leaf fragments was again present, some of the material clearly comprising the cuneate leaf-bases of one or more willow (*Salix*) species.

A somewhat larger list of molluscs was recorded from this sample than from 25, though they have essentially similar implications; the most abundant was the freshwater snail *Anisus vortex* (33 individuals), with smaller numbers of swamp taxa (*Lymnaea peregra* and *Aplexa*

*hypnorum*) and the 'slum' (*sensu* Boycott 1936) taxon *Pisidium personatum*.

Some vertebrate remains were recorded during processing of the subsample from 28: common frog (*Rana temporaria*), probably of one individual; 'mouse' (probably *Apodemus* sp.); and an immature small rodent.

Insect remains from this subsample were not examined in detail, but subjectively resembled the assemblages from other samples from pit 12.

**Sample 29** (depth not recorded) Dark grey to grey-brown, crumbly, humic sand with some wood and twig fragments and chalk gravel and modest amounts of plant detritus.

The flots from this subsample were scanned briefly and found to contain a plant macrofossil flora and an insect fauna very similar to those from the 'richer' parts of pit 12.

**Sample 81** (depth not recorded) Black sandy organic material; residue of organic detritus with a little sand and chalk gravel.

The flora in this subsample was essentially similar to that of the more richly organic parts of the main sequence and it certainly offers no new interpretative problems. The characteristic taxa, *Moehringia* and *Chaerophyllum* (score 2) were again present. The abundant wood chips may be related to the construction and insertion of the wicker structure into the pit; there is certainly no other evidence for any kind of deliberate disposal of material into the feature.

The subsample gave rather a large assemblage of beetles and bugs (200 individuals of 143 taxa). This fauna was essentially similar to those from other parts of the same context with good organic preservation. The most abundant species was *Apion dissimile*, with seven individuals; this weevil lives on certain clovers (*Trifolium* spp.). There were six *Brachypterus urticae*, generally found on nettles, and four each of the following: *Megasternum obscurum* (a generalised decomposer, found in habitats ranging from grass roots and litter to dung), *Lesteva longolytrata* (mud by water), *Aphodius contaminatus* (primarily herbivore dung) and *Meligethes ?aeneus* (on crucifers). There were also five individuals of the scale insect *Chionaspis salicis*. This bug, not included in the statistics given in Table 1(a), lives on a wide range of woody hosts, particularly willows (*Salix* spp.), ash (*Fraxinus*) and alder (*Alnus*), and has repeatedly been identified from archaeological sites. Its occurrence in a deposit associated with wicker is perhaps not surprising.

There were a few fly puparia in this subsample: Sepsidae sp. (4) and ?*Sphaerocera* sp. (3).

Samples 85-7 (spot finds of insects, depths not recorded):

**Sample 85** There were abundant insect fragments (which were not recorded), ostracods, and *Daphnia* and *Ceriodaphnia* ephippia. The sample appears to have been collected for a large dytiscid water beetle, represented by remains which could not easily be identified further.

**Sample 86** A variety of beetles resembling a small random extract from the richer parts of pit 12 was noted.

**Sample 87** Appears to have been collected for a single *Agabus bipustulatus*, one of the commonest large water beetles.

### General comments on Pit 12

The fall-off in numbers of both plants and insects in the higher samples from this fill is probably the result of poorer preservation, brought about by a less stable water regime in the sandy deposit. However, to some extent the numbers of insects and plants varied independently, numbers of insects in sample 11 being quite large whereas plant remains were still scarce (Table 1).

The consistent presence of cladoceran ephippia, small numbers of various aquatic insects, and ostracods, and the more abundant moss taxa (*Drepanocladus* sp. and *Scorpidium scorpioides*) indicate that the pit must have contained water, even if only periodically, and certainly remained permanently damp. The few fly puparia recovered confirm the presence of damp organic matter. The fills of the pit clearly did not receive dumps of organic rubbish, however - decomposer beetles were rather rare and mostly restricted to species likely to be found in surface litter around living plants or at the edge of water. At most there may have been a little ash from fires reaching the fills. For the most part, though, the deposit has every appearance of having accumulated slowly and naturally, with an abundant and species rich 'background' fauna of insects, mostly perhaps from not too far away. Both the insects and plant remains indicate a mixture of disturbed vegetation and established scrub (or even woodland) nearby (see below): a rich mosaic of herbs, with some bare ground, amongst scrub, perhaps. The 'bare ground' need only have been, for example, a trampled path or even the unstable edges of the pit. A plant group not represented by plant remains, but strongly indicated by the insects, is vetches, clovers and their relatives. It is conceivable that sample 11 represents a phase of usage, the flora being suppressed immediately circumjacent to the large pit, while the insect background flora was plentiful

and derived from habitats a short distance away. The later deposits within the main pit may have formed in disuse, when plants colonised in and immediately around it, while supporting a similar insect fauna. The wicker insert provides a complication. The fauna and flora of its fills were subjectively identical to those from the richer layers in the main pit (Table 1; the only substantial difference is for the percentage amount figure for group ARTE for sample 81 - although inspection of the taxa contributing to this show many of them to be weakly associated with the group, rather than good indicators of it).

It is possible that the fill of the wicker structure represents a continuation of the 'disuse' depositional regime, perhaps after a hiatus during which the pit or well was again used. Alternatively, since the deposits inside and outside it were so similar, the wicker structure may have infilled through percolation of deposits from the surrounding pit-fill.

The function of the pit is unclear. A few dung beetles were present in small numbers but there were no indications from insects or plants that stock was kept on the site at this time, for example, so it is unlikely to have been a watering hole (compare the insect results with those from the Bronze Age Wilsford shaft (Osborne 1969)). It was certainly not a cess pit, either, for there was no evidence of cereal 'bran', abundant food remains, or the eggs of intestinal worms. With the exception of a single record of coriander, and rare amounts of charred barley, wheat (including spelt grain and chaff), rye, and unidentifiable cereal grains, all the plants contributing to the 'uses' group FOOS (basic foodplants) could have grown in the local vegetation. The durable charred cereals might have been reworked from earlier deposits, though the presence of spelt chaff in one sample perhaps argues against this. The grains were mostly poorly preserved. There is no evidence at all from either plant or insect remains for the presence of domestic rubbish in the pit-fill - or, indeed, anywhere near to it. The small and dispersed slag and charcoal component is likely to have originated in the surrounding surface deposits rather than in

acts of deliberate dumping. Dumping of any kind, furthermore, would be incompatible with the growth of the wetland mosses that evidently became established in the pit, and which appear to have supported a small insect fauna.

In summary, this pit appears to have been a damp hollow, at least intermittently with open water - perhaps with seepage from a natural aquifer, giving a flora and fauna that would not be surprising in and around a spring - in an area of patchy scrub probably with little or no substantial contemporaneous human activity within tens of metres.

### Summary of Phase 3

Apart from the abundant evidence from the fills of Pit 12, discussed above, deposits of Phase 3 gave a variety of insights into contemporaneous conditions. Fills of several ditches were examined and in most there was at least limited preservation by anoxic waterlogging. Most of the ditches seem to have held water, in some cases probably for much or all of the year; aquatic vegetation had become established in some. Given the proximity of the ditches to structures, there was surprisingly little evidence of human activity or occupation, other than the various weed taxa and some peatland plants. The flora and fauna of pit 14 (the only one apart from 12 examined) again indicated standing water and weedy vegetation.

#### Phase 4 late 3rd century to late 4th century

A series of major enclosures and boundaries established, falling into 2 successive sub-Phases, 4a and 4b.

#### 4a (late 3rd century to mid 4th century)

**Context 311**, fill of pit P:311 (see also identifications of 'brushwood' from base of pit, Allison *et al.* 1990)

**Sample 311** (1.0 m depth) Dark grey-brown, silty, humic sand with sandier

patches, twigs, chalk and flint gravel and some lumps of grey sandy clay.

A 2 kg subsample was processed and the washover examined for plant remains. There was a large list of taxa (62, almost as large as the richest assemblages from the basal layers in Pit 12, though this perhaps partly reflects the larger subsample size). *Sambucus nigra* seeds and *Urtica dioica* achenes were, as in many other contexts at this site, the most abundant macrofossils (both scored an abundance of 3), whilst several taxa were recorded at a score of 2: *Stellaria media*, *Conium maculatum*, *Rumex acetosella* agg., *Montia fontana* ssp. *chondrosperma*, and *Prunus spinosa* (thorns). The emphasis here is on weeds of disturbed, nitrogen-rich soils, but with *R. acetosella* perhaps reflecting areas of poorer, sandy soils, and *Montia* indicating short vegetation on soils with impeded drainage.

