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**Assessment of plant and invertebrate macrofossil remains from excavations  
in 2002 at Kaupang, Norway**

by

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# Assessment of plant and invertebrate macrofossil remains from excavations in 2002 at Kaupang, Norway

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## Summary

*Plant and invertebrate (mainly beetle) remains have been examined from a series of 'GBA' subsamples (of 2 kg) and from rather larger bulk-sieved (BS) samples from the excavations at Kaupang in 2002.*

*The former group yielded some rich assemblages with evidence for a modest range of plants likely to have been useful to the inhabitants of the site, including hemp, hops, woad, flax, apple, strawberry and barley. There was some evidence for plant litter especially in one context containing 'blocks' of straw, probably from stable manure deposited before it had begun to decay. The BS samples mostly yielded only charcoal with very small concentrations of charred barley grains, hazel nutshell, a little charred seaweed and a few other remains.*

*The insect remains from the GBA subsamples included a variety of taxa typically associated with human occupation though their presence was much less marked than in some other, perhaps more intensively occupied, sites of the same general period (and thus with implications for understanding the scale and duration of occupation at Kaupang).*

*Overall, the material has the potential for some further study of samples not reviewed in this assessment and for a more fully quantitative study of selected samples from amongst those investigated.*

KEYWORDS: KAUPANG; NORWAY; VIKING AGE; OCCUPATION DEPOSITS; PLANT REMAINS; INSECTS; INVERTEBRATES; SYNANTHROPES

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# Assessment of plant and invertebrate macrofossil remains from excavations in 2002 at Kaupang, Norway

## Introduction

Samples collected during excavations in 2002 at Kaupang, southern Norway, were submitted for assessment of their potential value in reconstruction of past environment and activity at the site. Material consisted of (a) unprocessed 'GBA' samples (*sensu* Dobney *et al.* 1992) of about 5-10 kg; and (b) 'washovers' (or 'flots') from 'BS' samples processed on site during the excavation (and consisting mainly of small bags of charred material, stored wet).

## Methods

### *GBA samples*

Following description and selection, processing of subsamples of the raw sediment from 17 of the GBAs submitted was carried out, using methods described by Kenward *et al.* (1980). This involved taking a washover to concentrate the lighter, organic fraction (which was stored wet) from the heavier mineral fraction (which was oven-dried). Initial inspection of the washovers was carried out by ARH, who recorded the nature of the plant material and other components after resieving into convenient fractions (usually 4, 2, 1 and 0.3 mm). For this a 4-point semi-quantitative scale of abundance was used, from '1'—one or a few specimens (less than an estimated 6 per kg of raw sediment for whole structures like propagules) to 4—abundant remains (hundreds of specimens per kg or a major component of the matrix). Where washovers were large, only a proportion of some or all of the sieved fractions was examined. Data were recorded directly to a PC, using *Paradox* software. At this point subsamples containing insect material were subjected to paraffin flotation. Note that one sample was treated differently: a 'block' of compressed straw-like material from Sample 229 (PG 86385) from Context **86018** was too difficult to disaggregate easily for the purposes of assessment and was simply broken up a little and the residue checked quickly for plant remains (the bulk of the matrix of the sediment), with two insect specimens being recovered at this time.

Insects in the 'flots' resulting from paraffin flotation of the washovers from the GBAs were recorded using 'assessment recording' *sensu* Kenward (1992), creating a list of the taxa observed during rapid inspection of the flot, with an estimate of abundance, and a subjective record of the main ecological (e.g. aquatics, grain pests) or indicator groups (e.g. for stable manure, Kenward and Hall 1997) present. A record of the preservational condition of the remains was made using scales given by 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); these values are given for each sample in Table 1.

The dried residues from the GBA subsample were checked for bone and artefactual material and sorted (to 2 mm) where such material was present.

### *BS washovers*

A selection of 52 washovers was made using criteria suggested by the excavator (with respect to location on the site) whilst aiming also to represent the range of context types and to some extent washover volume, though with a bias towards larger rather than smaller washovers. The selected material was oven dried on a 0.3 mm sieve, then resieved into (usually) 4, 2, 1 and 0.3 mm fractions and inspection and recording carried out in a similar way to the GBA washovers (and using the same

semi-quantitative scale of abundance)

## Results

### *GBA samples (Table 1)*

#### Plant remains

Bearing in mind the appearance of the unprocessed sediment, most of which was unconsolidated dark grey material rich in coarse sand, most of the washovers from the GBA subsamples yielded surprising quantities of uncharred organic matter. This generally consisted of rather strongly decayed wood fragments (present in 13 samples and occurring at more than trace amounts in eight). Material thought to be wood chips (i.e. debris from woodworking) was noted in very small amounts in five contexts. Twelve samples yielded some remains of tree bark, usually uncharred and frequent or abundant in five of them—bark is very likely also to be a product of woodworking in the absence of any evidence that it was used for, for example, tanning leather (cf. Hall and Kenward 2003). Despite the large quantities of material preserved by anoxic ‘waterlogging’, other uncharred plant remains were rather sparse and only a few samples produced insects or other invertebrate remains. Of the uncharred plant taxa, those recorded in more than half the washovers were limited (in descending order of frequency) to spike-rush (*Eleocharis palustris* sl), toad rush (*Juncus bufonius* L.), buttercup (*Ranunculus* Section *Ranunculus*), thistle (*Carduus/Cirsium* sp(p).), fat hen (*Chenopodium album* L.), hazel nut, blackberry (*Rubus fruticosus* agg.) and violet/field pansy (*Viola* sp(p).). Most of these have little interpretative value.

Charred plant material other than wood charcoal—which was recorded in all 16 of the 2 kg subsamples and frequent or abundant in seven of them—was restricted to grains of barley (*Hordeum*, in three contexts), some seaweed (traces in three samples, in two cases only tentatively identified, cf. the indirect evidence for seaweed via hydroid oothecae reported by Buckland *et al.* 2001) and a few taxa of kinds also present in an uncharred state, the only one present in more than half the samples being hazel nut (*Corylus avellana* L.). The nutshell is commonly recorded on occupation sites and perhaps represents ‘snack’ food. The seaweed may simply have been brought with shellfish and burnt incidentally, though it has many uses, including roofs (e.g. Walker *et al.* 1996) and in glass-making (as a source of soda), and as a fertiliser and fodder for livestock.

