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Plant and invertebrate remains from excavations at Dowbridge Close, Kirkham, Lancashire (site code: KD94)

by

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Summary

Samples of deposits, mainly ditch fills of Roman date, associated with the fort at Kirkham, Lancashire, have been examined for their content of plant and invertebrate remains. Several of the ditch fills contained plant and insect remains which probably originated in stable manure or horse dung. In some cases there was evidence for temporary open water in the cuts. A large proportion of the fills may have consisted of surface deposits used to backfill the ditches, bringing with them horse dung and other material including turf; there were no layers of stable manure or turf as such, however. It is possible that 'indoor' insects in some of the samples had been eaten incidentally in stables and voided with dung in the open. The grain pests recorded doubtless came from horse feed rather than food for human consumption.

It appears that waste disposal at this site was generally well organised, for the fills examined gave little evidence for the disposal of waste from human occupation.

Keywords: Kirkham; Lancashire; Roman fort; ditch fills; plant remains; timbers; parasite eggs; insect remains

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Introduction

A series of samples of deposits mostly of Roman date from excavations in Dowbridge Close, Kirkham, Lancashire, were submitted for analysis of their content of plant and invertebrate remains, in order to cast light on a series of questions raised by the excavator in the Post-excavation Assessment Report (Buxton 1994). The samples came from 22 contexts, almost all representing features associated with the Roman fort, and mainly the fills of linear cuts interpreted as ditches.

The analyses reported here were carried out within a very restricted budget, which has placed constraints on the approach which could be taken.

Practical methods

Each sample was represented by between one and five ten litre tubs of sediment (there were 48 in total; see Table 8). In order to avoid confusion, where there was more than one tub each was assigned a unique sample number—by adding 01, 02, etc., to the sample number. The contents of all of the tubs were inspected in the laboratory and a description of their lithology recorded using a standard *pro forma*. At this stage, the samples were prioritised for further analysis.

Subsamples of 1 kg were taken from 21 of the samples for extraction of macrofossil remains, following procedures of Kenward *et al.* (1980; 1986a). In some cases, where 'waterlogged' organic remains were thought to be sparse or lacking, the 'light' fraction was recovered by a washover and paraffin flotation was not undertaken. Work on macro-invertebrates proceeded further by (a) an initial assessment and prioritisation and (b) scan-recording (*sensu* Kenward 1992) of selected material. Insect assemblages were assessment-recorded unless they appear in Table 6.

Eleven of the selected samples (Table 8) were also examined for the eggs of parasitic nematodes using the methods of Dainton (1992).

Plant remains were recorded (using a semi-quantitative four-point scale of abundance) from the residues either directly by AH (by scanning *sensu* Hall and Kenward 1990) or from material picked out by BMcK. The flots and washovers were also checked for plant remains by AH. Components of the residues other than identifiable plant macrofossils were recorded by either AH or BMcK during sorting/scanning. A selection, at least, of insect remains which had not been extracted from the residues by paraffin flotation was passed to HK/FL for identification. Paraffin extraction of insect fossils has become less reliable in the past few years; whereas almost all remains were extracted by the technique formerly, it is now not uncommon for quite substantial numbers to remain in the residue. The reason for this is suspected to lie in manufacturers' modifications to the domestic paraffin employed. For the present material, although the numbers of fossils in the residues were quite large, the addition of these remains to the assemblages from the flots generally had little influence on the main statistics or interpretation. However, some additional *taxa* were recorded from the residues.

For a few samples, all the remaining sediment (apart from a voucher) was 'bulk-sieved' to 1 mm (with a 500 :m washover), the residue being sorted when dry for artefacts and larger plant remains.

Interpretative methods

For plant and insect macrofossils the approach to interpretation followed that used by Hall and Kenward (1990). Thus, the lists of plant taxa (Table 3) were subjected to an analysis which uses a series of 'ecological' and 'use' groups (Tables 4, 5). The assemblages of adult beetles and bugs were examined for their 'community structure' using the index of diversity, alpha, of Fisher *et al.* (1943), regarded here as indicative of the degree of heterogeneity of origin of the death

assemblage. The ecological groups into which these insects were classified are explained in Table 7. It should be noted that the 'outdoor' component referred to below has a significance beyond the identification of assemblages as having formed inside or outside buildings. Statements concerning statistics of insect assemblages are relative to the distribution of values seen in a very large number of groups from archaeological occupation sites of many kinds.

Results

The samples were all essentially silts and clays with a varying proportion of organic matter, sometimes coarse detritus in lenses but more generally present as fine detritus or amorphous humic material distributed through the matrix. No sample gave an appearance consistent with the excavator's description (Buxton 1994, 13) of some of the deposits as 'what appeared to be horse bedding and hay ... found in the ditches'.

Plant remains were recorded from 21 subsamples representing 17 contexts. A third of the subsamples were devoid of identifiable remains; for the remaining subsamples, the minimum number of taxa ranged from two to 44 (the mean being 22). Preservation was almost exclusively by anoxic 'waterlogging', the quality of preservation varying quite considerably. Apart from charcoal, almost no charred plant remains were recorded, even from the bulk-sieved subsamples. There were certainly no charred cereal remains, evidence for this group of plants being present in the form of 'waterlogged' wheat/rye 'bran' from five subsamples from three contexts and traces of ?wheat chaff fragments from two contexts.

Two of the 'squashes' examined for parasite eggs produced traces of *Trichuris* sp. Only these two are explicitly discussed in the text below.

Eight of the subsamples were barren of macro-invertebrates or contained only insignificant traces. A further eight, representing seven contexts, gave small groups of very limited interpretative significance individually, but of some value in the context of the material from the site as a whole. Six subsamples from four contexts gave more substantial assemblages, which were scan-recorded. One of the subsamples giving a small assemblage contained fragments of the stag beetle *Lucanus cervus* (see below) and in an attempt to recover more specimens a further, much larger subsample was processed, the insect remains in it being rapid scan-recorded (*sensu* Kenward 1992). All these remains were preserved by anoxic waterlogging, the condition of the fossils ranging from 'average' to 'poor' by comparison with typical material from occupation sites with such preservation.
The results of the investigations are presented in phase and context number order, with information from the excavator concerning context types in brackets. A full list of taxa recorded is given in Table 1. Table 2 summarises some statistics for the scan-recorded insect remains from the site as a whole. Lists of plant remains and some other components of the subsamples are presented in Table 3, with statistics derived from them in Table 4 (the groupings used being explained in Table 5). Species lists and main statistics for the insect assemblages are given in Table 6 (with an explanation of the ecological groups in Table 7). Table 8 gives a list of the samples for which some action was taken.

Phase 1: The earliest Roman defences

This phase is represented by the construction of three substantial parallel military defensive ditches. Samples were available from ditch fills from the two later sub-phases.

Phase 1.3: The middle ditch

Context 227 [ditch fill, Trenches E and H]
Sample 1111 (1 kg subsample processed; flot)

Wet, mid grey/brown, plastic and sticky, clay with some light orange/brown sand so that the texture varied from clay through to sandy clay. Brick/tile, charcoal, ?birch bark and 2-6 mm stones were present. The clay part was favoured for processing.

Only a small assemblage of plant remains was recorded from the subsample examined, most of them weeds; there was also a single very well

preserved fig seed, but no other indicators of the nature of the deposits. There were few invertebrates, and these gave little information.

Context 338 [ditch fill, Trench L]
Sample1247
Sample 124701 (tub 1 of 5)
Moist, light, orange/grey sand and mid-dark brown, brittle (working crumbly), amorphous organic sediment and light-mid grey/brown silt. No further examination was undertaken.

Sample 124702 (tub 2 of 5)

Similar to *124701* but with the addition of pale buff and pale orange, slightly sandy, silty clay and coarse herbaceous detritus. No further examination was undertaken.

Sample 124703 (tub 3 of 5; 1 kg subsample processed; flot)

Moist, mid-dark greyish brown, humic, slightly sandy clay silt with a slightly sandy, silty clay and some coarse herbaceous detritus. Stones (2-60 mm) were present.

Although the residue was small, it was rich in very well preserved plant remains, especially weeds and grassland plants. Amongst the former, there were large numbers of seeds or fruits of: black nightshade (*Solanum nigrum*); two *Chenopodium* species (fat-hen, *C. album*, and fig-leaved goosefoot, *C. ficifolium*); and persicaria (*Polygonum persicaria*). All of these are taxa likely to be abundant on dung-heaps or similarly eutrophic substrates. The grassland taxa may well have included plants from hay, perhaps in manure, but there was also a cereal component in the form of 'bran' and traces of uncharred ?wheat chaff; the few seed fragments of corncockle (*Agrostemma githago*) can probably be counted with this. Two salt-marsh plants, *Triglochin maritima* and *Juncus gerardi* are no doubt consistent with hay or dung from animals grazing on salt-marsh meadows; such pastures would presumably have been located quite close to the site, for example on the Ribble estuary, currently about 5 km to the south of the site (both plants have been recorded in the area in recent decades, cf. Perring and Walters 1962)—if not rather nearer (cf. Buxton and Howard-Davis, forthcoming). Certainly, the presence of 'straw' fragments in moderate amounts, and sometimes in small clumps, suggests that cut vegetation—hay and/or straw—was present.

The insect remains also suggest the presence of dung near to the point of deposition, for there were grain pests, an appreciable component of foul decomposers, and a small number of species likely to have originated within buildings. However, there was no well-developed community to indicate heaps of dung or stable manure as such, and the records of seven *Aphodius prodromus* and three *A. granarius* are perhaps more indicative of dung deposited by animals on surfaces adjacent to the ditch. The numerous taxa likely to have originated in weedy waste ground reinforce this interpretation. The entry route of the single human flea, *Pulex irritans*, is not obvious but this species would probably be able to pass its larval stage in litter in stables; it might therefore have been dumped in stable manure or (like any of the 'indoor' species) have been eaten accidentally with fodder on a stable floor and subsequently voided in the open.

Aquatic insects were a little more abundant than seems likely in the absence of at least temporary standing water, and there were small numbers of water flea resting eggs. No truly aquatic plant taxa were recorded; the few wetland forms may have been part of the hay/grazing component or have lived on soils with impeded drainage close to the site of deposition.
In summary, the evidence suggests that this cut occasionally contained small amounts of open water but was receiving plant and invertebrate remains from a surface with quite substantial amounts of dung.

Context 339 [ditch fill, Trench L]
Sample 1248

Moist, light orange/brown, unconsolidated sand with some mid grey clay sand. Stones in the range 6-20 mm were present. No further action was taken.

Phase 1.4: (a) The northern ditch

Context 79 [ditch fill, Trench A]
Sample 1004 (1 kg subsample processed; washover)

Moist, very heterogeneous on the mm to cm scale, black, grey and pale orange, sticky sandy clays (?burnt) with 6-20 mm-sized stones present and charcoal common.

The residue and washover were barren of biological remains, other than a little charcoal (to 10 mm, in moderate amounts) and a single fragment of a beetle larva present in the latter.

Context 88 [ditch fill, Trench A]
Sample 1016 (1 kg subsample; flot)

Moist, very heterogeneous mid brown, stiff, sandy silt with dull orange to black clasts. Stones were present in the size range 2-60 mm. A ?mineralized root channel or worm burrow and charcoal were also observed.

There were a few poorly preserved plant macrofossils in the residue and flot, notably moderate numbers of seeds of toad-rush (*Juncus bufonius*, together with some other, tentatively identified, *Juncus* spp.) which are likely to have originated in plants on soils with impeded drainage—a track or path, or perhaps the bottom of a ditch in which standing water was no more than intermittent. No invertebrate remains were found. It is conceivable that this layer was redeposited surface material.

Context 160 [fill of possible linear feature, pit, or gully, cut through ditch before final silting]
Sample 1021 (10.5 kg BS)

Waterlogged, light brown, sticky clay sand with stones of the size range 2-20 mm common.

The residue consisted mainly of sand with stones (of a variety of different lithologies) and gravel with traces of pottery; of biological remains, there were only traces of charcoal and bone. The residue is recorded as containing material which may have been burnt soil.

Context '425' [ditch fill in cut 425; the fill context was not recorded]
Sample 1251 (1 kg subsample processed; flot; insects scan-recorded)

Moist, mid-dark grey/brown, brittle (working crumbly to plastic and soft), very humic, slightly sandy silt with some pale grey/yellow sand and crimson-coloured herbaceous detritus present.

The small residue left after processing consisted mainly of herbaceous plant detritus; 'seeds' were present in moderate numbers and were well preserved. The two groups of plants most abundantly represented were weeds of waste places and cultivated ground (including taxa of cereal fields), and plants of grassland habitats. There were moderate amounts of wheat/rye 'bran' fragments, presumably originating in flour or grain. The most abundant beetles were *Oryzaephilus surinamensis* and *Cryptolestes ferrugineus* (seven and six individuals respectively). These are pests of stored products, particularly grain, the identification of the latter as their source being confirmed by a single grain weevil, *Sitophilus granarius*; together they account for a fifth of the beetles and bugs. The association of evidence of cereals with remains of grassland plants suggests the possibility that this deposit included either stable manure or dung from adjacent ground surfaces. The rarity of decomposer insects (other than a few fly puparia) was notable, this component accounting for only two-fifths of the beetles and bugs even after subtraction of the grain pests; diversity of the decomposer group was high, indicating a mixed, probably random, origin. Thus, if stable manure was present, there had been no opportunity for the development of an insect fauna. The whole assemblage of beetles and bugs was of high diversity and had a substantial 'outdoor' component which itself was of high diversity, strong indications of the presence of a large proportion of 'background fauna'.

That the linear feature (presumably a ditch) held water at least at the time Context 425 formed is strongly indicated by the presence of numerous resting eggs (ephippia) of at least two species of Cladocera (water fleas), one of them a *Daphnia* species. Water beetles were a little more abundant than might be expected if there had been no water present, but they certainly give no evidence of permanent standing water. Submerged and floating aquatic plants were lacking (there were a few possible waterside/damp ground taxa), and this combination of abundant cladoceran resting eggs and rare aquatic plants and insects, seen frequently by the authors in archaeological ditch fills, is taken as evidence of only intermittent water. Apart from the grain pests, the beetles and bugs, at least,

almost certainly represent 'background fauna'.

Two very poorly preserved eggs of *Trichuris* sp. were noted in the 'squash'. It is impossible to determine whether these were from the whipworm of humans (*T. trichiura*) or one of the several species infecting other mammals including rodents, and dogs and foxes. In any case, the presence of such small numbers of eggs cannot be regarded as evidence of primary deposition of human faeces, especially in the absence of a full suite of remains of human foods.

Notable records are the beetles *Helophorus tuberculatus* and *Tachys* sp.; the former is discussed below.

Phase 1.4: (b) Internal features and destruction layers

Context 462 [uppermost fill of pit 458]
Sample 1315

Moist, mid grey, plastic to slightly sticky, slightly sandy clay with some black ?ash, light grey silt or ?ash and light orange/pink silt (?ash). Mid-orange mm-scale patches were also observed. The overall appearance was that of a burnt sediment with ash with no obvious large particles of charcoal. No further analysis was carried out.

It is unfortunate that a sample of the basal, ?primary, fill of this pit (Context 483), described by the excavator as a '0.10 m thick lens of black organic material' was not available for analysis.

Phase 2: Construction and use of signal station/fortlet

Phase 2.1: Primary defences of the signal station/fortlet

Context 148 [ditch fill, Trench C]
Sample 1040 (1 kg subsample; flot)

Moist, clearly heterogeneous, mid grey/brown, stiff (working crumbly to plastic and soft), clay silt. The minor components were the same as the main but darker and possibly more humic. Mottles on the 1-10 mm scale were pale orange to pale grey clay. Wood and stones >60 mm were present.