There was some other evidence of the presence of trees or shrubs in the vicinity, in the form of dicotyledonous leaf fragments (probably from willow), leaf abscission pads, a twig identified as Pomoideae (the sub-family of Rosaceae includes apple, pear, rowan and hawthorn), buds/bud-scales of oak, a sloe (*Prunus spinosa*) fruitstone and a hawthorn (*Crataegus monogyna*) pyrene, and fruit and testa fragments of ash (*Fraxinus excelsior*), a kind of assemblage very reminiscent of deposits forming in a ditch close to a hedge or area of woodland. By contrast, wetland taxa like *Cladium mariscus*, *Scorpidium scorpioides* and *Lycopus europaeus* perhaps suggest a less shaded environment (they will grow in fen carr, but there is no evidence for alder, for example, from this sample).

Other taxa of interest include *Sphagnum* (leaves), ?summer savory (cf. *Satureja hortensis* - the only

record of this culinary herb for the site), a single charred glume-base of ?spelt wheat (*Triticum* cf. *spelta*) and a rare record of corncockle (*Agrostemma githago*) seed fragment(s) (the only other record for this site was from sample 91). Most of the rest of the taxa recorded were weeds of various kinds, though there was a leafy shoot and charred root/twig fragments of heather (*Calluna*). The *Daphnia* ephippia at an abundance of 2 suggest the presence of a body of water, but there was no clear component of aquatic plants, perhaps suggesting the pit to have been permanently wet though only intermittently to have held standing water.

It is worth remarking that this context yielded some primary butchery waste (mainly cranial fragments and teeth) and some cow- and sheep-sized vertebrae and wild and domestic bird bones which probably represent other domestic waste.

#### Context 337, fill of pit P:337

**Sample 91** (base of pit) Very dark grey to black, highly organic, slightly sandy silt with chalk gravel; residue not examined.

There was a modest-sized assemblage of plant macrofossils (27 taxa), predominantly annual and perennial weeds of disturbed and cultivated soils, bearing some similarity to the assemblages from the pit-fill, pit 12, of phase 3 at this site - with *Moehringia trinervia* and *Chaerophyllum temulentum* again recorded. The presence of modest numbers of *Daphnia* ephippia and a record of *Scorpidium scorpioides* - together with several other taxa suggestive of damp to waterlogged soils - point to the likelihood that water stood in the pit during its

infilling. One of only two records for corncockle (*Agrostemma githago*, a whole seed), was from this sample (cf. sample 311).

Insect remains from this subsample were not examined.

**Sample 337** (a further 1 kg 'test' subsample, examined only for plant remains)

Though similar in many respects to the other subsample, this assemblage included modest numbers (abundance score 2) of hazel (*Corylus avellana*) buds/bud-scales, some of which were buds for male catkins, together with some fragments of juvenile catkins. Dicotyledonous leaf fragments (perhaps including willow) also scored 2, and there traces of leaf abscission pads, all suggestive of the presence of trees or scrub nearby. Stinging nettle achenes were the most abundant remains (score 3), however, and there was a score of 2 for *Stellaria media*, indicating disturbed soils at or near the point of deposition. The moderately common *Daphnia* ephippia point to a body of water, but aquatic plants were sparse. Traces of *Erica tetralix* leaves represent the single heathland taxon in this sample (they were otherwise only recorded from sample 25, pit P:12, with *E. cinerea* remains recorded from sample 448).

#### Context 335, fill of stone-built flue S:326

**Sample 89** (0.2 m depth) Dark brownish-grey sand with charcoal; residue predominantly quartz sand and daub with some flint, charcoal and small amounts of iron slag.

A single waterlogged fruit of annual knawel, *Scleranthus annuus*, was recorded from the flot from this subsample. *S. annuus* was formerly



widespread as a calcifuge weed of dry, sandy ground including arable and was recorded from the North Cave area around the end of the last century (Robinson 1902); it has become increasingly uncommon in the past half-century (Crackles 1990). *S. annuus* is likely to have been growing in the vicinity of the point of deposition on the sandy soils prevalent at this site.

No beetles, bugs or other invertebrates were observed.

**Sample 90** (0.2 m depth) Very dark grey sand; residue not examined.

*Scleranthus annuus* was again represented by a single waterlogged fruit; other plant remains comprised an indeterminable charred cereal grain and a nutlet of bristle clubrush (*Scirpus setaceus*), a plant of pond margins and short damp turf on sandy soils.

No insects or other invertebrates were present.

**Context 343**, fill of stone-built flue of S:326

**Sample 92** (0.2 m depth) Dark grey-brown organic sand, with yellow-grey clay inclusions; residue mainly quartz sand, with some quartz and chalk gravel.

There was no identifiable plant material in the flot from this sample, merely traces of fine plant detritus. The single beetle fragment was also unidentifiable.

**Sample 343** The remainder of the sample - about 14 kg - was bulk-sieved to 1 mm. From the residue, which consisted largely of burnt clay, there were traces of cereal grains, and some glume-bases identified variously

as wheat or spelt wheat (see below, Sample 364 for further discussion).

**Context 344**, fill of stone-built flue of S:326

**Sample 93** (0.2 m depth) Light grey-brown sand with yellow-brown clay inclusions; residue mainly quartz sand, gravel (including chalk) with some charcoal and mortar/plaster.

This subsample also failed to yield identifiable plant remains other than charcoal (not identified further). There were two snails (one whole, one fragment), also not examined further. Insects from this subsample were not examined.

**Context 364**, fill of stoke-hole at mouth of flue S:326

**Sample 364** This sample, of about 10 kg was bulk-sieved to 1 mm to retrieve charred grain noted as being present during excavation. It yielded modest numbers of charred remains of cereals and traces of charred remains of large-seeded cereal weeds. Much of the cereal chaff and grain could not be identified further, but a proportion was wheat, some of it of a hexaploid kind, to judge from the size and shape of the grains, and rare examples of spikelet fragments and glume-bases permitted a tentative identification of spelt wheat, *Triticum* cf. *spelta*, a glume-wheat commonly recorded from deposits of Roman date in Britain. The only other cereal remains identifiable to genus were traces of barley (*Hordeum* sp(p).) grains. The assemblage is consistent with the archaeologist's interpretation that the kilns were used, at least at some stage, as corn driers, unless the grain is simply waste from grain-processing or residual grain from poorly-threshed straw, either being used as fuel in the kilns (which may then have served some other purpose).

## Summary of Phase 4a

The two pits of this phase examined appeared to have been water-filled and to have stood in an area with weedy vegetation and some scrub, the latter perhaps in the form of hedgerows. Evidence of human occupation was limited to small amounts of possible foodplants and arable weeds, as well as some of the peatland taxa observed from earlier phases. The deposits associated with a stone-built flue gave a little evidence for cereals in the form of grains and chaff which were probably spelt wheat and grains of barley, consistent with but not diagnostic of the use of the feature as a corn-drier.

4b (mid to late 4th century and beyond)

**Context 289**, fill of pit P:289

**Sample 88** (0-0.2 m depth) Dark grey sand with inclusions of pale grey sand; residue mostly quartz sand and charcoal, with some mammal bone.

The only plant remains recorded from the subsample of this sample was a single nutlet of ?sedge (cf. *Carex* sp.). A single cladoceran ephippium was present. There were no beetles.

**Context 400**, fill of ditch of enclosure 4:383

**Sample 400** Rather firm, dark brown, crumbly sandy peat with twig and root fragments.

The 0.5 kg subsample examined proved to be very rich in plant remains, with large amounts of wood, twig and root fragments. Amongst the identifiable seeds and fruits, stinging nettle and elder were, as so often at this site, the most frequent, with smaller amounts of *Chaerophyllum temulentum*, *Carduus/Cirsium* spp. (thistles), and *Stachys* cf. *arvensis* (?field woundwort) fruits and *Populus* (poplar/aspens) bud-scales and (the only instance for the site) of *Lemna*

(duckweed) seeds. The latter, together with records for caddis larva cases and *Daphnia ephippia* indicate the presence of water, whilst the range of buds and bud-scales and wood and twig material is typical of a deposit formed in a ditch or pool with overhanging trees. One of the few cultivated taxa for this site was recorded from this sample - a charred caryopsis of barley, *Hordeum* sp. The 'flot' was not examined for insects.

4a/4b (feature in use throughout Phase 4)

**Context 323**, fill of southern driveway ditch 4:323

**Sample 323** (depth not recorded) Mid grey-brown, crumbly, humic sand with chalk gravel and large bone fragments; residue of chalk gravel and sand with some flint, bone, and pottery.

Dominated by seeds of elder and achenes of stinging nettle, the rather rich plant macrofossil assemblage from this sample gave evidence for disturbed, nitrogen-rich soils. Several taxa, including *Rorippa islandica* (at an abundance score of 2) also pointed to the nitrification of the ditch itself - reflected in the position of the group BIDE at rank 2 in the list of AIVs for 'vegetation'. There was no direct evidence for human activity - the ditch appears to have received no refuse from occupation (except for the pottery fragments observed in the residue).

