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**Technical Report: Biological remains from a site at Bolton Hall, Bolton,
East Riding of Yorkshire (site code: TSEP238)**

by

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Summary

A series of sediment samples and a few fragments of hand-collected bone and shell from deposits revealed by excavations at Bolton Hall, Bolton, East Riding of Yorkshire, were initially examined during an evaluation of their bioarchaeological potential.

Useful (though rather variably preserved) assemblages of plant and insect remains were recovered from three of the four examined samples and larger subsamples from these samples were subsequently examined. Two of these three additional subsamples also provided plant material for AMS dating of the deposits.

The fill of an Iron Age ditch terminal/pit indicated permanent water with some trees nearby, set in grazing land, but with no conclusive evidence for cultivation or for nearby buildings. The earlier fills of the feature interpreted as a meander of the Spittal Beck indicated natural aquatic deposition with no good evidence for human activity, and no indication of grazing land. The latest layer examined was rich in ashy material and partly-burnt wood and might have originated in bonfire ash thrown into the water.

The recovered hand-collected shell and bone fragments were too few and mostly too poorly preserved to be of any interpretative value.

Keywords: BOLTON HALL; EAST RIDING OF YORKSHIRE; IRON AGE; MEDIEVAL/POST-MEDIEVAL; DITCH/PIT FILLS; STREAM FILLS; PLANT REMAINS; INSECT REMAINS; INVERTEBRATES; VERTEBRATE REMAINS

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Introduction and methods

A series of sediment samples ('GBA'/'BS' sensu Dobney *et al.* 1992) were collected from deposits identified in the field as fills of a possible stream meander and ditch/pit fills. A few fragments of hand-collected bone and shell were also recovered. The deposits ranged in date (based on provisional dating of recovered pottery sherds) from Late Bronze Age to early post-medieval, but AMS dating of two samples with organic preservation gave dates in the Iron Age (for a pit/ditch fill) and medieval/early post-medieval period (for a deposit formed in what may have been a stream meander).

Sediment samples

The sediment samples were inspected in the laboratory. Four of the samples were selected for investigation for the initial evaluation and their lithologies were recorded, using a standard *pro forma*, prior to processing, following the procedures of Kenward *et al.* (1980; 1986), for recovery of plant and invertebrate macrofossils. The washovers and residues were examined for plant remains. The washovers were also examined for invertebrate remains, and the residues were examined for other biological and artefactual remains.

Additional subsamples of three of the samples were subsequently processed to provide more plant and invertebrate remains as well as material for dating. Two were from deposits interpreted as fills of the Spittal Beck, the uppermost being AMS dated to the late medieval/early post-medieval period, and the third from the primary fill of a pit/ditch terminal, AMS dated to the early to mid Iron Age.

Plant remains (and other components of the residues) were recorded using a semi-quantitative scale from 1 (one to five individuals per kg of sample, or one or a few

fragments of material which could not easily be counted) to 4 (many hundreds of individuals per kg, or a major component of the sample). Adult beetles and bugs were recorded at the 'detailed' level of Kenward (1992), and other invertebrates were recorded using a semi-quantitative scale of 1, 2, 3, 'several' (translated as 6), 'many' (15), with estimates for very large numbers. Quality of preservation was recorded using the scales of Kenward and Large (1998). In summary, preservation is recorded as chemical erosion (E) and fragmentation (F), in each case on a scale from 0.5 (superb) to 5.5 (extremely decayed or fragmented). Plant data were recorded directly into a database using *Paradox* software and insect data recorded on a *pro forma* and subsequently transferred to *Paradox* tables.

The principal sources for beetle ecology were Friday (1988), Hansen (1987), Koch (1989-92), and for bugs, Southwood and Leston (1959) and the Royal Entomological Society handbooks.

Table 1 shows a list of the examined samples and notes on their treatment.

Hand-collected shell

Three fragments of hand-collected shell were recovered from one context (2011). These were examined and some brief notes made on their preservational condition and possible identity.

Vertebrate remains

Data for the vertebrate remains were recorded electronically directly into a series of tables using a purpose-built input system and *Paradox* software. For each context (or sample) subjective records were made of the state of preservation, colour of the fragments, and the appearance of broken surfaces ('angularity'). Additionally, where more than ten fragments

were present, semi-quantitative information was recorded concerning fragment size, dog gnawing, burning, butchery and fresh breakage.

Where possible, fragments were identified to species or species group, using the reference collection at the EAU. Fragments not identifiable to species ('B' bones sensu Dobney *et al.* unpublished) were grouped into categories: large mammal (assumed to be cattle, horse or large cervid), medium-sized mammal 1 (assumed to be caprovid, pig or small cervid), small mammal (rats, mice, voles, etc), unidentified fish, unidentified bird, and completely unidentifiable.

Measurements followed von den Driesch (1976), whilst withers height for horses was estimated using calculations devised by Kiesewalter (in von den Driesch and Boessneck 1974),

Results

A complete list of plant and animal remains recorded is given in Table 2 and individual lists for plant remains and other components of residues and washovers from the sediment samples, recorded during analysis of plant material, in Table 3. Data concerning insect remains are presented in Tables 4 and 6 and Table 9 provides data concerning vertebrate remains.

Sediment samples

The results are presented in chronological and (for the sequence of fills of the presumed Spittal Beck meander) stratigraphic order, with archaeological information provided by the excavator given in square brackets.

Context 4055 [primary fill of pit/ditch terminal; dated to the Iron Age by AMS, see below]

Sample 6/T (2 kg sieved to 300 microns with paraffin flotation; assessment)

Moist to wet, dark brown (oxidising lighter), plastic and somewhat crisp in places, sandy amorphous organic sediment with some woody and herbaceous detritus.

There was a moderate-sized residue of about 250 cm³ of which about 75% by volume was twiggy debris, the rest sand. Amongst the plant remains were abundant tree leaf fragments and other detritus likely to have come trees and shrubs in the vicinity—various remains of alder (*Alnus*) and willow providing at least two candidates for the components of this vegetation. Seeds of duckweed (*Lemna*) were surprisingly abundant, indicating (together with remains of some other aquatic or waterside taxa) deposition in a body of water, but the presence of a variety of terrestrial taxa, including (again, unusually) rather large numbers of small Leguminosae (pea-family) petals, usually common in urban deposits thought to contain hay or stable manure, and silverweed (*Potentilla anserina*), either point to disposal of plant material into a lake, pond or ditch, or show that the fringe of alder and willow was in places broken to permit the development of shade-intolerant herbaceous vegetation.

A large quantity of invertebrate remains, mainly insects, was recovered by paraffin flotation. Preservation was often excellent, numerous complete or near-complete sclerites of even quite large species having survived (although many other fossils were fragmented); there were excellent specimens of a range of bugs. Many species were present, representing aquatic, waterside and terrestrial habitats. Dung beetles were abundant, suggesting grazing land, and perhaps even that this was a watering-place for stock. No woodland taxa were noted, though some are easily overlooked without detailed analysis (fragments which may have been of a wood-boring longhorn beetle were seen). Overall, an open landscape is suggested by the dung beetles, click beetles and chafers, with some herbaceous vegetation and perhaps scrub (which might be the source of the 'tree' remains).

Sample 6/T2 (5 kg; main analysis)

This additional subsample yielded a moderate-sized residue of about 700 cm³, mainly of woody (especially twiggy) and herbaceous detritus, and of which barely 50 cm³ was sand and gravel. The plant remains point to a local alder/willow carr (there were various remains of *Alnus* and *Salix*) with open water (represented by abundant duckweed—*Lemna*—seeds), drying mud (evidenced by moderate numbers of toad rush, *Juncus bufonius*, seeds) and some areas of meadow or pasture. Traces of charred heather basal twig/root may indicate material from burnt turves, and are the only evidence from the plant remains for human activity, other than some weeds of cultivated and waste places and some possible wood chips.

This large subsample produced a large flot containing abundant insect remains, even more than predicted on the basis of assessment. The assemblage was exceptionally species-rich: there were 916 individuals of a remarkable 253 taxa of adult beetles and bugs, giving a high value of Fisher *et al.*'s (1943) alpha (116, SE = 6). Preservation was variable, from excellent to poor but often rather good (E 1.5-3.5, mode 2.5 weak; F 1.0-4.0, mode 2.5 weak). Much of the fragmentation appeared to be recent, either in-ground (perhaps as a result of the passage of heavy machinery?), or during sampling or processing. Many small fragments could not be named confidently, certainly within the time limits of a project such as this (hence numerous 'sp.' identifications). Large numbers of well-preserved remains of 'froghoppers' were present (e.g. *Aphrodes* species and *Philaenus spumarius*, the latter being the 'cuckoo spit' insect). There was a remarkably close correspondence of numbers of parts (e.g. left and right elytra) in many cases, so that most of the insects almost certainly died *in situ* rather than having undergone transport by flowing water. Discrepancies were generally between parts with different likelihood of recovery, for example the easily-seen elytra of *Lathridius minutus* group, contrasted with the under-represented pronota which are small and hard to see.

Aquatics were abundant (29 taxa, 204 individuals, 22% of the assemblage). The more abundant water beetles were a small *Helophorus* species (69 individuals), *Ochthebius minimus* (42), a second small *Helophorus* (17), a *Hydroporus* species (13), *Limnebius truncatellus* (12), *Helophorus aquaticus* (8), *Hydrobius fuscipes* (6), *Anacaena* sp. (5) and another *Ochthebius* species (4). These, and all of the other specifically-identified aquatics, would have been at home together in a shallow body of weedy, still or sluggish, water. The weevil *Tanysphyrus lemnae* (2) lives on duckweeds (cf. the records of abundant *Lemna* seeds).

Plant feeders were present in large numbers too (82 taxa, 210 individuals, 23% of the assemblage). Some were typical of waterside vegetation, notably: *Aphrodes flavostriatus* (8), *Kateretes rufilabris* (4), *Hydrothassa glabra* (3), *Cicadella viridis* and *Notaris acridulus* (2).

Some species indicating short vegetation, probably poorish grazing land, were present: the chafer *Phyllopertha horticola* was remarkably abundant (24 individuals); *Agriotes obscurus* (11), a click beetle most likely to have been abundant in grassland; another chafer, *Hoplia philanthus* (3), *Dascillus cervinus* and *Agrypnus murinus* (1 of each). Habitat for these must have existed close by, supporting the supposition from dung beetles that the ditch/pit was set in grazing land and consistent with some of the evidence from plant remains. Many of the ground-living species, including ground beetles (Carabidae) and bugs (Lygaeidae), the *Tachyporus* and *Tachinus* species, and species including *Lathridius minutus* group, *Corticarina* sp. and other litter-dwellers, would have been able to live in grassland (indeed almost the whole of the terrestrial fauna, whether plant-feeding, predatory, or detritus-feeding, could have done so).