A few assemblages were notable for the presence of remains likely to have been of importance to the inhabitants of the site, however. Most conspicuous were the abundant remains of achenes of hop (*Humulus lupulus* L.) in two of the samples from Context **86018** (PG87731 and 87732, with traces in Contexts **87793** (PG87806) and **99879** (PG99948) and another of the samples from **86018**, PG86387) and of hemp (*Cannabis sativa* L.) in moderate amounts (though only fragments) in two of the samples from **86018**. A third plant in this category was woad (*Isatis tinctoria* L.) remains of whose pods were present in very low numbers in samples from Contexts **86018** (PG87732) and **99879** (PG99948). The most likely use for hops was in brewing (cf. Behre 1999), though they have also been recorded as a dyeplant, for their medicinal value, and it is possible that the mature bines (stems) found a use as ropes. Hemp, too, is most likely to have been a source of fibre for rope or cloth, though its seeds are rich in oil which is edible and which finds uses similar to those of linseed oil. Woad is well known as a source of blue dye—almost the only easily obtained blue dye in ancient times—and is known from other Viking Age sites in Norway, most notably the Oseberg Ship (Holmboe 1927), where fruits were found in a box buried with the other grave goods.

The only charred cereal remains in the GBA subsamples were grains of barley, as noted above (and about which see further below). Other remains of plants which may have been used in some way—though in this case all might have arrived by other means, since they were rarely present in more than

very small amounts—were seeds of raspberry (*Rubus idaeus* L., in six contexts), strawberry (*Fragaria vesca* L., in two), rose (*Rosa*, two), with the following recorded in only one context each: flax/linseed (*Linum usitatissimum* L.) seeds, apple (*Malus sylvestris* Miller) endocarp ('core') and bracken (*Pteridium aquilinum* (L.) Kuhn) stalk fragments.

The sample of 'compressed straw' from PG 86385 (Context **86018**, Sample 229) was, indeed, found to consist largely of this kind of material, perhaps with some evidence of grassland and heathland plants which might have arrived with hay or turf. It is perhaps most likely to represent stable manure and, if so, the very fresh nature of the vegetative material (and the very low density of insect remains) suggests it was deposited in the pit quickly after formation in the byre so that decay was minimal and there was no time for invasion by the kinds of beetles normally characteristic of such material.

The range of plant taxa recorded is essentially similar to those reported by previous workers at Kaupang (Buckland *et al.* 2001), with some, such as sedges (*Carex*) and celery-leaved crowfoot (*Ranunculus sceleratus* L.) well represented in both groups of assemblages. However, the 2003 study has seen the addition of the economically important plants hemp, apple, strawberry, woad and rye (hops having been recorded from one pit context previously) and some evidence of material probably brought for litter, such as bracken and moss. Through the use of bulk-sieving (see below), a better appreciation of the frequency (at low levels) of charred cereal remains, mainly barley, has also been achieved. The mosses recorded from this latest study are a mixture of taxa from woodland (perhaps brought on tree bark), heathland and some wetland habitats—many are typical of the kinds brought to 16-22 Coppergate, York (Kenward and Hall 1995), for example, or to medieval Bergen (Krzywinski and Fægri 1979) perhaps largely for sanitary purposes, though none was especially abundant at Kaupang and there was certainly no evidence for their specific use. Taxa recorded during the previous study but not seen here include *Empetrum nigrum*, *Lychnis flos-cuculi*, *Montia fontana* and *Triglochin maritima*; none (and certainly in the small quantities previously noted) is of much interpretative significance, however.

### **Invertebrate remains**

Nine of the subsamples yielded at least modest numbers of insects, and in some they were quite abundant. Beetles were generally the most numerous, as is often the case in archaeological deposits. Almost all samples yielded some mites (Acarina), which were occasionally abundant. Preservation of insects was never very good, and sometimes very poor, though whether this degradation occurred in antiquity or recently is uncertain (recent decay does seem possible, however). Despite this decay, remains were generally identifiable, except where extremely comminuted. A few assemblages consisted only of almost completely decayed scraps of cuticle. The size of flots, and abundance, preservation, and general character of the insect assemblages are given in Table 1.

The predominant component of the insect assemblages was a fauna typical of intensive occupation sites, including 'house fauna' taxa (i.e. species typical of buildings of some kind, whether domestic or for livestock or industry: Kenward and Hall 1995; Carrott and Kenward 2001). There were, however, no groups dominated by house fauna, and most of the assemblages appeared a little bland ecologically at the subjective level inevitable during assessment. This could be resolved by full recording of large numbers of remains. Again subjectively, the synanthrope component (i.e. those species favoured by human activity) appeared impoverished, more like that seen in the 11<sup>th</sup> century lakeside settlement at Viborg, Denmark (Kenward 2002) and in contrast to the rich synanthropic fauna observed in Anglo-Scandinavian York, at the Early Christian (7<sup>th</sup>/8<sup>th</sup> C.) rath (defended farmstead) in Co. Antrim, Northern Ireland or in medieval Oslo (Kenward and Hall 1995; Kenward and Hall 2000; Kenward 1988). The richness of the synanthrope component has been argued to reflect the degree of geographical isolation, continuity of occupation, and trading links of a settlement (Kenward 1997). The Kaupang assemblage would appear to fall towards the isolated or briefly/episodically occupied end of this spectrum. This, too, will probably be confirmed by examining more, larger assemblages. A

few fleas, including the human flea *Pulex irritans*, were seen but there were no lice, but the degree of decay of most of the insect remains may mean that the delicate lice—if present at the site—have been lost.

*Daphnia ephippia* (water flea resting eggs) were present in several assemblages and sometimes abundant. They may have lived *in situ* in water in pits on the site, or even in surface pools, or have arrived in floods. However, the rarity of other aquatics, including insects, suggests that the water fleas may have been imported with water, or perhaps even in the guts of humans or livestock, having been accidentally drunk and voided with faeces (although there is, somewhat surprisingly, no good evidence for human faecal material in any of the pits examined). Some groups included elements of a 'foul mouldering' fauna typical of stable manure, but sometimes apparently exploiting other kinds of waste, as was perhaps the case at the 16-22 Coppergate and 6-8 Pavement sites in York (Hall *et al.* 1983; Kenward and Hall 1995; Kenward and Hall 1997). Further analysis, and closer integration of plant and insect evidence, may clarify this point. The spider beetle *Ptinus ?fur*, found in buildings as well as in birds' nests, was unusually abundant in some samples, as was *Omosita colon*, which is rarely so common as here. *O. colon* has various habitats but often occurs in old bones left on the soil surface. Wood-associated fauna was notably well represented in some samples, and several species of bark beetles (Scolytidae) were present as single individuals. These presumably reflect the use of timber and firewood on the site rather than the close proximity of woodland.

