

**Assessment of biological remains from excavations at a site to the rear of
26 Market Place, Bedale, North Yorkshire (site code: BED03)**

by

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Summary

Two pairs of parallel column samples through mesolithic deposits in two sections (17 and 18) and two bulk sediment samples from medieval ditch fills, revealed by excavations at a site to the rear of 26 Market Place, Bedale, North Yorkshire, were submitted to PRS for an assessment of their palaeoecological/bioarchaeological potential.

The column samples showed the deposits to be either organic silts (muds) or detritus peats of early Holocene/mesolithic date. The pollen spectra from both Sections 17 and 18 record early Holocene vegetation changes, but there are good grounds to believe that Section 17 reflects a slightly earlier phase of landscape development (perhaps back into the Late-glacial). All of the plant and insect assemblages indicated aquatic deposition, though in some cases in swamp rather than open water; the sequence of insect assemblages from Section 18 seems to show a hydroseral succession from open water to swamp; an impression strongly supported by the pollen.

More detailed pollen analyses of both sequences, in conjunction with further study of the plant and invertebrate macrofossils, and supported by radiocarbon dating of the Section 17 deposits, is highly desirable. This would provide further information regarding the timing and nature of early Holocene vegetation changes and give more detail regarding the ecological conditions in and around the mesolithic lake/swamp and of the processes of terrestrialisation.

The plant and invertebrate remains from the medieval ditch fills indicated that these features held water. In one case (Context 139), some evidence of human activity was suggested, namely flax retting. Additional information regarding local land use and the immediate environment would almost certainly be forthcoming from detailed study of the remains (particularly of insects) from larger subsamples.

KEYWORDS: 26 MARKET PLACE; BEDALE; NORTH YORKSHIRE; ASSESSMENT; ?LATE-GLACIAL; MESOLITHIC; EARLY HOLOCENE; PREHISTORIC; MEDIEVAL; PLANT REMAINS; POLLEN; CHARRED PLANT REMAINS; CHARRED GRAIN; PEAT; INVERTEBRATE REMAINS; HYDROSERAL SUCCESSION; FLAX RETTING

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Introduction

An archaeological excavation was carried out by Pre-Construct Archaeology Ltd (Northern Office) (PCAN) at a site to the rear of 26 Market Place, Bedale, North Yorkshire (NGR SE 265 881), in 2003.

A previous field evaluation, undertaken by PCAN in 2002, revealed evidence relating to medieval, post-medieval and modern occupation of the site. In addition, an accumulation of peat material was encountered across the central portion of the site, suggesting the presence of a localised area of ancient wetland. An assessment study of the pollen indicated an early Holocene, broadly mesolithic, origin for the peat and this was confirmed by radiocarbon dating. In evaluation Trench 2, a deep sequence of alluvial silts, overlain by a peat formation, was recorded. These deposits were associated with the prehistoric wetland area.

The current excavation was undertaken to identify the full extent of the ancient wetland area, examine any possible evidence of anthropogenic activity at its margins and to recover further material (through bulk sampling) to characterise the ancient environment and gain absolute dates for organic accumulations.

Four column samples (two parallel columns in each of two sections) and six related sediment samples for radiocarbon dating, together with two bulk sediment samples ('GBA'/'BS' *sensu* Dobney *et al.* 1992) from medieval ditches, were recovered from the deposits and submitted to PRS for an evaluation of their palaeoecological/bioarchaeological potential.

Methods

The samples were inspected in the laboratory and their lithologies recorded. For the column samples the deposits were recorded following the sediment classification system of Troels-Smith (1955), together with a brief written description. The bulk samples were described using a standard *pro forma*.

Subsamples for pollen and diatom preparation were extracted from each sequence (Column Samples 1 and 4) depending on the stratigraphy. Pollen samples were concentrated on sediment with the highest apparent organic content, whilst diatom samples were taken from silt and clay rich segments of the monoliths.

A total of nine subsamples for pollen analysis were taken from Section 17—four from the peat layer (Context 158) at intervals of 0.04 m and five from the laminated organic silts (Contexts 159-168) at intervals of 0.16 m. Four diatom samples were taken from the laminated organic silts (at 0.54 m, 0.74 m, 0.88 m and 1.08 m; Contexts 159-168).