Although many are polyphagous (i.e. have a wide host range), some of the plant feeders indicate particular hosts or vegetation types (Table 7), waterside and dry-land herbaceous vegetation being indicated. There were no indications of woody plants from insect herbivores, which is perhaps surprising in view

of the strong indication from the plant remains that trees grew close by. However, unpublished research indicates that tree-associated insects may be effectively absent from aquatic deposits only a few metres from woodland. The only wood borer was *Anobium punctatum*, the woodworm, which may have exploited fence posts or dead stems of hedgerow shrubs or the willow and alder identified from the plant remains.

Scarabaeid dung beetles were very abundant, accounting for a large proportion of the 'decomposer' insects in the assemblage. This dung fauna was dominated by *Aphodius contaminatus* (91) and *A. sphacelatus* (62), with small numbers of *A. prodromus* (4), *A. depressus*, *A. ?fimetarius* and *A. rufipes* (all 2), and single *A. ater*, *A. granarius*, *A. porcus*, *A. sp.*, *Colobopterus fossor* and *Geotrupes sp.* The habitats of these species are summarised in Table 8. The most likely source of these beetles is grazing land, but what kind of livestock was present is uncertain. Other beetles associated with foul matter were rather rare, and those present, e.g. *Megasternum obscurum* (8) and *Anotylus rugosus* (7), are often found in dung or in organic-rich mud by water. Thus, dung rather than (say) artificial accumulations of rotting matter was probably their source. *A. contaminatus* is said to be particularly found in horse dung, but this is by no means exclusive, and it certainly occurs in cow dung (Landin 1961; Kenward unpublished). Landin (p. 193) points out that, in Sweden at least, autumnal species such as *A. contaminatus* are likely to feed on horse dung because cows are taken indoors early, placing a bias on records.

A few species classed as 'facultative synanthropes' (*sensu* Kenward 1997) were recorded, but there is no reason to suppose that they were not exploiting essentially natural habitats, albeit in a landscape dominated by human activity. Similarly, species rather typical of artificial accumulations of decaying matter ('coded 'st') were present (27 individuals, mostly *Lathridius minutus* group), but all may be found in natural litter, under bark, or in nests, for example. There were no obligate synanthropes. Thus, although there is some doubt as to how detectable local synanthrope

faunas are in aquatic deposits (Kenward unpublished), it seems unlikely that there were buildings nearby, or that more than traces of waste from houses, or from buildings used to house animals, found its way into the parts of the ditch/pit represented by the sample.

Was this fauna brought together in flood debris? This is possible, but there is no clear support for the hypothesis. The strongest evidence is the species-richness of the fauna, the range of ground beetles and weevils, and perhaps the abundance of dung beetles (which may have been flooded out of meadowland). However, insects associated with flowing water (e.g. helmid beetles) were absent, and dung beetles are sometimes abundant in deposits where flooding is not regarded as likely. These beetles sometimes fly in large numbers, and accidental drowning in a ditch/pit in grazing land seems very likely. It is hard to imagine Spittal Beck flooding in such a manner as to deposit the deep accumulations of debris in which abundant washed-out insects are often found by large rivers (e.g. along the River Ouse near York at the present day).

AMS dating:

Alnus twig fragments up to 10 mm diameter, about 4-5 yrs old were dated:

Cal BC 400 to 200 (Cal BP 2350 to 2150)
(Beta-61364)

Context 2030 [fill of presumed meander of Spittal Beck; not explicitly dated]

Sample 2/T (1 kg sieved to 300 microns with paraffin flotation: assessment)

Moist, very dark brown, somewhat brittle, slightly sandy peat.

The moderate-sized to large residue of about 300 cm³ consisted of plant debris, mainly woody and other root fragments; there were, however, also some small (to 5 mm) lumps of what appeared to be undisaggregated peaty sediment which might have been from fen peat. The only identifiable plant remains were traces of willow (*Salix*) bud-scales and of the moss

Drepanocladus, both consistent with an origin in fen or marsh habitats. Invertebrates were present in small numbers, but there were too few to justify further investigation.

Context 2016 [fill of presumed meander of Spittal Beck, overlying 2030; not explicitly dated but probably medieval]

Sample 1/T (2 kg sieved to 300 microns with paraffin flotation: assessment)

Moist, nearly black, brittle to crumbly, amorphous organic sediment and fine and coarse herbaceous and woody detritus with some large pieces of wood.

The moderate-sized residue of about 250 cm³ consisted of twig fragments and herbaceous detritus, perhaps largely from woody roots. The modest-sized range of identifiable plant taxa represented by well-preserved seeds indicated the deposit formed in a natural marsh/fen/mire community with abundant oogonia of stoneworts (Characeae) suggesting pools. (Some small calcareous granules may be marl formed through the accumulation of the calcium carbonate by this plant.) There were some insect remains (from the flot), which were well-decayed in many cases, but generally identifiable. Water beetles of the genus *Ochthebius* were abundant, and the remaining fauna mainly either aquatic or from waterside vegetation. A larger subsample would provide a useful (though fairly small) group of insect remains which would define water quality and surrounding environment more closely.

Sample 1/T2 (0.95 kg; main analysis)

There was a large residue of about 400 cm³ of rather flaky organic detritus—soft woody fragments (some flakes were certainly alder), including some root material, but perhaps mainly plant stems and ‘fen-type’ peat, i.e. material consistent with natural build-up of organic debris in a stream. There was no mineral sediment apart from the minutest trace of sand and some calcareous fragments perhaps from calcareous algae in the Characeae (given the oospores seen in the flot), indicating accumulation in a closed body of water into

which (by this stage in infilling) the beck no longer flowed. All the identifiable remains were consistent with a fen or mire with areas of open water, the most abundant being sedge (*Carex*) and bulrush or club-rush (*Scirpus*, probably *S. lacustris*).

The small flot, which contained abundant pale yellow rootlets, was combined with that from the /T subsample for invertebrate recording. This yielded 197 recognisable adult individuals of 68 beetle and bug taxa, and a few other remains, among which mites were the most numerous. Preservation was generally poor, most fossils being rather orange and clearly well-decayed, and this limited identification in many cases (E 3.0-5.0, mode 4.0 weak; F 2.0-4.0, mode 2.5 weak.).

Very much the most abundant beetle (102 individuals) was *Ochthebius minimus*, an aquatic with a broad habitat range, but found typically in stagnant water such as ponds, typically in mud or among vegetation in shallow water. Other aquatics were all species which would be able to co-exist with *O. minimus*, among them *Limnebius* sp. (4 individuals: specific identification limited by preservation), *Hydraena* sp. (3), several hydroporines, *Hydrobius fuscipes* (2), and single individuals of a range of taxa including *Coelambus impressopunctatus* (ponds, drain vegetation), *Hyphydrus ovatus* (still or slow-running water with vegetation), and *Hygrotus inaequalis* (ponds and other still or sluggish water). Aquatic or waterside vegetation is indicated by a few species, notably *Plateumaris* sp. (4: again too decayed for confident identification), *Limnobaris piliatriata* (3), and *Cyphon padi* and *Prasocuris phellandrii* (both single individuals). Many of the recorded species will, or may have, exploited waterside mud and litter. The insects thus evoke a clear image of shallow weedy water, with at most a little flow. They do not, however, provide much information about the surroundings. Dung beetles of all kinds were notable absentees (compare with the assemblage from Context 4055!), suggesting that livestock did not graze in the immediate vicinity, and there were no species strongly or obligately associated with human occupation. Indeed, species associated

with accumulations of decaying matter of any kind were remarkably rare (only seven individuals).

Context 2012 [organic layer within a hollow interpreted as a meander of Spittal Beck; AMS dating to medieval/early post-medieval period. see below]

Sample 3/T (2 kg sieved to 300 microns with paraffin flotation: assessment)

A moist, jumbled mixture of black, white, grey and light orange, ash with some wood fragments.

The small residue of about 200 cm³ was approximately 25% by volume sand, the rest granular charcoal (including some quite large lumps, to 45 mm), small fragments of burnt soil or daub (to 15 mm) ranging in colour from red to grey and some 'glassy slag' (to 15 mm); this was perhaps all from fire ash with an industrial connection—the presence of part-burnt wood, bark and twig fragments is perhaps more consistent with a bonfire, however. The moderate quantities of wood fragments (to 10 mm) were mostly very decayed and also quite small (they perhaps originated in sawdust?). Identifiable plant remains in the residue and flot were a mixture of charred and uncharred taxa, mainly weeds of cultivated land and waste places but with some woody taxa perhaps representing scrub. A single amphibian bone was identified from this sample.

Invertebrate remains were present in the flot in small numbers, and not well preserved, but an unusual group of taxa was recorded. There were hints of rather strong human modification of the surroundings.

Sample 3/T2 (3 kg; main analysis)

This additional subsample gave a small to modest-sized residue of about 250 cm³ of which about 100 cm³ was sand, ?daub and grit, the rest charcoal (to 40 mm) with some rather large (to 65 mm) chunks of part-burnt wood (including willow, *Salix*). The mineral fraction contained some dark grey ?baked soil as well as some reddened burnt material and slag. Amongst the charcoal and part-burnt wood

were some fragments of poorly preserved (soft and rather filmy) wood as well as a few poorly preserved charred cereal grains (which could not be identified further). The more abundant plant remains were charred and uncharred oak (*Quercus*) buds, grass (Gramineae) caryopses and stinging nettle (*Urtica dioica*) achenes, the rarer remains being a mixture of charred and uncharred fruits and seeds with no particular interpretative character. The nature of the material, with charred, part-charred and uncharred specimens, is consistent with what was observed in the subsample examined during the evaluation (i.e. it represents debris from, for example, a bonfire, with few remains from local or *in situ* vegetation in the Beck contributing to the assemblage).

Invertebrate remains were present in small numbers in the flot (which consisted primarily of rather decayed plant debris), and were variably, but generally poorly, preserved, with appreciable amounts of rotted, unidentifiable, fragments of cuticle (E 3.0-4.5, mode 4 weak; F 2.0-5.0, mode 3.5 weak). Poor preservation is hardly surprising if ash was present—indeed, the survival of any delicate invertebrate remains is somewhat unexpected. Single adult individuals of 22 beetle and bug taxa were recognised, together with a few other insects. Little can be said of this assemblage other than that it probably formed in water into which ash and incompletely charred woody debris were thrown. The subjective impression from the assessment could not be objectively supported.

AMS dating:

One fragment of partly-charred *Salix* wood, apparently from a branch of about 30-35mm diameter, from Sample 3/T2 was selected for dating, prior to paraffin flotation. Other material in the residue was mostly fine wood debris (rather like sawdust) and not suitable for dating as a 'bulk' sample.

Date: Cal AD 1440 to 1640 (Cal BP 510 to 310) (Beta-161363)

Hand-collected shell

Only three small fragments of hand-collected shell were recovered from (Context 2011). These were very poorly preserved but appeared to be remains of one of the freshwater mussels.

Hand-collected vertebrate remains

Only five fragments were recovered from this site, representing five deposits (Contexts 2016, 2027, 3009, 4008 and 4055). The bones from Trench 2 were well preserved, whilst those from the other trenches were very poor, with eroded surfaces. Root etch damage was recorded on the bones from Contexts 2027 and 3009.