Only a few insect remains were recovered: traces of very decayed beetle cuticle and a single head of the weevil *Otiorhynchus* sp. This material is typical of assemblages recovered from deposits where the bulk of insect remains are believed to have decayed completely. A few poorly preserved plant macrofossils were also present, the most abundant being seeds of rushes (*Juncus bufonius* and *J.* cf. *inflexus/effusus/conglomeratus*) indicative (in isolation) merely of land with impeded drainage. The presence of a trace of greater plantain (*Plantago major*) seeds may, with the *J. bufonius* seeds, point to the presence of areas of trampled ground.

Phase 2.2: (a) Modification of the main ditch

Context 222 [fill of possible recut of ditch]
Sample 1110
Sample 111001 (tub 1 of 3, 1 kg subsample processed; flot; tub 3 had a similar lithology and was not examined further)

Waterlogged, mid grey, sandy clay and with what appeared to be abundant slag with mid orange/brown concretions attached to it.

Plant and invertebrate remains were almost lacking in the subsample examined. There were traces of charcoal and some root/rootlet fragments but no identifiable macrofossils. However, a large proportion of the residue consisted of lumps of somewhat indurated material which may have been peat or humic soil which had been dried at some stage, and perhaps baked, but not burnt; this was evidently the material which was thought, on initial examination in the laboratory, might have been slag. A single *Trichuris* egg was recorded from the 'squash'.

Sample 111002 (tub 2 of 3)

Moist, mid grey/brown, crumbly (working plastic), clay sand. Also present were stones (2-20 mm), ?ash and concretions (these were presumably more ?baked peat) . No further analysis was undertaken.

Phase 2.2: (b) The secondary ditch

Context 237 [ditch fill, Trench C]
Sample 1109 (1 kg subsample processed; flot)

Moist-wet, light-mid brown, plastic, clay sand with pale orange, pale brown, strong orange, dark brown and black mm scale ?clasts of separate origin. Stones of all sizes were present, as was charcoal.

A few arthropod remains of no interpretative significance were noted from the flot. The residue contained some ?peat fragments to 15 mm and a trace of charcoal. Otherwise, the only plant remains were moderate numbers of toad-rush seeds and a rare sedge (*Carex* sp.) nutlet.

Phase 3: The sandstone fort

Phase 3.1: (a) The first stone fort and it associated outwork

Context 409 [ditch fill, Trench P]
Sample 1250 (1 kg subsample processed; washover)

Moist, mid-dark grey/brown, brittle (working crumbly to plastic), slightly sandy clay silt ('looks like a soil with mm-scale crumb structure'). Stones in the size range 6-20 mm were present, as were modern rootlets.

There was a little charcoal (up to 10 mm) in the washover, but otherwise this subsample was devoid of plant or invertebrate remains.

Phase 3.1: (b) Possible annex ditch

Context 362 [primary ditch fill, Trench N]
Sample 1317 (1 kg subsample processed; flot)

Moist, dark brown, crumbly (working plastic), amorphous organic sediment with lumps of pinkish-grey clay and patches of fine herbaceous detritus. Wood was present.

Although small, the assemblage of plant macrofossils included a suite of taxa highly suggestive of the presence of short acid grassland, perhaps turves. Particularly notable were ?tormentil (*Potentilla* cf. *erecta*) achenes, present in large numbers, together with moderate numbers of heath-grass (*Danthonia decumbens*) caryopses, grass culm fragments, and some ?grass culm base/rhizome fragments. Invertebrate remains were rare but the records of an elaterid larva (wireworm) abdominal apex, some earthworm egg capsules, and of variable preservation in the insect remains all fit comfortably with the interpretation based on plant remains.

Despite the position of this deposit in a linear feature, there was no biological evidence for the presence of water and the structure of the deposit (so far as it could be determined from a sample) indicated dumped material rather than gradually accumulated sediment.

Phase 3.2: Second stone fort ditch and associated outwork

Context 330 [lowermost ditch fill, Trench C]
Sample 1249
Sample 124903 (tub 3 of 4; 1 kg subsample processed; flot; a further 6.25 kg processed for insect remains and rapid scan-recorded)

Moist-wet, mid grey/brown, crumbly (working plastic), moderately humic, slightly sandy silt with mm-scale patches of fine herbaceous detritus and amorphous organic sediment. Stones of the size 2-20 mm were present.

Although weed taxa were the most prominent group of plants in terms of numbers of taxa and of remains in this subsample, there was a notable component of heathland and grassland taxa, perhaps consistent with the presence of turf either in the deposits or on the surrounding land. The presence of *Juncus squarrosus* seeds in large numbers is of some interest; this widespread plant is confined to acid soils, particularly wet heaths and bogs, perhaps unlikely to have occurred in the Kirkham area and not recorded in the Fylde area (Perring and Walters 1962).

There were few insects in the flot from the first subsample, most of them originating from natural or semi-natural habitats. A notable record was of several fragments of the stag beetle *Lucanus cervus*. (Although the remains showed minor differences in surface sculpturation from the available reference material, there can hardly be any doubt as to this identification.) *L. cervus* has a southerly distribution in the British Isles, with some records from central England. It is absent from northern England apart from some very isolated records from Cumbria (Clark 1967; Hall 1970) which perhaps require verification—particularly in view of Jessop's (1986, 14)

summary of the distribution of the species. There is some evidence for appreciably higher temperatures in Roman Britain than those of the present day (Kenward *et al*. 1986b), with which this record would concur, but the possibility of transport of insects in (for example) hay in the well-organised Roman military economy has to be recognised.

The second, large, subsample gave an assemblage of beetles and bugs of modest size and with characteristics similar to those of the initial group, confirming an essentially natural origin for almost the entire assemblage. An additional fragment of *Lucanus cervus* was recorded, doubtless from the same individual, and there were three pronota of a *Tachys* sp.

Sample 124904 (tub 4 of 4; 1 kg subsample processed; flot)

Lithology as 124903.

Although rather smaller in terms of both numbers of taxa and of numbers of fossils, the assemblage of plant remains from this subsample was essentially similar interpretatively to that from 124903, with a suggestion that turf was present. The presence of at least three fig (*Ficus carica*) seeds indicates that food waste was probably also finding its way into the deposits to a small extent. The flot yielded a slightly larger insect assemblage than that from 124903, but its character was essentially similar; it was assessment-recorded only. There were three species of *Aphodius* dung beetles (four individuals), consistent with the general pattern seen in the material from this site. The only synanthropic species identified was a single individual of *Oryzaephilus surinamensis*. There was also a specimen of *Hoplia philanthus* (see below).

Context 216 [ditch fill, Trench G]
Sample 1102
Sample 110201 (tub 1 of 2; flot)

Moist, mid olive (oxidising brown), stiff to plastic clay with 2-20 mm stones present and beetle remains also visible. The sediment had a ‘cheesy’ texture, possibly a result of its having a fine organic component.

Three kinds of cladoceran (water flea) resting-eggs, two of them very abundant, and a single ostracod, testify to aquatic deposition. Evidence from the beetles (single individuals of seven aquatic taxa) and from one plant species (a seed of duckweed, *Lemna* sp.) offers support for such an interpretation, as does the record of ‘cheesy’ texture of the sediment—a description consistent with richly organic and highly humified detrital sediment which formed gradually in a body of still water.

The assemblage of beetles appears to have accumulated from a variety of sources, and much of it may have been background fauna; the very high value of the index of diversity (albeit with a large error), and the fact that half of the assemblage was accounted for by ‘outdoor’ forms (this component also being of high diversity), strongly support such an interpretation. There were indications of dung from *Aphodius ?prodromus* (the most abundant taxon, with four individuals) and perhaps from *Oxytelus sculptus* (two individuals, the only other beetle of which there was more than one). The dung may have been on adjacent ground surfaces, although the presence of moderate amounts of grass/cereal straw fragments perhaps suggests that at least some stable manure or dung actually found its way into the ditch (there was, however, no evidence of a breeding decomposer community of stable manure and, indeed, decomposers in general were rare). Some other beetle species probably also originated in dung, others from grain and (a substantial proportion of the species) from amongst short vegetation. The most prominent vegetation types indicated by the plant remains were weed communities and grassland, but there was also a distinctive wetland group, perhaps from marsh or waterside environments (which may have been within the ditch itself). There was also a small group of remains from woody plants—various fragments from alder, birch, oak, hazel and holly—which may have originated in brushwood if not from nearby woodland or scrub. Some probable heathland/moorland taxa were also recorded in very small amounts.

Sample 110202 (tub 2 of 2; 1 kg subsample; flot)

Moist, mid/dark slightly greyish brown, brittle (working plastic) and crumbly, very humic, silt or amorphous organic sediment with patches of

fibrous plant material. Stones of 6-20 mm and some wood and charcoal were also present.

Although from the same context, the subsample from this tub of sample 1102 yielded plant and invertebrate assemblages which have been interpreted in a somewhat different way. Firstly, there was no evidence for aquatic deposition from the sediment itself or from the fossils recovered from it. As for the previous sample, the dung beetle *Aphodius prodromus* was the most numerous beetle (five individuals), but there was almost no other evidence for foul matter and, as in the previous subsample, decomposers in general were rare. The remaining beetles seem to have had various origins, either in background fauna (diversity was high and the outdoor component large) or in some very restricted semi-natural habitat. The most abundant plant macrofossils were probably components of turf (?tormentil and heath grass, with many other grass caryopses, and some mosses likely also to have grown in short acid grassland habitats, notably *Leucobryum glaucum*). The other plant remains included a few weeds, as well as bracken (frond and stalk fragments) and wheat/rye bran, perhaps from stable manure.

Sample 1316 (tub 1 of 3)

Moist, light-mid olive/brown, plastic and 'cheesy' clay and very dark brown fibrous and amorphous organic material with some herbaceous detritus (?peat). Wood was also present. Possibly aquatic deposition.

The two distinct components of this sample were examined via separate subsamples:

Sample 131611 (organic component; 1 kg subsample processed; flot; insects scan-recorded)

The presence of turves or material derived from them in this subsample is suggested by some of the plant remains, in particular the abundant pearlwort (*Sagina* sp.) seeds and the ?grass culm-base/rhizome fragments. The assemblage was rather small, however. The invertebrate assemblage was also limited but led to somewhat similar conclusions. There were numerous cysts (probably from the soil nematode *Heterodera*) and beetle larvae, and small numbers of water flea resting eggs, fly puparia and adult flies. The adult beetles, of which there were only 25 individuals, were predominantly taxa from natural or semi-natural habitats, although there was a single *Cryptolestes* sp., likely to have been *C. ferrugineus* (probably from grain and consistent with the presence of a trace of wheat/rye bran). Only *Othius* sp. and *Aphodius prodromus* were represented by more than one individual (there were two of each), and the low concentration of remains, high diversity, and large proportion of outdoor forms suggest an essentially 'background' origin for the beetles and bugs.

Although interpretation of this material can only be rather tentative, it may be that turf, or surface soil derived from it, was thrown into the cut, becoming mixed with aquatic sediment.

Sample 131612 (clay component; 1 kg subsample processed; flot)

Despite some underlying similarities to the assemblages from 131611, the plant and insect macrofossils from this subsample have rather different implications, albeit that the conclusions drawn must be somewhat tentative. Both the plants and insects included components which, were they present in larger numbers, might be taken as indicative of the presence of stable manure. Amongst these were wheat/rye 'bran' and whole caryopses, ?wheat chaff, legume flowers, and the beetles *Oxytelus sculptus*, *Monotoma picipes* and *Anthicus floralis* or *formicarius*. It is not impossible that all these remains entered the deposit separately or indirectly, however, and the main statistics of the insect assemblage, including the decomposers, indicate mixed origins. One possibility is that the cut acted as a 'dead space' within which wind-blown detritus from surface-deposited dung or manure settled, together no doubt with flying insects. Another group of plants perhaps points to the presence of turves within the deposits or of short grassland close to the ditch: ?tormentil, heath grass, water-blinks (*Montia fontana* ssp. *chondrosperma*), ?grass culm-base/rhizome fragments, and most of the moss taxa. Some of the insects may have had the same origin.

Phase 3.3: Third stone fort ditch and associated outwork

Context 448 [ditch fill, Trench Q]
Sample 1255 (1 kg subsample processed; washover)

Moist, mid-dark grey/brown, brittle, working plastic and crumbly, ?slightly humic, sandy, clay silt with paler, sometimes grey and sometimes orange patches and ?burnt material.

There was a small amount of granular ?peat or mor-humus-rich soil in the washover with a few root and rootlet fragments. The residue yielded traces of fine charcoal and mortar.

Phases 2/3: Extra-mural activity (possible industrial activity)

Context 431 [primary fill of large hollow 429]
Sample 1253 (1 kg subsample processed; flot; 4.85kg washover from 'excess' material)

Moist, black to mid-brown to pale pinkish/orange, plastic, 'gritty', sandy clay with some lumps of orange clay and an overall mm-scale ped structure. Possibly containing ash and burnt clay. Charcoal and 2-20 mm scale stones were present.

No plant or invertebrate remains were present in the flot or residue from the test subsample, other than a trace of small (<5 mm) charcoal. The larger subsample also gave a trace of charcoal but most of it was red/orange burnt clay soil (up to 20 mm) with some small slag fragments, sand and gravel.

Context 430 [fill of hollow, overlying 431]
Sample 1252

Moist, light orangish brown, plastic to stiff, slightly sandy clay with mid-dark grey, crumbly (working plastic), sticky sandy clay. A component derived from ash may have been present. The clay showed signs of internal mixing on the mm scale. No further action.

Context 443 [layer immediately W of wall 417]
Sample 1254 (8 kg bulk-sieved to 1 mm)

Concreted charcoal in a pale, sandy silt matrix with iron-stained patches.

The residue comprised massive (up to 15-20 cm) lumps of orange-stained concreted material, perhaps slag, incorporating charcoal and gravel.

Context 450 [lowermost fill of linear feature cutting hollow 429]
Sample 1256 (tub 1 of 2; 1 kg subsample processed; flot)

Moist, light-mid brown/grey, stiff to plastic, clay with mid-dark brown amorphous organic material in a patch of 10 cm diameter. Charcoal, wood and ?brick/tile were present. Some fine root penetration channels were also evident. The sediment in tub 2 of 2 included more sandy patches and some pale brown clay.

The formation of this deposit in water is attested by the numerous *Daphnia* ephippia, but there were too few other invertebrates to define the conditions within the ditch any more closely. No truly aquatic plant taxa were recorded, although several species from wet meadows or ditch banks were present. The most abundant plant remains were from stinging nettles (*Urtica dioica*), perhaps indicative of seasonally wet ground with a high nutrient status, but there were also some possible grassland plants and some other taxa of disturbed habitats; however, the assemblage was rather too small and uncharacteristic to be of much interpretative value. The small group of insects might have originated in grazing land with dung from animals fed with cereals. A single fig seed was recorded.

Other features

Two samples from contexts of modern or unknown date were examined speculatively.

Context 174 [pit fill; modern/?modern]
Sample 1100 (1 kg subsample processed; flot)

Moist-wet, mid brown, brittle (working crumbly), clay sand. 2-20 mm stones were present, as were some brick/tile/?burnt earth and ?root fragments.

Apart from a few scraps of root/rootlet in the flot, plant and invertebrate remains were lacking in the subsample examined.

Context 279 [pit fill; unknown date]
Sample 1103 (1 kg subsample processed; flot; the excess of 8 kg was bulk-sieved)

Moist, black, brown, and pale pink/orange clay sand with patches that are more rich in clay. 'Looks like ash and burnt sediment.'

There was a large amount of charcoal to 20 mm in the residue from the test subsample, together with some ?burnt soil; this sample presumably *did*, therefore, contain ash. The BS sample was also rich in charcoal (not identified, but certainly diffuse-porous and apparently fine-grained) with some burnt clay soil and traces of stone and gravel.

Timber/wood samples

A sample of wood fragments from Sample 1105, Context 216 was also examined; the material was divided into three groups: (a) four fragments with clear evidence of working as tent pegs ('laths' with notches cut along one edge); (b) about 14 fragments of roundwood, mostly unworked (but with one fragment clearly cut at either end); and (c) about 31 fragments of worked and unworked wood, mostly irregular lumps, but sometimes squared lengths. No attempt was made to identify all the material, except for group (a); a selection from each of the other groups only was checked.