The range of insects noted during this assessment corresponds reasonably closely to that found by Buckland *et al.* (2001), with a somewhat restricted range of synanthropes in both. The detailed analyses made in the 2001 report produced many more specific identifications of rare taxa, of course. In both cases some assemblages with abundant *Omosita colon* were present and the significance of these needs to be considered further.

Overall, the plant and insect remains from these GBA samples have substantial potential in reconstructing the character of the site, both in terms of its physical appearance, function and occupancy, and detail of human diet and activity.

### *BS samples (Table 2)*

Apart from some modern roots (present in many of the washovers) and a few seeds (perhaps mostly weed taxa) the plant material in the BS washovers was exclusively charred and for the most part charcoal. The absence of any washovers containing quantities of uncharred material in the proportions seen in most of the GBA subsamples is noteworthy and difficult to explain other than in that few pit fills were examined as BS samples.

The charcoal in these washovers was mostly quite small (the maximum dimension of the largest fragment in any sample being only 30 mm) and generally rather angular. It certainly did not give the appearance of having been heavily reworked. In those cases where the charcoal was inspected more closely, diffuse- and ring-porous taxa were generally both present (both oak and ash being noted amongst the latter). Some coniferous wood was also present in some samples but was not identified further at this stage.

Fruits and seeds were sparse in these washovers, hazel nutshell being (unexpectedly) largely restricted to the residues (and not recorded systematically here). Grains of barley were recorded in 32 of the washovers, but in modest amounts in only two and never more abundant. As before, no cereal chaff was detected, although straw was presumably present on the site (as indicated by the compressed material in PG86385) though this is not unusual for occupation sites where, it is presumed, crop processing was not carried out, the grain arriving from elsewhere already threshed and winnowed. The highest concentrations of grain, seen in Samples 218 and 282 (Contexts **83319**, PB83825 and **90609**, PB91136) were still quite low—of the order of at most only a few grains per litre of sediment,

and do not seem to indicate the deliberate dumping of large quantities of burnt grain from, for example, a store. The grains were often quite well preserved, however, perhaps indicating primary deposition. Traces of rye (*Secale cereale* L.) were noted in two contexts (with tentatively identified material in a further four), some tentatively identified wheat (*Triticum*) grains in four, and traces of oats (*Avena*) in two. The regularly occurring charred sedge (*Carex*) nutlets (in 25 contexts) perhaps originated in burnt peat or turves, but no very well developed group from such a source was recorded (the achenes of ?tormentil, *Potentilla* cf. *erecta* (L.) Rauschel, from four contexts may have arrived in grassland or heathland turves, for example); most of the other charred seeds were from plants likely to have been growing as crop weeds or in disturbed places near the site: the more frequent were goosegrass (*Galium aparine* L., five contexts) and persicaria (*Polygonum persicaria* L., four).

With the charred plant remains there were often clasts of subspherical or amorphous whitish vesicular material which are probably to be counted as 'plant fuel ash', though their specific origin cannot presently be determined. Some other fragments (in 17 contexts) are yet more enigmatic. They consisted of irregular (but usually somewhat 'platy') fragments of blackish material with a somewhat vesicular and/or resinous quality, brittle, and usually showing a distinction between the two faces—with one (?the lower) carrying sand grains, the other having characteristic rounded 'pustules' whose central part was sunken. The sunken-pustular surfaces are reminiscent of encrusting lichens, but it is difficult to see how these would become charred in such a way that they could survive as brittle but rather tough fragments. A preliminary investigation of this material involved heating some specimens to a high enough temperature that they were 'ashed'; the resulting reddened fragments were white internally (and, on treatment with dilute acid, found to be calcareous), with some thin-walled spongy tissue apparently surviving.

#### *Plant and insect material in time and space*

Although the number of samples from any one phase/plot combination is probably too small to permit detailed comparisons (somewhat inappropriate for what is, after all, an assessment), the following summary of information by phase and plot may help to indicate where, in time and space, the better preserved material has been recovered from the 2002 excavations.

##### Phase 2 Plot 1

Few remains were recovered from the two samples examined.

##### Plot 2B

The single sample examined yielded an assemblage rather different to the others though its nature is not immediately obvious. Several 'useful' plant taxa were noted, including woad. Certainly further examination is desirable to try to understand the origin of the organic component of the sediment and the mode of formation of this pit fill.

##### Phase 3 Plot 1

Plant and insect remains from the fills of Pit 64981 were sparse, though a sample from PG87806 yielded some food remains, including hop. The fill of 'latrine' Pit 65132 on the other hand produced some rich assemblages of both plant and insect remains, the former including well preserved material of hemp and hops, as well as traces of woad and a few foodplant taxa. This presumably represents waste from domestic/craft activity but there is no strong indication that the fills represent human faecal waste. The compressed straw material in PG86385 has the appearance of stable manure. In general, the insects from these deposits have the potential to give information concerning conditions in and around the pit and the source of the waste within it.

### Plot 3

The single sample examined yielded no more than a little charcoal, consistent with its context type (hearth).

### Phase 4 Plot 3

Some of the fills of Pit 43852 produced moderately rich assemblages of plant and insect remains. The plants represented rather mixed origins, with no groups particularly prominent, though perhaps with some evidence for litter. There was no indication of human faecal waste. For the future, the insects have a modest potential to give information concerning conditions in and around the pit and the source of the material within it; the numerous *Omosita* beetles are not surprising given that over 2000 fragments of mammal and fish bone have been identified from this feature (cf. Barrett *et al.* 2003).

### Unphased

The single unphased sample examined yielded few remains.

### *Samples of wood*

A small series of samples of uncharred wood from stakeholes was examined. All the material was rather soft and good thin sections were generally rather difficult to obtain. The material is listed in Table 3; with the exception of one large sample of oak, nearly all the material seemed likely to be from willow, though in some cases the fragments were too small and/or soft to be identified without some considerable effort (e.g. freezing).