The remains of cow and horse were identified and included an almost complete horse metacarpal from Context 2027. This bone gave an estimated withers height for the animal of 1394.8 mm or 13.3 hh (where 101.6 mm or 4 inches = 1 hand).

Table 9 gives a brief summary of the vertebrate remains by context.

Discussion

Substantial assemblages of plant and invertebrate remains preserved by anoxic waterlogging were recorded from some of the deposits interpreted as the fills of pit or ditch terminal and from a former meander of the Spittal Beck, and the analyses undertaken support the interpretations made in the field, as well as offering additional information about the local environment as the deposits formed. It has rarely been possible to study rural deposits of this kind, especially in the north of England, so that the present investigation, and work on similar material from other sites along the BP TSE pipeline, represent an important opportunity to research a poorly-known aspect of our past.

The Iron Age ditch (Cut 4056) yielded rich organic remains indicating essentially permanent water with at least some alder and

willow trees nearby. The surroundings appear to have been grazing land on the basis of abundant dung beetles and indications of grassland. There was no conclusive evidence for cultivation or for nearby buildings. The latter appears to be at variance with the archaeological evidence for structures from postholes in the vicinity of the ditch, but dating for these and other features as late Iron Age or early Roman contrasts with the rather earlier date obtained for plant material from the ditch fill and it may be that the lower parts of the ditch, at least, had filled before the occupation responsible for the dateable artefacts and features occurred.

The earlier fills of the feature interpreted as a meander of the Spittal Beck (and this appears to be a reasonable interpretation) indicate natural aquatic deposition with no good evidence for human activity, and no indication of grazing land from dung beetles. The latest layer examined, however, was rich in ashy material and partly-burnt wood which, it is suggested might have originated in a bonfire. This deposit can only have formed through ash being discarded into the water of the meander.

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Table 1: List of examined sediment samples from excavations at Bolton Hall, Bolton (TSEP site 238), with notes on their treatment.

Context	Sample	Notes
2012	3	2 kg sieved to 300 microns with paraffin flotation; plus additional 3 kg sieved to 300 microns with paraffin flotation
2016	1	1 kg sieved to 300 microns with paraffin flotation; plus additional 0.95 kg sieved to 300 microns with paraffin flotation
2030	2	1 kg sieved to 300 microns with paraffin flotation
4055	6	2 kg sieved to 300 microns with paraffin flotation; plus additional 5 kg sieved to 300 microns with paraffin flotation

Table 2: Complete list of taxa recorded from deposits at TSEP site 238, at Bolton Hall, Bolton. Taxonomic order and nomenclature follow Tutin et al. (1964-80) for vascular plants, Smith (1978) for mosses, and Kloet and Hincks (1964-77) for insects.

Tentative records for insects are not included if secure ones were also made. Plant material not specifically noted as being preserved by charring or mineral replacement can be taken to be uncharred and unmineralised (i.e. 'waterlogged', but sometimes denoted simply as 'uncharred'). For invertebrates (all preserved by anoxic waterlogging), * = not used in calculating assemblage statistics (Table 4); ecode—ecological code used in generating main statistics; Sp(p).—species not previously listed; Sp(p). indet.—may be a species already listed.

Taxon	Vernacular name	Remains recorded
Filicales	ferns	stem epidermis fragment(s)
<i>Salix</i> sp(p).	willow	bud(s), leaf fragment(s), part-burnt wood fragment(s), twig epidermis fragment(s), twig fragment(s)
<i>Salix/Populus</i> sp(p).	willow/poplar/aspens	charcoal fragment(s)
<i>Populus</i> sp(p).	poplar/aspens	bud(s) and/or bud-scale(s)
<i>Betula</i> sp(p).	birch	fruit(s)
<i>Alnus glutinosa</i> (L.) Gaertner	alder	bud(s) and/or bud-scale(s), female cone(s)/cone-axis(es), fruit(s), twig fragment(s), wood fragment(s)
<i>Corylus avellana</i> L.	hazel	charred nut(s) and/or nutshell fragment(s)
<i>Quercus</i> sp(p).	oak	bud(s) and/or bud-scale(s), charcoal fragment(s), charred bud and/or bud-scales
<i>Urtica dioica</i> L.	stinging nettle	achene(s)
<i>U. urens</i> L.	annual nettle	achene(s)
<i>Polygonum aviculare</i> agg.	knotgrass	fruit(s)
<i>P. hydropiper</i> L.	water-pepper	fruit(s)
<i>P. persicaria</i> L.	persicaria/red shank	charred and uncharred fruit(s)
<i>P. lapathifolium</i> L.	pale persicaria	fruit(s)
<i>Bilderdykia convolvulus</i> (L.) Dumort.	black bindweed	fruit(s)
<i>Rumex</i> sp(p).	docks	charred and uncharred fruit(s)
<i>Chenopodium</i> Section <i>Pseudoblitum</i>	red goosefoot, etc.	seed(s)
<i>C. album</i> L.	fat hen	charred and uncharred seed(s)
<i>Atriplex</i> sp(p).	oraches	seed(s)
<i>Montia fontana</i> ssp.		
<i>chondrosperma</i> (Fenzl) Walters	blinks	seed(s)
<i>Stellaria media</i> (L.) Vill.	chickweed	seed(s)
<i>Stellaria</i> sp(p).	stitchworts/chickweeds	seed(s)
<i>Cerastium</i> sp(p).	mouse-ear chickweeds	seed(s)
<i>Caltha palustris</i> L.	marsh marigold	seed(s)
<i>Ranunculus</i> Section <i>Ranunculus</i>	meadow/creeping/ bulbous buttercup	charred and uncharred achene(s)
<i>R. flammula</i> L.	lesser spearwort	achene(s)
<i>R. lingua</i> L.	greater spearwort	achene(s)
<i>R.</i> Subgenus <i>Batrachium</i>	water crowfoots	achene(s)
<i>Rorippa palustris</i> (L.) Besser	marsh yellow-cress	seed(s)
<i>Thlaspi arvense</i> L.	field penny-cress	seed(s)

<i>Raphanus raphanistrum</i> L.	wild radish	pod segments and/or fragment(s), seed(s)
<i>Rubus idaeus</i> L.	raspberry	seed(s)
<i>R. fruticosus</i> agg.	blackberry/bramble	charred and uncharred seed(s)
<i>Potentilla palustris</i> (L.) Scop.	marsh cinquefoil	achene(s)
<i>P. anserina</i> L.	silverweed	achene(s)
<i>Crataegus</i> sp./ <i>Prunus spinosa</i> L.	hawthorn/sloe	charred thorn(s)
Leguminosae	pea family	charred seed(s), uncharred flower(s) and/or petal(s)
<i>Hippuris vulgaris</i> L.	mare's-tail	seed(s)
<i>Aethusa cynapium</i> L.	fool's parsley	mericarp(s)
<i>Conium maculatum</i> L.	hemlock	mericarp(s)
<i>Apium nodiflorum</i> (L.) Lag.	fool's watercress	mericarp(s)
cf. <i>Calluna vulgaris</i> (L.) Hull	?heather, ling	charred basal twig and/or root fragment(s)
<i>Menyanthes trifoliata</i> L.	bogbean	seed(s)
<i>Galium</i> sp(p).	bedstraws, etc.	fruit(s)
<i>Galeopsis</i> Subgenus <i>Galeopsis</i>	hemp-nettles	nutlet(s)
<i>Lycopus europaeus</i> L.	gipsywort	nutlet(s)
<i>Mentha</i> sp(p).	mints	nutlet(s)
<i>Veronica beccabunga</i> -type	brooklime/water/ marsh speedwells	seed(s)
<i>Rhinanthus</i> sp(p).	yellow rattles	seed(s)
<i>Sambucus nigra</i> L.	elder	seed fragment(s)
Compositae	daisy family	achene(s)
<i>Carduus/Cirsium</i> sp(p).	thistles	achene(s)
<i>Sonchus asper</i> (L.) Hill	prickly sow-thistle	achene(s)
<i>Alisma</i> sp(p).	water-plantains	carpel(s) and/or seed(s)
<i>Potamogeton</i> sp(p).	pondweeds	pyrene(s)
<i>Juncus bufonius</i> L.	toad rush	seed(s)
Gramineae	grasses	charred culm fragment(s), waterlogged caryopsis/es
Cerealia indet.	cereals	charred caryopsis/es
cf. <i>Glyceria</i> sp(p).	?sweet-grasses	caryopsis/es
<i>Bromus</i> sp(p).	bromes, etc.	waterlogged caryopsis/es
<i>Lemna</i> sp(p).	duckweeds	seed(s)
<i>Sparganium</i> sp(p).	bur-reeds	fruit(s)
<i>Typha</i> sp(p).	bulrushes	seed(s)
<i>Scirpus maritimus/lacustris</i>	sea club-rush/bulrush	nutlet(s)
<i>Eleocharis palustris sensu lato</i>	common spike-rush	nutlet(s)
<i>Carex</i> sp(p).	sedges	nutlet(s)

Mosses (all remains were leaf/leaves and/or shoot fragment(s))

<i>Sphagnum</i> sp(p).	
<i>Bryum</i> cf. <i>capillare</i> Hedw.	
<i>Leskea polycarpa</i> Hedw.	
<i>Cratoneuron filicinum</i> (Hedw.) Spruce	
<i>Amblystegium riparium</i> (Hedw.) Br. Eur.	
<i>Drepanocladus</i> sp(p).	