The results are as follows:

(a) tent peg fragments: all oak (*Quercus*)

(b) roundwood: included several pieces of hazel (*Corylus*) to 25 mm, one fragment of oak (to 25 mm, with intact bark and sliced at both ends); and at least two pieces of willow (*Salix*) to 15 mm.

(c) all of the fragments examined (about 10) in this group were oak.

Discussion

Excavation at this site was undertaken by means of a large number of trenches of limited lateral extent. Although linear features could be correlated between some of the trenches, for the most part the evidence from them appears to be difficult to tie together. The deposits were thinly sampled; there were certainly some cases (e.g. Context 353) where an overtly organic deposit was not sampled (a recommended policy for sampling most kinds of archaeological sites is offered by Dobney *et al.* 1992). As remarked above, the project was limited from a bioarchaeological point of view by the small number of samples collected and a lack of sufficient funding for detailed examination of all of the material. In spite of this, the available samples have made it possible to resolve many of the questions posed in the Post-Excavation Assessment document.

Although most of the samples examined (and all of those with an appreciable fossil content) came from the fills of ditches, the quantity of 'waterlogged' biological remains and the quality of their preservation were both very varied, some subsamples being effectively barren and others rich in remains, some giving good preservation and others poor. Those subsamples for which interpretatively large enough assemblages of plant and invertebrate remains *were* recorded showed a broad consistency—with evidence for dung, probably sometimes in the form of stable manure, and vegetation favoured by nutrient enrichment. Several of the samples contained small numbers of insects likely to have originated in animal (probably horse) feed, but gave little evidence of stable manure proper. Rather, there were strong hints of deposition where there was dung on ground surfaces. It is postulated that a few 'indoor' species of this kind were introduced via dung deposited in the open by animals fed on hay and cereals, probably indoors.

Some other Roman sites for which plant and insect macrofossils have been investigated have produced evidence of large-scale disposal of what has been interpreted as stable manure—for example Ribchester, Lancashire (Large *et al.* 1994), Papcastle, Cumbria (Kenward and Allison 1995) and several other sites, especially in York (Hall and Kenward 1990 and, in retrospect, Kenward *et al.* 1986b) and Carlisle (Allison *et al.* 1991a, b; Allison and Kenward, forthcoming; Kenward *et al.* 1991; Kenward, Allison *et al.* 1992; Kenward, Dainton *et al.* 1992a; b). A particularly characteristic 'stable manure' insect fauna was reported by Osborne (1971) from Roman Alcester, Warwickshire (although not

explicitly recognised as such); Wilson (1979) reported horse dung in the form of discrete 'horse apples' from a well in Roman Lancaster.
For the Roman fort at Ribchester, it was remarked that 'the importance of stable manure at a military site such as a fort is perhaps hardly surprising. What is rather more unexpected is the rarity of evidence of other kinds of wastes detectable by insect remains. It appears that the site was kept pretty much clear of other wastes and of more than a thin vegetation cover for most of the period represented'. The site at Kirkham shows similar evidence but with less emphasis on the disposal of stable manure and more evidence for local vegetation (whether in or beside the ditches or represented by imported turves). Papcastle, too, seems to have been very similar. Roman forts in the North seem, as perhaps might be predicted, to have had a somewhat uniform character—there was discipline in waste disposal but so much horse manure was generated that it inevitably left detectable evidence in the ground. Alternatively, or perhaps as well, horse dung was not seen as especially offensive (again, perhaps a product of familiarity or inevitability?), as suggested by Hall and Kenward (1990, 404).

Another probable component of at least some of the deposits examined from this site was turf, most of it probably from an area with acid soils, such as heathland or moorland. This interpretation rests largely on the botanical evidence but there were substantial numbers of insects consistent with it from the samples as a whole. None of the insects gave incontrovertible evidence of heathland or heather-dominated moorland, however, although most records for *Helophorus tuberculatus* (see below) are for such places.

Some of the deposits contained what appeared to be ash and/or burnt soil: in the fills of features of Phase 1.4 (Contexts 79, 160, and 462), as well as the ?modern pit fill 279, and perhaps also fill 431 of a hollow dated to Phase 2/3 (extra-mural activity). Some material which may have been 'baked' peat was recorded in 222 (a fill of a possible re-cut of the main Signal Tower ditch). This ?peat seems to have dried completely without being burnt, either by being near a fire or even through dehydration in a dry atmosphere. It is possible that this peat was imported as fuel or litter for stable but it may equally well have originated in humus-rich turf such as a mor soil brought for construction.

The analyses produced little evidence of waste disposal directly into the features other than the deposition of quite large quantities of ash (although this may have found its way into the deposits indirectly via surface material). Context 443 (Phase 2/3), however, clearly contained some possible industrial residue in the form of massive concretions. There is certainly no reason to suppose that waste from food preparation or human faeces were deliberately disposed of in the cuts. Evidence for foodplants is very sparse at this site; apart from a few fig seeds (and these are remarkably resistant to decay) and some wheat/rye 'bran' (which, as has been noted, may have been from animal feed), the only plant remains likely to have been eaten were rare seeds of blackberry, raspberry and elderberry, all easily arriving in other ways. Only two of the samples examined gave any eggs of intestinal parasites and these may not have originated in humans or may have entered the deposits indirectly via a variety of routes.

Other waste from human domestic occupation was absent, too. The 'domestic' and stored products insects are all likely to have been associated with stabling and animal feed, and the single human flea is inadequate evidence for the incorporation of material from houses.

The replicate samples from single contexts were often rather different in lithology and there was much heterogeneity within some of the samples. This was reflected to some extent in the biota, but conclusions drawn from the assemblages were essentially consistent. A likely origin for much of the fills is surface 'soil' from the immediate surroundings, bringing with it a variety of sediment types, ranging from essentially mineral subsoil through humus- (and fossil-) rich surface layers to dung or stable manure deposited on them.

Some notable insect records

Some of the records of beetles from this site are sufficiently interesting and unusual to deserve further comment. The remains of the stag beetle *Lucanus cervus* from Context 330 have been discussed above. The small chafer beetle *Hoplia philanthus*, many of the remains distinguished by the characteristic and beautiful oval metallic scales, was recorded from six subsamples representing three contexts (216, 330, 425). Remains suspected to have been of *H. philanthus* have occasionally been noted from other Roman sites, particularly some in Carlisle, Cumbria, but this is the first material seen by HK to have been sufficiently well preserved for a confident determination (one specimen from Old Grapes Lane A, Carlisle (Kenward, Allison *et al.* 1992) can now be definitely identified by comparison with the Kirkham material, however). *H. philanthus* is a root-feeder in the larval stage, the adults occurring in May to July, reportedly sometimes in quite large numbers locally (Jessop 1986, 29). The occurrence of *H. philanthus* is interesting in relation to the very frequent records of another small and supposedly locally abundant chafer, *Phyllopertha horticola*. It has been postulated that *P. horticola* was a common component of background fauna but also likely to be imported in turf or cut vegetation (Kenward *et al.* 1992, 8). Both chafers may have arrived at sites in these ways, or even have been accidentally eaten by livestock grazing on the turf in which the beetles pass their immature stages.

The specimen of terrestrial 'water beetle' *Helophorus tuberculatus* (Hansen 1987, 102), which appears to be rare in Britain at the present day (Balfour-Browne 1958, 95; Kenward 1976; Booth 1981), from Context 425 is also of note. The beetle is known from Roman deposits at Ribchester (Large *et al.* 1994), Carlisle (Goodwin *et al.* 1991, 23; Allison and Kenward forthcoming; Kenward 1984; Kenward, Allison *et al.* 1992) and York (Kenward 1988; Hall and Kenward 1990). The consistency of occurrence of *H. tuberculatus* in small numbers in archaeological deposits remains enigmatic, although it must be suspected that it was very much more common in the past than it seems to be now.

Retention and disposal

The remaining unprocessed material from samples with a rich fossil biota should be retained as material for further research and stored under appropriate cool, dark conditions. All extracted material and residues should also be retained.

Archive

All extracted fossils from the test subsamples, and the residues and flots, are currently stored in the Environmental Archaeology Unit, University of York, along with remaining sediment and paper and electronic records pertaining to the work described here.

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Appendix

Table 1. Complete list of plant and invertebrate taxa recorded from deposits at Kirkham Dowbridge. Taxonomic order and nomenclature for plants follow Smith (1978) for mosses, Tutin et al. (1964-90) for vascular plants and Kloet and Hincks (1964-77) for insects. The list of plants includes parts recorded.

Mosses

Sphagnum sp(p).	leaf/leaves and/or shoot fragment(s)
Leucobryum glaucum (Hedw.) Ångstr.	leaf/leaves and/or shoot fragment(s)
Neckera complanata (Hedw.) Hüb.	leaf/leaves and/or shoot fragment(s)
Thuidium tamariscinum (Hedw.) Br. Eur.	leaf/leaves and/or shoot fragment(s)
Drepanocladus sp(p).	leaf/leaves and/or shoot fragment(s)
Isothecium myosuroides Brid.	leaf/leaves and/or shoot fragment(s)
Eurhynchium sp(p).	leaf/leaves and/or shoot fragment(s)
Hypnum cf. *cupressiforme* Hedw.	leaf/leaves and/or shoot fragment(s)
Rhytidiadelphus squarrosus (Hedw.) Warnst.	leaf/leaves and/or shoot fragment(s)
Pleurozium schreberi (Brid.) Mitt.	leaf/leaves and/or shoot fragment(s)
Hylocomium splendens (Hedw.) Br. Eur.	leaf/leaves and/or shoot fragment(s)

Vascular plants

Filicales (fern)	pinnule fragment(s)
Pteridium aquilinum (L.) Kuhn (bracken)	pinnule and stalk fragment(s)
Betula sp(p). (birch)	fruit(s)
cf. *Betula* sp(p). (?birch)	bud(s) and/or bud-scale(s)
Alnus glutinosa (L.) Gaertner (alder)	bud(s) and/or bud-scale(s)
Corylus avellana L. (hazel)	nut(s) and/or nutshell fragment(s)
Quercus sp(p). (oak)	bud(s) and/or bud-scale(s)
Ficus carica L. (fig)	seed(s)
Urtica dioica L. (stinging nettle)	achene(s)
Urtica urens L. (annual nettle)	achene(s)
Polygonum aviculare agg. (knotgrass)	fruit(s)
Polygonum hydropiper L. (water-pepper)	fruit(s)
Polygonum persicaria L. (persicaria/red shank)	fruit(s)
Polygonum lapathifolium L. (pale persicaria)	fruit(s)
Bilderdykia convolvulus (L.) Dumort. (black bindweed)	fruit fragment(s)
Rumex sp(p). (docks)	fruit(s)
Chenopodium ficifolium Sm. (fig-leaved goosefoot)	seed(s)
Chenopodium album L. (fat hen)	seed(s)
Chenopodium sp(p). (goosefoots)	seed(s)
Atriplex sp(p). (oraches)	seed(s)
Montia fontana ssp. *chondrosperma* (Fenzl) Walters (blinks)	seed(s)
Stellaria media (L.) Vill. (chickweed)	seed(s)
Stellaria cf. *neglecta* Weihe in Bluff & Fingerh. (?greater chickweed)	seed(s)
Stellaria graminea L. (lesser stitchwort)	seed(s)
Sagina sp(p). (pearlworts)	seed(s)
Spergula arvensis L. (corn spurrey)	seed(s)
Agrostemma githago L. (corncockle)	seed fragment(s)
Ranunculus Section *Ranunculus* (meadow/creeping/bulbous buttercup)	achene(s)
Ranunculus sceleratus L. (celery-leaved crowfoot)	achene(s)
Ranunculus flammula L. (lesser spearwort)	achene(s)
Ranunculus Subgenus *Batrachium* (water crowfoots)	achene(s)
Rorippa islandica (Oeder) Borbàs	

(northern marsh yellow-cress)	seed(s)
Brassica rapa L. (turnip)	seed(s)
Raphanus raphanistrum L. (wild radish)	pod segments and/or fragment(s)
Rubus idaeus L. (raspberry)	seed(s)
Rubus fruticosus agg. (blackberry/bramble)	seed(s)
Rubus/Rosa sp(p). (blackberry, etc./rose)	prickle(s)
Potentilla anserina L. (silverweed)	achene(s)
Potentilla cf. *erecta* (L.) Räuschel (?tormentil)	achene(s)
Potentilla cf. *reptans* L. (?creeping cinquefoil)	achene(s)
Aphanes microcarpa (Boiss. & Reuter) Rothm. (slender parsley-piert)	achene(s)
Crataegus sp./*Prunus spinosa* (hawthorn/sloe)	thorn(s)
Prunus spinosa L. (sloe)	charred fruitstone(s)
Leguminosae (pea family)	flower(s) and/or petal(s), pod(s) and/or pod fragment(s)
cf. *Trifolium pratense* L. (?red clover)	pod(s) and/or pod lid(s)
Linum catharticum L. (purging flax)	capsule(s) and/or capsule fragment(s), seed(s)
Ilex aquifolium L. (holly)	leaf epidermis fragment(s)
Viola sp(p). (violets/pansies, etc.)	seed(s)
Hydrocotyle vulgaris L. (marsh pennywort)	mericarp(s)
Pastinaca sativa L. (wild parsnip)	mericarp(s)
Ericaceae (heather family)	leaf/leaves
Calluna vulgaris (L.) Hull (heather, ling)	flower(s), seed(s), shoot fragment(s), twig fragment(s)
cf. *Calluna vulgaris* (L.) Hull (?heather, ling)	root and/or twig fragment(s)
Vaccinium sp(p). (bilberries)	seed(s)
Fraxinus excelsior L. (ash)	wood fragment(s)
Galeopsis Subgenus *Galeopsis* (hemp-nettles)	nutlet(s)
Prunella vulgaris L. (selfheal)	nutlet(s)
Lycopus europaeus L. (gipsywort)	nutlet(s)
Solanum nigrum L. (black nightshade)	seed(s)
Solanum dulcamara L. (woody nightshade)	seed(s)
Rhinanthus sp(p). (yellow rattles)	charred and uncharred seed(s)
Plantago major L. (greater plantain)	seed(s)
Plantago lanceolata L. (ribwort plantain)	seed(s)
Sambucus sp(p). (elder, etc.)	seed fragment(s)
Sambucus nigra L. (elder)	seed(s)
cf. *Aster tripolium* L. (?sea aster)	achene(s)
Achillea millefolium L. (yarrow)	achene(s)
Carduus/Cirsium sp(p). (thistles)	achene(s)
Centaurea sp(p). (knapweeds, etc.)	achene fragment(s)
Hypochoeris sp(p). (cat's ears)	achene(s)
Leontodon sp(p). (hawkbits)	achene(s)
Sonchus asper (L.) Hill (prickly sow-thistle)	achene(s)
Taraxacum sp(p). (dandelions)	achene(s)
cf. *Crepis* sp(p). (?hawk's-beards)	achene(s)
Triglochin maritima L. (sea arrowgrass)	carpel(s)
Juncus sp(p). (rushes)	seed(s)
Juncus inflexus/effusus/conglomeratus (hard/soft/compact rush)	seed(s)
Juncus squarrosus L. (heath rush)	seed(s)
Juncus gerardi Loisel. (mud rush)	seed(s)
Juncus bufonius L. (toad rush)	seed(s)
Juncus cf. *articulatus* L. (?jointed rush)	seed(s)
Luzula sp(p). (woodrushes)	seed(s)
cf. Gramineae (?grasses)	culm base-rhizome fragment(s)

Gramineae (grasses)	culm fragment(s)
Gramineae (grasses)	waterlogged caryopsis/es
Gramineae/Cerealia (grasses/cereals)	culm node(s)
cf. *Triticum* sp(p). (?wheats)	waterlogged glume-base(s)
Triticum/Secale (wheat/rye)	waterlogged caryopsis/es and periderm fragments ('bran')
Danthonia decumbens (L.) DC. in Lam. & DC. (heath grass)	caryopsis/es, spikelets/cleistogenes
cf. *Danthonia decumbens* (L.) DC. in Lam. & DC. (?heath grass)	cleistogene(s) (basal sterile flowers)
Lemna sp(p). (duckweeds)	seed(s)
Scirpus lacustris sl (bulrush)	nutlet(s)
Scirpus setaceus L. (bristle club-rush)	nutlet(s)
cf. *Eriophorum vaginatum* L. (?cotton-grass)	rhizome and/or stem fragment(s)
Eleocharis palustris sl (common spike-rush)	nutlet(s)
Carex sp(p). (sedges)	nutlet(s)

Nematoda
Heterodera sp. (cyst)
Trichuris sp. (egg)

Oligochaeta
Oligochaeta sp. (egg capsule)

Arthropoda
Crustacea
Daphnia sp. (ephippium)
Cladocera spp. (ephippium)
Ostracoda sp.