A further 1 kg subsample, numbered **3232** in the laboratory, probably from another layer within pit 323, was also analysed for plant macrofossils. The residue was described as being 'rather strawy', indicating that there were abundant herbaceous stem fragments, possibly from monocotyledonous plants (like grasses or sedges). Again,

there were large numbers of seeds of elder and achenes of stinging nettle, and *R. islandica* seeds also scored an abundance of 3; together with these were redshank (*Polygonum persicaria*) and hemlock (*Conium maculatum*) and smaller numbers of water-pepper (*P. hydropiper*). The overall impression of a ditch receiving some nutrients, running through an area of disturbed land is reinforced, though other components of the fill, such as shoot and root/twig fragments, and flowers of heather must be seen as evidence for disposal of some imported materials rather than for the presence of quite different kinds of vegetation in the vicinity. The modest numbers of rose prickles and thorns of hawthorn and blackthorn are consistent with deposition in a ditch near scrub or perhaps a hedgerow.

The only evidence for another cultivated plant - flax (presumably *Linum usitatissimum*) - recorded from this subsample, was a single capsule fragment.

A modest-sized insect fauna was recovered, with a character reminiscent of the assemblages from pit 12 (Phase 3), perhaps with a larger proportion of aquatics. Two species of corixid water bugs were present. There were also wings of the moorland/heathland bug *Ulopa reticulata*, associated primarily with *Calluna* and perhaps imported with cut heather or turves. The insects were not recorded quantitatively.

This context also produced evidence from bones for primary butchery and domestic waste as well as a complete horse skull deposited at the base of the ditch (p. 00).

### Unassigned features

The following feature has not been assigned to a particular phase.

#### Context 154, fill of pit P:154

**Sample 66** (1.0-1.2 m depth) Dark yellowish-grey sand with abundant chalk gravel; residue dominated by chalk gravel and quartz sand.

This subsample yielded a small plant macrofossil assemblage, with quite large numbers of toad rush seeds and with mud rush present; the rest of the taxa were mainly weeds of various kinds.

The material was not examined for insects.

**Sample 65** (0.7-0.8 m depth) Reddish-brown sand with lenses of very dark grey-brown to black organic material; residue mainly quartz sand with some flint and chalk gravel and organic detritus.

A small assemblage of plant macrofossils was obtained from the flot from this subsample, only one of the taxa, toad rush (*Juncus bufonius*), being present in large numbers (abundance score 3 on a four-point scale). The assemblage is scarcely large enough to be interpretable - most taxa were weeds of some kind. The mud rush, *Juncus gerardi*, recorded from Iron Age pit-fills at this site, was once again recorded here.

The material was not examined for insects.

### General discussion

The most remarkable feature of the deposits at North Cave from a bioarchaeological point of view is the consistent paucity of evidence for

food- or other useful plants and for insects strongly associated with human occupation or the penning of stock. Small quantities of a very limited range of food plants (including cereals) were noted, but many of the taxa recorded may have been accidentally imported or part of the local vegetation.

Plants likely to have been used for other purposes, including feeding livestock and various craft and industrial activities were, likewise, very sparse; the only remains consistently present through all the phases of this site were taxa from acid peatland. These remains were sometimes charred, which perhaps lends credence to the suggestion that material for fuel, most probably turves from heathland, was the source of the peatland plants (and of the small fragments of peat or ?peat recorded in many samples). There were, however, no peatland insects, though this might be expected if peat was being used for a destructive purpose such as burning. Synanthropic insects (i.e. those favoured by human activity) were a very minor component of the fauna, apart from species exploiting disturbed ground and the plants colonising it.

There is thus no reason to believe, on the basis of the plant and invertebrate remains, that there was year-round intensive occupation over long periods of time. The rather sparse corpus of vertebrate remains (Gilchrist, this volume) presents a somewhat similar picture. Seasonal or short-lived exploitation of the area, or continuous use for special purposes by a restricted population, seem far more likely. It must be said, however, that the relationship between the biological remains in the fills of cut features and adjacent artificial habitats or sites of human exploitation of materials is not established (e.g. Kenward in press, for insect remains). Similarly, we do not know what the nature of the insect fauna in artificial habitats would be in very isolated sites which the (often alien or putatively alien) typical or strong synanthropic fauna had not been able to colonise (Kenward *loc. cit.*). Subjectively, though, the 'settlement' at North Cave does not seem to have presented habitats for communities of even weakly synanthropic species associated with decaying matter.

In summary, the deposits examined for their plant and invertebrate remains seem to have formed at times when there was only a low density of human occupation, with little evidence of contamination of pit fills or ditches by organic rubbish—indeed, the pits do not appear to have served for the disposal of rubbish and to have infilled naturally. The vegetation in the vicinity ranged from stands of weeds to scrub, with very little sign of grassland habitats except perhaps wet grassland or damp turf. There was no evidence of nearby cultivation, except perhaps for some of the weeds, though most are taxa found on a wide variety of disturbed and cultivated soils and cannot necessarily be seen as strongly associated with cereal or other crops (the assemblage from Sample 59, Context 100 might be seen as an exception to this). There seems to have been negligible importation of foods and raw materials from other settlements since no strong synanthropes such as storage pests (e.g. grain weevils) and typical 'house fauna' (Kenward and Hall 1995, 662-7) appear in the fossil record.

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*Table 1. Selected statistics for plant and insect assemblages from North Cave. (a) statistics for assemblages of adult beetles and bugs from all samples; (b) statistics for plant assemblages from samples from pit 12.*

*The insect data are directly comparable between samples; those for AIV (abundance-indicator value) for plant remains may be compared between groups for a given sample, but between-sample comparisons may not be justified. The percentage amount values were obtained by calculating the total abundance 'amount' (on the four-point scale used) for taxa assigned to the group as a percentage of the sum of abundance amounts for all taxa in the sample; these figures may be compared between samples. Variations in the statistics for the 'richer' samples are regarded as within those predictable from a series of samples from deposits formed under essentially similar conditions.*

*Explanations of the abbreviations for the plant ecological and use groupings are given in Table 3 and for the insect statistics in Table 4.*

(a)