Algae

Characeae (freshwater green alga): oogonium/ia

	ecode	DIPTERA	
CRUSTACEA		*Chironomidae sp. (larva)	w
CLADOCERA		* <i>Bibio</i> sp.	oa
* <i>Daphnia</i> sp. (ephippium)	oa-w	*Bibionidae sp. indet.	u
*Cladocera sp. (ephippium)	oa-w	*Diptera sp. (adult)	u
*Cladocera sp. L (ephippium)	oa-w	*Diptera sp. (puparium)	u
		*Diptera sp. (pupa)	u
OSTRACODA			
*Ostracoda sp.	oa-w	COLEOPTERA	
		<i>Carabus arvensis</i> Herbst	oa
NEUROPTERA		<i>Carabus nemoralis</i> Muller	oa
* <i>Sialis</i> sp. (larva)	oa-w	<i>Carabus violaceus</i> Linnaeus	oa
		<i>Leistus rufescens</i> (Fabricius)	oa-d
TRICHOPTERA		<i>Notiophilus ?biguttatus</i> (Fabricius)	oa
*Trichoptera sp.	oa-w	<i>Blethisa multipunctata</i> (Linnaeus)	oa-d
		<i>Elaphrus cupreus</i> Duftschmid	oa-d
DERMAPTERA		<i>Loricera pilicornis</i> (Fabricius)	oa
* <i>Forficula</i> sp.	u	<i>Dyschirius globosus</i> (Herbst)	oa
		<i>Clivina fossor</i> (Linnaeus)	oa
HEMIPTERA		<i>Trechus obtusus</i> Erichson	oa
? <i>Legnotus</i> sp.	oa-p	<i>Bembidion (Philochthus)</i> sp.	oa
<i>Sehirus</i> sp.	oa-p	<i>Bembidion</i> spp. and spp. indet.	oa
* <i>Sehirinae</i> sp. indet. (larva)	oa-p	<i>Pterostichus cupreus</i> (Linnaeus)	oa
*Pentatomidae sp. (nymph)	oa-p	<i>Pterostichus melanarius</i> (Illiger)	ob
<i>Stygnocoris pedestris</i> (Fallen)	oa-p	<i>Pterostichus nigrita</i> (Paykull)	oa-d
? <i>Stygnocoris</i> sp.	oa	<i>Pterostichus ?strenuus</i> (Panzer)	oa
<i>Drymus sylvaticus</i> (Fabricius)	oa-p	<i>Calathus fuscipes</i> (Goeze)	oa
<i>Scolopostethus</i> sp.	oa-p	<i>Calathus melanocephalus</i> (Linnaeus)	oa
Lygaeidae sp. indet.	oa-p	<i>Agonum marginatum</i> (Linnaeus)	oa-d
<i>Temnostethus</i> sp.	oa	<i>Agonum</i> sp.	oa
<i>Anthocoris</i> sp.	oa-p	<i>Amara</i> spp.	oa
<i>Pithanus maerkeli</i> (H-S.)	oa	<i>Harpalus rufipes</i> (Degeer)	oa
<i>Capsus ?ater</i> (Linnaeus)	oa-p	<i>Harpalus</i> sp.	oa
<i>Salda littoralis</i> (Linnaeus)	oa-d	<i>Lebia chlorocephala</i> (Hoffmannsegg)	oa
<i>Saldula</i> sp.	oa-d	Carabidae spp. and spp. indet.	ob
Saldidae sp. indet.	oa-d	<i>Haliphys</i> sp.	oa-w
Heteroptera sp.	u	<i>Coelambus impressopunctatus</i> (Schaller)	oa-w
<i>Philaenus spumarius</i> (Linnaeus)	oa-p	<i>Hyphydrus ovatus</i> (Linnaeus)	oa-w
<i>Neophilaenus ?lineatus</i> (Linnaeus)	oa-p	<i>Hygrotus inaequalis</i> (Fabricius)	oa-w
Cercopidae sp. indet.	oa-p	<i>Hydroporus</i> spp.	oa-w
<i>Cicadella viridis</i> (Linnaeus)	oa-p	<i>Porhydrus lineatus</i> (Fabricius)	oa-w
<i>Aphrodes bicinctus</i> (Schrank)	oa-p	Hydroporinae spp. and spp. indet.	oa-w
<i>Aphrodes flavostriatus</i> (Donovan)	oa-p-d	<i>Agabus bipustulatus</i> (Linnaeus)	oa-w
<i>Aphrodes</i> sp.	oa-p	<i>Agabus ?paludosus</i> (Fabricius)	oa-w
? <i>Stroggylocephalus agrestis</i> (Fallen)	oa-p	<i>Agabus</i> sp.	oa-w
Cicadellidae spp.	oa-p	<i>Ilybius</i> sp.	oa-w
? <i>Delphacodes</i> (s. lat.) sp.	oa-p	? <i>Rhantus</i> sp.	oa-w
<i>Delphacidae</i> spp.	oa-p	<i>Colymbetes fuscus</i> (Linnaeus)	oa-w
Fulgoromorpha spp. indet.	oa-p	Colymbetinae sp. indet.	oa-w
Auchenorrhyncha spp. and spp. indet.	oa-p	<i>Gyrinus</i> sp.	oa-w
Psyllidae spp.	oa-p	<i>Hydrochus</i> sp.	oa-w
*Aphidoidea sp.	oa-p	<i>Helophorus aquaticus</i> (Linnaeus)	oa-w

<i>Helophorus grandis</i> Illiger	oa-w	<i>Gyrohypnus angustatus</i> Stephens	rt-st
<i>Helophorus aquaticus</i> or <i>grandis</i>	oa-w	<i>Gyrohypnus fracticornis</i> (Muller)	rt-st
<i>Helophorus nanus</i> Sturm	oa-w	<i>Xantholinus glabratus</i> (Gravenhorst)	rt
<i>Helophorus porculus</i> Bedel	oa	<i>Xantholinus linearis</i> (Olivier)	rt-sf
<i>Helophorus</i> spp.	oa-w	<i>Xantholinus longiventris</i> Heer	rt-sf
<i>Sphaeridium ?bipustulatum</i> Fabricius	rf	<i>Philonthus</i> spp.	u
<i>Cercyon ?nalis</i> (Paykull)	rt-sf	<i>Gabrius</i> sp.	rt
<i>Cercyon convexiusculus</i> Stephens	oa-d	<i>Staphylinus</i> spp.	u
<i>Cercyon tristis</i> (Illiger)	oa-d	<i>Quedius boops</i> group	u
<i>Cercyon</i> spp.	u	<i>Quedius</i> sp.	u
<i>Megasternum obscurum</i> (Marsham)	rt	Staphylininae sp. indet.	u
<i>Cryptopleurum minutum</i> (Fabricius)	rf-st	<i>Tachyporus ?hypnorum</i> (Fabricius)	u
<i>Hydrobius fuscipes</i> (Linnaeus)	oa-w	<i>Tachyporus ?nitidulus</i> (Fabricius)	u
<i>Anacaena</i> sp.	oa-w	<i>Tachyporus obtusus</i> (Linnaeus)	u
<i>Laccobius</i> sp.	oa-w	<i>Tachyporus</i> spp. and spp. indet.	u
<i>Chaetarthria seminulum</i> (Herbst)	oa-w	<i>Tachinus corticinus</i> Gravenhorst	u
Hydrophilinae spp.	oa-w	<i>Tachinus laticollis</i> or <i>marginellus</i>	u
<i>Acritus nigricornis</i> (Hoffmann)	rt-st	<i>Tachinus signatus</i> Gravenhorst	u
<i>Onthophilus striatus</i> (Forster)	rt-sf	<i>Aleochara</i> sp.	u
Histerinae spp.	rt	Aleocharinae spp.	u
<i>Ochthebius minimus</i> (Fabricius)	oa-w	<i>Amauronyx maerkeli</i> (Aube)	u
<i>Ochthebius</i> spp.	oa-w	<i>Geotrupes</i> sp.	oa-rf
<i>Hydraena testacea</i> Curtis	oa-w	<i>Colobopterus fossor</i> (Linnaeus)	oa-rf
<i>Hydraena</i> sp.	oa-w	<i>Aphodius ater</i> (Degeer)	oa-rf
<i>Limnebius truncatellus</i> (Thunberg)	oa-w	<i>Aphodius contaminatus</i> (Herbst)	oa-rf
<i>Limnebius</i> sp. indet.	oa-w	<i>Aphodius depressus</i> (Kugelann)	oa-rf
<i>Ptenidium</i> sp.	rt	<i>Aphodius ?fimetarius</i> (Linnaeus)	oa-rf
Leiodinae spp.	u	<i>Aphodius granarius</i> (Linnaeus)	ob-rf
<i>Nicrophorus ?vespillo</i> (Linnaeus)	rf	<i>Aphodius porcus</i> (Fabricius)	ob-rf
<i>Aclypea opaca</i> (Linnaeus)	ob-rt	<i>Aphodius prodromus</i> (Brahm)	ob-rf
<i>Silpha</i> sp.	u	<i>Aphodius rufipes</i> (Linnaeus)	oa-rf
<i>Micropeplus fulvus</i> Erichson	rt	<i>Aphodius sphaelatus</i> (Panzer)	oa-rf
<i>Micropeplus porcatus</i> (Paykull)	rt	<i>Aphodius</i> spp. and spp. indet.	ob-rf
<i>Anthobium</i> sp.	oa	<i>Hoplia philanthus</i> Illiger	oa
<i>Lesteva longoelytrata</i> (Goeze)	oa-d	<i>Phyllopertha horticola</i> (Linnaeus)	oa-p
? <i>Lesteva</i> sp. indet.	oa-d	<i>Dascillus cervinus</i> (Linnaeus)	oa-p
<i>Eusphalerum minutum</i> (Fabricius)	oa-d	<i>Clambus</i> sp.	rt-sf
<i>Phyllodrepa</i> sp.	rt	<i>Cyphon padi</i> (Linnaeus)	oa-d
<i>Omalium</i> sp.	rt	<i>Cyphon</i> sp.	oa-d
<i>Bledius</i> sp.	oa-d	<i>Simplocaria ?semistriata</i> (Fabricius)	oa-p
<i>Carpelimus</i> spp.	u	<i>Cytilus sericeus</i> (Forster)	oa-p
<i>Platystethus arenarius</i> (Fourcroy)	rf	<i>Dryops</i> sp.	oa-d
<i>Platystethus nodifrons</i> (Mannerheim)	oa-d	<i>Agrypnus murinus</i> (Linnaeus)	oa-p
<i>Anotylus complanatus</i> (Erichson)	rt-sf	<i>Athous ?haemorrhoidalis</i> (Fabricius)	oa-p
<i>Anotylus nitidulus</i> (Gravenhorst)	rt	<i>Agriotes obscurus</i> (Linnaeus)	oa-p
<i>Anotylus rugosus</i> (Fabricius)	rt	Elateridae sp. and sp. indet.	ob
<i>Anotylus sculpturatus</i> group	rt	*Elateridae sp. indet. (larva)	ob
<i>Stenus</i> spp.	u	<i>Cantharis ?pallida</i> Goeze	ob
<i>Lathrobium</i> spp.	u	<i>Cantharis rufa</i> Linnaeus	ob
<i>Rugilus ?orbiculatus</i> (Paykull)	rt-sf	<i>Cantharis</i> sp. and sp. indet.	ob
<i>Othius</i> sp.	rt	? <i>Grynobius planus</i> (Fabricius)	l
<i>Leptacinus</i> sp.	rt-st	<i>Anobium punctatum</i> (Degeer)	l-sf