Dermaptera
Dermaptera sp.

Hemiptera
Stygnocoris sp. oa
Scolopostethus sp. oap
Conomelus anceps (Germar) oap
Auchenorhyncha spp. oap
Aphidoidea sp.
Coccoidea sp.
Hemiptera sp. (nymph)

Diptera
Bibionidae sp.
Syrphidae sp. (larva)
Diptera sp. (larva)
Diptera spp. (pupa)
Diptera spp. (puparium)
Diptera spp. (adult)

Siphonaptera
Pulex irritans (Linnaeus)

Hymenoptera
Formicidae sp.
Proctotrupoidea sp.
Hymenoptera Parasitica sp.
Hymenoptera sp.

Coleoptera
Carabus nemoralis Müller oa
Nebria sp. oa
Dyschirius globosus (Herbst) oa
Dyschirius sp. indet. oa
Trechus obtusus or *quadristriatus* oa
Trechus micros (Herbst) u
Trechus sp. indet. ob
Asaphidion flavipes (Linnaeus) oa
Bembidion lampros or *properans* oa
Bembidion sp. oa
Tachys sp. oa
Pterostichus (*Poecilus*) sp. oa
Pterostichus sp. ob
Calathus sp. oa
Agonum sp. oa
Amara sp. oa
Harpalus rufipes (Degeer) oa
Harpalus sp. oa
Acupalpus dubius Schilsky oa
Carabidae spp. ob
Haliplidae sp. u
Hydroporinae sp. oaw
Agabus bipustulatus (Linnaeus) oaw
Colymbetinae sp. oaw
Helophorus aquaticus (Linnaeus) oaw
Helophorus tuberculatus Gyllenhal oa
Helophorus spp. oaw
Coelostoma orbiculare (Fabricius) oaw
Sphaeridium sp. rf

Cercyon analis (Paykull) rt
Cercyon haemorrhoidalis (Fabricius) rf
Cercyon melanocephalus (Linnaeus) rt
Cercyon terminatus (Marsham) rf
Cercyon unipunctatus (Linnaeus) rf
Cercyon sp. indet. u
Megasternum obscurum (Marsham) rt
Cryptopleurum minutum (Fabricius) rf
?*Anacaena* sp. oaw
Laccobius sp. oaw
Acritus nigricornis (Hoffmann) rt
Gnathoncus sp. rt
Onthophilus striatus (Forster) rt
Histerinae spp. u
Ochthebius sp. oaw
Ptenidium sp. rt
Leiodidae sp. u
Micropeplus fulvus Erichson rt
Acidota crenata (Fabricius) oa
Lesteva longoelytrata (Goeze) oad
Phyllodrepa ?floralis (Paykull) rt
Omalium ?rivulare (Paykull) rt
Omalium sp. rt
Omaliinae sp. u
Carpelimus ?bilineatus Stephens rt
Carpelimus pusillus group u
Carpelimus sp. indet. u
Platystethus arenarius (Fourcroy) rf
Platystethus cornutus group oad
Platystethus nitens (Sahlberg) oad
Anotylus nitidulus (Gravenhorst) rtd
Anotylus rugosus (Fabricius) rt
Anotylus sculpturatus group rt
Anotylus tetracarinatus (Block) rt
Oxytelus sculptus Gravenhorst rt
Stenus spp. u
?*Euaesthetus* sp. oa
Lathrobium sp. u
Lithocharis ochracea (Gravenhorst) rt
Rugilus orbiculatus (Paykull) rt
Paederinae sp. u
Othius myrmecophilus Kiesenwetter rt
Othius sp. rt
Leptacinus sp. rt
Gyrohypnus angustatus Stephens rt
Gyrohypnus fracticornis (Müller) rt
Xantholinus glabratus (Gravenhorst) rt
Xantholinus linearis (Olivier) rt
Xantholinus longiventris Heer rt
Xantholinus linearis or *longiventris* rt
Neobisnius sp. u
Erichsonius sp. u
Philonthus spp. u
Gabrius sp. rt
Quedius boops group u
Quedius sp. u
Staphylininae spp. indet. u
Tachyporus spp. u
Tachinus ?signatus Gravenhorst u
Tachinus sp. u
Cordalia obscura (Gravenhorst) rt
Falagria caesa or *sulcatula* rt
Falagria or *Cordalia* sp. rt
?*Aleochara* sp. u
Aleocharinae spp. u
Lucanus cervus (Linnaeus) l
Geotrupes sp. oarf
Aphodius ?ater (Degeer) oarf
Aphodius granarius (Linnaeus) obrf
Aphodius prodromus (Brahm) obrf
Aphodius spp. obrf
Onthophagus sp. oarf
Hoplia philanthus Illiger oa
Phyllopertha horticola (Linnaeus) oap
Melolonthinae/Rutelinae/Cetoninae sp. indet. oap
Cyphon sp. oad
Byrrhidae sp. oap
Dryops sp. oad
Ctenicera cuprea (Fabricius) oap
Agriotes sp. oap
Elateridae sp. (larva)
Elateridae sp. ob
Cantharidae sp. ob
Anobium punctatum (Degeer) l
Kateretes sp. oapd
Brachypterus sp. oap
Meligethes sp. oap
Omosita colon (Linnaeus) rt
Omosita colon or *discoidea* rt
Rhizophagus sp. u
Monotoma picipes Herbst rt
Monotoma sp. indet. rt
Cryptolestes ferrugineus (Stephens) g
Oryzaephilus surinamensis (Linnaeus) g
Cryptophagus spp. rd
Atomaria sp. rd
Ephistemus globulus (Paykull) rd
Phalacridae sp. oap
Cerylon sp. l
Orthoperus sp. rt
Stephostethus lardarius (Degeer) rt
Lathridius minutus group rd
Enicmus sp. rt
Corticaria sp. rt
Corticarina or *Cortinicara* sp. rt
Typhaea stercorea (Linnaeus) rd
Aglenus brunneus (Gyllenhal) rt
Palorus ?ratzeburgi (Wissman) g
Tenebrio obscurus Fabricius rt
Anthicus floralis or *formicarius* rt
Bruchinae sp. u
Gastrophysa viridula (Degeer) oap

Hydrothassa sp. oadp
Chrysomelinae sp. oap
Longitarsus sp. oap
Altica sp. oap
Chaetocnema arida group oap
Chaetocnema concinna (Marsham) oap
Chaetocnema sp. indet. oap
Cassida ?flaveola Thunberg oap
Apion sp. oap
Otiorhynchus sp. oap
Sitona sp. oap
Alophus triguttatus (Fabricius) oap
Sitophilus granarius (Linnaeus) g
Limnobaris ?pilistriata (Stephens) oapd
Curculionidae sp. oa
Scolytidae sp. l
Coleoptera sp. (larva)
Coleoptera sp. u

Arachnida
Acarina sp.
Aranae sp.

Table 2 Main statistics for the assemblages of adult beetles and bugs from scan-recorded subsamples from Dowbridge Close, Kirkham. For P%NOB etc: P%Nx - 'site percentage', i.e. percentage based all individuals from the site for that parameter. For explanation of abbreviations see Table 5. For the ∀ values, the number in parentheses indicates the number of assemblages where the value of ∀ exceeded its standard error, or half its standard error; other values have been excluded from calculation of means, and ∀ values have not in any case been calculated for assemblages of less than 20 individuals. Note the small number of cases available. Subjectively, the rapid scanned and assessment recorded assemblages were generally similar in composition to those summarised here.

Parameter		Parameter	
Number of assemblages	6	Site percentages (total individuals = 343)	
S	45	P%NOB	41
N	57	P%NW	6
Where SE alpha less than alpha:		P%ND	3
∀	138 (6)	P%NP	11
∀ OB	97 (3)	P%NM	0
∀ RT	45 (3)	P%NL	2
Where SE alpha less than alpha/2:		P%NG	8
∀	112 (3)	P%NRT	40
∀ OB	- (1)	P%NRD	4
∀ RT	- (1)	P%NRF	14

Table 3. Lists of plant taxa and other components from samples from Dowbridge Close, Kirkham, in context and sample number order. For a complete list of plant taxa for the site see Table 1.

Abbreviations (see also list of plant parts in Table 1): af—achene fragment(s); b/bs—bud(s)/bud-scale(s); caps—capsule(s); ch—charred; clstgns—cleistogenes; fc/n—culm-nodes; f—fruit fragment(s); fgts—fragment(s); fls—flower(s); lef—leaf epidermis fragment(s); lfless—leafless; lvs—leaf/leaves; pet—petal(s); pinn—pinnule; rh-st—rhizome-stem; rt-tw—root-twig fragment(s); sf—seed fragment(s); sht—shoot(s); spklts—spikelet(s); w/l—waterlogged, i.e. uncharred.

Context: 79	
Sample: 1004/T	No. taxa: 0
charcoal	2
concretions	1
gravel	1
sand	3
stones	1

Context: 88	
Sample: 1016/T	No. taxa: 5
herbaceous detritus	1
root/rootlet fgts	1
Rubus idaeus	1
Prunus spinosa (ch)	1
Juncus cf. inflexus/effusus/conglomeratus	1
Juncus cf. gerardi	1
Juncus bufonius	1

Context: 148	
Sample: 1040/T	No. taxa: 4
Cenococcum (sclerotia)	1
herbaceous detritus	1
Plantago major	1
Juncus cf. inflexus/effusus/conglomeratus	2
Juncus bufonius	2
Carex sp(p).	1

Context: 174	
Sample: 1100/T	No. taxa: 0
brick/tile	3
gravel	2
root/rootlet fgts	1
sand	3

Context: 216	
Sample: 110201/T	No. taxa: 44
Cenococcum (sclerotia)	1
Heterodera (cysts)	1
bark fgts	1
cladocerans	3
dicot lf fgts	1
earthworm egg caps	1
herbaceous detritus	2
straw fgts	2
twig fgts	1
Betula sp(p).	1
Alnus glutinosa (b/bs)	1
Corylus avellana	1
Quercus sp(p). (b/bs)	1
Urtica dioica	1
Polygonum aviculare agg.	1
Polygonum persicaria	2
Polygonum lapathifolium	2
Atriplex sp(p).	1
Montia fontana cf. ssp. chondrosperma	1
Sagina sp(p).	1
Spergula arvensis	2
Agrostemma githago (sf)	1
Ranunculus flammula	1
cf. Chelidonium majus (ch)	1
Rorippa islandica	2
Rubus fruticosus agg.	1
Rubus/Rosa sp(p). (prickles)	1
Potentilla cf. erecta	1
Potentilla cf. reptans	1
Ilex aquifolium (lef)	1
Viola sp(p).	1
Hydrocotyle vulgaris	1
Ericaceae (lvs)	1
Calluna vulgaris (sht fgts)	1
Galeopsis Subgenus Galeopsis	1
Prunella vulgaris	1
Lycopus europaeus	1
Plantago major	1
Achillea millefolium	1
Sonchus asper	1
cf. Crepis sp(p).	1

Juncus bufonius	2
Juncus cf. articulatus	2
Luzula sp(p).	1
Gramineae	2
Danthonia decumbens	1
Lemna sp(p).	1
Scirpus setaceus	2
cf. Eriophorum vaginatum (rh-st fgts)	1
Carex sp(p).	3
Isothecium myosuroides	1
Hypnum cf. cupressiforme	1
Hylocomium splendens	1

Sample: 110202/T No. taxa: 27

Cenococcum (sclerotia)	2
bark fgts	1
charcoal	1
moss stems (lfless)	2
root/rootlet fgts	1
stones	1
wood fgts	1
Pteridium aquilinum (pinn fgts)	1
Pteridium aquilinum (stalk fgts)	1
Polygonum persicaria	1
Atriplex sp(p).	1
Montia fontana ssp. chondrosperma	1
Ranunculus Section Ranunculus	1
Ranunculus flammula	1
Brassica rapa	1
Rubus idaeus	1
Potentilla cf. erecta	3
Viola sp(p).	1
Hydrocotyle vulgaris	2
Vaccinium sp(p).	1
Galeopsis Subgenus Galeopsis	1
Prunella vulgaris	1
Juncus squarrosus	2
Juncus cf. bufonius	2
Gramineae	3
Triticum/Secale (‘bran’ fgts)	1
Danthonia decumbens	3
cf. Danthonia decumbens (spklts/fgts)	2
Carex sp(p).	2
Sphagnum sp(p). (lvs/shts)	2
Leucobryum glaucum	1
Thuidium tamariscinum	1
Drepanocladus sp(p).	1
Eurhynchium sp(p).	1

Sample: 131611/T No. taxa: 16

Cenococcum (sclerotia)	3
Quercus (wood)	1
earthworm egg caps	1
gravel	1
root/rootlet fgts	2
sand	2
straw fgts	1
twig fgts	1
wood fgts	1
Polygonum persicaria	1
Sagina sp(p).	3
Rorippa islandica	1
Potentilla cf. erecta	2
Leguminosae (fls/pet)	1
Ilex aquifolium (lef)	1
cf. Calluna vulgaris (rt-tw fgts)	1
Sonchus asper	1
Juncus bufonius	2
cf. Gramineae (culm base-rh fgts)	3
Triticum/Secale (‘bran’ fgts)	1
Carex sp(p).	2
Leucobryum glaucum	1
Eurhynchium sp(p).	1
Hypnum cf. cupressiforme	1
Hylocomium splendens	1

Sample: 131612/T No. taxa: 32

Cenococcum (sclerotia)	2
Quercus (wood)	1
charcoal	1
gravel	1
herbaceous detritus	3
sand	2
stones	1
wood fgts	1
Polygonum persicaria	1
Polygonum lapathifolium	1
Chenopodium sp(p).	1
Chenopodium album	1
Montia fontana ssp. chondrosperma	2
Agrostemma githago (sf)	1
Ranunculus Section Ranunculus	2
Brassica rapa	1
Potentilla anserina	1
Potentilla cf. erecta	2
Aphanes microcarpa	1
Crataegus sp./Prunus spinosa (thorns)	1
Leguminosae (fls/pet)	1
Carduus/Cirsium sp(p).	1
Sonchus asper	1
Taraxacum sp(p).	1
Juncus cf. gerardi	2
Gramineae	2
cf. Gramineae (culm base-rh fgts)	2
cf. Triticum sp(p). (w/l glb)	2
Triticum/Secale (‘bran’ fgts)	2

Triticum/Secale (w/l)	1
Danthonia decumbens	1
Danthonia decumbens (spklts/clstgns)	1
Carex sp(p).	1
Leucobryum glaucum	1
Thuidium tamariscinum	1
Isothecium myosuroides	1
Hypnum cf. cupressiforme	2
Rhytidiadelphus squarrosus	1
Pleurozium schreberi	1
Hylocomium splendens	1

Context: 222
Sample: 1110/T No. taxa: 0

?peat fgts	2
charcoal	1
concretions	3
gravel	2
root/rootlet fgts	1
sand	2

Context: 227
Sample: 1111/T No. taxa: 10

bark fgts	1
charcoal	1
earthworm egg caps	1
gravel	1
grit	2
sand	3
wood fgts	2
Ficus carica	1
Urtica dioica	2
Urtica urens	2
Polygonum persicaria	2
Stellaria media	1
Solanum nigrum	1
Sonchus asper	1
Juncus sp(p).	1
Gramineae	1
Carex sp(p).	1