A total of 15 subsamples for pollen analysis were taken from Section 18. Ten of these were from the peat layer (Contexts 71, 171, 172, 173) at 0.08 m intervals and five from the laminated organic silts (Context 176) at 0.16 m intervals. Four subsamples for diatom analysis were taken from the laminated organic silts (at 1.02 m, 1.22 m, 1.29 m and 1.49 m; Context 176).

Pollen and diatom preparations followed standard procedures (Moore *et al.* 1991 for pollen; Batterbee *et al.* 2001 for diatoms). At least 125 total land pollen grains (TLP) excluding aquatics and spores were counted for each sample where possible. Pollen nomenclature follows Moore *et al.* (1991),

with the modifications suggested by Bennett *et al.* (1994). The pollen sum is based on percentage of TLP excluding obligate aquatics and spores. Percentages for these excluded groups are calculated as percentage of the basic sum plus sum of the relevant group.

Two of the columns (Column Sample 2 from Section 17 and Column Sample 3 from Section 18) were divided into subsamples according to the excavators' allocated contexts. Eleven of these, and 3 kg subsamples of each of the bulk samples, were processed following the procedures of Kenward *et al.* (1980; 1986), for the recovery of plant and invertebrate macrofossils. As the corresponding pair of columns (those subsampled for pollen and diatoms) remain largely intact, an approximately equal amount of sediment to that processed for this assessment remains for each deposit.

Plant remains were examined from a series of sieved samples during examination for material suitable for dating by AMS. In addition the two bulk samples (from medieval ditch fills) were investigated via a residue, washover and flot from paraffin flotation, in one case, and residue and flot in the other. Plant remains (and the general nature of the residues, flots and washovers) were recorded briefly by 'scanning' taxa and other components being listed directly to a PC using *Paradox* software. Notes on the quantity and quality of preservation were made for each fraction.

Insects in the flots were recorded using 'assessment recording' *sensu* Kenward (1992), creating a list of the taxa observed during rapid inspection of the flot, with a semi-quantitative estimate of abundance, and a subjective record of the main ecological groups. A record of the preservational condition of the remains was made using scales given by Kenward and Large (1998). This scheme provides scales for chemical erosion and fragmentation (0.5-5.5, the higher figure representing the greatest degree of damage), and colour change (0-4), in each case giving a range and a value for the

position and strength of the mode (Kenward and Large 1998, tables 2, 3 and 5-7).

For three of the deposits requiring radiocarbon dating plant macrofossils (for dating via AMS) were recovered from the processed subsamples prior to the application of paraffin flotation. A fourth deposit (Section 17, Context 158) did not yield suitable remains for AMS dating to be attempted and, in view of the macrofossils recovered, it was thought that processing additional material from the dedicated dating sample (Sample 7) would be similarly unproductive. After consultation with the excavator, it was decided to submit plant remains recovered from the base of Column Sample 3 (Section 18, Context 176, 0.0 to 9.0 cm in monolith tin D) for dating in place of material from Context 158 (Section 17)—thus providing an earliest date for the longer of the two sequences. Two of the subsamples extracted from Column Sample 3 (from Contexts 71 and 172) were not processed for assessment as they appeared of very similar composition to those above, and above and below, respectively, in the sequence. For these, 5 cm slivers of raw sediment (from 1 to 6 cm from the lowest point of each deposit) were sent for dating. After pre-treatment, Context 172 gave 1.6 g of organic remains which were dated by AMS. Context 71 gave rather more organic material (7.4 g) and radiometric dating with extended counting was employed.

All of the material for radiocarbon dating was submitted to Beta Analytic Inc. (Miami, Florida).

Results

Radiocarbon dates

The radiocarbon dates reported here confirmed and refined the results for the deposits in Section 18 ranging from cal BC 7970 to 6050 (the earliest peat layers being dated to cal BC 7040 to 6670). The individual

results from radiocarbon dating of the selected deposits are summarised in Table 1.

Column samples

The results for the lacustrine and peat deposits from the main trench are presented by Section.

For the subsamples for plant and invertebrate macrofossils the uppermost contexts are considered first in each case. These subsamples varied considerably in size depending upon the thickness of the deposit. Dates quoted in the text sections following refer to the conventional radiocarbon age obtained.