Context	12	12	12	12	12	12	12	12	12	12	12	12	40	51	51	55	56	57	57	69	69	102	102	289	335	335	343	151	211	263	265	316	Whole	
Sample	1	2	3	4	5	9	10	11	12	14	79	81	86	38	42	43	46	51	53	55	57	97	62	63	88	89	90	92	2	3	11	15	6	site
Ext	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/SPT	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	/T	
S	0	0	1	8	13	148	129	80	6	149	0	143	21	0	60	32	5	29	38	34	40	1	18	32	0	0	0	1	0	82	52	88	0	465
N	0	0	1	9	13	238	198	106	6	255	0	200	25	0	85	36	5	30	47	42	47	1	22	35	0	0	0	1	0	109	62	131	0	1704
ALPHA	0	0	0	0	0	167	160	148	0	150	0	224	60	0	90	135	0	389	91	82	125	0	48	175	0	0	0	0	0	150	150	117	0	211
SEALPHA	0	0	0	0	0	20	22	32	0	17	0	33	31	0	20	69	0	346	33	31	50	0	27	100	0	0	0	0	0	32	50	20	0	8
NOB	0	0	1	3	8	137	121	69	3	166	0	136	18	0	50	21	3	16	25	23	24	0	9	15	0	0	0	0	81	36	72	0	1037	
PNOB	0	0	100	33	62	58	61	65	50	65	0	68	72	0	59	58	60	53	53	55	51	0	41	43	0	0	0	0	74	58	55	0	61	
ALPHAOB	0	0	0	0	0	118	98	88	0	87	0	145	0	0	57	91	0	0	268	50	121	0	0	0	0	0	0	0	85	104	77	0	149	
SEALPHAOB	0	0	0	0	0	20	17	23	0	12	0	26	0	0	17	63	0	0	239	26	83	0	0	0	0	0	0	0	19	48	19	0	7	
NW	0	0	0	0	0	11	9	9	0	30	0	14	2	0	4	2	0	2	4	7	5	0	3	2	0	0	0	0	28	6	23	0	161	
PNW	0	0	0	0	0	5	5	8	0	12	0	7	8	0	5	6	0	7	9	17	11	0	14	6	0	0	0	0	26	10	18	0	9	
ND	0	0	0	0	1	19	14	16	0	32	0	13	0	0	10	2	0	1	9	6	7	0	3	0	0	0	0	0	18	6	13	0	170	
PND	0	0	0	0	8	8	7	15	0	13	0	7	0	0	12	6	0	3	19	14	15	0	14	0	0	0	0	0	17	10	10	0	10	
NP	0	0	0	1	4	85	86	42	2	80	0	81	8	0	26	7	2	3	10	4	7	0	1	6	0	0	0	0	29	16	22	0	522	
PNP	0	0	0	11	31	36	43	40	33	31	0	41	32	0	31	19	40	10	21	10	15	0	5	17	0	0	0	0	27	26	17	0	31	
ALPHAP	0	0	0	0	0	51	50	29	0	43	0	66	0	0	41	0	0	0	0	0	0	0	0	0	0	0	0	0	64	0	27	0	76	
SEALPHAP	0	0	0	0	0	10	10	9	0	9	0	14	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	13	0	5	
NM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PNM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NL	0	0	0	0	0	2	3	1	0	2	0	2	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	1	3	0	0	17
PNL	0	0	0	0	0	1	2	1	0	1	0	1	0	0	0	3	0	0	2	0	2	0	0	0	0	0	0	0	0	2	2	0	0	1
NRT	0	0	0	2	3	51	41	21	1	50	0	38	6	0	28	11	1	13	15	16	14	0	11	13	0	0	0	0	21	17	45	0	418	
PNRT	0	0	0	22	23	21	21	20	17	20	0	19	24	0	33	31	20	43	32	38	30	0	50	37	0	0	0	0	19	27	34	0	25	
ALPHART	0	0	0	0	0	21	25	58	0	29	0	25	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	29	0	186	
SEALPHART	0	0	0	0	0	5	7	34	0	8	0	8	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	8	0	16	
NRD	0	0	0	0	0	11	6	4	0	4	0	7	0	0	3	2	0	2	0	0	3	0	2	3	0	0	0	0	1	5	13	0	66	
PNRD	0	0	0	0	0	5	3	4	0	2	0	4	0	0	4	6	0	7	0	0	6	0	9	9	0	0	0	0	1	8	10	0	4	
NRF	0	0	0	0	1	4	4	2	0	7	0	8	3	0	5	3	0	6	5	4	2	0	3	5	0	0	0	0	5	6	12	0	85	
PNRF	0	0	0	0	8	2	2	2	0	3	0	4	12	0	6	8	0	20	11	10	4	0	14	14	0	0	0	0	5	10	9	0	5	
NSA	0	0	0	0	1	10	17	6	0	16	0	11	0	0	9	6	1	8	1	6	4	0	5	4	0	0	0	0	6	7	22	0	140	
PNSA	0	0	0	0	8	4	9	6	0	6	0	6	0	0	11	17	20	27	2	14	9	0	23	11	0	0	0	0	6	11	17	0	8	
NSF	0	0	0	0	1	6	14	3	0	14	0	7	0	0	7	6	1	5	0	5	2	0	5	2	0	0	0	0	3	6	20	0	107	
PNSF	0	0	0	0	8	3	7	3	0	5	0	4	0	0	8	17	20	17	0	12	4	0	23	6	0	0	0	0	3	10	15	0	6	
NST	0	0	0	0	0	4	3	3	0	2	0	4	0	0	2	0	0	3	1	1	2	0	0	2	0	0	0	0	3	1	2	0	33	
PNST	0	0	0	0	0	2	2	3	0	1	0	2	0	0	2	0	0	10	2	2	4	0	0	6	0	0	0	0	3	2	2	0	2	
NSS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PNSS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(b)

Plants:

Sample no.taxa	12	11	10	9	8	14	7	6	5	4	3	2	1	81
	2	7	37	46	47	39	38	42	15	7	0	0	1	29

AIVfor

ALNE	-	2	6	15	13	12	17	12	2	2	-	-	-	7
ARTE	-	2	19	26	23	19	29	26	3	2	-	-	-	26
CHEN	-	4	33	44	33	27	25	37	11	5	-	-	-	16
EPIL	-	2	12	16	8	10	14	10	2	2	-	-	-	6
MOAR	-	2	10	12	14	12	12	9	4	0	-	-	-	10
QUFA	-	4	20	21	17	16	21	17	7	6	-	-	-	17
RHPR	-	4	14	16	14	14	16	12	6	6	-	-	-	12
SECA	-	6	21	26	21	16	14	17	8	3	-	-	-	13

FOOS	-	3	15	15	12	12	21	15	7	6	-	-	-	12
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percentage amount for

ALNE	-	-	7	11	9	11	16	11	-	-	-	-	-	9
ARTE	-	-	21	23	21	19	31	28	-	-	-	-	-	41
CHEN	-	-	35	38	30	26	27	37	-	-	-	-	-	25
EPIL	-	-	14	14	8	11	16	11	-	-	-	-	-	9
MOAR	-	-	12	11	13	13	13	11	-	-	-	-	-	16
QUFA	-	-	23	20	17	17	24	20	-	-	-	-	-	28
RHPR	-	-	16	14	13	15	18	13	-	-	-	-	-	19
SECA	-	-	23	25	21	17	18	20	-	-	-	-	-	22

FOOS	-	-	12	9	8	9	16	15	-	-	-	-	-	13
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*Table 2. Complete list of plant and invertebrate taxa recorded from North Cave. For the plants, the parts recovered are included; all material was preserved by waterlogging unless otherwise indicated. Latin names and authorities and taxonomic order follow Tutin et al. (1964–80) (vascular plants) and Smith (1978) (mosses) and vernacular names of vascular plants follow Clapham, Tutin and Moore (1987). For Coleoptera and Hemiptera the ecological codes assigned for the analyses are given in square brackets and nomenclature follows Kloet and Hincks (1964-77), except where superceded. 'Indet.' indicates records which may include taxa already listed. For molluscs, nomenclature follows Kerney and Cameron (1979).*

## MUSCI

*Sphagnum* sp(p). [leaves and shoot fragments]  
*Polytrichum* sp(p). [leaf-bases, leaves and/or shoot fragments]  
*Dicranum* sp(p). [leaves]  
*Leucobryum glaucum* (Hedw.) Ångstr. [leaves and shoot fragments]  
*Racomitrium* sp(p). [shoot fragments]  
*Drepanocladus* sp(p). [leaves and shoot fragments]  
*Scorpidium scorpioides* (Hedw.) Limpr. [leaves and shoot fragments]  
*Calliargon* cf. *giganteum* (Schimp.) Kindb. [shoot fragments]  
*Eurhynchium* cf. *praelongum* (Hedw.) Br. Eur. [shoot fragments]  
*Hypnum* cf. *cupressiforme* Hedw. [shoot fragments]  
 cf. *Rhytidadelphus* sp(p). [shoot fragments]  
*Hylocomium splendens* (Hedw.) Br. Eur. [leaves and shoot fragments]

## PTERIDOPHYTA

Filicales (ferns) [pinnule fragments]  
*Pteridium aquilinum* (L.) Kuhn (bracken) [pinnule and stalk fragments]

## ANGIOSPERMAE

*Salix* sp(p). (willow) [fruits, buds, leaf fragments]  
 cf. *Salix* sp(p). (willow) [twig epidermis fragments]  
*Populus* sp(p). (poplar/aspens) [buds/bud-scales]  
*Alnus* sp(p). (alder) [fruits, female cone axes, male catkin fragments, twig fragments and buds/bud-scales]  
*Corylus avellana* L. (hazel) [buds/bud-scales and male catkin fragments]  
*Quercus* sp(p). (oak) [twig fragments and buds/bud-scales]  
*Urtica dioica* L. (stinging nettle) [achenes]  
*U. urens* L. (annual nettle) [achenes]

*Polygonum aviculare* agg. (knotgrass) [nutlets]  
*P. hydropiper* L. (water-pepper) [nutlets]  
*P. persicaria* L. (persicaria/red shank) [nutlets, including charred]  
*P. lapathifolium* L. (pale persicaria) [nutlets]  
*Bilderdykia convolvulus* (L.) Dumort. (black bindweed) [nutlets]  
*Rumex acetosella* agg. (sheep's sorrel) [nutlets, including charred]  
*Rumex* sp(p). (docks) [nutlets]  
*Chenopodium* Section *Pseudoblitum* (red goosefoot etc.) [seeds]  
*C. ficifolium* Sm. (fig-leaved goosefoot) [seeds]  
*C. album* L. (fat hen) [seeds]  
*Atriplex* sp(p). (oraches) [seeds]  
*Montia fontana* ssp. *chondrosperma* (Fenzl) Walters (blinks) [seeds]  
*Arenaria serpyllifolia* L. (thyme-leaved sandwort) [seeds]  
*Moehringia trinervia* (L.) Clairv. (three-nerved sandwort) [seeds]  
*Stellaria media* (L.) Vill. (chickweed) [seeds]  
*S. cf. neglecta* Weihe in Bluff & Fingerh. (?greater chickweed) [seeds]  
*S. palustris/graminea* (marsh/lesser stitchwort) [seeds]  
*S. graminea* L. (lesser stitchwort) [seeds]  
*Stellaria* sp(p). (stitchworts/chickweeds) [seeds]  
*Cerastium* sp(p). (mouse-ear chickweeds) [seeds]  
*Scleranthus annuus* L. (annual knawel) [fruits]  
*Spergula arvensis* L. (corn spurrey) [seeds]  
*Agrostemma githago* L. (corncockle) [seeds]  
*Silene vulgaris* (Moench) Garcke (bladder campion) [seeds]  
*S. alba* (Miller) Krause in Sturm (white campion) [seeds]  
*Ranunculus* Section *Ranunculus*  
 (meadow/creeping/bulbous buttercup) [achenes, including charred]  
*R. flammula* L. (lesser spearwort) [achenes]  
*R.* Subgenus *Batrachium* (water crowfoots) [achenes]  
*Ranunculus* sp. [achenes]  
*Thalictrum flavum* L. (common meadow rue) [achenes]  
*Papaver* cf. *rheas/dubium* (?common/long-headed