## **Recommendations**

Recommendations for further analysis of GBA samples are given in Table 1. It is worth making a full quantitative record of the plant remains from a few of the GBAs examined and processing a few more (perhaps mainly pit fills, given these were the contexts which were productive in the assessment) to check on the distribution of remains in space and time and maybe add some more ‘useful’ taxa. A few of the charcoal assemblages from the BS material should be examined to establish the kinds of wood used. Some further study of the ‘sunken-pustular’ charred organic material may be worthwhile, too.

With regard to the insect (and other invertebrate) remains, many of the samples deserve detailed quantitative recording, to amplify context interpretation or to gather data for analysis at the site level. Those afforded priority P1A or P1B (explained in caption to Table 1) should certainly be recorded, but the P2 samples would provide useful data for higher-level analysis of site statistics. Any samples from contexts stratigraphically related to those found productive, but not included in the assessment to avoid duplication, might usefully be examined too. If sufficient assemblages can be listed it may be possible to detect statistically significant differences in the fauna (and especially synanthrope richness) across plots and through time, which might have important archaeological implications. This would require substantially more sample assemblages than examined in this assessment, however.

A species association analysis (Carrott and Kenward 2001) of selected insect remains would be worthwhile, providing sufficient productive samples exist, as it might clarify, or at least illustrate, the various origins of the components of the fauna. Analyses of this kind have proved productive elsewhere—e.g. for Roman Carlisle (Kenward 1999), and for the rath site at Deer Park Farms (Allison



*et al.* 1999 a; b).

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Table 1. Assessment of plant and insect (and other macro-invertebrate) remains from Kaupang. Material is presented by phase and plot order and within that by Intrasis sample number. All the subsamples were of 2.0 kg. SN—sample number. Priority: P1A - important as a characteristic group, for context interpretation and for site-level statistics; P1B - for context interpretation and for site-level statistics; P2 - some limited value for context interpretation, but useful for site-level statistics; P3 - limited value for context interpretation, but useful for site-level statistics; NFA - no further action recommended.

Context/ Intrasis Sample	Context type	SN	Assessment notes	Further action?
<b>PHASE 2</b>				
<b>PLOT 1</b>				
61643/ 62381	Clay from hearth of house A200	20	Mid grey to grey-brown, dry, crumbly, locally somewhat indurated, ?ashy silt with ?fire-cracked stones.  There was a small washover of about 60 cm <sup>3</sup> of charred material, mostly <1mm, but with charcoal (including oak, <i>Quercus</i> ) to 10 mm and traces of hazel ( <i>Corylus avellana</i> L.) nutshell; there were also two uncharred blackberry ( <i>Rubus fruticosus</i> agg.) seeds and some (presumably modern) rootlets. The large residue of about 825 cm <sup>3</sup> was of gravel (to 55 mm), grit and sand. No insect remains were observed.	NFA
68495/ 68512	Layer in large dumping area at South of excavation area	83	Very dark grey to black, moist, crumbly to soft, gritty ?humic sandy silt or sandy humic deposit, probably charcoal rich.  The very large washover of about 500 cm <sup>3</sup> comprised charred material, much of it fine (<1 mm) clasts of (presumably) ash, with much charcoal (to 10 mm), sometimes with iron-concreted material adhering. There was also a little very decayed uncharred wood (to 5 mm). A light washover from this yielded some uncharred rush ( <i>Juncus</i> ) seeds. The large residue of about 475 cm <sup>3</sup> was of sand, grit and gravel (to 75 mm) with a single fragment (to 80 mm) which may have been from a quern.  There was a small flot, with only traces of decayed cuticle.	NFA
<b>PLOT 2</b>				
99879/	Pit fill in 99030	294	Very dark grey to black, moist, crumbly humic sand with lumps of very dark blue-grey	The vegetative monocot material

Context/ Intrasis Sample	Context type	SN	Assessment notes	Further action?
99948			<p>plastic clay.</p> <p>This subsample yielded a large washover of about 900 cm<sup>3</sup> of organic debris, mainly granular woody fragments (to 40 mm) with much fine material; there were many achenes of celery-leaved crowfoot floating, and some quite large lumps of rhizome/root material and some monocot culm, the latter two types from something quite small, not reed or cereal. Some lumps of loosely consolidated pale strawy material looked like root/rhizome (to about 1.5 mm max width) and there was perhaps other 'littery' material that had dried and not fully rewetted. Unusually, and characteristically for this sample. Quite a lot of grey dusty debris was still adhering to some wood and bark clasts. Amongst the modest-sized range of quite well preserved plant remains were woad pods (two specimens), well-preserved hop achenes and moderate numbers of fruits of the cornfield weed annual knawel, <i>Scleranthus annuus</i> L. (also having a dried-unrewetted appearance). Potentially 'useful' taxa in this sample included hazel nut, strawberry, hop, woad, raspberry and rose (<i>Rosa</i>), though only the last of these was present in more than trace amounts. The large residue of about 525 cm<sup>3</sup> comprised sand, grit and gravel (to 45 mm).</p> <p>The large flot contained fibrous plant tissue and was only part-examined. There was a small group of insects, mostly moderately well preserved (E 2.5-4.5, mode 2.5 weak; F 2.0-3.5, mode 2.5 weak). Several <i>Daphnia</i> ephippia and a second cladoceran may indicate imported water. The remaining fauna was undiagnostic. (The whole flot probably would yield a borderline useful group.)</p>	<p>may be interpretatively important and should be given more attention. Record, preferably together with additional subsample for insects (though sorting time long). P2.</p>
<b>PHASE 3</b>				
<b>PLOT 1</b>				
86018/ 86385	'Compressed straw blocks', fill in Pit 64981	229	<p>Highly compressed dark brown, coarse herbaceous plant material (with the appearance of straw), sometimes paler within clasts.</p> <p>This material subsample broke down with extreme difficulty—it was mostly left as lumps of strongly compressed, strawy debris. For the most part these consisted of quite coarse culm fragments, pale and rather well preserved and probably cereal straw, but</p>	<p>Record plant remains. Properly processed, it may be worth pursuing insect remains from this material but they are likely to be very dilute.</p>