<i>Kateretes rufilabris</i> (Latreille)	oa-p-d	*Coleoptera sp. indet. (larva)	u
<i>Brachypterus urticae</i> (Fabricius)	oa-p		
<i>Meligethes ?aeneus</i> (Fabricius)	oa-p	HYMENOPTERA	
<i>Meligethes</i> spp.	oa-p	*Chalcidoidea sp.	u
<i>Cryptophagus</i> sp.	rd-sf	*Proctotrupoidea sp.	u
<i>Atomaria</i> spp.	rd	*Hymenoptera Parasitica sp.	u
Phalacridae sp.	oa-p	* <i>Myrmica</i> sp.	u
<i>Orthoperus</i> sp.	rt	*Formicidae spp.	u
<i>Thea vigintiduopunctata</i> (Linnaeus)	oa-p	*Hymenoptera sp.	u
Coccinellidae spp.	oa-p		
<i>Lathridius minutus</i> group	rd-st	*Insecta sp. (larva)	u
<i>Enicmus</i> sp.	rt-sf	*Insecta sp. (immature)	u
<i>Corticarina</i> sp.	rt		
<i>Corticaria gibbosa</i> (Herbst)	rt	ARACHNIDA	
<i>Plateumaris</i> sp.	oa-d-p	*Opiliones sp.	u
<i>Chrysolina fastuosa</i> (Scopoli)	oa-p	*Araneae sp.	u
<i>Gastrophysa polygoni</i> (Linnaeus)	oa-p	*Acarina sp.	u
<i>Hydrothassa glabra</i> (Herbst)	oa-d-p		
<i>Prasocuris phellandrii</i> (Linnaeus)	oa-p-d	MOLLUSCA	
Chrysomelinae sp.	oa-p	(freshwater mussel)	
<i>Galerucella</i> sp.	oa-p		
<i>Phyllotreta nemorum</i> group	oa-p	VERTEBRATA	
<i>Phyllotreta</i> sp.	oa-p	<i>Equus</i> f. domestic	
<i>Longitarsus</i> spp.	oa-p	<i>Bos</i> f. domestic	
<i>Altica</i> sp.	oa-p	Indet. bone fragment	
<i>Chaetocnema concinna</i> (Marsham)	oa-p		
Halticinae sp.	oa-p		
<i>Apion (Erythrapion)</i> sp.	oa-p		
<i>Apion</i> spp.	oa-p		
<i>Otiorhynchus ovatus</i> (Linnaeus)	oa-p		
<i>Phyllobius pyri</i> (Linnaeus)	oa-p		
<i>Phyllobius viridiaeris</i> (Laicharting)	oa-p		
<i>Tropiphorus terricola</i> (Newman)	oa		
<i>Tropiphorus</i> sp. indet.	oa		
<i>Sitona hispidulus</i> (Fabricius)	oa-p		
<i>Sitona lepidus</i> Gyllenhal	oa-p		
<i>Sitona</i> sp.	oa-p		
<i>Hypera</i> sp.	oa-p		
<i>Alophus triguttatus</i> (Fabricius)	oa-p		
<i>Tanysphyrus lemnae</i> (Paykull)	oa-w-p		
<i>Bagous</i> sp. s. lat.	oa-p-w		
<i>Notaris acridulus</i> (Linnaeus)	oa-d-p		
<i>Ceutorhynchus</i> spp. A	oa-p		
<i>Rhinoncus</i> sp.	oa-p		
<i>Phytobius</i> sp.	oa-d		
Ceuthorhynchinae sp.	oa-p		
<i>Limnobaris pilistriata</i> (Stephens)	oa-p-d		
<i>Anthonomus</i> sp.	oa-p		
<i>Mecinus pyraster</i> (Herbst)	oa-p		
<i>Gymnetron ?labile</i> (Herbst)	oa-p		
Curculionidae spp. and spp. indet.	oa		
<i>Leperisinus ?varius</i> (Fabricius)	l		

Table 3: Complete lists of plant remains and other components of samples recorded during examination of plant material from Bolton Hall (site TSEP238). Samples are presented in context and sample order and within each list components are listed by decreasing abundance, using a semi-quantitative four-point scale (see text for explanation).

Abbreviations: ab—abscission; b, b/bs—buds, buds/bud-scales; caps—capsules; ch—charred; dec—decayed; fca—female cone axes; fgts—fragments; fls—flowers; max—maximum dimension; not pap/imb—not *S. papillosum* or *S. imbricatum*; n/u—nutlets with utricles, or free utricles present; pet—petals; rt-tw—basal twig/root; segs—segments; sef—stem epidermis fragments; sf—seed fragments; spec—specimen; tef—twig epidermis fragments; tw—twig; v—very; w/l—waterlogged (i.e. uncharred); for twig fragments, measurements are length x diameter in mm.

Context 2012, Sample 3/T		Gramineae	2
charcoal	3 max 45 mm	Quercus sp(p). (b/bs)	2
?baked clay/daub	2 max 15 mm	Quercus sp(p). (ch b/bs)	2
Urtica dioica	2	part-burnt wood	2 max 65 mm
glassy slag	2 max 15 mm	sand	2
sand	2	wood fgts	2 v dec, max
wood fgts	2 v dec, max 10 mm		
?daub	1 max 20 mm		
Bilderdykia convolvulus	1		
Carduus/Cirsium sp(p).	1		
Carex sp(p).	1	'ash beads'	1
Chenopodium album	1	Apium nodiflorum	1 single spec
Crataegus sp./Prunus spinosa (ch thorns)	1	Cerealia indet.	1
Gramineae	1	Chenopodium album	1
Polygonum persicaria (ch)	1	Chenopodium album (ch)	1
Quercus sp(p). (b/bs)	1	Conium maculatum	1
Quercus sp(p). (ch b/bs)	1	Gramineae (ch culm fgts)	1
Ranunculus Sect. Ranunculus (ch)	1	Leguminosae	1
Rubus fruticosus agg. (ch)	1	Quercus sp(p). (charcoal)	1 max 10 mm
Rumex sp(p).	1	Ranunculus Section Ranunculus	1 v dec
Sambucus nigra (sf)	1	Rubus fruticosus agg.	1 v dec
Stellaria media	1	Rubus idaeus	1
bark fgts	1 max 20 mm	Rumex sp(p).	1
beetles	1	Rumex sp(p). (ch)	1
bone fgts	1 max 5 mm	Salix sp(p). (part-burnt wood)	1 max 65 mm
brick/tile	1 max 5 mm	Salix/Populus sp(p). (charcoal)	1 max 10 mm
burnt flint	1 max 10 mm	Sambucus sp(p). (sf)	1
chalk	1 max 5 mm	Stellaria media	1
earthworm egg caps	1	bark fgts	1 max 5 mm
gravel	1 max 10 mm	bark fgts (ch)	1 max 10 mm
part-burnt bark	1 max 20 mm	bast fgts (ch)	1 max 2 mm
part-burnt twig fgts	1 max 25 mm	beetles	1 max 1 mm
part-burnt wood	1 max 10 mm	brick/tile	1 max 10 mm
twig fgts (ch)	1 max 15 mm	earthworm egg caps	1
woody root fgts	1	fish bone	1 max 5 mm
		glassy slag	1 max 2 mm
		gravel	1 max 20 mm
		grit	1
		herbaceous detritus (ch)	1
Context 2012, Sample 3/T2		leaf ab pads	1
Urtica dioica	3	metallic slag	1 max 10 mm
charcoal	3 max 40 mm	mortar	1 max 20 mm
?burnt soil	2 max 10 mm	small mammal tooth	1
?daub	2 max 10 mm		

twig fgts (ch)	1 max 15 mm	?peat fgts	1 max 5 mm
Context 2016, Sample 1/T		Drepanocladus sp(p).	1
Characeae	4	Salix sp(p). (b)	1
woody root fgts	3 max 40 x 10 mm	herbaceous detritus	1
Carex sp(p).	2 n/u	Context 4055, Sample 6/T	
Menyanthes trifoliata	2	Lemna sp(p).	3
Potamogeton sp(p).	2	dicot lf fgts	3
Potentilla palustris	2	twig fgts	3 max 70 x 10
Ranunculus lingua	2		
Scirpus maritimus/lacustris	2		
beetles	2	Juncus bufonius	2
root/rootlet fgts	2	Leguminosae (fls/pet)	2
?lake marl	1 max 1 mm	Potentilla anserina	2
Alisma sp(p).	1	Sonchus asper	2
Betula sp(p).	1	Stellaria media	2
Carduus/Cirsium sp(p).	1	Urtica dioica	2
Hippuris vulgaris	1	beetles	2
Lycopus europaeus	1	?lake marl	1 max 2 mm
Mentha sp(p).	1	?wood chips	1 max 10 mm
Populus sp(p). (b/bs)	1	Alisma sp(p).	1
Ranunculus Section Ranunculus	1	Alnus glutinosa	1
Ranunculus Subgenus Batrachium	1	Alnus glutinosa (b/bs)	1
sand	1	Amblystegium riparium	1
twig fgts	1 max 30 x 10 mm	Atriplex sp(p).	1
		Bromus sp(p). (w/l)	1 single fgt
Context 2016, Sample 1/T2		Caltha palustris	1
wood fgts	4 v dec, max 10 mm	Carduus/Cirsium sp(p).	1
Carex sp(p).	3	Carex sp(p).	1
Characeae	3	Cerastium sp(p).	1
Scirpus maritimus/lacustris	3	Chenopodium Sect. Pseudoblitum	1
Alnus (wood)	2 v dec, max 10 mm	Chenopodium album	1
peat fgts	2 max 10 mm	Daphnia (ephippia)	1
Betula sp(p).	1 v dec	Filicales (sef)	1
Hippuris vulgaris	1	Galeopsis Subgenus Galeopsis	1
Potamogeton sp(p).	1	Galium sp(p).	1
Potentilla palustris	1	cf. Glyceria sp(p).	1
Quercus sp(p). (b/bs)	1	Gramineae	1
Ranunculus Subgenus Batrachium	1	Hippuris vulgaris	1
Ranunculus flammula	1	Montia fontana	
Salix sp(p). (b)	1	ssp. chondrosperma	1
Typha sp(p).	1	Polygonum aviculare agg.	1
beetles	1	Polygonum hydropiper	1
herbaceous detritus	1	Polygonum lapathifolium	1
root/rootlet fgts	1	Polygonum persicaria	1
woody root fgts	1	Ranunculus Section Ranunculus	1
		Ranunculus Subgenus Batrachium	1
Context 2030, Sample 2/T		Raphanus raphanistrum	
root/rootlet fgts	3	(pod segs/fgts)	1
woody root fgts	2	Rorippa palustris	1
?lake marl	1 max 2 mm	Rubus idaeus	1
		Rumex sp(p).	1
		Salix sp(p). (tw fgts)	1 max 70 x 10
		Sparganium sp(p).	1

Sphagnum sp(p). (lvs)	1 not pap/imb	Compositae	1 single spec
Thlaspi arvense	1 fg(s) only	Conium maculatum	1
Urtica urens	1	Corylus avellana (ch)	1
Veronica beccabunga-type	1	Cratoneuron filicinum	1
charcoal	1 max 15 mm	Eleocharis palustris sl	1
earthworm egg caps	1	Galeopsis Subgenus Galeopsis	1
fly puparia	1	Galium sp(p).	1
herbaceous detritus	1	Leguminosae (fls/pet)	1
leaf ab pads	1	Leskea polycarpa	1
mites	1	Polygonum hydropiper	1
root/rootlet fgts	1	Polygonum lapathifolium	1
sand	1	Polygonum persicaria	1
		Potentilla anserina	1
		Ranunculus Section Ranunculus	1
		Ranunculus Subgenus Batrachium	1
		Raphanus raphanistrum	1
		Raphanus raphanistrum	
		(pod segs/fgts)	1
		Rhinanthus sp(p).	1
		Rorippa palustris	1
		Rumex sp(p).	1
		Salix sp(p). (b)	1
		Salix sp(p). (lf fgts)	1
		Salix sp(p). (tef)	1
		Sparganium sp(p).	1
		Stellaria sp(p).	1
		Veronica beccabunga-type	1
		bark fgts	1 max 15 mm
		charcoal	1 max 15 mm
		earthworm egg caps	1
		fly puparia	1
		gravel	1 max 10 mm
		leaf ab pads	1
		mites	1
		moss	1
Context 4055, Sample 6/T2			
Lemna sp(p).	3		
beetles	3		
dicot lf fgts	3		
twig fgts	3 max 20 x 10 mm		
Juncus bufonius	2		
Sonchus asper	2		
Urtica dioica	2		
herbaceous detritus	2		
sand	2		
?wood chips	1 max 10 mm		
Aethusa cynapium	1		
Alisma sp(p).	1		
Alnus glutinosa	1		
Alnus glutinosa (b/bs)	1		
Alnus glutinosa (fca)	1		
Alnus glutinosa (tw fgts)	1 max 20 x 10 mm		
Amblystegium riparium	1		
Bryum cf. capillare	1		
cf. Calluna vulgaris (ch rt-tw fgts)	1 max 10 mm		
Carduus/Cirsium sp(p).	1		
Cerastium sp(p).	1		

Table 4: Main statistics for the assemblages of adult Coleoptera and Hemiptera (excluding Aphidoidea and Coccidoidea) from Bolton Hall (TSEP site 238). For explanation of codes see Table 5.