SECTION 18 – COLUMN SAMPLES 3 AND 4

Pollen and diatoms

No diatoms were present in the samples. This may be a result of the acid environment causing dissolution of the silica based frustules. The presence of copulae (girdle bands connecting the diatom frustules) in some samples indicated that diatoms were once present, but it is difficult to draw further conclusions based on this evidence alone. Further information regarding preservation and taphonomic processes may be found in Lowe and Walker (1998, p. 177) or Batterbee (1986).

The results of the pollen analyses are presented as a percentage pollen diagram (Figure 1). With the exception of the samples from 0.21 m and 0.45 m, all the samples assessed contained high to moderate concentrations of pollen. Pollen concentrations in the samples from 0.21 m and 0.45 m were too low to permit adequate counts. Preservation was assessed as good to moderate for the samples from this sequence.

The radiocarbon dates indicated that sediment accumulation began at 8770 \pm 40 BP (Beta-187370). The basal section of the diagram (1.65-1.01 m) corresponding to the laminated organic silts, was characterised by high percentages of *Corylus avellana*-type (hazel-type, 70-80%). Other trees and shrubs were recorded at lower percentages, with *Betula* (birch) up to 15% and *Ulmus* (elm) up to 8%. Lower values for *Quercus* (oak, 5% maximum) and *Pinus sylvestris* L. (Scots pine, 5% maximum) were also recorded. Little herbaceous pollen was present. Following the transition to peat at around 0.95 m, which was dated to 7940 \pm 40 BP (Beta-187369), there was a marked change in the pollen spectra with Cyperaceae (sedges) increasing markedly to around 90% and *Corylus avellana*-type

initially reduced to approximately 5%. *Quercus* increased slightly initially and values for *Pinus sylvestris* were also enhanced and there was a significant increase in Pteropsida (monoete) indet. to 80% TLP+spores. A peak in *Betula* of approximately 50% at 0.37-0.29 m shortly after 7490 \pm 60 BP (Beta-187366) was associated with the beginning of a decline in Cyperaceae and a reduction in *Pinus sylvestris*. However, by the close of the diagram, and just after a date of 7290 \pm 40 BP (Beta-187365), the situation was reversed, with *Pinus sylvestris* peaking at 40% and *Betula* reduced to 10%. The proportion of *Alnus glutinosa* (L.) Gaertner (alder) also rose to 10% by the top of the diagram.

The Section 18 sequence reflects early Holocene vegetation changes. The basal segment of the diagram records hazel dominated wood/scrub land, with some birch probably also present locally. Other trees including oak and elm were perhaps growing either as subordinate components of the local arboreal cover or at some distance from the site in extra-local contexts. The low percentages of herbaceous pollen indicate that the woodland was fairly dense with few open areas. The sizeable increase in Cyperaceae above 0.77 m is closely associated with a change in the stratigraphy from organic silt to peat and suggests that following basin infill, sedge communities became established on the sampling site. Likewise, the marked rise in Pteropsida (monoete) indet. must reflect the local expansion of ferns. Hazel woodland probably remained dominant in the wider landscape, with the reduction in representation of this pollen type largely a result of its suppression by the abundance of Cyperaceae. The increase in pine is most likely a reflection of the increased local availability of suitable conditions for this tree as a result of peat growth.

The steady reduction in Cyperaceae and rise in *Betula* above 0.53 m is probably a reflection of successional processes, with the continued accumulation of peat at the site leading to a slightly drier substrate suitable for birch growth at the expense of sedge communities. By the close of the diagram, similar processes connected to changes in soils on and around the site, and resulting from peat accumulation, probably account for the fall in *Betula* and peak in *Pinus sylvestris*. During this period there is little evidence for changes in the extent of the other arboreal taxa, although the rise in *Alnus glutinosa* at the top of the diagram may be connected to the beginning of the local expansion of this tree.

Plant and invertebrate macrofossils

Context 67 [Tin A: 18.0 to 50.0 cm]

Sample 311/T (1.75 kg sieved to 300 microns with paraffin flotation)

Dark brown, crumbly, woody detritus. Troels-Smith: D12Dh/Dg2.