Context/ Intrasis Sample	Context type	SN	Assessment notes	Further action?
86018/ 86386	Fill in Pit 64981	230	<p>there were also rather frequent well-preserved leafy shoots of the mosses <i>Polytrichum</i> (<i>P. commune</i> var. <i>commune</i> Hedw. readily identifiable from the grooved apical cells of the lamella as seen in section) and other moss shoots (some retaining a greenish coloration). Apart from mosses (which were mostly from heathland, bog or woodland habitats), most of the identifiable plant remains are likely to have arrived with stable manure, the most likely explanation for the nature of this material.</p> <p>No insect remains were observed.</p> <p>Very dark grey, moist, crumbly, humic sandy silt with some lumps rich in small wood fragments.</p> <p>The large washover of about 1000 cm<sup>3</sup> was mostly wood fragments (to 50 mm) and fine organic detritus, but rather a high proportion of the material was incompletely disaggregated matrix—humic silt, sometimes with compressed fine-strawy material having something of the appearance of very decayed stable manure, but overall the plant material was rather decayed. There were seeds in modest numbers, but the assemblage was not very diverse. Small but characteristic elements perhaps representing hay and/or grassland turves were present. The modest-sized residue of about 300 cm<sup>3</sup> was of sand, grit and gravel (to 40 mm).</p> <p>The flot was of moderate size, mostly woody plant fragments. There was a modest number of insect remains, with variable preservation, some pale to orange, others reduced to thin films (E 1.5-4.5, mode 3.0 weak; F 2.0-3.5, mode 2.5 weak). The assemblage was primarily eurytopic occupation-site decomposer taxa, a human flea (<i>Pulex irritans</i> Linnaeus) and some 'natural habitats' species. Bark beetles were also noted.</p>	Record, preferably with an additional subsample for insects. PIB
86018/ 86387	Fill in Pit 64981	231	<p>Very dark grey, moist, crumbly (and rather soft), humic sandy silt.</p> <p>The large washover of about 1000 cm<sup>3</sup> consisted of organic debris including some undisaggregated sediment, of which some were clasts of very compressed, very decayed fine-strawy debris, often spotted with fungal sclerotia. There was also some bark (to 50</p>	Record plants and insects, preferably with an additional subsample for insects. PIB

Context/ Intrasis Sample	Context type	SN	Assessment notes	Further action?
			<p>mm). Identifiable plant remains were moderately common, the more abundant being ?tormentil (<i>Potentilla</i> cf. <i>erecta</i> (L.) Rauschel), celery-leaved crowfoot (<i>Ranunculus sceleratus</i> L.) and stinging nettle, with a range of other taxa including possible food/flavouring plants— hazel nut, strawberry (<i>Fragaria</i> cf. <i>vesca</i> L.), barley (<i>Hordeum</i> sp(p).), blackberry and (as a single fragment) hop. Traces of taxa which might have arrived in hay or grassland turves were also present. The modest-sized residue of about 325 cm<sup>3</sup> was of sand, grit and gravel (to 50 mm).</p> <p>The small flot contained modest numbers of variably-preserved, often rather reddened, insects (E 2.0-4.0, mode 2.5 weak; F 2.0-3.5, mode 2.5 weak; trend to red-brown 1-3, mode 2 weak). There were occupation-site decomposers, probably from material which was a little foul, some plant feeders, and a bark beetle.</p>	
86018/ 87731	Fill in Pit 64981	251	<p>Very dark grey moist, crumbly, somewhat laminated humic silty sand with wood fragments and stones.</p> <p>There was a large washover of about 800 cm<sup>3</sup> of woody debris, including wood (to 25 mm), bark (to 35 mm), a few twig fragments and much finer material. Preservation was generally poorer than in 230 and 231, for example, though there were some moss shoots retaining a greenish colour. Some quite large and well-preserved hazel nutshell fragments were noted, though none bore the characteristic apical knife marks seen from material of Anglo-Scandinavian age at 16-22 Coppergate, York (Kenward and Hall 1995) or in Bergen (Krzywinski <i>et al.</i> 1983).</p> <p>Plants likely to have been useful to the inhabitants of the settlement were rather well represented in this subsample, with abundant and mostly well-preserved achenes of hop, as well as fragmentary ‘seeds’ of hemp (<i>Cannabis sativa</i> L.), and seeds of flax (<i>Linum usitatissimum</i> L.). The remainder of the assemblage largely comprised weeds and taxa of damp ground, including disturbed damp habitats, together with some debris from trees, including birch (<i>Betula</i>), oak and poplar/aspens (<i>Populus</i>) and some woodland/heathland mosses. The modest-sized residue of about 450 cm<sup>3</sup> was of sand, grit and gravel (to 40 mm).</p>	Record, preferably with an additional subsample for insects. PIB

Context/ Intrasis Sample	Context type	SN	Assessment notes	Further action?
			<p>The rather large flot consisted of fine woody plant debris. There were moderately large numbers of insects, with varied preservation from quite good to poor (E 2.0-4.0, mode 3.0 weak; F 2.0-3.5, mode 2.5 weak; trend to pale 0-3, mode 2 weak). The fauna was ecologically mixed, with a clear 'outdoor' component as well as occupation-site taxa and perhaps a 'house fauna'.</p>	
86018/ 87732	Basal fill in Pit 64981, pressed into clay	253	<p>Very dark grey, moist, crumbly humic sandy silt with some wood fragments.</p> <p>The large washover of about 850 cm<sup>3</sup> was of organic debris, including twig fragments and other woody debris, perhaps 'cleaner' and less fine-strawy than 230 or 231, though there were a few coarser fragments of ?monocot culm. The material was also rather better preserved, generally, than for the previous samples in this sequence and some material was noted as being 'well preserved. A wide range of taxa was observed. There were again modest amounts of hemp 'seeds', all fragmentary and many and well-preserved hop achenes (some with bract remains present). Traces of woad (<i>Isatis tinctoria</i> L.) pod and flax seed were also noted. There was perhaps some food debris and taxa from hay or other cut grassland vegetation, and hints of material from bog or fen habitats. The modest-sized residue of about 450 cm<sup>3</sup> consisted of sand, grit and gravel (to 45 mm).</p> <p>The rather large flot was mostly woody plant debris. There were modest numbers of insects, preservation being recorded as good to fair (E 1.503.5, mode 2.5 weak; F 1.0-3.5, mode 2.0 weak; trend to pale 1-3, mode 2 weak). A clear dead wood component was present, including three bark beetle (Scolytidae) species. Also noted were dung beetles (<i>Aphodius</i> spp.), but this was primarily an occupation-site fauna (including several spider beetles, <i>Ptinus</i>) but also some plant feeders.</p>	Record, preferably with an additional subsample for insects. PIA
65189/ 87792	Fill in Pit 64981	255	<p>Moist light to mid grey plastic clay in a matrix of more or less black crumbly ?humic sand.</p> <p>The small washover of about 150 cm<sup>3</sup> consisted primarily of fine-grained charred</p>	NFA