Context	2012	2016	4055	Whole site
Sample	2	1	6	
Ext	/T2	/T1+2	/T2	
S	22	68	253	307
N	22	197	916	1135
ALPHA	0	37	116	138
SEALPHA	0	4	6	7
SOB	11	49	176	215
PSOB	50	72	70	70
NOB	11	170	694	875
PNOB	50	86	76	77
ALPHAOB	0	23	76	91
SEALPHAOB	0	3	5	5
SW	3	23	29	42
PSW	14	34	11	14
NW	3	135	204	342
PNW	14	69	22	30
ALPHAW	0	8	9	13
SEALPHAW	0	1	1	1
SD	0	10	17	27
PSD	0	15	7	9
ND	0	16	40	56
PND	0	8	4	5
ALPHAD	0	0	11	21
SEALPHAD	0	0	3	5
SP	5	13	82	97
PSP	23	19	32	32
NP	5	18	210	233
PNP	23	9	23	21

Context	2012	2016	4055	Whole site
ALPHAP	0	0	50	62
SEALPHAP	0	0	6	7
SM	0	0	0	0
PSM	0	0	0	0
NM	0	0	0	0
PNM	0	0	0	0
ALPHAM	0	0	0	0
SEALPHAM	0	0	0	0
SL	2	0	1	3
PSL	9	0	0	1
NL	2	0	8	10
PNL	9	0	1	1
ALPHAL	0	0	0	0
SEALPHAL	0	0	0	0
SRT	7	5	47	45
PSRT	32	7	19	15
NRT	7	7	282	296
PNRT	32	4	31	26
ALPHART	0	0	16	15
SEALPHART	0	0	2	2
SRD	1	1	5	7
PSRD	5	1	2	2
NRD	1	1	26	28
PNRD	5	1	3	2
ALPHARD	0	0	2	3
SEALPHARD	0	0	1	1
SRF	2	0	15	17
PSRF	9	0	6	6
NRF	2	0	173	175
PNRF	9	0	19	15
ALPHARF	0	0	4	5

Context	2012	2016	4055	Whole site
SEALPHARF	0	0	1	1
SSA	2	2	12	16
PSSA	9	3	5	5
NSA	2	3	50	55
PNSA	9	2	5	5
ALPHASA	0	0	5	8
SEALPHASA	0	0	1	2
SSF	1	2	7	10
PSSF	5	3	3	3
NSF	1	3	23	27
PNSF	5	2	3	2
ALPHASF	0	0	4	6
SEALPHASF	0	0	1	2
SST	1	0	5	6
PSST	5	0	2	2
NST	1	0	27	28
PNST	5	0	3	2
ALPHAST	0	0	2	2
SEALPHAST	0	0	1	1
SSS	0	0	0	0
PSSS	0	0	0	0
NSS	0	0	0	0
PNSS	0	0	0	0
ALPHASS	0	0	0	0
SEALPHASS	0	0	0	0
SG	0	0	0	0
PSG	0	0	0	0
NG	0	0	0	0
PNG	0	0	0	0
ALPHAG	0	0	0	0
SEALPHAG	0	0	0	0

Table 5: Abbreviations for ecological codes and statistics used for interpretation of insect remains in text and tables. Lower case codes in parentheses are those assigned to taxa and used to calculate the group values (the codes in capitals). See Table 2 for codes assigned to taxa from the present site. Alpha - the index of diversity alpha (Fisher et al. 1943); Indivs - individuals (based on MNI); No - number.

No taxa	S	Percentage of indivs of grain pests	PNG
Estimated number of indivs (MNI)	N	No decomposer taxa (rt + rd + rf)	SRT
Index of diversity (α)	alpha	Percentage of RT taxa	PSRT
Standard error of alpha	SE alpha	No RT indivs	NRT
No 'certain' outdoor taxa (oa)	SOA	Percentage of RT indivs	PNRT
Percentage of 'certain' outdoor taxa	PSOA	Index of diversity of RT component	alpha RT
No 'certain' outdoor indivs	NOA	Standard error	SEalphaRT
Percentage of 'certain' outdoor indivs	PNOA	No 'dry' decomposer taxa (rd)	SRD
No OA and probable outdoor taxa (oa+ob)	SOB	Percentage of RD taxa	PSRD
Percentage of OB taxa	PSOB	No RD indivs	NRD
No OB indivs	NOB	Percentage of RD indivs	PNRD
Percentage OB indivs	PNOB	Index of diversity of the RD component	alphaRD
Index of diversity of the OB component	alphaOB	Standard error	SEalphaRD
Standard error	SEalphaOB	No 'foul' decomposer taxa (rf)	SRF
No aquatic taxa (w)	SW	Percentage of RF taxa	PSRF
Percentage of aquatic taxa	PSW	No RF indivs	NRF
No aquatic indivs	NW	Percentage of RF indivs	PNRF
Percentage of W indivs	PNW	Index of diversity of the RF component	alphaRF
Index of diversity of the W component	alphaW	Standard error	SEalphaRF
Standard error	SEalphaW	No synanthropic taxa (sf+st+ss)	SSA
No damp ground/waterside taxa (d)	SD	Percentage of synanthropic taxa	PSSA
Percentage D taxa	PSD	No synanthropic indivs	NSA
No damp D indivs	ND	Percentage of SA indivs	PNSA
Percentage of D indivs	PND	Index of diversity of SA component	ALPHASA
Index of diversity of the D component	alphaD	Standard error	SEALPHASA
Standard error	SEalphaD	No facultatively synanthropic taxa (sf)	SSF
No strongly plant-associated taxa (p)	SP	Percentage of SF taxa	PSSF
Percentage of P taxa	PSP	No SF indivs	NSF
No strongly P indivs	NP	Percentage of SF indivs	PNSF
Percentage of P indivs	PNP	Index of diversity of SF component	ALPHASF
Index of diversity of the P component	alphaP	Standard error	SEALPHASF
Standard error	SEalphaP	No typical synanthropic taxa (st)	SST
No heathland/moorland taxa (m)	SM	Percentage of ST taxa	PSST
Percentage of M taxa	PSM	No ST indivs	NST
No M indivs	NM	Percentage of ST indivs	PNST
Percentage of M indivs	PNM	Index of diversity of ST component	ALPHAST
Index of diversity of the M component	alphaM	Standard error	SEALPHAST
Standard error	SEalphaM	No strongly synanthropic taxa (ss)	SSS
No wood-associated taxa (l)	SL	Percentage of SS taxa	PSSS
Percentage of L taxa	PSL	No SS indivs	NSS
No L indivs	NL	Percentage of SS indivs	PNSS
Percentage of L indivs	PNL	Index of diversity of SS component	ALPHASS
Index of diversity of the L component	alphaL	Standard error	SEALPHASS
Standard error	SEalphaL	No uncoded taxa (u)	SU
No indivs of grain pests (g)	NG	Percentage of uncoded indivs	PNU

Table 6: Insects and other macro-invertebrates from Bolton Hall (TSEP site 238): species lists by sample. Taxa are listed in descending order of abundance.

Key: n - minimum number of individuals; q - quantification (s - semi-quantitative 'several', m - semi-quantitative 'many', both sensu Kenward et al. (1986), e - estimate); ecodes - ecological codes (see Table 5 for explanation); * - not used in calculation of statistics in Table 4.

Context: 2012 Sample: 2/T2 ReM: D
Weight: 3.00 E: 4.00 F: 3.50

cases. E 3.0-5.0, mode 4.0 weak; F 2.0-4.0, mode 2.5 weak. *Chara* abundant.

Notes: Entered HK 1/2/02. 2 dish flot, primarily rather decayed plant debris. E 3.0-4.5, mode 4 weak; F 2.0-5.0, mode 3.5 weak. Quite a lot of rotted, unidentifiable, cuticle fragments.