- poppy) [seeds]  
*P. dubium* L. (long-headed poppy) [seeds]  
*P. argemone* L. (long prickly-headed poppy) [seeds]  
*Fumaria* sp(p). (fumitories) [seeds]  
 Cruciferae (shepherds purse/cabbage family) [seeds]  
*Descurainia sophia* (L.) Webb ex Prantl (flixweed) [seeds]  
*Rorippa islandica* (Oeder) Borbás (northern marsh yellow-cress) [seeds]  
*Nasturtium officinale* R.Br in Aiton (water-cress) [seeds]  
*Capsella bursa-pastoris* (L.) Medicus (shepherd's purse) [seeds]  
*Thlaspi arvense* L. (field penny-cress) [seeds]  
*Brassica rapa* L. ((?wild) turnip) [seeds]  
*Brassica* sp. {cabbages, etc.} [seeds]  
*Raphanus raphanistrum* L. (wild radish) [pod segments/fragments and seeds]  
*Filipendula ulmaria* (L.) Maxim. (meadowsweet) [achenes]  
*Rubus idaeus* L. (raspberry) [seeds]  
*R. fruticosus* agg. (blackberry/bramble) [seeds]  
*R. caesius* L. (dewberry) [seeds]  
*Rubus* sp(p). (blackberry, raspberry etc.) [prickles]  
*Rubus/Rosa* sp(p). (blackberry, etc./rose) [prickles]  
*Rosa* sp(p). (roses) [prickles]  
*Potentilla palustris* (L.) Scop. (marsh cinquefoil) [achenes]  
*P. anserina* L. (silverweed) [achenes]  
*P. cf. erecta* (L.) Rauschel (tormentil) [achenes]  
*P. cf. reptans* L. (?creeping cinquefoil) [achenes]  
*Potentilla* sp(p). (cinquefoils, etc.) [achenes]  
*Aphanes microcarpa* (Boiss. & Reuter) Rothm. (slender parsley-piert) [achenes]  
 Pomoideae (apple/pear/rowan/hawthorn) [twigs]  
*Crataegus monogyna* Jacq. (hawthorn) [pyrenes]  
*Crataegus* sp(p). [thorns]  
*Prunus spinosa* L. (blackthorn, sloe) [thorns]  
 Leguminosae (pea family) [waterlogged flowers and/or petals and charred cotyledons]  
*Vicia* sp(p). (vetches, etc.) [charred seeds]  
*Linum usitatissimum* L. (flax, linseed) [capsule fragments]  
*Malva sylvestris* L. (common mallow) [nutlets]  
*Hypericum* sp(p). (St John's-worts) [seeds]  
*Viola* sp(p). (violets/pansies, etc.) [seeds, capsule segments]  
*Epilobium* sp(p). (willow-herbs, etc.) [seeds]  
*Hippuris vulgaris* L. (mare's-tail) [seeds]  
 Umbelliferae (cow parsley/carrot family) [mericarps]  
*Hydrocotyle vulgaris* L. (marsh pennywort) [mericarps]  
*Chaerophyllum temulentum* L. (rough chervil) [mericarps]
- cf. *Anthriscus sylvestris* (L.) Hoffm. (?cow parsley) [mericarps]  
*A. caucalis* Bieb. (bur chervil) [mericarps]  
*Coriandrum sativum* L. (coriander) [mericarps]  
*Oenanthe lachenalii* C. G. Gmelin (parsley water-dropwort) [mericarps]  
*Aethusa cynapium* L. (fool's parsley) [mericarps]  
*Conium maculatum* L. (hemlock) [mericarps]  
*Apium nodiflorum* (L.) Lag. (fool's watercress) [mericarps]  
*Pastinaca sativa* L. ((?wild) parsnip) [mericarps]  
*Heracleum sphondylium* L. (hogweed) [mericarps]  
*Torilis japonica* (Houtt.) DC. (upright hedge-parsley) [mericarps]  
*Daucus carota* L. ((?wild) carrot) [mericarps]  
*Erica tetralix* L. (cross-leaved heath) [leaves]  
*E. cinerea* L. (bell heather) [leaves]  
*Calluna vulgaris* (L.) Hull (heather, ling) [capsules, flowers, leaves, seeds, shoot and root/twig fragments (incl. charred shoot and root/twig fragments)]  
 Primulaceae (primrose family) [seeds]  
*Anagallis arvensis* L. (scarlet pimpernel) [seeds]  
*Fraxinus excelsior* L. (ash) [testa and fruit fragments]  
*Menyanthes trifoliata* L. (bogbean) [seeds]  
*Galium aparine* L. (goosegrass, cleavers) [fruits, including charred]  
*Galium* sp(p). (bedstraws) [fruits]  
 cf. *Callitriche* sp(p). (?water-starworts) [fruits]  
 Labiatae (mint family) [nutlets]  
*Marrubium vulgare* L. (white horehound) [nutlets]  
*Galeopsis* Subgenus *Galeopsis* (hemp-nettles) [nutlets]  
*Galeopsis* sp(p). (hemp-nettles) [nutlets]  
*Lamium* Section *Lamiopsis* (annual dead-nettles) [nutlets]  
*Stachys* cf. *sylvatica* L. (hedge woundwort) [nutlets]  
*S. cf. arvensis* (L.) L. (?field woundwort) [nutlets]  
*Stachys* sp(p). (woundworts) [nutlets]  
*Prunella vulgaris* L. (selfheal) [nutlets]  
 cf. *Satureja hortensis* L. (?summer savory) [nutlets]  
*Lycopus europaeus* L. (gypsywort) [nutlets]  
*Mentha* sp(p). (mints) [nutlets]  
*Hyoscyamus niger* L. (henbane) [seeds]  
*Solanum nigrum* L. (black nightshade) [seeds]  
*S. dulcamara* L. (woody nightshade) [seeds]  
*Scrophularia* sp(p). (figworts) [seeds]  
*Veronica beccabunga*-type (brooklime/water/marsh speedwells) [seeds]  
*Odontites verna* (Bellardi) Dumort (red bartsia) [seeds]  
*Rhinanthus* sp(p). (yellow rattles) [seeds]  
*Plantago major* L. (greater plantain) [seeds]  
*Plantago* sp(p). (plantains) [capsule fragments]  
*Sambucus nigra* L. (elder) [seeds, twig fragments]  
*Valerianella dentata* (L.) Pollich (narrow-fruited cornsalad) [fruits]  
*Campanula* cf. *rotundifolia* L. (?harebell, bluebell)