Context/ Intrasis Sample	Context type	SN	Assessment notes	Further action?
			<p>material (with modest amounts of charcoal to 20 mm), some undisaggregated sediment, and moderate numbers of rather poorly preserved toad rush (<i>Juncus bufonius</i> L.) and raspberry (<i>Rubus idaeus</i> L.) seeds, with some very decayed wood fragments (to 5 mm). The few other charred and uncharred plant remains present provided little further interpretative information. The large residue of about 700 cm<sup>3</sup> was of sand, with some gravel (to 50 mm) and grit.</p> <p>There was a minute flot, containing only traces of well-decayed insects (E 4.5; F 4.0; trend to orange 3). Only very few of the remains were identifiable.</p>	
87793/ 87806	Fill in Pit 64981	256	<p>Very dark grey, moist, unconsolidated stony coarse sand with a little very decayed humic material (perhaps mainly wood).</p> <p>The small washover of about 175 cm<sup>3</sup> was of very decayed wood (to 35 mm) and other organic detritus; there were rather few seeds and these were mostly rather worn and decayed. Only stinging nettle (<i>Urtica dioica</i> L.) was present in more than trace amounts, but the assemblage overall included a variety of taxa probably representing damp to better-drained disturbed ground (and with small food/flavouring component of hazel, blackberry, raspberry, and also hop, <i>Humulus lupulus</i> L.). The large residue of about 750 cm<sup>3</sup> was of sand, grit and gravel (to 30 mm).</p> <p>The flot was minute, with small numbers of variably preserved beetles (E 2.0-4.5, mode 4.0 weak; F 2.0-4.0, mode 2.5 weak).</p>	<p>The insect material is perhaps worth recording (if only to examine apparent differential decay). P2</p> <p>Plants: probably NFA.</p>
<b>PHASE 3</b>				
<b>PLOT 3</b>				
47045/ 62139	Layer in hearth in Plot 3	10	<p>Mid grey-brown, dry, crumbly, silty ash with some more or less orange brown patches of clay or ?burnt soil.</p> <p>The very small washover was of charred material: about 40 cm<sup>3</sup> of ash-coated charcoal (to 10 mm). The large residue of about 725 cm<sup>3</sup> was of sand, grit and gravel (to 30 mm). No insect remains were observed.</p>	NFA



Context/ Intrasis Sample	Context type	SN	Assessment notes	Further action?
<b>PHASE 4</b>				
<b>PLOT 3</b>				
87669/ 87679	Fill in Pit 43852	254	<p>Very dark grey, moist, silty sandy grit.</p> <p>There was a large washover of about 400 cm<sup>3</sup> of mainly fine organic debris with some granular woody fragments (to 15 mm), mostly rather decayed wood (though including some small flaky fragments of conifer wood that were quite well preserved, and which might have been thin 'chips'). There was also some charcoal (to 20 mm), undisaggregated sediment (with a surprising degree of coherence, containing mainly fine woody fragments and a little silt). A modest range of identifiable plant remains was present, preservation often quite to very good (e.g. <i>Rubus</i> seed and most of the spike-rush (<i>Eleocharis palustris</i> s.l.) nutlets), sometimes poor (?bulrush, <i>Scirpus ?lacustris</i> L.); there were several tens of seeds per kg, the assemblage having a notable component of taxa from woody vegetation (four kinds of buds/bud-scales) but otherwise quite a broad mixture ecologically and with no one group dominating. There was a large residue of about 350 cm<sup>3</sup> of sand, grit and gravel (to 50 mm) with some slight concretion on mineral clasts or groups of clasts (which might be ?iron-rich material from the matrix or sediment, rather than faecal in origin).</p> <p>There was a small flot, with modest numbers of variably preserved insects (E 2.5-4.5, mode 3.5 weak; F 2.0-4.0, mode 2.5 weak; trend to pale/orange 1-4, mode 2 weak). There were numerous water flea (<i>Daphnia</i>) resting eggs (ephippia, ?imported), and typical occupation-site taxa, but the most notable feature was the presence of numerous <i>Omosita colon</i> (which live in various habitats, but especially in old bones).</p>	Record, preferably using an additional subsample of 3 kg for insects. P1A.
61411/ 87216	Fill in Pit 43852	237	<p>Jumbled dark olive brown to mid yellowish brown to dark grey to black, moist, crumbly slightly silty sand, perhaps somewhat layered.</p> <p>There was a small washover of about 100 cm<sup>3</sup> of mainly charred material (including charcoal to 10 mm), plus a very little uncharred organic debris. There were modest numbers of charred goosegrass (<i>Galium aparine</i> L.) fruits but no other identifiable plant</p>	NFA