Context: 237
Sample: 1109/T No. taxa: 2

?peat fgts	2
charcoal	1
earthworm egg caps	1
gravel	2
sand	3
stones	2
Juncus cf. bufonius	2
Carex sp(p).	1

Context: 279
Sample: 1103/T No. taxa: 0

?burnt soil	2
charcoal	3
sand	2

Context: 330
Sample: 124903/T No. taxa: 32

Cenococcum (sclerotia)	2
Daphnia (ephippia)	1
herbaceous detritus	1
Filicales (pinn fgts)	1
Urtica dioica	1
Polygonum aviculare agg.	1
Polygonum persicaria	3
Polygonum lapathifolium	2
Bilderdykia convolvulus (ff)	1
Rumex sp(p).	2
Chenopodium ficifolium	1
Chenopodium album	2
Montia fontana cf. ssp. chondrosperma	1
Ranunculus Section Ranunculus	2
Rubus idaeus	1
Rubus fruticosus agg.	1
Potentilla cf. erecta	2
Potentilla cf. reptans	1
Linum catharticum	1
Viola sp(p).	1
Hydrocotyle vulgaris	1
Calluna vulgaris (s)	1
Calluna vulgaris (sht fgts)	1
Galeopsis Subgenus Galeopsis	2
Prunella vulgaris	1
Lycopus europaeus	1
Solanum nigrum	1
Sambucus nigra	1
Juncus squarrosus	3
Juncus bufonius	2
Gramineae	1
Scirpus setaceus	1
Eleocharis palustris sl	1
Carex sp(p).	3
Hylocomium splendens	1

Sample: 124904/T No. taxa: 19

Cenococcum (sclerotia)	1
charcoal	1
gravel	1
herbaceous detritus	1
sand	2
straw fgts	1
wood fgts	1
Ficus carica	1
Polygonum hydropiper	1
Polygonum persicaria	1
Polygonum lapathifolium	1
Rumex sp(p).	1
Chenopodium album	1
Ranunculus Section Ranunculus	1
Rubus fruticosus agg.	1
Potentilla cf. erecta	1
Linum catharticum	1
Calluna vulgaris (sht fgts)	1
Calluna vulgaris (tw fgts)	2
Galeopsis Subgenus Galeopsis	1
cf. Aster tripolium	1
Juncus sp(p).	1
Juncus bufonius	1
cf. Gramineae (culm base-rh fgts)	2
Danthonia decumbens	1
Carex sp(p).	2

Context: 338
Sample: 124703/T\ No. taxa: 43

Cenococcum (sclerotia)	1
bark fgts	1
charcoal	1
dicot lf fgts	1
fly puparia	2
gravel	1
herbaceous detritus	2
sand	2
straw fgts	2
twig fgts	1
cf. Betula sp(p). (b/bs)	1
Corylus avellana	1
Urtica dioica	2
Urtica urens	1
Polygonum aviculare agg.	1
Polygonum persicaria	1
Polygonum lapathifolium	3
Chenopodium ficifolium	3
Chenopodium album	3
Atriplex sp(p).	1
Stellaria media	1
Stellaria cf. neglecta	1
Stellaria graminea	1
Agrostemma githago (sf)	1
Ranunculus Section Ranunculus	2
Ranunculus flammula	1
Ranunculus Subgenus Batrachium	1
Potentilla cf. erecta	2
Leguminosae (fls/pet)	1
Leguminosae (pods/fgts)	1
cf. Trifolium pratense (pods/lids)	1
Ilex aquifolium (lef)	1
Prunella vulgaris	2
Solanum nigrum	3
Rhinanthus sp(p).	1
Plantago major	1
Plantago lanceolata	1
Carduus/Cirsium sp(p).	1
Centaurea sp(p). (af)	1
Hypochoeris sp(p).	1
Leontodon sp(p).	1
Sonchus asper	2
Triglochin maritima	2
Juncus inflexus/effusus/conglomeratus	1
Juncus gerardi	1
Gramineae	3
Gramineae/Cerealia (c/n)	1
cf. Triticum sp(p). (w/l glb)	1
Triticum/Secale (‘bran’ fgts)	2
Scirpus setaceus	1
Eleocharis palustris sl	1
Carex sp(p).	2
Neckera complanata	1

Context: 362
Sample: 1317/T No. taxa: 11

Cenococcum (sclerotia)	1
charcoal	1
earthworm egg caps	1
gravel	1
grit	1
herbaceous detritus	2
sand	1
twig fgts	1
unwashed sediment	3
wood fgts	1
Chenopodium album	1
Rubus idaeus	1
Potentilla cf. erecta	3
cf. Calluna vulgaris (rt-tw fgts)	2
Fraxinus excelsior (wood)	1
Gramineae (culm fgts)	1
cf. Gramineae (culm base-rh fgts)	2
Danthonia decumbens	2
Carex sp(p).	2

Thuidium tamariscinum	1
Hylocomium splendens	1

Context: 409
Sample: 1250/T No. taxa: 0

charcoal	1
gravel	1
mortar	1
root/rootlet fgts	1
sand	3

Context: 425
Sample: 1251/T No. taxa: 38

Cenococcum (sclerotia)	2
bark fgts	1
charcoal	1
earthworm egg caps	2
fly puparia	1
herbaceous detritus	2
sand	2
stones	1
straw fgts	1
twig fgts	1
wood fgts	2
Betula sp(p).	1
Urtica dioica	1
Polygonum aviculare agg.	2
Polygonum persicaria	1
Polygonum lapathifolium	2
Rumex sp(p).	1
Chenopodium album	1
Stellaria media	1
Agrostemma githago (sf)	1
Ranunculus Section Ranunculus	1
Ranunculus flammula	1
Raphanus raphanistrum (pod segs/fgts)	1
Rubus idaeus	1
Potentilla anserina	1
Potentilla cf. erecta	1
Potentilla cf. reptans	1
Leguminosae (fls/pet)	2
Linum catharticum (caps/fgts)	1
Viola sp(p).	1
Hydrocotyle vulgaris	1
Pastinaca sativa	1
Calluna vulgaris (fls)	1
cf. Calluna vulgaris (rt-tw fgts)	1
Galeopsis Subgenus Galeopsis	1
Prunella vulgaris	1
Solanum nigrum	1
Solanum dulcamara	1
Rhinanthus sp(p). (ch)	1
Sonchus asper	1
Juncus cf. gerardi	2
Juncus bufonius	2
Gramineae	1
Triticum/Secale (‘bran’ fgts)	2
Scirpus lacustris sl	1
cf. Eriophorum vaginatum (rh-st fgts)	1
Carex sp(p).	2
Sphagnum sp(p).	1
Hylocomium splendens	1

Context: 431
Sample: 1253/T No. taxa: 0

?burnt soil	3
charcoal	2
gravel	2
sand	2

Context: 448
Sample: 1255/T No. taxa: 0

?peat fgts	1
charcoal	1
gravel	1
mortar	1
root/rootlet fgts	1
sand	2

Context: 450
Sample: 1256/T No. taxa: 23

Daphnia (ephippia)	3
bark fgts	1
twig fgts	1
Quercus sp(p). (b/bs)	1
Ficus carica	1
Urtica dioica	3
Urtica urens	2
Polygonum lapathifolium	1
Rumex sp(p).	1
Ranunculus Section Ranunculus	2
Ranunculus sceleratus	1
Ranunculus flammula	1
Rorippa islandica	1
Rubus idaeus	1
Rubus fruticosus agg.	1
Potentilla cf. erecta	2
Plantago major	1
Sambucus sp(p). (sf)	1
Carduus/Cirsium sp(p).	1

Triglochin maritima	1	cf. Danthonia decumbens (cleistogenes)	1
Juncus inflexus/effusus/conglomeratus	2	Eleocharis palustris sl	2
Juncus gerardi	2	Carex sp(p).	3
Gramineae	2		

Table 4. Statistics for plant remains from samples from Dowbridge Close, Kirkham. For each subsample, the numbers and percentages of taxa are presented for each of a number of groups (listed in Table 5). Since taxa can be placed in more than one group, percentages will not necessarily sum to 100 for any subsample. AIV (abundance-indicator value) is derived by summing the products of two parameters—the 'amount' of the taxon on a four-point abundance scale (cf. Table 3) and the 'score' for that taxon in one or more ecological or use groups. This statistic is discussed by Hall and Kenward (1990, 299 and 434).

Context: 88
Sample: 1016/T

Uses

Group	No.	% taxa	AIV
FOOS	2	40	6

Vegetation

Group	No.	% taxa	AIV
RHPR	2	40	4
EPIL	2	40	3
ISNA	1	20	3
QUFA	1	20	2
ASTE	1	20	1
MOAR	1	20	1

Context: 148
Sample: 1040/T

Unclassified

Group	No.	% taxa	AIV
UNCL	1	25	0

Vegetation

Group	No.	% taxa	AIV
ISNA	1	25	6
MOAR	2	50	4
PLAN	1	25	3
CHEN	1	25	2
EPIL	1	25	2

Context: 216
Sample: 110201/T

Unclassified

Group	No.	% taxa	AIV
UNCL	9	20	0

Edaphics

Group	No.	% taxa	AIV
FUGE	2	5	8

Mosses

Group	No.	% taxa	AIV
HEMO	2	5	3
LIGN	2	5	3
WOOF	2	5	3
GRAS	1	2	2
SLIT	1	2	2
OLIT	1	2	1
SOIL	1	2	1

Uses

Group	No.	% taxa	AIV
FOOS	2	5	6
WOOD	3	7	3
HERB	1	2	1

Vegetation

Group	No.	% taxa	AIV
CHEN	8	18	22
BIDE	4	9	16
MOAR	9	20	16
ISNA	3	7	15
SECA	5	11	15
QUFA	5	11	11
NACA	5	11	10
PLAN	3	7	8
ALNE	3	7	7
ARTE	3	7	6
EPIL	2	5	4
LITT	2	5	4
PHRA	2	5	4
RHPR	2	5	4
SCCA	2	5	4
LEMN	1	2	3
OXSP	2	5	3
CAKI	1	2	2
QUER	2	5	2
FEBR	1	2	1
MOCA	1	2	1

Sample: 110202/T

Unclassified

Group	No.	% taxa	AIV
UNCL	3	11	0

Edaphics

Group	No.	% taxa	AIV
FUGE	1	4	4

Mosses

Group	No.	% taxa	AIV
BOGS	2	7	8
LIGN	2	7	4
SLIT	2	7	4
WOOF	2	7	4
HEMO	1	4	2
UNCL	2	7	0

Uses

Group	No.	% taxa	AIV
FOOS	3	11	9
USEF	2	7	4
FOOO	1	4	1

Vegetation

Group	No.	% taxa	AIV
NACA	7	26	23
MOAR	7	26	21
CHEN	5	19	10
QUER	3	11	7
LITT	2	7	6
RHPR	3	11	6
SCCA	2	7	6
ARTE	3	11	5
FEBR	2	7	5
ISNA	2	7	5
PHRA	2	7	5
BIDE	2	7	4
EPIL	2	7	4
OXSP	1	4	4
VAPI	2	7	4
SECA	2	7	3
CAKI	1	4	2
PLAN	1	4	2
MOCA	1	4	1
QUFA	1	4	1

Sample: 131611/T

Unclassified

Group	No.	% taxa	AIV
UNCL	4	25	0

Mosses

Group	No.	% taxa	AIV
HEMO	3	19	5
WOOF	3	19	5
LIGN	2	13	3
BOGS	1	6	2
GRAS	1	6	2
SLIT	1	6	2
OLIT	1	6	1
SOIL	1	6	1
UNCL	1	6	0

Uses

Group	No.	% taxa	AIV
FOOS	1	6	3
WOOD	1	6	1

Vegetation

Group	No.	% taxa	AIV
ISNA	1	6	6
BIDE	2	13	5
CHEN	2	13	4
NACA	2	13	3
QUFA	1	6	3
FEBR	1	6	2
MOAR	1	6	2
QUER	1	6	2
SECA	1	6	2
OXSP	1	6	1

Sample: 131612/T

Unclassified

Group	No.	% taxa	AIV
UNCL	7	22	0

Mosses

Group	No.	% taxa	AIV
HEMO	5	16	11
LIGN	4	13	8
WOOF	4	13	8
SLIT	3	9	6
GRAS	2	6	4
BOGS	1	3	2
OLIT	1	3	2
SOIL	1	3	2

Uses

Group	No.	% taxa	AIV
FOOS	3	9	11
FOOO	1	3	1
WOOD	1	3	1

Vegetation

Group	No.	% taxa	AIV
CHEN	6	19	14
MOAR	5	16	12
SECA	4	13	9

FEBR	2	6	6
ISNA	1	3	6
NACA	3	9	6
ARTE	2	6	4
BIDE	2	6	4
QUFA	2	6	3
ASTE	1	3	2
MOCA	1	3	2
PHRA	1	3	2
PLAN	1	3	2
QUER	1	3	2
SESC	1	3	2
RHPR	1	3	1

Context: 227
Sample: 1111/T

Unclassified

Group	No.	% taxa	AIV
UNCL	3	30	0

Uses

Group	No.	% taxa	AIV
FOOS	1	10	3

Vegetation

Group	No.	% taxa	AIV
CHEN	5	50	16
BIDE	2	20	6
SECA	3	30	6
ALNE	1	10	4
ARTE	1	10	4
EPIL	1	10	4
QUFA	1	10	4
RHPR	1	10	4

Context: 237
Sample: 1109/T

Unclassified

Group	No.	% taxa	AIV
UNCL	1	50	0

Vegetation

Group	No.	% taxa	AIV
ISNA	1	50	2

Context: 330
Sample: 124903/T

Unclassified

Group	No.	% taxa	AIV
UNCL	5	16	0

Edaphics

Group	No.	% taxa	AIV
FUGE	1	3	6

Mosses

Group	No.	% taxa	AIV
GRAS	1	3	2
HEMO	1	3	2
WOOF	1	3	2

Uses

Group	No.	% taxa	AIV
FOOS	3	9	9

Vegetation

Group	No.	% taxa	AIV
CHEN	9	28	30
NACA	6	19	18
MOAR	7	22	15
BIDE	3	9	12
ISNA	3	9	12
SECA	5	16	12
ARTE	4	13	10
OXSP	3	9	10
EPIL	3	9	8
FEBR	3	9	8
PHRA	4	13	8
QUFA	4	13	8
RHPR	4	13	8
PLAN	2	6	5
ALNE	2	6	4
LITT	1	3	2
QUER	1	3	2
SCCA	1	3	2
MOCA	1	3	1
SESL	1	3	1

Sample: 124904/T

Unclassified

Group	No.	% taxa	AIV
UNCL	4	21	0

Uses

Group	No.	% taxa	AIV
FOOS	2	11	6

Vegetation

Group	No.	% taxa	AIV
NACA	5	26	14
CHEN	5	26	10
BIDE	3	16	7
MOAR	4	21	7
OXSP	2	11	6
ARTE	3	16	5
FEBR	3	16	5
ISNA	1	5	3
QUFA	2	11	3
SECA	2	11	3
EPIL	1	5	2
RHPR	1	5	2
ASTE	1	5	1
PHRA	1	5	1
QUER	1	5	1
SESL	1	5	1

Context: 338
Sample: 124703/T

Unclassified

Group	No.	% taxa	AIV
UNCL	9	21	0

Mosses

Group	No.	% taxa	AIV
LIGN	1	2	2
SLIT	1	2	2
WOOF	1	2	2

Uses

Group	No.	% taxa	AIV
FOOS	3	7	10
WOOD	2	5	2
USEF	1	2	1

Vegetation

Group	No.	% taxa	AIV
CHEN	13	30	47
MOAR	10	23	23
BIDE	6	14	19
SECA	6	14	19
QUFA	5	12	14
PLAN	3	7	10
ASTE	2	5	9
FEBR	4	9	9
ARTE	3	7	7
EPIL	2	5	6
ALNE	1	2	4
ISNA	2	5	4
NACA	2	5	4
PHRA	2	5	4
RHPR	1	2	4
POTA	1	2	3
CAKI	1	2	2
LITT	1	2	2
QUER	1	2	2
SCCA	1	2	2
MOCA	1	2	1
TRGE	1	2	1