[seeds]  
 Compositae (daisy family) [involucral fragments]  
*Bidens* sp(p). (bur-marigolds) [achenes]  
*Matricaria perforata* Mérat (scentless mayweed)  
 [achenes]  
*Arctium* sp(p). (burdocks) [achenes]  
*Carduus/Cirsium* sp(p). (thistles) [achenes]  
*Centaurea* sp. (knapweeds, etc.) [achenes,  
 involucre fragments]  
*Leontodon* sp(p). (hawkbits) [achenes]  
*Sonchus asper* (L.) Hill (prickly sow-thistle)  
 [achenes]  
*S. oleraceus* L. (common sow-thistle) [achenes]  
*Taraxacum* sp(p). (dandelions) [achenes]  
*Lapsana communis* L. (nipplewort) [achenes]  
*Baldellia ranunculoides* (L.) Parl. (lesser water-  
 plantain) [carpels]  
*Alisma* sp(p). (water-plantains)  
 [carpels]  
*Triglochin maritima* L. (sea arrow-grass) [fruits]  
*Zannichellia palustris* L. (horned pondweed)  
 [fruits]  
*Juncus* cf. *inflexus/effusus/conglomeratus*  
 (?hard/soft/compact rush) [seeds]  
*J. gerardi* Loisel. (mud rush) [seeds]  
*J. bufonius* L. (toad rush) [seeds]  
*Juncus* sp(p). (rushes) [seeds]  
 Gramineae (grasses) [caryopses, including charred]  
 cf. Gramineae (?grasses) [culm fragments]  
 Cerealia indet. (cereals) [charred caryopses,  
 spikelet bases and rachis fragments]  
 cf. Cerealia indet. (?cereals) [charred culm-nodes]  
 cf. *Glyceria* sp(p). (sweet-grasses) [caryopses]  
*Bromus* sp(p). (bromes, etc.) [waterlogged and  
 charred caryopses]  
*Triticum spelta* (spelt wheat) [charred glume-bases]  
*T.* cf. *spelta* (?spelt wheat) [charred caryopses and  
 glume-bases]  
*Triticum* sp(p). (wheats) [charred caryopses and  
 glume-bases]  
 cf. *Secale cereale* (?rye) [charred caryopses]  
*Hordeum* sp(p). (barley) [charred caryopses and  
 rachis internodes]  
*Alopecurus* sp(p). (foxtails) [caryopses]  
*Lemna* sp(p). (duckweeds) [seeds]  
*Sparganium* sp(p). (bur-reeds) [fruits]  
*Typha* sp(p). (reed-maces) [seeds]  
*Scirpus lacustris* sensu lato (?bulrush) [nutlets]  
*S. setaceus* L. (bristle club-rush) [nutlets]  
*Eleocharis palustris* sensu lato (common spike-  
 rush) [nutlets]  
*Cladium mariscus* (L.) Pohl (great sedge/saw-  
 sedge) [nutlets]  
*Carex* sp(p). (sedges) [nutlets]

## ANNELIDA

Oligochaeta sp. (egg capsule)

## CRUSTACEA

*Daphnia* sp.  
*Ceriodaphnia* sp.  
 Cladocera sp.  
 Ostracoda sp.

## DERMAPTERA

*Forficula auricularia* Linnaeus  
 Dermaptera sp. indet.

## HEMIPTERA

*Sehirus bicolor* (Linnaeus) [oa-p]  
*Thyreocoris scarabaeoides* (Linnaeus) [oa-p]  
*Dolycoris baccarum* (Linnaeus) [oa-p]  
*Picromerus bidens* (Linnaeus) [oa-p]  
*Peritrechus ?lundi* (Gmelin) [oa-p]  
*Stygnocoris pedestris* (Fallén) [oa-p]  
*S. ?rusticus* (Fallén) [oa-p]  
*?Stygnocoris* sp. indet. [oa]  
*Drymus sylvaticus* (Fabricius) [oa-p]  
*Scolopostethus ?affinis* (Schilling) [oa-p]  
*Scolopostethus* sp. indet. [oa-p]  
 Lygaeidae sp. [oa-p]  
*Berytinus* sp. [oa-p]  
*Acalypta* sp. [oa-p]  
 Tingidae sp. [u]  
*Anthocoris* sp. [oa-p]  
 Cimicidae sp. [u]  
 Miridae sp. [oa-p]  
*Saldula saltatoria* (Linnaeus) [oa-d]  
*Chartoscirta* sp. [oa-w]  
 Saldidae sp. indet. [oa-d]  
 Corixidae spp. [oa-w]  
 Heteroptera sp. [u]  
 Heteroptera sp. (nymph)  
*Neophilaenus campestris* (Fallén) [oa-p]  
*Ulopa reticulata* (Fabricius) [oa-p-m]  
*Agallia brachyptera* (Boheman) [oa-p-d]  
*Aphrodes flavostriatus* (Donovan) [oa-p-d]  
*Aphrodes* sp. [oa-p]  
 Auchenorrhyncha spp. [oa-p]  
 Aphidoidea sp.  
*Trioza urticae* (Linnaeus) [oa-p]  
*Chionaspis salicis* (Linnaeus)  
 Coccidoidea sp. indet.  
 Hemiptera sp. [u]

TRICHOPTERA

Trichoptera sp(p).

COLEOPTERA

*Carabus granulatus* Linnaeus [oa]  
*Leistus ferrugineus* (Linnaeus) [oa]  
*Leistus* sp. [oa]  
*Nebria brevicollis* (Fabricius) [oa-a]  
*Notiophilus palustris* (Duftschmid) [oa]  
*Notiophilus* sp. [oa]  
*Blethisa multipunctata* (Linnaeus) [oa-d]  
*Elaphrus ?cupreus* Duftschmid [oa-d]  
*Loricera pilicornis* (Fabricius) [oa]  
*Clivina ?fossor* (Linnaeus) [oa]  
*Dyschirius globosus* (Herbst) [oa]  
*Trechus obtusus* Erichson [oa]  
*T. quadristriatus* (Schrank) [oa]  
*T. secalis* (Paykull) [oa-d]  
*Asaphidion flavipes* (Linnaeus) [oa]  
*Bembidion lampros* or *properans* [oa]  
*B. ?guttula* (Fabricius) [oa]  
*B. lunulatum* (Fourcroy) [oa-d]  
*Bembidion* spp. [oa]  
*Pterostichus cupreus* (Linnaeus) [oa]  
*Pterostichus (Poecilus)* sp. indet. [oa]  
*P. melanarius* (Illiger) [ob]  
*P. minor* (Gyllenhal) [oa]  
*P. niger* (Schaller) [oa]  
*P. nigrita* (Paykull) [oa-d]  
*Calathus fuscipes* (Goeze) [oa]  
*C. ?melanocephalus* (Linnaeus) [oa]  
*C. micropterus* or *mollis* [oa]  
*C. mollis* (Marsham) [oa]  
*Calathus* sp. indet. [oa]  
*Synuchus nivalis* (Panzer) [oa]  
*Agonum* sp. [oa]  
*Amara apricaria* (Paykull) [oa]  
*Amara* spp. [oa]  
*Harpalus rufipes* (Degeer) [oa]  
*Harpalus* spp. [oa]  
*Bradycellus* sp. [oa]  
*Badister ?sodalis* (Duftschmid) [oa-d]  
*Lebia chlorocephala* (Hoffmannsegg) [oa]  
*Dromius linearis* (Olivier) [oa]  
*Microlestes* sp. [oa]  
*Cymindis* sp. [oa]  
 Carabidae spp. indet. [ob]  
*Halipus* sp. [oa-w]  
 Hydroporinae spp. [oa-w]  
*Agabus bipustulatus* (Linnaeus) [oa-w]  
*Agabus* sp. indet. [oa-w]  
*Colymbetes fuscus* (Linnaeus) [oa-w]  
 Colymbetinae sp. [oa-w]  
*Georissus crenulatus* (Rossi) [oa-w]

*Hydrochus elongatus* (Schaller) [oa-w]  
*H. grandis* Illiger [oa-w]  
*H. aquaticus* or *grandis* [oa-w]  
*Helophorus* spp. [oa-w]  
*Helophorus* sp. (terrestrial) [oa]  
*Coelostoma orbiculare* Fabricius [oa-w]  
*Cercyon analis* (Paykull) [rt]  
*C. atricapillus* (Marsham) [rf]  
*C. ?convexiusculus* Stephens [oa-d]  
*C. ?haemorrhoidalis* (Fabricius) [rf]  
*C. ?pygmaeus* (Illiger) [rf-st]  
*C. ?melanocephalus* (Linnaeus) [rt]  
*C. sternalis* Sharp [oa-d]  
*C. terminatus* (Marsham) [rf]  
*C. ?tristis* (Illiger) [oa-d]  
*Cercyon* sp. indet. [u]  
*Megasternum obscurum* (Marsham) [rt]  
*Cryptopleurum minutum* (Fabricius) [rf]  
*Hydrobius fuscipes* (Linnaeus) [oa-w]  
*Laccobius bipunctatus* or *minutus* [oa-w]  
*Laccobius* sp. indet. [oa-w]  
*Chaetarthria seminulum* (Herbst) [oa-w]  
 Hydrophilinae spp. [oa-w]  
*Acritus nigricornis* (Hoffmann) [rt]  
*Onthophilus striatus* (Forster) [rt]  
 Histerinae sp. [u]  
*Ochthebius minimus* (Fabricius) [oa-w]  
*Ochthebius* sp. [oa-w]  
*Hydraena riparia* Kugelann [oa-w]  
*H. testacea* Curtis [oa-w]  
*Hydraena* sp. indet. [oa-w]  
*Limnebius* spp. [oa-w]  
*Ptenidium* sp. [rt]  
*Acrotrichis* spp. [rt]  
*Nargus anisotomoides* (Spence) [u]  
*N. velox* (Spence) [u]  
*Catops* sp. [u]  
 Catopinae sp. indet. [u]  
*Silpha ?tristis* Illiger [u]  
*Silpha* sp. indet. [u]  
 ?Scydmaenidae sp. [u]  
*Micropeplus fulvus* Erichson [rt]  
*M. porcatus* (Paykull) [rt]  
*M. staphylinoides* (Marsham) [rt]  
*Metopsia retusa* (Stephens) [u]  
*Anthobium atrocephalum* (Gyllenhal) [oa]  
*Lesteva longoelytrata* (Goeze) [oa-d]  
 ?*Lesteva* sp. indet. [oa-d]  
*Dropephylla* sp. [u]  
*Omalium ?rivulare* (Paykull) [rt]  
*Omalium* spp. [rt]  
*Xylodromus ?concinnus* (Marsham) [rt-st]  
 Omaliinae spp. indet. [u]  
 ?*Planeustomus palpalis* (Erichson) [rt]  
*Syntomium aeneum* (Müller) [oa]  
*Bledius* sp. [oa-d]  
*Carpelimus bilineatus* Stephens [rt]  
*C. ?corticinus* (Gravenhorst) [oa-d]