Context/ Intrasis Sample	Context type	SN	Assessment notes	Further action?
			taxa. The large residue of about 475 cm <sup>3</sup> was of sand, grit and gravel (to 50 mm), plus modest amounts of burnt bone (to 50 mm) and baked clay/daub (to 40 mm). No insect remains were observed.	
87427/ 87447	Fill in Pit 43852	243	<p>Very dark grey to grey-brown, moist, crumbly to more or less plastic humic silty sand, locally humic silt.</p> <p>The small to moderate-sized washover of about 150 cm<sup>3</sup> was of extremely well decayed, mostly fine woody and herbaceous detritus, not initially too well cleaned. The modest-sized residue of about 300 cm<sup>3</sup> consisted of sand, grit and gravel (to 35 mm) with one large (to 60 mm) fragment of slag. There were small numbers of mostly rather poorly preserved uncharred plant remains representing a range of taxa of limited interpretative value.</p> <p>The minute flot contained only traces of well-decayed beetles (E 4; F 2.5-50, mode 3 weak).</p>	NFA
87626/ 87649	Fill in Pit 43852	247	<p>Very dark grey, moist, crumbly to more or less plastic silty clay sand to sandy clay silt with stones and much grit.</p> <p>The modest-sized washover of about 275 cm<sup>3</sup> was mostly rather fine granular woody organics, mainly wood (to 15 mm) and charcoal (to 20 mm). The rather large residue of about 500 cm<sup>3</sup> was of sand, grit and gravel (to 50 mm).</p> <p>There was a fairly small flot, with abundant <i>Daphnia</i> and a small but unusual group of insects with variable, often poor, preservation (E 2.5-4.5, mode 3.5 weak; F 2.5-4.0, mode 3.0 weak; trend to pale 1-3, mode 2 weak). Traces of plant feeders were noted, but this was mainly an occupation-site fauna, with several <i>Ptinus ?fur</i> (Linnaeus) and at least three <i>Omosita colon</i> (Linnaeus).</p>	Record, preferably using an additional subsample of up to 5 kg for insects. P1A.
88226/ 88241	Fill in Pit 43852	257	Very dark grey to black, moist, crumbly to more or less plastic, gritty sandy silt to silty sand, ?somewhat humic; stones to 40 mm.	Record, preferably using an additional subsample of 3 kg for

Context/ Intrasis Sample	Context type	SN	Assessment notes	Further action?
			<p>sand, ?somewhat humic; stones to 40 mm.</p> <p>The large washover of about 425 cm<sup>3</sup> comprised woody organic material, including much bark (to 25 mm) and wood (to 15 mm); preservation was mostly good. There was a wide range of identifiable taxa including weeds, plants of wetland and woodland habitats. Possible food remains were hazel and blackberry, and there was a single charred barley grain. The large residue of about 450 cm<sup>3</sup> was mainly sand, grit and gravel (to 10 mm) with some fish bone (to 15 mm).</p> <p>The small flot contained quite a lot of insects, with variable, often poor, preservation (E 2.5-4.5, mode 3.5 weak; F 2.0-4.5, mode 3.5 weak; trend to pale 1-4, mode 3, weak). Occupation-site decomposers, including several <i>Omosita colon</i>, were noted, along with a human flea (<i>Pulex irritans</i>). There were also numerous <i>Daphnia ephippia</i> (?imported with water).</p>	insects. P1A.
<b>NO PHASE OR PLOT ASSIGNED</b>				
94901/ 94864	pit fill	289	<p>Moist, dark grey, very gritty but somewhat plastic stony clay sand with some waterlogged wood to 50mm, gravel to 100 mm, locally more clayey or sandy (some pellets of more or less pure clay).</p> <p>The small washover of about 180 cm<sup>3</sup> consisted of mainly woody organics—very decayed wood (to 35 mm) and some herbaceous detritus, including fine roots which appear to be ancient. There were rather few and rather worn seeds, mostly probably from weed taxa. The large residue of about 625 cm<sup>3</sup> comprised sand, grit and gravel (to 35 mm). The very small flot contained with only traces of rather orange cuticle (E 5.5; F 5.0; trend to orange 4.0).</p>	NFA

Table 2. Plant remains and other components of the washovers from 52 selected BS samples. Data are presented by phase and plot where these are known. The term ‘charred organic material’ is used for the fragments of resin-like material with a characteristic ‘sunken-pustular’ surface, and ‘fuel plant ash’ for whitish beads and amorphous material thought to originate in the burning of plant materials. ‘+’ and ‘++’ represent the first two points on the semi-quantitative four-point scale of abundance used to record this material.

Phase	Plot	Intrasis sample	Context	Sample	Charcoal: abundance	Charcoal: maximum dimension (mm)	<i>Hordeum</i> grains	Other plant and non-plant components (charred and recorded at an abundance of ‘1’ (‘trace’) unless otherwise indicated)
1	2	75134	75001	132	++	25		<i>Carex</i> ; plant fuel ash
		75215	75167	134	++	10	+	plant fuel ash
		75679	75579	140	+	15		plant fuel ash
		76884	76555	153	++	15		<i>Carex</i> , <i>Galium aparine</i> ; unburnt fish bone, plant fuel ash
		78680	78587	174	++	15		plant fuel ash
		79086	71826	182	++	15	+	cf. <i>Linum usitatissimum</i> ; unburnt bark, unburnt cancellous bone and fish bone, plant fuel ash
		88581	87926	260	++	15		<i>Cenococcum</i> (sclerotia), <i>Chenopodium album</i> ; unburnt bark, charred organic material, plant fuel ash
2	1	62377	61670	21	+	15	+	Gramineae, <i>Stellaria media</i> ; unburnt bark, unburnt bone, plant fuel ash
		63190	61643	25	+	10		bark; herbaceous detritus
		64667	64612	48	++	10		<i>Triticum/Hordeum</i> ; plant fuel ash
2	2	69307	69242	92	+	10		<i>Carex</i> , <i>Chenopodium album</i> , <i>Potentilla</i> cf. <i>erecta</i> ; plant fuel ash (++)
		74111	74037	118	++	25		<i>Carex</i> , <i>Potentilla</i> cf. <i>erecta</i> , <i>Scirpus lacustris</i> sl, <i>Stellaria media</i> , <i>S. palustris/graminea</i> ; uncharred bark, plant fuel ash (++)
2	3	73307	70602	114	++	15	+	charred organic material, plant fuel ash
		78273	73520	164	++	15	+	<i>Carex</i> , <i>Chenopodium album</i> , <i>Galium</i> , <i>Polygonum hydropiper</i> , cf. <i>Triticum</i> ; bark, charred organic material, plant fuel ash
		78456	78393	170	+	10	+	<i>Carex</i> , cf. <i>Secale cereale</i> , cf. <i>Triticum</i> ; charred organic material, plant fuel ash