Context: 362

Sample: 1317/T
Unclassified

Group	No.	% taxa	AIV
UNCL	3	27	0

Mosses

Group	No.	% taxa	AIV
WOOF	2	18	4
GRAS	1	9	2
HEMO	1	9	2
LIGN	1	9	2
SLIT	1	9	2

Uses

Group	No.	% taxa	AIV
FOOS	1	9	3
WOOD	1	9	3

Vegetation

Group	No.	% taxa	AIV
NACA	3	27	9
MOAR	2	18	7
CHEN	1	9	3
FEBR	1	9	3
QUER	1	9	3
EPIL	1	9	2
OXSP	1	9	2
RHPR	1	9	2

Context: 425
Sample: 1251/T

Unclassified

Group	No.	% taxa	AIV
UNCL	7	18	0

Mosses

Group	No.	% taxa	AIV
BOGS	1	3	3
GRAS	1	3	2

HEMO	1	3	2
WOOF	1	3	2

Uses

Group	No.	% taxa	AIV
FOOS	2	5	9

Vegetation

Group	No.	% taxa	AIV
CHEN	10	26	24
SECA	8	21	19
MOAR	9	24	16
PLAN	3	8	10
ARTE	5	13	9
BIDE	3	8	8
PHRA	4	11	8
FEBR	4	11	7
NACA	4	11	7
EPIL	3	8	6
ISNA	1	3	6
ALNE	2	5	4
LITT	2	5	4
OXSP	3	8	4
RHPR	2	5	4
SCCA	2	5	4
QUFA	2	5	3
ASTE	1	3	2
CAKI	1	3	2
BULB	1	3	1
QUER	1	3	1
SESL	1	3	1

Context: 450
Sample: 1256/T

Unclassified

Group	No.	% taxa	AIV
UNCL	5	22	0

Uses

Group	No.	% taxa	AIV
FOOS	3	13	9
WOOD	1	4	1

Vegetation

Group	No.	% taxa	AIV
MOAR	7	30	19
CHEN	4	17	12
EPIL	3	13	12
QUFA	4	17	11
ARTE	3	13	10
RHPR	3	13	10
ASTE	2	9	9
BIDE	3	13	8
ALNE	1	4	6
FEBR	2	9	6
PHRA	2	9	6
NACA	3	13	5
PLAN	1	4	3
QUER	2	9	3
LITT	1	4	2
SCCA	1	4	2
SECA	1	4	2

Table 5. Groups used in preparation of statistics presented in Table 4 regarding plant remains listed in Table 3.

Edaphics	
FUGE	Calcifuge plants
Mosses	
BOGS	Mosses found in bogs
GRAS	Mosses of grassland
HEMO	Mosses of heathland/moorland
LIGN	Mosses of living and dead bark and wood
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
Uses	
FOOO	Plants with oil-seeds
FOOS	Plants forming a major component of diet - cereals, pulses, nuts, fruit, vegetables
HERB	Plants used for medicinal purposes
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 *Calluna*-) 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
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
SESL	Montane dwarf-shrub heaths and grassland, mainly on calcareous substrates
TRGE	Species rich communities of grassland/scrub boundaries, often calcicolous

Table 6. Main statistics and species lists in rank order for the scan-recorded assemblages from Dowbridge Close, Kirkham. Nomenclature follows Kloet and Hincks (1964-77). For species codes contributing to the group code sums, see Table 7. R = Rank.

Site: KD94 Context: 425 Sample: 1251/T - beetle/bug main statistics

Erosion = 0 Fragmentation = 0; Weight = 1.000kg

Number of individuals estimated as	N =71
Number of taxa	S =55
Index of diversity (alpha)	alpha =111
Standard error of alpha	SE alpha =30
Number of 'certain' outdoor taxa	SOA =18
Percentage of 'certain' outdoor taxa	%SOA =33
Number of 'certain' outdoor individuals	NOA =19
Percentage of 'certain' outdoor individuals	%NOA =27
Number of 'certain' and probable outdoor taxa	SOB =26
Percentage of 'certain' and probable outdoor taxa	%SOB =47
Number of 'certain' and probable outdoor individuals	NOB =28
Percentage 'certain' and probable outdoor individuals	%NOB =39
Index of diversity of outdoor component	alpha OB =168
Standard error	SE alpha OB =115
Number of aquatic taxa	SW = 3
Percentage of aquatic taxa	%SW = 5
Number of aquatic individuals	NW = 4
Percentage of aquatic individuals	%NW = 6
Number of damp ground/waterside taxa	SD = 3
Percentage of damp ground/waterside taxa	%SD = 5
Number of damp ground/waterside individuals	ND = 3
Percentage of damp ground/waterside individuals	%ND = 4
Number of strongly plant-associated taxa	SP = 7
Percentage of strongly plant-associated taxa	%SP =13
Number of strongly plant-associated individuals	NP = 7
Percentage of strongly plant-associated individuals	%NP =10
Number of heathland/moorland taxa	SM = 0
Number of heathland/moorland individuals	NM = 0
Percentage of heathland/moorland individuals	%NM = 0
Number of wood-associated taxa	SL = 1
Number of wood-associated individuals	NL = 1
Percentage of wood-associated individuals	%NL = 1
Number of decomposer taxa	SRT =20
Percentage of decomposer taxa	%SRT =36
Number of decomposer individuals	NRT =23
Percentage of decomposer individuals	%NRT =32
Number of 'dry' decomposer taxa	SRD = 2
Percentage of 'dry'decomposer taxa	%SRD = 4
Number of 'dry' decomposer individuals	NRD = 2
Percentage of 'dry'decomposer individuals	%NRD = 3
Number of 'foul' decomposer taxa	SRF = 6
Percentage of 'foul' decomposer taxa	%SRF =11
Number of 'foul' decomposer individuals	NRF = 7
Percentage of 'foul' decomposer individuals	%NRF =10
Index of diversity of decomposer component	alpha RT =70
Standard error	SE alpha RT =41
Number of individuals of grain pests	NG =14
Percentage of individuals of grain pests	%NG =20

NB - over 10% grain pests and n > 50: for corrected re-run see below.

Number of individuals of grain pests	NG =14
Number of uncoded taxa	SU = 9
Percentage of uncoded individuals	PNU =14

Site: KD94 Context: 425 Sample: 1251/T - beetle/bug main statistics

re-run after subtraction of grain pest component

Erosion = 0 Fragmentation = 0; Weight = 1.000kg

Number of individuals estimated as	N =57
Number of taxa	S =52
Index of diversity (alpha)	alpha =281
Standard error of alpha	SE alpha =128
Number of 'certain' outdoor taxa	SOA =18
Percentage of 'certain' outdoor taxa	%SOA =35
Number of 'certain' outdoor individuals	NOA =19
Percentage of 'certain' outdoor individuals	%NOA =33
Number of 'certain' and probable outdoor taxa	SOB =26
Percentage of 'certain' and probable outdoor taxa	%SOB =50
Number of 'certain' and probable outdoor individuals	NOB =28
Percentage 'certain' and probable outdoor individuals	%NOB =49
Index of diversity of outdoor component	alpha OB =168
Standard error	SE alpha OB =115
Number of aquatic taxa	SW = 3
Percentage of aquatic taxa	%SW = 6
Number of aquatic individuals	NW = 4
Percentage of aquatic individuals	%NW = 7
Number of damp ground/waterside taxa	SD = 3
Percentage of damp ground/waterside taxa	%SD = 6
Number of damp ground/waterside individuals	ND = 3
Percentage of damp ground/waterside individuals	%ND = 5
Number of strongly plant-associated taxa	SP = 7
Percentage of strongly plant-associated taxa	%SP =13
Number of strongly plant-associated individuals	NP = 7
Percentage of strongly plant-associated individuals	%NP =12
Number of heathland/moorland taxa	SM = 0
Number of heathland/moorland individuals	NM = 0
Percentage of heathland/moorland individuals	%NM = 0
Number of wood-associated taxa	SL = 1
Number of wood-associated individuals	NL = 1
Percentage of wood-associated individuals	%NL = 2
Number of decomposer taxa	SRT =20
Percentage of decomposer taxa	%SRT =38
Number of decomposer individuals	NRT =23
Percentage of decomposer individuals	%NRT =40
Number of 'dry' decomposer taxa	SRD = 2
Percentage of 'dry'decomposer taxa	%SRD = 4
Number of 'dry' decomposer individuals	NRD = 2
Percentage of 'dry'decomposer individuals	%NRD = 4

Number of 'foul' decomposer taxa	SRF = 6
Percentage of 'foul' decomposer taxa	%SRF =12
Number of 'foul' decomposer individuals	NRF = 7
Percentage of 'foul' decomposer individuals	%NRF =12
Index of diversity of decomposer component	alpha RT =70
Standard error	SE alpha RT =41
Number of individuals of grain pests	NG =14
Number of uncoded taxa	SU = 9
Percentage of uncoded individuals	PNU =18

Site: KD94 Context: 425 Sample: 1251/T - species list in rank order

Taxon	No.	%	R	Ecodes
Oryzaephilus surinamensis (Linnaeus)	7	10	1	g
Cryptolestes ferrugineus (Stephens)	6	8	2	g
Helophorus sp. C	2	3	3	oa w
Megasternum obscurum (Marsham)	2	3	3	rt
Cordalia obscura (Gravenhorst)	2	3	3	rt
Aleocharinae sp. D	2	3	3	u
Aphodius ?prodromus (Brahm)	2	3	3	ob rf
Conomelus anceps (Germar)	1	1	8	oa p
Auchenorhyncha sp. A	1	1	8	oa p
Dyschirius sp.	1	1	8	oa
Trechus obtusus or quadristriatus	1	1	8	oa
Tachys sp.	1	1	8	oa
Pterostichus sp.	1	1	8	ob
Calathus sp.	1	1	8	oa
Carabidae sp.	1	1	8	ob
Carabidae sp. B	1	1	8	ob
Helophorus tuberculatus Gyllenhal	1	1	8	oa
Helophorus sp. A	1	1	8	oa w
Helophorus sp. B	1	1	8	oa w
Sphaeridium sp.	1	1	8	rf
Cercyon ?analis (Paykull)	1	1	8	rt
Cercyon ?haemorrhoidalis (Fabricius)	1	1	8	rf
Phyllodrepa ?floralis (Paykull)	1	1	8	rt
Omalium sp.	1	1	8	rt
Anotylus nitidulus (Gravenhorst)	1	1	8	rt d
Anotylus tetracarinatus (Block)	1	1	8	rt
Leptacinus sp.	1	1	8	rt
Gyrohypnus ?angustatus Stephens	1	1	8	rt
Xantholinus longiventris Heer	1	1	8	rt
Philonthus sp.	1	1	8	u
Tachyporus sp.	1	1	8	u
Aleocharinae sp. A	1	1	8	u
Aleocharinae sp. B	1	1	8	u
Aleocharinae sp. C	1	1	8	u
Aleocharinae sp. E	1	1	8	u
Aleocharinae sp. F	1	1	8	u
Aphodius sp. A	1	1	8	ob rf
Aphodius sp. B	1	1	8	ob rf
Aphodius sp. C	1	1	8	ob rf
Hoplia philanthus Illiger	1	1	8	oa
Phyllopertha horticola (Linnaeus)	1	1	8	oa p
Dryops sp.	1	1	8	oa d
Elateridae sp.	1	1	8	ob
Kateretes sp.	1	1	8	oa p d
Brachypterus sp.	1	1	8	oa p
Omosita colon (Linnaeus)	1	1	8	rt
Rhizophagus sp.	1	1	8	u
Atomaria sp.	1	1	8	rd
Cerylon sp.	1	1	8	l
Corticarina or Cortinicara sp.	1	1	8	rt
Typhaea stercorea (Linnaeus)	1	1	8	rd
Chaetocnema arida group	1	1	8	oa p
Cassida ?flaveola Thunberg	1	1	8	oa p
Sitophilus granarius (Linnaeus)	1	1	8	g
Curculionidae sp.	1	1	8	oa

Site: KD94 Context: 216 Sample: 110201/T - beetle/bug main statistics

Erosion = 2 Fragmentation = 3; Weight = 1.000kg

Number of individuals estimated as	N =46
Number of taxa	S =42
Index of diversity (alpha)	alpha =228
Standard error of alpha	SE alpha =115
Number of 'certain' outdoor taxa	SOA =18
Percentage of 'certain' outdoor taxa	%SOA =43
Number of 'certain' outdoor individuals	NOA =18
Percentage of 'certain' outdoor individuals	%NOA =39
Number of 'certain' and probable outdoor taxa	SOB =20
Percentage of 'certain' and probable outdoor taxa	%SOB =48
Number of 'certain' and probable outdoor individuals	NOB =23
Percentage 'certain' and probable outdoor individuals	%NOB =50
Index of diversity of outdoor component	alpha OB =70
Standard error	SE alpha OB =41
Number of aquatic taxa	SW = 7
Percentage of aquatic taxa	%SW =17
Number of aquatic individuals	NW = 7
Percentage of aquatic individuals	%NW =15
Number of damp ground/waterside taxa	SD = 1
Percentage of damp ground/waterside taxa	%SD = 2
Number of damp ground/waterside individuals	ND = 1
Percentage of damp ground/waterside individuals	%ND = 2
Number of strongly plant-associated taxa	SP = 4
Percentage of strongly plant-associated taxa	%SP =10
Number of strongly plant-associated individuals	NP = 4
Percentage of strongly plant-associated individuals	%NP = 9
Number of heathland/moorland taxa	SM = 0
Number of heathland/moorland individuals	NM = 0
Percentage of heathland/moorland individuals	%NM = 0
Number of wood-associated taxa	SL = 0
Number of wood-associated individuals	NL = 0
Percentage of wood-associated individuals	%NL = 0
Number of decomposer taxa	SRT =14
Percentage of decomposer taxa	%SRT =33

Number of decomposer individuals	NRT =18
Percentage of decomposer individuals	%NRT =39
Number of 'dry' decomposer taxa	SRD = 3
Percentage of 'dry'decomposer taxa	%SRD = 7
Number of 'dry' decomposer individuals	NRD = 3
Percentage of 'dry'decomposer individuals	%NRD = 7
Number of 'foul' decomposer taxa	SRF = 4
Percentage of 'foul' decomposer taxa	%SRF =10
Number of 'foul' decomposer individuals	NRF = 7
Percentage of 'foul' decomposer individuals	%NRF =15

Diversity index for RT not calculated, NRT = SRT or NRT < 20

Number of individuals of grain pests	NG = 1
Percentage of individuals of grain pests	%NG = 2
Number of individuals of grain pests	NG = 1
Number of uncoded taxa	SU = 9
Percentage of uncoded individuals	PNU =20