The large residue of about 120 cm³ was of granular woody detritus, including some largish wood fragments (they were very crumbly; it was impossible to check their identification using hand-cut thin-sections). There were also some small, squarish, shiny bark fragments which were selected for dating. The large fine fraction was essentially undisaggregated amorphous peaty matrix with wood and bark fragments and a few rootlets. The only identifiable remains were traces of birch (*Betula*) fruits.

The flot was small, with rather few insects and a few mites and cladocerans. While most of the insects would have exploited swamp with pools, there was a tiny fragment from a single wood-boring beetle (probably *Grynobius planus* (Fabricius)), perhaps a pointer to the development of trees locally. A much larger subsample would probably give an assemblage of insects just large enough to be informative.

Context 171 [Tin B: 20.0 to 32.0 cm]

Sample 309/T (0.7 kg sieved to 300 microns with paraffin flotation)

Dark brown, rather crumbly, mix of mud and fine detritus. Troels-Smith: Ld3Dg/Dh1.

There was a large residue of about 375 cm³ of woody and herbaceous detritus, mostly very fine roots (presumably ancient) and monocotyledonous stem/leaf fragments, with some wood fragments to 10 mm (all rather poorly decayed and perhaps largely comprising roots rather than twigs or stem wood). The large fine fraction was remarkably free of identifiable remains, apart from a few poorly preserved birch fruits.

The small flot included only modest numbers of insect remains, which were often badly preserved, fragmented and pale (E 2.5-4.5, mode 3.0 weak; F 2.0-5.5, mode 3.5 weak). There were some aquatics (both beetles and a few cladocerans), but this was probably the fauna of swamp with pools. No 'dry land' (as opposed to marsh) species were recorded. A larger subsample would give a useful assemblage in the context of a stratigraphic series.

Context 173 [Tin B: 0.0 to 8.0 cm; Tin C: 38.0 to 48.0 cm]

Sample 307/T (1.35 kg sieved to 300 microns with paraffin flotation)

Mid to dark brown (somewhat 'banded'), mix of mud and fine detritus. Troels-Smith: Ld4?Dg+.

The very large residue of about 1300 cm³ consisted of herbaceous detritus rich in fine rootlets, with some small woody fragments, and frequent sedge (*Carex*) nutlets (with more in the flot). Other well-preserved identifiable remains included some fragments of hazel (*Corylus avellana* L.) nutshell and remains of other woody taxa (birch female catkin-scales, with traces of fruits and buds/bud-scales and oak (*Quercus*) bud/bud-scales) and a little moss (some identified as *Hypnum* cf. *cupressiforme* Hedw.). Traces of fern shoots (small emerging fronds, perhaps a species such as marsh fern, *Thelypteris palustris* Schott) and fern tracheids were also noted. One whole hazelnut recovered from this samples showed evidence of rodent gnawing.

The flot was notable for its large proportion of seeds. Insect remains were numerous but variably preserved and mostly pale (E 2.5-4.5, mode 3.5 weak; F 1.5-4.0, mode 2.5 weak; trend to pale 1-4, mode 3 distinct). There were quite large numbers of aquatics, but a 'swamp' fauna was well represented, and deposition must have been at the water's edge, or in pools. A notable record was of fragments of what appeared to be the frog hopper *Aphrophora major* Uhler, typically found on *Myrica gale* L., supporting the inference of swamp. All of the terrestrial fauna, including a range of both beetles and bugs, may have exploited moss and litter in a swamp. A larger subsample would provide a useful group of insect remains capable of giving a detailed reconstruction of local conditions, although very careful processing would be needed to try to avoid fragmenting the fossils further, and identification would be time-consuming.

Context 174 [Tin C: 36.0 to 38.0 cm]

Sample 306/T (0.2 kg sieved to 300 microns with paraffin flotation)

Mid to dark brown, 'moss-rich' detritus. Troels-Smith: Dh4.

This very small sample, representing a thin layer, yielded a huge residue of about 1200 cm³ of fine herbaceous detritus which proved to be a mass of matted fine moss (*Drepanocladus*) fragments, pale and rather decayed, with some fine roots, and some well-preserved birch fruits. Sedge nutlets were frequent, but no other identifiable plant remains were noted.