- C. elongatulus* (Erichson) [oa-d]  
*C. ?rivularis* (Motschulsky) [ob-d]  
*C. bilineatus* or *rivularis* [u]  
*Carpelimus* spp. indet. [u]  
*Aploderus caelatus* (Gravenhorst) [rt]  
*Platystethus alutaceus* Thomson [oa-d]  
*P. arenarius* (Fourcroy) [rf]  
*P. cornutus* group [oa-d]  
*P. nitens* (Sahlberg) [oa-d]  
*P. ?nodifrons* (Mannerheim) [oa-d]  
*Anotylus nitidulus* (Gravenhorst) [rt-d]  
*A. rugosus* (Fabricius) [rt]  
*A. sculpturatus* group [rt]  
*A. tetracarinatus* (Block) [rt]  
*Oxytelus fulvipes* Erichson [oa-d]  
*O. sculptus* Gravenhorst [rt]  
*Stenus* spp. [u]  
*Lathrobium* spp. [u]  
*Rugilus orbiculatus* (Paykull) [rt]  
*R. rufipes* (Germar) [rt-st]  
*Rugilus* sp. indet. [rt]  
Paederinae sp. [u]  
*Othius punctulatus* (Goeze) [rt]  
*Gyrophypnus ?angustatus* Stephens [rt]  
*Gyrophypnus* sp. indet. [rt]  
*Xantholinus linearis* (Olivier) [rt]  
*X. longiventris* Heer [rt]  
*Neobisnius* sp. [u]  
*Erichsonius cinerascens* (Gravenhorst) [oa-d]  
*Philonthus* spp. [u]  
*Philonthus* or *Gabrius* sp. [u]  
*Staphylinus ?aeneocephalus* Degeer [u]  
*Staphylinus* sp. [u]  
Staphylininae spp. indet. [u]  
*Mycetoporus* sp. [u]  
*Sepedophilus ?marshami* (Stephens) [u]  
*S. nigripennis* or *pedicularius* [u]  
*Sepedophilus* sp. indet. [u]  
*Tachyporus ?hypnorum* (Fabricius) [u]  
*T. obtusus* (Linnaeus) [u]  
*Tachyporus* spp. [u]  
*Tachinus corticinus* Gravenhorst [u]  
*T. laticollis* or *marginellus* [u]  
*T. signatus* Gravenhorst [u]  
*Tachinus* sp. indet. [u]  
*Cypha* sp. [rt]  
*Falagria caesa* or *sulcatula* [rt]  
*Falagria* or *Cordalia* sp. indet. [rt]  
Aleocharinae spp. [u]  
Pselaphidae sp. [u]  
*Geotrupes* sp. [oa-rf]  
*Aphodius contaminatus* (Herbst) [oa-rf]  
*A. granarius* (Linnaeus) [ob-rf]  
*A. prodromus* (Brahm) [ob-rf]  
*Aphodius* spp. [ob-rf]  
*Oxyomus sylvestris* (Scopoli) [rt]  
*Onthophagus joannae* Goljan [oa-rf]  
*O. ?similis* (Scriba) [oa-rf]  
*Onthophagus* sp. [oa-rf]  
*Serica brunnea* (Linnaeus) [oa-p]  
*Hoplia philanthus* Illiger [oa]  
*Phyllopertha horticola* (Linnaeus) [oa-p]  
Melolonthinae/Rutelinae/Cetoniae sp. indet. [oa-p]  
*Clambus* sp. [rt]  
*Cyphon* sp. [oa-d]  
*Simplocaria semistriata* (Fabricius) [oa-p]  
Byrrhidae sp. [oa-p]  
*Heterocerus* sp. [oa-d]  
*Dryops* sp. [oa-d]  
*Agrypnus murinus* (Linnaeus) [oa-p]  
*A. murinus* (larva)  
*?Cidnopus* sp. (larva)  
*Athous haemorrhoidalis* (Fabricius) [oa-p]  
*A. hirtus* (Herbst) [oa-p]  
*Agriotes obscurus* (Linnaeus) [oa-p]  
*Agriotes* sp. indet. [oa-p]  
*Dalopius marginatus* (Linnaeus) [oa-p]  
*Adrastus pallens* (Fabricius) [oa-p]  
Elateridae spp. [ob]  
Elateridae sp. (larva)  
*Cantharis rustica* Fallén [ob]  
*Cantharis* sp. [ob]  
*Rhagonycha fulva* (Scopoli) [ob]  
*R. lutea* (Müller) [ob]  
*R. testacea* or *femoralis* [ob]  
*Rhagonycha* sp. indet. [ob]  
*Cantharis* or *Rhagonycha* sp. indet. [ob]  
Cantharidae sp. indet. [ob]  
*Anobium ?punctatum* (Degeer) [I]  
*Ptilinus pectinicornis* (Linnaeus) [I]  
Anobiidae sp. indet. [I]  
*Ptinus fur* (Linnaeus) [rd]  
*Ptinus* sp. indet. [rd]  
*Malachius* sp. [u]  
*Kateretes ?pedicularis* (Linnaeus) [oa-p-d]  
*K. rufilabris* (Latreille) [oa-p-d]  
*Brachypterus glaber* (Stephens) [oa-p]  
*B. urticae* (Fabricius) [oa-p]  
*Meligethes aeneus* (Fabricius) [oa-p]  
*Meligethes* spp. [oa-p]  
*Omosita discoidea* (Fabricius) [rt]  
*Monotoma* sp. [rt]  
*Cryptophagus* spp. [rd]  
*Atomaria* spp. [rd]  
*Ephistemus globulus* (Paykull) [rd]  
*Olibrus* sp. [oa-p]  
Phalacridae sp. [oa-p]  
*Orthoperus* sp. [rt]  
*Subcoccinella vigintiquatuorpunctata* (Linnaeus) [oa-p]  
*Coccidula rufa* (Herbst) [oa-p]  
*Coccinella undecimpunctata* Linnaeus [oa-p]  
Coccinellidae sp. indet. [oa-p]  
*Stephostethus lardarius* (Degeer) [rt]

*Lathridius minutus* group [rd]  
*Enicmus* sp. [rt]  
*Corticaria* sp. [rt]  
*Corticarina* ?*fuscula* (Gyllenhal) [rt]  
*Cortinicara gibbosa* (Herbst) [rt]  
*Corticarina* or *Cortinicara* sp. indet. [rt]  
Corticariinae sp. indet. [rt]  
*Pyrochroa serraticornis* (Scopoli) [oa-l]  
*Anthicus* sp. [rt]  
Donaciinae sp. [oa-p-d]  
*Lema* or *Oulema* sp. [oa-p]  
*Timarcha tenebricosa* (Fabricius) [oa-p]  
*Chrysolina polita* (Linnaeus) [oa-p]  
*C. staphylaea* (Linnaeus) [oa-p]  
*Chrysolina* sp. indet. [oa-p]  
*Gastrophysa polygoni* (Linnaeus) [oa-p]  
*G. viridula* (Degeer) [oa-p]  
Chrysomelinae spp. indet. [oa-p]  
*Phyllotreta nemorum* group [oa-p]  
*Phyllotreta* spp. [oa-p]  
*Longitarsus* sp. [oa-p]  
*Crepidodera ferruginea* (Scopoli) [oa-p]  
*Crepidodera* sp. indet. [oa-p]  
*Hippuriphila modeeri* (Linnaeus) [oa-p-d]  
*Chalcoides* sp. [oa-p]  
*Chaetocnema concinna* (Marshall) [oa-p]  
*Sphaeroderma* ?*testaceum* (Fabricius) [oa-p]  
*Psylliodes* sp. [oa-p]  
Halticinae spp. indet. [oa-p]  
*Apion* (*Ceratapion*) *carduorum* Kirby [oa-p]  
*A.* ?(*Synapion*) *ebeninum* Kirby [oa-p]  
*A.* (*Pirapion*) sp. [oa-p]  
*A.* (*Oxystoma*) *craccae* (Linnaeus) [oa-p]  
*A.* (*Protapion*) *dissimile* Germar [oa-p]  
*Apion* spp. [oa-p]  
*Otiorrhynchus ovatus* (Linnaeus) [oa-p]  
? *Trachyphloeus* sp. [oa-p]  
*Phyllobius pomaceus* Gyllenhal [oa-p]  
*P. viridiaeris* (Laicharting) [oa-p]  
*Phyllobius* sp. indet. [oa-p]  
*Phyllobius* or *Polydrusus* sp. indet. [oa-p]  
? *Barypeithes* sp. [oa-p]  
*Cneorhinus plumbeus* (Marshall) [oa-p]  
*Sitona humeralis* Stephens [oa-p]  
*S. lepidus* Gyllenhal [oa-p]  
*S.* ?*lineatus* (Linnaeus) [oa-p]  
*Sitona* spp. indet. [oa-p]  
*Hypera nigrirostris* (Fabricius) [oa-p]  
*H. punctata* (Fabricius) [oa-p]  
*Tanysphyrus lemnae* (Paykull) [oa-w-p]  
*Notaris acridulus* (Linnaeus) [oa-p-d]  
*Cidnorhinus quadrimaculatus* (Linnaeus) [oa-p]  
*Ceutorhynchus contractus* (Marshall) [oa-p]  
*C. erysimi* (Fabricius)  
*C. litura* (Fabricius) [oa-p]  
*Ceutorhynchus* spp. [oa-p]  
*Rhinoncus castor* (Fabricius) [oa-p]