Site: KD94 Context: 216 Sample: 110201/T - species list in rank order

Taxon	No.	%	R	Ecodes
Aphodius ?prodromus (Brahm)	4	9	1	ob rf
Oxytelus sculptus Gravenhorst	2	4	2	rt
Carabus nemoralis Muller	1	2	3	oa
Nebria sp.	1	2	3	oa
Trechus sp.	1	2	3	ob
Harpalus rufipes (Degeer)	1	2	3	oa
Acupalpus dubius Schilsky	1	2	3	oa
Hydroporinae sp.	1	2	3	oa w
Agabus bipustulatus (Linnaeus)	1	2	3	oa w
Helophorus sp. A	1	2	3	oa w
Helophorus sp. B	1	2	3	oa w
Helophorus sp. C	1	2	3	oa w
Coelostoma orbiculare (Fabricius)	1	2	3	oa w
Cercyon melanocephalus (Linnaeus)	1	2	3	rt
Cercyon terminatus (Marsham)	1	2	3	rf
Cercyon unipunctatus (Linnaeus)	1	2	3	rf
Cercyon sp.	1	2	3	u
?Anacaena sp.	1	2	3	oa w
Acritus nigricornis (Hoffmann)	1	2	3	rt
Histerinae sp.	1	2	3	u
Omalium sp.	1	2	3	rt
Platystethus nitens (Sahlberg)	1	2	3	oa d
Stenus sp.	1	2	3	u
Gyrohypnus fracticornis (Muller)	1	2	3	rt
Xantholinus linearis or longiventris	1	2	3	rt
Quedius sp.	1	2	3	u
Tachyporus sp. A	1	2	3	u
Tachyporus sp. B	1	2	3	u
Aleocharinae sp. A	1	2	3	u
Aleocharinae sp. B	1	2	3	u
Onthophagus sp.	1	2	3	oa rf
Hoplia philanthus Illiger	1	2	3	oa
Phyllopertha horticola (Linnaeus)	1	2	3	oa p
Monotoma sp.	1	2	3	rt
Atomaria sp.	1	2	3	rd
Lathridius minutus group	1	2	3	rd
Typhaea stercorea (Linnaeus)	1	2	3	rd
Altica sp.	1	2	3	oa p
Sitona sp.	1	2	3	oa p
Alophus triguttatus (Fabricius)	1	2	3	oa p
Sitophilus granarius (Linnaeus)	1	2	3	g
Coleoptera sp.	1	2	3	u

Site: KD94 Context: 216 Sample: 110202/T - beetle/bug main statistics

Erosion = 2 Fragmentation = 2; Weight = 1.000kg

Number of individuals estimated as	N =36
Number of taxa	S =32
Index of diversity (alpha)	alpha =135
Standard error of alpha	SE alpha =69
Number of 'certain' outdoor taxa	SOA = 9
Percentage of 'certain' outdoor taxa	%SOA =28
Number of 'certain' outdoor individuals	NOA = 9
Percentage of 'certain' outdoor individuals	%NOA =25
Number of 'certain' and probable outdoor taxa	SOB =13
Percentage of 'certain' and probable outdoor taxa	%SOB =41
Number of 'certain' and probable outdoor individuals	NOB =17
Percentage 'certain' and probable outdoor individuals	%NOB =47

Diversity index for OB not calculated, NOB = SOB or NOB < 20

Number of aquatic taxa	SW = 0
Percentage of aquatic taxa	%SW = 0
Number of aquatic individuals	NW = 0
Percentage of aquatic individuals	%NW = 0
Number of damp ground/waterside taxa	SD = 2
Percentage of damp ground/waterside taxa	%SD = 6
Number of damp ground/waterside individuals	ND = 2
Percentage of damp ground/waterside individuals	%ND = 6
Number of strongly plant-associated taxa	SP = 7
Percentage of strongly plant-associated taxa	%SP =22
Number of strongly plant-associated individuals	NP = 7
Percentage of strongly plant-associated individuals	%NP =19
Number of heathland/moorland taxa	SM = 0
Number of heathland/moorland individuals	NM = 0
Percentage of heathland/moorland individuals	%NM = 0
Number of wood-associated taxa	SL = 2
Number of wood-associated individuals	NL = 2
Percentage of wood-associated individuals	%NL = 6
Number of decomposer taxa	SRT = 9
Percentage of decomposer taxa	%SRT =28
Number of decomposer individuals	NRT =13
Percentage of decomposer individuals	%NRT =36
Number of 'dry' decomposer taxa	SRD = 1
Percentage of 'dry'decomposer taxa	%SRD = 3
Number of 'dry' decomposer individuals	NRD = 1
Percentage of 'dry'decomposer individuals	%NRD = 3
Number of 'foul' decomposer taxa	SRF = 2

Percentage of 'foul' decomposer taxa	%SRF = 6
Number of 'foul' decomposer individuals	NRF = 6
Percentage of 'foul' decomposer individuals	%NRF =17
Diversity index for RT not calculated, NRT = SRT or NRT < 20	
Number of individuals of grain pests	NG = 0
Percentage of individuals of grain pests	%NG = 0
Number of individuals of grain pests	NG = 0
Number of uncoded taxa	SU =10
Percentage of uncoded individuals	PNU =28

Site: KD94 Context: 216 Sample: 110202/T - species list in rank order

Taxon	No.	%	R	Ecodes
Aphodius prodromus (Brahm)	5	14	1	ob rf
Auchenorhyncha sp.	1	3	2	oa p
Pterostichus sp.	1	3	2	ob
Agonum sp.	1	3	2	oa
Amara sp.	1	3	2	oa
Cercyon sp.	1	3	2	u
Megasternum obscurum (Marsham)	1	3	2	rt
Histerinae sp.	1	3	2	u
Anotylus rugosus (Fabricius)	1	3	2	rt
Anotylus tetracarinatus (Block)	1	3	2	rt
Oxytelus sculptus Gravenhorst	1	3	2	rt
Stenus sp. A	1	3	2	u
Stenus sp. B	1	3	2	u
Xantholinus longiventris Heer	1	3	2	rt
Philonthus sp. A	1	3	2	u
Philonthus sp. B	1	3	2	u
Philonthus sp. C	1	3	2	u
Staphylininae sp.	1	3	2	u
Aleocharinae sp. A	1	3	2	u
Aleocharinae sp. B	1	3	2	u
Aphodius sp.	1	3	2	ob rf
Phyllopertha horticola (Linnaeus)	1	3	2	oa p
Ctenicera cuprea (Fabricius)	1	3	2	oa p
Agriotes sp.	1	3	2	oa p
Elateridae sp.	1	3	2	ob
Anobium punctatum (Degeer)	1	3	2	l
Kateretes sp.	1	3	2	oa p d
Cryptophagus sp.	1	3	2	rd
Anthicus floralis or formicarius	1	3	2	rt
Hydrothassa sp.	1	3	2	oa d p
Longitarsus sp.	1	3	2	oa p
Scolytidae sp.	1	3	2	l

Site: KD94 Context: 338 Sample: 124703/T - beetle/bug main statistics

Erosion = 2 Fragmentation = 3; Weight = 1.000kg

Number of individuals estimated as	N =119
Number of taxa	S =80
Index of diversity (alpha)	alpha =107
Standard error of alpha	SE alpha =19
Number of 'certain' outdoor taxa	SOA =26
Percentage of 'certain' outdoor taxa	%SOA =33
Number of 'certain' outdoor individuals	NOA =29
Percentage of 'certain' outdoor individuals	%NOA =24
Number of 'certain' and probable outdoor taxa	SOB =31
Percentage of 'certain' and probable outdoor taxa	%SOB =39
Number of 'certain' and probable outdoor individuals	NOB =42
Percentage 'certain' and probable outdoor individuals	%NOB =35
Index of diversity of outdoor component	alpha OB =53
Standard error	SE alpha OB =18
Number of aquatic taxa	SW = 5
Percentage of aquatic taxa	%SW = 6
Number of aquatic individuals	NW = 7
Percentage of aquatic individuals	%NW = 6
Number of damp ground/waterside taxa	SD = 4
Percentage of damp ground/waterside taxa	%SD = 5
Number of damp ground/waterside individuals	ND = 4
Percentage of damp ground/waterside individuals	%ND = 3
Number of strongly plant-associated taxa	SP =11
Percentage of strongly plant-associated taxa	%SP =14
Number of strongly plant-associated individuals	NP =12
Percentage of strongly plant-associated individuals	%NP =10
Number of heathland/moorland taxa	SM = 0
Number of heathland/moorland individuals	NM = 0
Percentage of heathland/moorland individuals	%NM = 0
Number of wood-associated taxa	SL = 1
Number of wood-associated individuals	NL = 2
Percentage of wood-associated individuals	%NL = 2
Number of decomposer taxa	SRT =28
Percentage of decomposer taxa	%SRT =35
Number of decomposer individuals	NRT =55
Percentage of decomposer individuals	%NRT =46
Number of 'dry' decomposer taxa	SRD = 6
Percentage of 'dry'decomposer taxa	%SRD = 8
Number of 'dry' decomposer individuals	NRD = 8
Percentage of 'dry'decomposer individuals	%NRD = 7
Number of 'foul' decomposer taxa	SRF = 6
Percentage of 'foul' decomposer taxa	%SRF = 8
Number of 'foul' decomposer individuals	NRF =17
Percentage of 'foul' decomposer individuals	%NRF =14
Index of diversity of decomposer component	alpha RT =23
Standard error	SE alpha RT = 5
Number of individuals of grain pests	NG = 9
Percentage of individuals of grain pests	%NG = 8
Number of individuals of grain pests	NG = 9
Number of uncoded taxa	SU =18
Percentage of uncoded individuals	PNU =18

Site: KD94 Context: 338 Sample: 124703/T - species list in rank order

Taxon	No.	%	R	Ecodes
Aphodius prodromus (Brahm)	7	6	1	ob rf

Oryzaephilus surinamensis (Linnaeus)	5	4	2	g
Cercyon haemorrhoidalis (Fabricius)	4	3	3	rf
Acritus nigricornis (Hoffmann)	4	3	3	rt
Corticarina or Cortinicara sp.	4	3	3	rt
Helophorus sp.	3	3	6	oa w
Cercyon analis (Paykull)	3	3	6	rt
Megasternum obscurum (Marsham)	3	3	6	rt
Stenus sp. B	3	3	6	u
Aphodius granarius (Linnaeus)	3	3	6	ob rf
Omosita colon or discoidea	3	3	6	rt
Lathridius minutus group	3	3	6	rd
Onthophilus striatus (Forster)	2	2	13	rt
Tachyporus sp.	2	2	13	u
Falagria caesa or sulcatula	2	2	13	rt
Anobium punctatum (Degeer)	2	2	13	l
Cryptolestes ferrugineus (Stephens)	2	2	13	g
Chaetocnema concinna (Marsham)	2	2	13	oa p
Scolopostethus sp.	1	1	19	oa p
Conomelus anceps (Germar)	1	1	19	oa p
Auchenorhyncha sp. A	1	1	19	oa p
Auchenorhyncha sp. B	1	1	19	oa p
Auchenorhyncha sp. C	1	1	19	oa p
Trechus obtusus or quadristriatus	1	1	19	oa
Trechus micros (Herbst)	1	1	19	u
Asaphidion flavipes (Linnaeus)	1	1	19	oa
Bembidion lampros or properans	1	1	19	oa
Bembidion sp.	1	1	19	oa
Tachys sp.	1	1	19	oa
Amara sp.	1	1	19	oa
Carabidae sp. A	1	1	19	ob
Carabidae sp. B	1	1	19	ob
Hydroporinae sp.	1	1	19	oa w
Helophorus aquaticus (Linnaeus)	1	1	19	oa w
Cercyon ?terminatus (Marsham)	1	1	19	rf
Cryptopleurum minutum (Fabricius)	1	1	19	rf
Laccobius sp.	1	1	19	oa w
Gnathoncus sp.	1	1	19	rt
Histerinae sp.	1	1	19	u
Ochthebius sp.	1	1	19	oa w
Ptenidium sp.	1	1	19	rt
Lesteva longoelytrata (Goeze)	1	1	19	oa d
Omalium sp.	1	1	19	rt
Carpelimus sp.	1	1	19	u
Platystethus arenarius (Fourcroy)	1	1	19	rf
Platystethus cornutus group	1	1	19	oa d
Platystethus nitens (Sahlberg)	1	1	19	oa d
Anotylus nitidulus (Gravenhorst)	1	1	19	rt d
Oxytelus sculptus Gravenhorst	1	1	19	rt
Stenus sp. A	1	1	19	u
Xantholinus sp.	1	1	19	u
?Erichsonius sp.	1	1	19	u
Philonthus sp. A	1	1	19	u
Philonthus sp. B	1	1	19	u
Staphylininae sp.	1	1	19	u
?Aleochara sp.	1	1	19	u
Aleocharinae sp. A	1	1	19	u
Aleocharinae sp. B	1	1	19	u
Aleocharinae sp. C	1	1	19	u
Aleocharinae sp. D	1	1	19	u
Elateridae sp.	1	1	19	ob
Brachypterus sp.	1	1	19	oa p
Meligethes sp.	1	1	19	oa p
Cryptophagus sp. A	1	1	19	rd
Cryptophagus sp. B	1	1	19	rd
Atomaria sp.	1	1	19	rd
Ephistemus globulus (Paykull)	1	1	19	rd
Phalacridae sp.	1	1	19	oa p
Orthoperus sp.	1	1	19	rt
Stephostethus lardarius (Degeer)	1	1	19	rt
Typhaea stercorea (Linnaeus)	1	1	19	rd
Aglenus brunneus (Gyllenhal)	1	1	19	rt
Palorus ?ratzeburgi (Wissman)	1	1	19	g
Tenebrio obscurus Fabricius	1	1	19	rt
Bruchinae sp.	1	1	19	u
Gastrophysa viridula (Degeer)	1	1	19	oa p
Chaetocnema arida group	1	1	19	oa p
Sitophilus granarius (Linnaeus)	1	1	19	g
Curculionidae sp.	1	1	19	oa
Coleoptera sp.	1	1	19	u

Site: KD94 Context: 330 Sample: 124901/T3 - beetle/bug main statistics

Erosion = 2 Fragmentation = 3; Weight = 6.250kg

Number of individuals estimated as	N =94
Number of taxa	S =65
Index of diversity (alpha)	alpha =93
Standard error of alpha	SE alpha =19
Number of 'certain' outdoor taxa	SOA =25
Percentage of 'certain' outdoor taxa	%SOA =38
Number of 'certain' outdoor individuals	NOA =29
Percentage of 'certain' outdoor individuals	%NOA =31
Number of 'certain' and probable outdoor taxa	SOB =29
Percentage of 'certain' and probable outdoor taxa	%SOB =45
Number of 'certain' and probable outdoor individuals	NOB =38
Percentage 'certain' and probable outdoor individuals	%NOB =40
Index of diversity of outdoor component	alpha OB =55
Standard error	SE alpha OB =20
Number of aquatic taxa	SW = 3
Percentage of aquatic taxa	%SW = 5
Number of aquatic individuals	NW = 4
Percentage of aquatic individuals	%NW = 4
Number of damp ground/waterside taxa	SD = 4
Percentage of damp ground/waterside taxa	%SD = 6
Number of damp ground/waterside individuals	ND = 4
Percentage of damp ground/waterside individuals	%ND = 4
Number of strongly plant-associated taxa	SP =10
Percentage of strongly plant-associated taxa	%SP =15
Number of strongly plant-associated individuals	NP =11

Percentage of strongly plant-associated individuals	%NP =12
Number of heathland/moorland taxa	SM = 0
Number of heathland/moorland individuals	NM = 0
Percentage of heathland/moorland individuals	%NM = 0
Number of wood-associated taxa	SL = 1
Number of wood-associated individuals	NL = 1
Percentage of wood-associated individuals	%NL = 1
Number of decomposer taxa	SRT =18
Percentage of decomposer taxa	%SRT =28
Number of decomposer individuals	NRT =40
Percentage of decomposer individuals	%NRT =43
Number of 'dry' decomposer taxa	SRD = 1
Percentage of 'dry'decomposer taxa	%SRD = 2
Number of 'dry' decomposer individuals	NRD = 1
Percentage of 'dry'decomposer individuals	%NRD = 1
Number of 'foul' decomposer taxa	SRF = 3
Percentage of 'foul' decomposer taxa	%SRF = 5
Number of 'foul' decomposer individuals	NRF = 8
Percentage of 'foul' decomposer individuals	%NRF = 9
Index of diversity of decomposer component	alpha RT =13
Standard error	SE alpha RT = 3
Number of individuals of grain pests	NG = 2
Percentage of individuals of grain pests	%NG = 2
Number of individuals of grain pests	NG = 2
Number of uncoded taxa	SU =18
Percentage of uncoded individuals	PNU =22

Site: KD94 Context: 330 Sample: 124901/T3 - species list in rank order

NOTE: this list includes 'semi-quantitative' records, marked by '*' in the first column of the comment following a record.