	n	q	ecode				
				Ochthebius minimus	102	-	oa-w
				Limnebius sp.	4	-	oa-w
				Plateumaris sp.	4	-	oa-d-p
				Bembidion sp. A	3	-	oa
				Hydrophilinae sp. B	3	-	oa-w
				Hydraena sp.	3	-	oa-w
				Carpelimus sp. A	3	-	u
				Aleocharinae sp. C	3	-	u
				Limnobaris pilistriata	3	-	oa-p-d
				*Sialis sp. (larva)	2	-	oa-w
				Leistus rufescens	2	-	oa-d
				Agonum sp.	2	-	oa
				Hydroporinae sp. A	2	-	oa-w
				Hydrobius fuscipes	2	-	oa-w
				Helophorus sp. A	2	-	oa-w
				Helophorus sp. B	2	-	oa-w
				Cercyon ?nalis	2	-	rt-sf
				Megasternum obscurum	2	-	rt
				Hydrobius fuscipes	2	-	oa-w
				Philonthus sp. B	2	-	u
				Aleocharinae sp. D	2	-	u
				?Legnotus sp.	1	-	oa-p
				Lygaeidae sp.	1	-	oa-p
				Saldidae sp.	1	-	oa-d
				Heteroptera sp.	1	-	u
				Cercopidae sp.	1	-	oa-p
				?Stroggylocephalus agrestis	1	-	oa-p
				Cicadellidae sp.	1	-	oa-p
				Delphacidae sp. A	1	-	oa-p
				Delphacidae sp. B	1	-	oa-p
				Bembidion sp. B	1	-	oa
				Carabidae sp.	1	-	ob
				Coelambus impressopunctatus	1	-	oa-w
				Hyphydrus ovatus	1	-	oa-w
				Hygrotus inaequalis	1	-	oa-w
				Hydroporinae sp. B	1	-	oa-w
				Hydroporinae sp. C	1	-	oa-w
				Agabus bipustulatus	1	-	oa-w
				Agabus ?paludosus	1	-	oa-w
				Agabus sp. B	1	-	oa-w
				Ilybius sp.	1	-	oa-w
				?Rhantus sp.	1	-	oa-w
				Colymbetes fuscus	1	-	oa-w
Cicadellidae sp.	1	-	oa-p				
Carabidae sp.	1	-	ob				
Helophorus aquaticus or grandis	1	-	oa-w				
Helophorus sp.	1	-	oa-w				
Cercyon sp.	1	-	u				
Megasternum obscurum	1	-	rt				
Cryptopleurum minutum	1	-	rf-st				
Hydrobius fuscipes	1	-	oa-w				
Anthobium sp.	1	-	oa				
Omalium sp.	1	-	rt				
Anotylus complanatus	1	-	rt-sf				
Anotylus rugosus	1	-	rt				
Tachyporus sp.	1	-	u				
Aleocharinae sp.	1	-	u				
Aphodius sp.	1	-	ob-rf				
?Phyllopertha horticola	1	-	oa-p				
?Grynobius planus	1	-	l				
Meligethes sp.	1	-	oa-p				
Atomaria sp.	1	-	rd				
Halticinae sp.	1	-	oa-p				
?Sitona sp.	1	-	oa-p				
Leperisinus ?varius	1	-	l				
*Bibionidae sp.	1	-	u				
*Formicidae sp.	1	-	u				
*Hymenoptera sp.	1	-	u				

Context: 2016 Sample: 1/T1+2 ReM: D
Weight: 1.95 E: 4.00 F: 2.50

Notes: Entered HK 13.2.02. One dish flot, abundant pale yellow rootlets. Mostly identified from filter paper. Combined remains from /T1 and /T2 subsamples. Most fossils rather orange and well decayed: limited identification in many

Cercyon convexiusculus	1	-	oa-d
Cercyon ?tristis	1	-	oa-d
Anacaena sp.	1	-	oa-w
Laccobius sp.	1	-	oa-w
Hydrophilinae sp. A	1	-	oa-w
Eusphalerum minutum	1	-	oa-d
Carpelimus sp. B	1	-	u
Stenus sp. A	1	-	u
Stenus sp. B	1	-	u
Philonthus sp. A	1	-	u
Philonthus sp. C	1	-	u
Gabrius sp.	1	-	rt
Quedius sp.	1	-	u
Staphylininae sp.	1	-	u
Aleocharinae sp. A	1	-	u
Aleocharinae sp. B	1	-	u
Clambus sp.	1	-	rt-sf
Cyphon padi	1	-	oa-d
Cyphon sp.	1	-	oa-d
Elateridae sp.	1	-	ob
Atomaria sp.	1	-	rd
Coccinellidae sp. A	1	-	oa-p
Coccinellidae sp. B	1	-	oa-p
Prasocuris phellandrii	1	-	oa-p-d
Tropiphorus sp.	1	-	oa
Bagous sp. s. lat.	1	-	oa-p-w
Curculionidae sp.	1	-	oa
*Acarina sp.	15	m	u
*Chironomidae sp. (larva)	6	s	w
*Diptera sp. (puparium)	3	-	u
*Cladocera sp. L (ephippium)	2	-	oa-w
*Formicidae sp.	2	-	u
*Ostracoda sp.	1	-	u
*Hymenoptera Parasitica sp.	1	-	u
*Proctotrupoidea sp.	1	-	u
*Insecta sp. (larva)	1	-	u
*Aranae sp.	1	-	u

Context: 4055 Sample: 6/T2 ReM: D
Weight: 5.00 E: 2.50 F: 2.50

Notes: Entered 31/1/02 HK (identification completed today). Flot 2 cm in jar, insects a large proportion of flot. Many remains very well preserved. Far more abundant than expected on basis of assessment. Fragmentation appears to be recent: processing or in situ? Remarkably good correspondence of numbers of each part in many cases. E 1.5-3.5, mode 2.5 weak; F 1.0-4.0, mode 2.5 weak. Mostly

recorded on filter paper. The round numbers are real counts.

Aphodius contaminatus	91	-	oa-rf
Helophorus sp. B	69	-	oa-w
Aphodius sphacelatus	62	-	oa-rf
Ochthebius minimus	42	-	oa-w
Phyllopertha horticola	24	-	oa-p
Lathridius minutus group	20	-	rd-st
Helophorus sp. A	17	-	oa-w
Hydroporus sp. B	13	-	oa-w
Limnebius truncatellus	12	-	oa-w
Agriotes obscurus	11	-	oa-p
Dyschirius globosus	10	-	oa
Calathus melanocephalus	10	-	oa
Anotylus nitidulus	10	-	rt
Aleocharinae sp. F	10	-	u
Corticarina sp.	10	-	rt
Phyllobius viridiaeris	10	-	oa-p
Tachyporus ?hypnorum	9	-	u
Sitona lepidus	9	-	oa-p
Aphrodes flavostriatus	8	-	oa-p-d
Helophorus aquaticus	8	-	oa-w
Megasternum obscurum	8	-	rt
Aleocharinae sp. B	8	-	u
Anobium punctatum	8	-	l-sf
Aphrodes bicinctus	7	-	oa-p
Anotylus rugosus	7	-	rt
Tachinus signatus	7	-	u
Philaenus spumarius	6	-	oa-p
Calathus fuscipes	6	-	oa
Hydrobius fuscipes	6	-	oa-w
Tachinus corticinus	6	-	u
Gastrophysa polygona	6	-	oa-p
Amara sp. D	5	-	oa
Anacaena sp.	5	-	oa-w
Stenus sp. D	5	-	u
Philonthus sp. B	5	-	u
Anthocoris sp.	4	-	oa-p
Cicadellidae sp. A	4	-	oa-p
Ochthebius sp. A	4	-	oa-w
Anotylus sculpturatus group	4	-	rt
Xantholinus linearis	4	-	rt-sf
Xantholinus longiventris	4	-	rt-sf
Aleocharinae sp. C	4	-	u
Aphodius prodromus	4	-	ob-rf
Dryops sp.	4	-	oa-d
Kateretes rufilabris	4	-	oa-p-d
Orthoperus sp.	4	-	rt
Enicmus sp.	4	-	rt-sf
Alophus triguttatus	4	-	oa-p
Aphrodes sp.	3	-	oa-p

?Delphacodes (s. lat.) sp. A	3	-	oa-p	Gyrophypnus fracticornis	2	-	rt-st
Trechus obtusus	3	-	oa	Philonthus sp. A	2	-	u
Bembidion sp. C	3	-	oa	Philonthus sp. F	2	-	u
Pterostichus cupreus	3	-	oa	Staphylinus sp. A	2	-	u
Pterostichus ?strenuus	3	-	oa	Tachinus laticollis or marginellus	2	-	u
Harpalus rufipes	3	-	oa	Aleocharinae sp. E	2	-	u
Hydroporus sp. A	3	-	oa-w	Aphodius depressus	2	-	oa-rf
Aclypea opaca	3	-	ob-rt	Aphodius ?fimetarius	2	-	oa-rf
Silpha sp.	3	-	u	Aphodius rufipes	2	-	oa-rf
Lesteva longolytrata	3	-	oa-d	Athous ?haemorrhoidalis	2	-	oa-p
Platystethus nodifrons	3	-	oa-d	Cantharis ?pallida	2	-	ob
Stenus sp. F	3	-	u	Cantharis rufa	2	-	ob
Gyrophypnus angustatus	3	-	rt-st	Meligethes sp. A	2	-	oa-p
Philonthus sp. C	3	-	u	Phyllotreta nemorum group	2	-	oa-p
Philonthus sp. G	3	-	u	Longitarsus sp. A	2	-	oa-p
Gabrius sp.	3	-	rt	Apion sp. B	2	-	oa-p
Hoplia philanthus	3	-	oa	Apion sp. D	2	-	oa-p
Brachypterus urticae	3	-	oa-p	Apion sp. E	2	-	oa-p
Meligethes ?aeneus	3	-	oa-p	Apion sp. H	2	-	oa-p
Atomaria sp. B	3	-	rd	Otiorhynchus ovatus	2	-	oa-p
Corticaria gibbosa	3	-	rt	Sitona hispidulus	2	-	oa-p
Chrysolina fastuosa	3	-	oa-p	Tanysphyrus lemnae	2	-	oa-w-p
Hydrothassa glabra	3	-	oa-d-p	Notaris acridulus	2	-	oa-d-p
Galerucella sp.	3	-	oa-p	Phytobius sp.	2	-	oa-d
Chaetocnema concinna	3	-	oa-p	Mecinus pyraeter	2	-	oa-p
Apion sp. F	3	-	oa-p	Gymnetron ?labile	2	-	oa-p
Ceutorhynchus sp. B	3	-	oa-p	Sehirus sp.	1	-	oa-p
Ceutorhynchus sp. C	3	-	oa-p	?Stygnocoris sp.	1	-	oa
Ceutorhynchus sp. D	3	-	oa-p	Scolopostethus sp.	1	-	oa-p
Stygnocoris pedestris	2	-	oa-p	Lygaeidae sp.	1	-	oa-p
Drymus sylvaticus	2	-	oa-p	Temnostethus sp.	1	-	oa
Saldula sp.	2	-	oa-d	Pithanus maerkeli	1	-	oa
Cicadella viridis	2	-	oa-p	Capsus ?ater	1	-	oa-p
Cicadellidae sp. B	2	-	oa-p	Salda littoralis	1	-	oa-d
?Delphacodes (s. lat.) sp. B	2	-	oa-p	Neophilaenus ?lineatus	1	-	oa-p
Clivina fossor	2	-	oa	Cicadellidae sp. C	1	-	oa-p
Bembidion (Philochthus) sp.	2	-	oa	Cicadellidae sp. D	1	-	oa-p
Bembidion sp. B	2	-	oa	Cicadellidae sp. E	1	-	oa-p
Pterostichus melanarius	2	-	ob	Cicadellidae sp. F	1	-	oa-p
Pterostichus nigrita	2	-	oa-d	Cicadellidae sp. G	1	-	oa-p
Agonum sp.	2	-	oa	?Delphacodes (s. lat.) sp. C	1	-	oa-p
Amara sp. B	2	-	oa	Fulgoromorpha sp. A	1	-	
Haliplus sp.	2	-	oa-w	Fulgoromorpha sp. B	1	-	
Hygrotus inaequalis	2	-	oa-w	Auchenorhyncha sp.	1	-	oa-p
Agabus bipustulatus	2	-	oa-w	Psyllidae sp. A	1	-	oa-p
Helophorus grandis	2	-	oa-w	Psyllidae sp. B	1	-	oa-p
Cercyon sp. A	2	-	u	Carabus arvensis	1	-	oa
Histerinae sp. B	2	-	rt	Carabus nemoralis	1	-	oa
Hydraena testacea	2	-	oa-w	Carabus violaceus	1	-	oa
Platystethus arenarius	2	-	rf	Notiophilus ?biguttatus	1	-	oa
Stenus sp. B	2	-	u	Blethisa multipunctata	1	-	oa-d
Lathrobium sp. B	2	-	u	Elaphrus cupreus	1	-	oa-d