? *Rhinoncus* sp. indet. [oa-p]  
Ceuthorhynchinae spp. indet. [oa-p]  
? *Tychiinae* sp. [oa-p]  
*Mecinus pyraster* (Herbst) [oa-p]  
*Gymnetron labile* (Herbst) [oa-p]  
*G. pascuorum* (Gyllenhal) [oa-p]  
*Gymnetron* sp. indet. [oa-p]  
? *Rhynchaenus foliorum* (Müller) [oa-p]  
Curculionidae spp. [oa]  
*Scolytus* sp. [l]  
*Leperisinus* ?*varius* (Fabricius) [l]  
Coleoptera spp. [u]  
Coleoptera sp. (larva)

#### DIPTERA

(puparia where not otherwise indicated)

Bibionidae sp. (adult)  
? *Sphaerocera* sp.  
Sphaeroceridae sp.  
? *Spilogona* sp.  
? *Nemopoda* sp.  
Diptera spp. indet.  
Diptera sp. indet. (adult)

#### SIPHONAPTERA

Siphonaptera sp.

#### HYMENOPTERA

? *Bethylidae* sp.  
Proctotrupeoidea sp.  
Parasitica spp.  
Formicidae spp.  
Apoidea sp.  
Aculeata spp.

#### ARACHNIDA

Acarina spp.  
Aranae spp.

#### MOLLUSCA

*Carychium* sp.  
*Aplexa hypnorum* (Linnaeus)  
*Lymnaea peregra* (Müller)  
*Anisus leucostoma* (Millet)  
*A. vortex* (Linnaeus)  
*Succinea putris* (Linnaeus)  
Succineidae sp.  
*Cochlicopa lubrica* (Müller)

?*C. lubricella* (Porro)  
*Vertigo pygmaea* (Draparnaud)  
*Vallonia costata* (Müller)  
*V. excentrica* Sterki  
*Vitrea crystallina* (Müller)  
*Aegopinella nitidula* (Draparnaud)  
?*Aegopinella* sp. indet.

*Oxychilus alliarius* (Miller)  
*Trichia plebeia* (Draparnaud)  
*Ashfordia granulata* (Alder)  
*Trichia hispida* agg.  
Helicidae indet.  
*Pisidium personatum* Malm  
*Pisidium/Sphaerium* sp.

*Table 3. Ecological and 'use' groups to which plant taxa from deposits at North Cave have been assigned. Note that any taxon may be assigned to more than one group (though with a different 'indicator' score of between 1 and 3, and that different parts of plants are each scored separately for the analyses whose results appear in Appendix 3.*

Group	Description
UNCL	Not classified
Uses:	
FIBR	Plants used for their fibre
FOOF	Plants used as flavouring, including herbs and spices
FOOO	Plants with oil-seeds
FOOS	Plants forming a major component of diet - cereals, pulses, nuts, fruit, vegetables
USEF	Plants useful in some way other than those already defined
WOOD	Parts of woody plants other than fruits/seeds
Vegetation:	
ALNE	Plants of alder carr
ARTE	Nitrophilous tall-herb weed communities of waste places, river banks, waysides and hedgerows
ASTE	Plants of upper salt-marsh and sea-cliff vegetation
BIDE	Nitrophilous weed communities of pond edges, ditches and other places subject to periodic inundation
BULB	Plants of brackish and saline reedswamp
CAKI	Nitrophilous weedy communities of shingle beaches and sandy strandlines
CHEN	Nitrophilous weed communities of cultivated and other disturbed land (especially rootcrop fields and gardens)
EPIL	Nitrophilous woodland edge and clearing communities
FEBR	Plants of drier, typically calcareous, grassland
ISNA	Short-lived dwarf rush communities of winter-wet (often sandy) habitats, pond edges, etc.
LEMN	Free-floating aquatic communities of eutrophic waters
LITT	Rooted aquatic vegetation at the edge of (usually) oligotrophic waters
MOAR	Plants of grassland, including the wetter hay meadows and pastures, and adjacent paths
MOCA	Plants of oligotrophic springs and flushes, mainly upland
NACA	Plants of grass and dwarf-shrub (typically <i>Calluna</i> ) -dominated dry heaths and moors
OXSP	Plants of raised bogs and wet heaths
PHRA	Freshwater reedswamp communities
PLAN	Plant communities of trampled places
POTA	Rooted aquatic vegetation of still or slow-moving water
QUER	Deciduous woodland on poorer soils
QUFA	Deciduous woodland on better soils
RHPR	Woodland edge scrub communities
RUPP	Submerged communities of brackish water
SCCA	Communities of poor and intermediate fens (acid to mildly basic peat)
SECA	Weeds of cereal fields
SESC	Established vegetation of sand dunes and other sandy acidic soils
TRGE	Species rich communities of grassland/scrub boundaries, often calcicolous
VAPI	Conifer forest and scrub of upland areas (mainly non-British communities)



Ecology:

CALC	Calcicole plants
FUGE	Calcifuge plants

Mosses:

BOGS	Mosses found in bogs
FENS	Mosses of fens
GRAS	Mosses of grassland
HEMO	Mosses of heathland/moorland
LIGN	Mosses of living and dead bark and wood
MARS	Mosses of marshes
OLIT	Mosses of drier, unshaded rocks, stones, and walls
SLIT	Mosses of shaded, moist rocks, stones, and walls
SOIL	Mosses of bare, usually well-drained soil in unshaded places
WOOF	Mosses of woodland floor habitats, principally humus and litter

Table 4. Explanation of main statistics used in Table 1(a).

Number of individuals (MNI) estimated at	N
Number of taxa	S
Index of diversity (alpha)	alpha
Standard error of alpha	SE alpha
Number of 'certain' outdoor individuals	NOA
Percentage of 'certain' outdoor individuals	PNOA
Number of 'certain' and probable outdoor individuals	NOB
Percentage 'certain' and probable outdoor individuals	PNOB
Index of diversity (alpha) of outdoor component	alpha OB
Standard error	SE alpha OB
Number of aquatic individuals	NW
Percentage of aquatic individuals	PNW
Number of damp ground/waterside individuals	ND
Percentage of damp ground/waterside individuals	PND
Number of strongly plant-associated individuals	NP
Percentage of strongly plant-associated individuals	PNP
Number of heathland/moorland individuals	NM
Percentage of heathland/moorland individuals	PNM
Number of wood-associated individuals	NL
Percentage of wood-associated individuals	PNL
Number of decomposer individuals	NRT
Percentage of decomposer individuals	PNRT
Number of 'dry' decomposer individuals	NRD
Percentage of 'dry' decomposer individuals	PNRD
Number of 'foul' decomposer individuals	NRF
Percentage of 'foul' decomposer individuals	PNRF
Index of diversity (alpha) of decomposer component	alpha RT
Standard error	SE alpha RT
Number of individuals of facultative synanthropes	NSF
Percentage of individuals of facultative synanthropes	PNSF
Number of individuals of typical synanthropes	NST
Percentage of individuals of typical synanthropes	PNST
Number of individuals of strong synanthropes	NSS
Percentage of individuals of strong synanthropes	PNSS
Number of individuals of all synanthropes	NSA
Percentage of individuals of all synanthropes	PNSA