Taxon	No.	%	R	Ecodes
Acritus nigricornis (Hoffmann)*	6	6	1	rt
Aphodius sp. *	6	6	1	ob rf
Rugilus orbiculatus (Paykull)	4	4	3	rt
Tachys sp.	3	3	4	oa
Megasternum obscurum (Marsham)	3	3	4	rt
Othius myrmecophilus Kiesenwetter	3	3	4	rt
Xantholinus linearis (Olivier)	3	3	4	rt
Helophorus sp.	2	2	8	oa w
Xantholinus glabratus (Gravenhorst)	2	2	8	rt
Xantholinus longiventris Heer	2	2	8	rt
Neobisnius sp.	2	2	8	u
Erichsonius sp.	2	2	8	u
Gabrius sp.	2	2	8	rt
Aleocharinae sp. B	2	2	8	u
Sitona sp.	2	2	8	oa p
Stygnocoris sp.	1	1	16	oa
Dyschirius globosus (Herbst)	1	1	16	oa
Trechus sp.	1	1	16	ob
Pterostichus (Poecilus) sp.	1	1	16	oa
Agonum sp.	1	1	16	oa
Amara sp.	1	1	16	oa
Carabidae sp. A	1	1	16	ob
Haliplidae sp.	1	1	16	u
Hydroporinae sp.	1	1	16	oa w
Histerinae sp. A	1	1	16	u
Histerinae sp. B	1	1	16	u
Ochthebius sp.	1	1	16	oa w
Leiodidae sp.	1	1	16	u
Micropeplus fulvus Erichson	1	1	16	rt
Omalium sp.	1	1	16	rt
Omaliinae sp.	1	1	16	u
Platystethus cornutus group	1	1	16	oa d
Platystethus nitens (Sahlberg)	1	1	16	oa d
Stenus sp. A	1	1	16	u
Stenus sp. B	1	1	16	u
?Euaesthetus sp.	1	1	16	oa
?Lathrobium sp.	1	1	16	u
Lithocharis ochracea (Gravenhorst)	1	1	16	rt
Paederinae sp.	1	1	16	u
Gyrohypnus angustatus Stephens	1	1	16	rt
Philonthus sp.	1	1	16	u
Staphylininae sp. A	1	1	16	u
Staphylininae sp. B	1	1	16	u
Tachyporus sp.	1	1	16	u
Tachinus sp.	1	1	16	u
Falagria or Cordalia sp.	1	1	16	rt
Aleocharinae sp. A	1	1	16	u
Lucanus cervus (Linnaeus)	1	1	16	l
Geotrupes sp.	1	1	16	oa rf
Aphodius sp. B	1	1	16	ob rf
Hoplia philanthus Illiger	1	1	16	oa
Melolonthinae/Rutelinae/Cetoninae sp.	1	1	16	oa p
?Dryops sp.	1	1	16	oa d
Ctenicera cuprea (Fabricius)	1	1	16	oa p
Agriotes sp.	1	1	16	oa p
Oryzaephilus surinamensis (Linnaeus)	1	1	16	g
Atomaria sp.	1	1	16	rd
Phalacridae sp.	1	1	16	oa p
Corticaria sp.	1	1	16	rt
Chrysomelinae sp.	1	1	16	oa p
Chaetocnema sp.	1	1	16	oa p
Apion sp.	1	1	16	oa p
Otiorhynchus sp.	1	1	16	oa p
Sitophilus granarius (Linnaeus)	1	1	16	g
Limnobaris ?pilistriata (Stephens)	1	1	16	oa p d

Site: KD94 Context: 216 Sample: 131611/T - beetle/bug main statistics

Erosion = 2 Fragmentation = 3; Weight = 1.000kg

Number of individuals estimated as	N =25
Number of taxa	S =23
Index of diversity (alpha)	alpha =132
Standard error of alpha	SE alpha =91

Number of 'certain' outdoor taxa	SOA =10
Percentage of 'certain' outdoor taxa	%SOA =43
Number of 'certain' outdoor individuals	NOA =10
Percentage of 'certain' outdoor individuals	%NOA =40
Number of 'certain' and probable outdoor taxa	SOB =14
Percentage of 'certain' and probable outdoor taxa	%SOB =61
Number of 'certain' and probable outdoor individuals	NOB =15
Percentage 'certain' and probable outdoor individuals	%NOB =60
Diversity index for OB not calculated, NOB = SOB or NOB < 20	
Number of aquatic taxa	SW = 2
Percentage of aquatic taxa	%SW = 9
Number of aquatic individuals	NW = 2
Percentage of aquatic individuals	%NW = 8
Number of damp ground/waterside taxa	SD = 0
Percentage of damp ground/waterside taxa	%SD = 0
Number of damp ground/waterside individuals	ND = 0
Percentage of damp ground/waterside individuals	%ND = 0
Number of strongly plant-associated taxa	SP = 4
Percentage of strongly plant-associated taxa	%SP =17
Number of strongly plant-associated individuals	NP = 4
Percentage of strongly plant-associated individuals	%NP =16
Number of heathland/moorland taxa	SM = 0
Number of heathland/moorland individuals	NM = 0
Percentage of heathland/moorland individuals	%NM = 0
Number of wood-associated taxa	SL = 0
Number of wood-associated individuals	NL = 0
Percentage of wood-associated individuals	%NL = 0
Number of decomposer taxa	SRT = 5
Percentage of decomposer taxa	%SRT =22
Number of decomposer individuals	NRT = 7
Percentage of decomposer individuals	%NRT =28
Number of 'dry' decomposer taxa	SRD = 0
Percentage of 'dry'decomposer taxa	%SRD = 0
Number of 'dry' decomposer individuals	NRD = 0
Percentage of 'dry'decomposer individuals	%NRD = 0
Number of 'foul' decomposer taxa	SRF = 2
Percentage of 'foul' decomposer taxa	%SRF = 9
Number of 'foul' decomposer individuals	NRF = 3
Percentage of 'foul' decomposer individuals	%NRF =12
Diversity index for RT not calculated, NRT = SRT or NRT < 20	
Number of individuals of grain pests	NG = 1
Percentage of individuals of grain pests	%NG = 4
Number of individuals of grain pests	NG = 1
Number of uncoded taxa	SU = 5
Percentage of uncoded individuals	PNU =20

Site: KD94 Context: 216 Sample: 131611/T - species list in rank order

Taxon	No.	%	R	Ecodes
Othius sp.	2	8	1	rt
Aphodius ?prodromus (Brahm)	2	8	1	ob rf
Auchenorhyncha sp. A	1	4	3	oa p
Auchenorhyncha sp. B	1	4	3	oa p
Harpalus sp.	1	4	3	oa
Carabidae sp. A	1	4	3	ob
Carabidae sp. B	1	4	3	ob
Colymbetinae sp.	1	4	3	oa w
Helophorus sp.	1	4	3	oa w
Acidota crenata (Fabricius)	1	4	3	oa
Carpelimus ?bilineatus Stephens	1	4	3	rt
Carpelimus sp.	1	4	3	u
Lathrobium sp.	1	4	3	u
Xantholinus linearis or longiventris	1	4	3	rt
Quedius sp.	1	4	3	u
Aleocharinae sp.	1	4	3	u
Aphodius ?ater (Degeer)	1	4	3	oa rf
Hoplia philanthus Illiger	1	4	3	oa
Byrrhidae sp.	1	4	3	oa p
Cantharidae sp.	1	4	3	ob
Cryptolestes ?ferrugineus (Stephens)	1	4	3	g
Longitarsus sp.	1	4	3	oa p
Coleoptera sp.	1	4	3	u

Site: KD94 Context: 216 Sample: 131602/T - beetle/bug main statistics

Erosion = 2 Fragmentation = 2; Weight = 1.000kg

Number of individuals estimated as	N =46
Number of taxa	S =39
Index of diversity (alpha)	alpha =119
Standard error of alpha	SE alpha =47
Number of 'certain' outdoor taxa	SOA =10
Percentage of 'certain' outdoor taxa	%SOA =26
Number of 'certain' outdoor individuals	NOA =10
Percentage of 'certain' outdoor individuals	%NOA =22
Number of 'certain' and probable outdoor taxa	SOB =12
Percentage of 'certain' and probable outdoor taxa	%SOB =31
Number of 'certain' and probable outdoor individuals	NOB =15
Percentage 'certain' and probable outdoor individuals	%NOB =33
Diversity index for OB not calculated, NOB = SOB or NOB < 20	
Number of aquatic taxa	SW = 1
Percentage of aquatic taxa	%SW = 3
Number of aquatic individuals	NW = 1
Percentage of aquatic individuals	%NW = 2
Number of damp ground/waterside taxa	SD = 2
Percentage of damp ground/waterside taxa	%SD = 5
Number of damp ground/waterside individuals	ND = 2
Percentage of damp ground/waterside individuals	%ND = 4
Number of strongly plant-associated taxa	SP = 3
Percentage of strongly plant-associated taxa	%SP = 8
Number of strongly plant-associated individuals	NP = 3
Percentage of strongly plant-associated individuals	%NP = 7
Number of heathland/moorland taxa	SM = 0
Number of heathland/moorland individuals	NM = 0
Percentage of heathland/moorland individuals	%NM = 0
Number of wood-associated taxa	SL = 1
Number of wood-associated individuals	NL = 1

Percentage of wood-associated individuals	%NL = 2
Number of decomposer taxa	SRT =17
Percentage of decomposer taxa	%SRT =44
Number of decomposer individuals	NRT =21
Percentage of decomposer individuals	%NRT =46
Number of 'dry' decomposer taxa	SRD = 0
Percentage of 'dry'decomposer taxa	%SRD = 0
Number of 'dry' decomposer individuals	NRD = 0
Percentage of 'dry'decomposer individuals	%NRD = 0
Number of 'foul' decomposer taxa	SRF = 4
Percentage of 'foul' decomposer taxa	%SRF =10
Number of 'foul' decomposer individuals	NRF = 7
Percentage of 'foul' decomposer individuals	%NRF =15
Index of diversity of decomposer component	alpha RT =43
Standard error	SE alpha RT =25
Number of individuals of grain pests	NG = 1
Percentage of individuals of grain pests	%NG = 2
Number of individuals of grain pests	NG = 1
Number of uncoded taxa	SU =11
Percentage of uncoded individuals	PNU =30

Site: KD94 Context: 216 Sample: 131602/T - species list in rank order

Taxon	No.	%	R	Ecodes
Aleocharinae sp. D	3	7	1	u
Aphodius ?prodromus (Brahm)	3	7	1	ob rf
Megasternum obscurum (Marsham)	2	4	3	rt
Aleocharinae sp. B	2	4	3	u
Aphodius sp.	2	4	3	ob rf
Trechus obtusus or quadristriatus	1	2	6	oa
Helophorus sp.	1	2	6	oa w
Sphaeridium sp.	1	2	6	rf
Cercyon sp.	1	2	6	u
Onthophilus striatus (Forster)	1	2	6	rt
Acidota crenata (Fabricius)	1	2	6	oa
Phyllodrepa ?floralis (Paykull)	1	2	6	rt
Omalium ?rivulare (Paykull)	1	2	6	rt
Omalium sp.	1	2	6	rt
Omaliinae sp.	1	2	6	u
Carpelimus pusillus group	1	2	6	u
Anotylus sculpturatus group	1	2	6	rt
Anotylus tetracarinatus (Block)	1	2	6	rt
Oxytelus sculptus Gravenhorst	1	2	6	rt
Xantholinus linearis or longiventris	1	2	6	rt
Quedius boops group	1	2	6	u
Staphylininae sp. A	1	2	6	u
Staphylininae sp. B	1	2	6	u
Tachinus ?signatus Gravenhorst	1	2	6	u
Aleocharinae sp. A	1	2	6	u
Aleocharinae sp. C	1	2	6	u
Onthophagus sp.	1	2	6	oa rf
Hoplia philanthus Illiger	1	2	6	oa
Phyllopertha horticola (Linnaeus)	1	2	6	oa p
Cyphon sp.	1	2	6	oa d
Dryops sp.	1	2	6	oa d
Meligethes sp.	1	2	6	oa p
Monotoma picipes Herbst	1	2	6	rt
Oryzaephilus ?surinamensis (Linnaeus)	1	2	6	g
Enicmus sp.	1	2	6	rt
Corticaria sp.	1	2	6	rt
Anthicus floralis or formicarius	1	2	6	rt
Sitona sp.	1	2	6	oa p
Scolytidae sp.	1	2	6	l

Table 7. Ecological codes used for adult Coleoptera and Hemiptera (excluding Aphidoidea and Coccoidea) in text and tables. Lower case codes in parentheses are those assigned to taxa (see Table 1) and used to calculate the group values (codes in capitals: see Table 6).

‘certain’ outdoor taxa (oa)	OA
‘certain’ and probable outdoor taxa (oa + ob)	OB
aquatic taxa (w)	W
damp ground/waterside taxa (d)	D
strongly plant-associated taxa (p)	P
heathland/moorland taxa (m)	M
wood-associated taxa (l)	L
decomposer taxa (rt + rd + rf)	RT
'dry' decomposer taxa (rd)	RD
'foul' decomposer taxa (rf)	RF
individuals of grain pests (g)	G
uncoded taxa (u)	U

Table 8. Biological samples from Dowbridge Close, Kirkham: action taken. NFA: no further action.

Context	Sample	Action	Tub number sampled	Total number of tubs	Notes	Parasite squash
79	1004	1kg w/o	1	1		
88	1016	1kg w/o	1 of 2	2	voucher tub 1, NFA on tub 2	
148	1040	1kg flot	1 of 3	3	hold on other 2 tubs, voucher tub 1	x
160	1021	BS all	1	1		
174	1100	1kg flot	2 of 2	2	tub 1 NFA, tub 2 voucher	
216	110201	1kg flot	1 of 2	2	different from tub 2, voucher tub 1	x
216	110202	1 kg flot	2 of 2	2	different from tub 1, voucher tub 2	x
216	110202	WOOD	2 of 2	2	included in sample	
216	131611	1kg flot	1 of 3	3	organic component of sample. Tubs 2 and 3 NFA	x
216	131612	1kg flot	1 of 3	3	clay component of sample, voucher tub 1	x
222	111001	1kg flot	1 of 3	3	tub 3 on hold, voucher tub 1	x
222	111002	none yet	2 of 3	3	different from other tubs but on hold	
227	1111	1kg flot	1 of 2	2		
237	1109	1kg flot	3 of 3	3	check numbers of tubs 1 and 2, voucher tub 3	
279	1103	1kg flot and BS of excess	1	1		
330	124903	1kg flot	3 of 4	4	tubs 1 and 4 NFA; tub 2 on hold, voucher tub 3	
330	124904	1kg flot	4 of 4	4	done by mistake as an extra, voucher tub 4	
338	124701	none	1 of 5	5	tubs 2, 4 and 5 same but on hold	
338	124702	none	2 of 5	5	same as 1,4 and 5	
338	124703	1kg flot	3 of 5	5	different from 1, 2, 4 and 5, voucher tub 3	x
339	1248	none	2 of 3	3	NFA on all	

Context	**Sample**	**Action**	**Tub number sampled**	**Total number of tubs**	**Notes**	**Parasite squash**
362	1317	1kg flot	1 of 2	2	tub 2 on hold, voucher tub 1	x
409	1250	1kg w/o	1 of 1	1	voucher	
425	1251	1kg flot	1 of 1	1	voucher	x
430	1252	none	1 of 1	1	NFA	
431	1253 (T1)	1kg flot	1	1		
431	1253 (T2)	4.85kg w/o				
443	1254	8kg BS	1 of 1	1		x
448	1255	1kg w/o	1 of 1	1	voucher	
450	1256	1kg flot	1 of 2	2	voucher tub 1, tub 2 on hold	x
462	1315	none	1 of 1	1	on hold	