Phase	Plot	Intrasis sample	Context	Sample	Charcoal: abundance	Charcoal: maximum dimension (mm)	<i>Hordeum</i> grains	Other plant and non-plant components (charred and recorded at an abundance of '1' ('trace') unless otherwise indicated)
		82229	81762	203	++	15		<i>Rubus fruticosus</i> agg.
		82311	82178	209	++	15		plant fuel ash
		82619	82362	205	+	15	+	charred organic material, plant fuel ash
		83825	83319	218	+	10	++	<i>Atriplex, Avena, Carex, Chenopodium album, Galium, Polygonum persicaria</i> , cf. <i>Secale cereale</i> ; unburnt bark and cancellous bone, charred organic material (++), herbaceous detritus, plant fuel ash
		84672	84296	221	++	15	+	<i>Carex</i> ; plant fuel ash
		84895	84844	225	+	10		
		84937	84615	224	+	15	+	<i>Carex</i> ; plant fuel ash
		86599	85299	239	++	10	+	<i>Chenopodium album, Galium aparine</i> ; unburnt bark
		87318	86485	242	+	15		<i>Cenococcum</i> (sclerotia), plant fuel ash
		87783	83246	252	+	10	+	<i>Carex, Polygonum persicaria</i> ; unburnt bone, burnt fish bone, plant fuel ash
3	1	84730	84282	223	+	25		cf. <i>Secale cereale</i> ; charred organic material, unburnt fish bone
3	2	61410	61359	4	++	15		<i>Carex</i> ; bone (burnt and unburnt), plant fuel ash
		64550	64458	43	++	15	+	<i>Carex</i> (++) , <i>Chenopodium album</i> , Gramineae, <i>Rumex</i> ; bark, bone, plant fuel ash
3	3	63610	62023	30	++	15	+	<i>Avena, Rosa</i> ; bark, charred organic material
		66007	65597	60	++	30		
		66061	65556	59	+	15	+	<i>Carex, Polygonum persicaria, Stellaria media</i>
		68753	68717	86	++	30	+	<i>Carex, Chenopodium album, Galium aparine</i> ; charred organic material, plant fuel ash
		69558	68986	94	+	25	+	
		71214	67217	103	++	30	+	<i>Carex</i> ; charred organic material

Phase	Plot	Intrasis sample	Context	Sample	Charcoal: abundance	Charcoal: maximum dimension (mm)	<i>Hordeum</i> grains	Other plant and non-plant components (charred and recorded at an abundance of '1' ('trace') unless otherwise indicated)
		71949	70696	108	+	15		<i>Carex</i> , Chenopodiaceae, <i>Eleocharis palustris</i> sl; charred organic material, plant fuel ash
		74138	74121	125	+	5		Cerealia indet.; plant fuel ash
		74292	74188	126	++	30	+	bark, plant fuel ash
		75820	75751	146	+	20	+	<i>Bilderdykia convolvulus</i> , <i>Carex</i> , cf. <i>Eleocharis</i> sp., <i>Secale cereale</i> ; charred organic material, plant fuel ash
		77600	76697	158	++	25	+	uncharred bark, plant fuel ash
		78003	76661	159	++	20	+	<i>Carex</i> , Gramineae, <i>Plantago media</i> , <i>Ranunculus</i> Section <i>Ranunculus</i> , <i>R. flammula</i> , cf. <i>Triticum</i> ; plant fuel ash
		78139	77759	162	++	10	+	<i>Carex</i> , <i>Eleocharis palustris</i> sl, <i>Viola</i> ; plant fuel ash, twig fragments
		78141	76910	157	++	20	+	bark
		78274	77718	166	++	15	+	<i>Carex</i> , <i>Chenopodium album</i> , <i>Potentilla</i> cf. <i>erecta</i> ; unburnt bone
		78572	78497	173	++	20	+	<i>Carex</i> , <i>Potentilla</i> cf. <i>erecta</i> ; plant fuel ash
4	3	83550	61237	210	+	10		<i>Carex</i> , <i>Galium aparine</i> ; charred organic material, fuel plant ash
<b>Unphased</b>								
-	3	74003	73950	117	++	20		<i>Chenopodium album</i> , uncharred <i>Rubus idaeus</i>
		78142	75901	150	+	15	+	<i>Carex</i> ; plant fuel ash
		78190	78143	165	+	10	+	<i>Carex</i> ; charred organic material, plant fuel ash
		78495	78457	171	+	10	+	<i>Galium aparine</i> , <i>Polygonum persicaria</i> , cf. <i>Secale cereale</i> ; unburnt bone, charred organic material (++) , plant fuel ash
		78570	78522	172	+	25	+	<i>Carex</i> , <i>Chenopodium album</i> , <i>Galeopsis</i> Subgenus <i>Ladanum</i> , <i>Polygonum lapathifolium</i> , <i>Spergula arvensis</i> ; charred organic material
		91136	90609	282	+	10	++	<i>Secale cereale</i> ; charred organic material, unburnt fish bone, plant fuel ash

Table 3. Wood samples from excavations at Kaupang 2003 (listed in Intrasis sample order).

Context/ Intrasis sample	Sample	Identification and notes
88220/ 88152	261	A few fragments of soft wood (to 20 mm) in a matrix of very wet and unconsolidated grey sandy clay; wood identified as willow/poplar/aspens, <i>Salix/Populus</i> sp(p).
88221/ 88153	262	Stake tip in three fragments (to 90mm); probably willow, cf. <i>Salix</i> sp(p).
88222/ 88154	263	Stake fragments to 85 mm, somewhat soft; cf. <i>Salix</i> sp(p).
88223/ 88155	264	Stake point, very soft, to 130 mm; cf. <i>Salix</i> sp(p).
88589/ 88156	265	A small (to 45 mm) fragment of wood, too soft to section, but could well be ? <i>Salix</i> as per other tentative identifications in this group.
88224/ 88157	266	Sample consisted of grey silty clay with a few fragments of brown, concreted material (to 30 mm), rich in grit; a trace of wood fragments to 15 mm, too soft to identify easily.
88225/ 88158	267	Small fragments (to 50 mm) of soft wood in clay, too soft to identify easily.
88660/?	268	Very soft stake remains (to 110 mm), probably <i>Salix</i> sp(p).
99879/?	-	There was a small fragment of ?bark which was, indeed, tree bark. A separate large bag contained chunks of wood to about 160 mm, apparently all oak ( <i>Quercus</i> ), to judge from a subsample; one block with a rectangular section exhibited clear axe/adze cut marks on the cut end and was in good condition, some other fragments being very soft and strongly eroded. The matrix contained some 'grassy' monocot rhizome fragments and celery-leaved crowfoot seeds as seen in the GBA sample from this pit (PG99948).