Loricera pilicornis	1	-	oa	Tachyporus obtusus	1	-	u
Bembidion sp. A	1	-	oa	Tachyporus sp. A	1	-	u
Agonum marginatum	1	-	oa-d	Tachyporus sp. B	1	-	u
Amara sp. A	1	-	oa	Aleochara sp.	1	-	u
Amara sp. C	1	-	oa	Aleocharinae sp. A	1	-	u
Amara sp. E	1	-	oa	Aleocharinae sp. D	1	-	u
Harpalus sp.	1	-	oa	Amauronyx maerkeli	1	-	u
Lebia chlorocephala	1	-	oa	Geotrupes sp.	1	-	oa-rf
Carabidae sp.	1	-	ob	Colobopterus fossor	1	-	oa-rf
Coelambus impressopunctatus	1	-	oa-w	Aphodius ater	1	-	oa-rf
Porhydrus lineatus	1	-	oa-w	Aphodius granarius	1	-	ob-rf
Agabus sp.	1	-	oa-w	Aphodius porcus	1	-	ob-rf
Colymbetes fuscus	1	-	oa-w	Aphodius sp.	1	-	ob-rf
Colymbetinae sp.	1	-	oa-w	Dascillus cervinus	1	-	oa-p
Gyrinus sp.	1	-	oa-w	Simplocaria ?semistriata	1	-	oa-p
Hydrochus sp.	1	-	oa-w	Cytilus sericeus	1	-	oa-p
Helophorus nanus	1	-	oa-w	Agrypnus murinus	1	-	oa-p
Helophorus porculus	1	-	oa	Elateridae sp. A	1	-	ob
Sphaeridium ?bipustulatum	1	-	rf	Elateridae sp. B	1	-	ob
Cercyon tristis	1	-	oa-d	Cantharis sp. A	1	-	ob
Cercyon sp. B	1	-	u	Cantharis sp. B	1	-	ob
Laccobius sp.	1	-	oa-w	Meligethes sp. C	1	-	oa-p
Chaetarthria seminulum	1	-	oa-w	Cryptophagus sp.	1	-	rd-sf
Acritus nigricornis	1	-	rt-st	Atomaria sp. A	1	-	rd
Onthophilus striatus	1	-	rt-sf	Atomaria sp. C	1	-	rd
Histerinae sp. A	1	-	rt	Phalacridae sp.	1	-	oa-p
Ochthebius sp. B	1	-	oa-w	Thea vigintiduopunctata	1	-	oa-p
Hydraena sp.	1	-	oa-w	Coccinellidae sp.	1	-	oa-p
Ptenidium sp.	1	-	rt	Chrysomelinae sp.	1	-	oa-p
Leiodinae sp.	1	-	u	Phyllotreta sp.	1	-	oa-p
Nicrophorus ?vespillo	1	-	rf	Longitarsus sp. B	1	-	oa-p
Micropeplus fulvus	1	-	rt	Longitarsus sp. C	1	-	oa-p
Micropeplus porcatus	1	-	rt	Altica sp.	1	-	oa-p
?Lesteva sp.	1	-	oa-d	Apion (Erythrapion) sp.	1	-	oa-p
Phyllodrepa sp.	1	-	rt	Apion sp. A	1	-	oa-p
Omalium sp.	1	-	rt	Apion sp. C	1	-	oa-p
Bledius sp.	1	-	oa-d	Apion sp. G	1	-	oa-p
Stenus sp. A	1	-	u	Phyllobius pyri	1	-	oa-p
Stenus sp. C	1	-	u	Tropiphorus terricola	1	-	oa
Stenus sp. E	1	-	u	Sitona sp.	1	-	oa-p
Stenus sp. G	1	-	u	Hypera sp.	1	-	oa-p
Lathrobium sp. A	1	-	u	Bagous sp. s. lat.	1	-	oa-p-w
Rugilus ?orbiculatus	1	-	rt-sf	Ceutorhynchus sp. A	1	-	oa-p
Othius sp.	1	-	rt	Rhinoncus sp.	1	-	oa-p
Leptacinus sp.	1	-	rt-st	Ceuthorhynchinae sp. A	1	-	oa-p
Xantholinus glabratus	1	-	rt	Anthonomus sp.	1	-	oa-p
Philonthus sp. D	1	-	u	Curculionidae sp. A	1	-	oa
Philonthus sp. E	1	-	u	Curculionidae sp. B	1	-	oa
Philonthus sp. H	1	-	u	*Acarina sp.	100	e	u
Staphylinus sp. B	1	-	u	*Bibio sp.	15	m	oa
Quedius boops group	1	-	u	*Insecta sp. (immature)	15	m	u
Tachyporus ?nitidulus	1	-	u	*Daphnia sp. (ephippium)	6	s	oa-w

*Cladocera sp. (ephippium)	6	s	oa-w
*Diptera sp. (adult)	6	s	u
*Diptera sp. (pupa)	6	s	u
*Diptera sp. (puparium)	6	s	u
*Coleoptera sp. (larva)	6	s	u
*Hymenoptera sp.	6	s	u
*Myrmica sp.	6	s	u
*Opiliones sp.	6	s	u
*Aranae sp.	3	-	u
*Forficula sp.	2	-	u
*Trichoptera sp.	1	-	oa-w
*Sehirinae sp. (larva)	1	-	oa-p
*Pentatomidae sp. (nymph)	1	-	oa-p
*Aphidoidea sp.	1	-	u
*Elateridae sp. (larva)	1	-	ob
*Chalcidoidea sp.	1	-	u
*Formicidae sp. A	1	-	u

Table 7: Plant feeding insects recorded from Bolton Hall (TSEP site 238), excluding taxa which cannot be tied to a narrow host plant range or vegetation type.

Taxon	n	Host or vegetation type
<i>Phyllopertha horticola</i>	24	Larvae typically in soil of unimproved meadows
<i>Agriotes obscurus</i>	11	At roots of grasses and other herbs
<i>Phyllobius viridiaeris</i>	10	Polyphagous on herbaceous plants
<i>Sitona lepidus</i>	9	Fabaceae
<i>Aphrodes flavostriatus</i>	8	Grasses in damp places
<i>Aphrodes bicinctus</i>	7	Grasses
<i>Philaenus spumarius</i>	6	Polyphagous
<i>Gastrophysa polygoni</i>	6	<i>Polygonum</i> and <i>Rumex</i>
<i>Kateretes rufilabris</i>	4	Usually <i>Carex</i> and <i>Juncus</i>
<i>Alophus triguttatus</i>	4	Various herbaceous plants, often near water
<i>Hoplia philanthus</i>	3	Larvae among grass roots
<i>Brachypterus urticae</i>	3	Nettles
<i>Chrysolina fastuosa</i>	3	<i>Galeopsis</i> ; sometimes <i>Lamium</i>
<i>Hydrothassa glabra</i>	3	<i>Ranunculus</i> spp. in damp places and waterside
<i>Gallerucella</i> sp.	3	Trees shrubs and herbs
<i>Chaetocnema concinna</i>	3	Polygonaceae
<i>Cicadella viridis</i>	2	Grasses in marshy places
<i>Phyllotreta nemorum</i> group	2	Mostly Cruciferae
<i>Otiorhynchus ovatus</i>	2	Larvae at plant roots
<i>Sitona hispidulus</i>	2	Fabaceae, especially <i>Trifolium</i>
<i>Tanysphyrus lemnae</i>	2	Herbaceous plants
<i>Notaris acridulus</i>	2	<i>Glyceria</i>
<i>Mecinus pyraster</i>	2	<i>Plantago</i>
<i>Gymnetron ?labile</i>	2	<i>Plantago</i>
<i>Neophilaenus ?lineatus</i>	1	Grasses
<i>Sehirus</i> sp.	1	On short herbs
<i>Pithanus maerkeli</i>	1	Grasses and rushes
<i>Capsus ?ater</i>	1	Tall grasses
<i>Apion (Erythrapion)</i> sp.	1	<i>Rumex</i>
<i>Phyllobius pyri</i>	1	Polyphagous
<i>Tropiphorus terricola</i>	1	Herbaceous plants

Table 8: Dung beetle biology for taxa recorded from Bolton Hall (TSEP 238). Sources: J – Jessop (1986); L - Landin (1961).

Species	<i>n</i>	Biology
<i>Aphodius contaminatus</i>	91	Various sorts of dung, especially horse (J, L).
<i>A. sphaecelatus</i>	62	Dung of various kinds, and vegetable material; flood debris. Often with <i>A. prodromus</i> (J). Often with <i>A. prodromus</i> , all kinds of dung and in decaying vegetables (L).
<i>A. prodromus</i>	4	Dung of various kinds, but rarely cow dung; decomposing vegetable material; flood debris (J). All kinds of dung, very often in horse droppings; compost and decaying vegetables (L).
<i>A depressus</i>	2	Dung of various sorts (J) including in forests (L)
<i>A. ?fimetarius</i>	2	Dung of various sorts and decaying vegetable matter, decaying potatoes and mushrooms, flood debris (J). All kinds of dung, including old droppings, and also feeding on vegetables (L).
<i>A. rufipes</i>	2	Dung of large herbivores (J). All kinds of dung (L).
<i>A. ater</i>	1	Dung of various sorts and decaying vegetable matter, flood debris (J). Dung of domestic and game animals, sometime compost and decaying vegetables (L).
<i>A. granarius</i>	1	Dung of various sorts (most often cow) and decomposing vegetable material, sometimes muddy places under stones; flood debris (J). <i>Highly</i> polyphagous, all kinds of dung, debris, decaying vegetables, compost, carrion etc (L).
<i>A. porcus</i> ,	1	Dung, typically in burrows of <i>Geotrupes</i> sp. (J)
<i>Colobopterus fossor</i>	1	Usually cow dung, often on damp soil, prefers open pastures (J, L)
<i>Geotrupes</i> sp.	1	Dung

Table 9: Summary of hand-collected vertebrate remains from excavations at Bolton Hall (TSEP site 238).

Context	No. of fragments	Notes
2016	1	1 large-sized mammal shaft fragment.
2027	1	Horse metacarpal - may have knife marks on shaft but marks are rather ambiguous. Measurements: GL1 = 217.6, LI = 213.6, GL = 220.9, Bp = 49.27, SD = 29.81 (right).
3009	1	2 freshly broken fragments representing a cow metatarsal.
4008	1	1 burnt medium-sized mammal shaft fragment.
4055	1	1 horse femur shaft fragment - very poorly preserved.