The flot, which was large in relation to the amount of sediment processed, consisted mostly of fragments of moss (*Drepanocladus*) shoots. Insect remains were not abundant and their preservation variable (E 1.5-3.0, mode 2.5 weak; F 2.0-4.0, mode 3.0 weak). Although aquatics were present (there were no crustaceans,

however), the overall impression was, again, of a swamp fauna. A subsample of 3 to 5 kg would be needed to provide a useful assemblage and clarify depositional conditions. No truly terrestrial forms were seen, although this is not surprising in such a small group.

Context 175 [Tin C: (34.0-36.0) to 36.0 cm]

Sample 305/T (0.28 kg sieved to 300 microns with paraffin flotation)

Dark brown, soft mud, with a little herbaceous detritus. Troels-Smith: Ld3Dg1.

A moderate-sized to large residue of about 80 cm³ of organic debris was obtained from this subsample. It was quite rich in identifiable plant remains, mainly birch fruits (with buds/bud-scales and female catkin-scales), together with tree leaf fragments and unidentifiable (rather decayed) moss (though some material determined as *Drepanocladus*, typical of bogs, fens and marshes, was also present). There were also traces of saw-sedge nutlets (*Cladium mariscus* (L.) Pohl) and bog-bean (*Menyanthes trifoliata* L.) seeds representing waterside or fen habitats. Preservation was generally good or very good. Indicators of open water were traces of hornwort (*Ceratophyllum*) fruits and Characeae oogonia, but most of the other remains were from terrestrial plants, including oak (*Quercus*) and rowan (*Sorbus aucuparia* L.).

Insect remains were present in modest numbers, but their preservation was sometimes fairly poor (E 2.0-3.5, mode 3.0 weak; F 2.5-5.0, mode 3.5 weak). The flot, which was quite large bearing in mind the very small subsample processed, was difficult to sort, and the numerous very fragmented insects would be difficult (but often not impossible) to identify. Deposition was aquatic, though cladocerans were rare and no ostracods were seen. The terrestrial component was limited. A substantial subsample (perhaps 3-5 kg) would be required to give an interpretatively useful assemblage in the context of a stratigraphic series.

Context 176 [Tin D: 0.0 to 9.0 cm]

Sample 303/T (3.6 kg sieved to 300 microns with paraffin flotation)

Dark grey-brown, soft (working more or less plastic), mud, with some fine laminations/partings. Snails were present. Troels-Smith: Ld4test mol.+.

The residue was not checked at this stage for plant remains (being, in essence, the same as that recorded from Sample 301, below). The flot was large and very rich in insect remains, although the latter were typically reduced to small fragments which would be fairly difficult to identify and quantify. Chemical preservation

was generally quite good, however (E 1.5-3.0, mode 2.0 weak; F 2.5-5.0, mode 4.0 weak). The fauna indicated aquatic deposition, including flowing water (*Limnius volckmari* (Panzer)), but terrestrial conditions were only weakly represented. A larger subsample (significantly more than the 3.6 kg already processed) would be needed to obtain much information about conditions beyond the site of deposition, and the nature of the flot was such that sorting would be slow. However, despite these methodological difficulties, the fauna would be of value as part of a stratigraphic series.

Context 176 [Tin C: 0.0 to 12.0 cm; Tin D: 27.0 to 50.0 cm]

Sample 301/T (1.0 kg sieved to 300 microns with paraffin flotation)

Mid yellowish-brown (oxidising mid to dark grey-brown), soft (working more or less plastic), mud, with moderate numbers of snails present. Troels-Smith: Ld4test mol.+.

There was a moderate-sized residue of about 200 cm³ of herbaceous detritus and (mostly) very fine mollusc shell fragments. The former included tree leaf fragments (to 5 mm in maximum dimension), with moderate numbers of fruits, buds/bud-scales and female catkin-scales of birch. Preservation of plant material was generally good. Other plant remains observed were restricted to traces of saw-sedge nutlets and poplar/aspens (*Populus*) buds/bud-scales; the fine fraction was rather rich in oogonia of the freshwater green alga stonewort (Characeae). A lacustrine to base-rich fen environment is indicated with trees fringing the wetland area.

The flot, which was fairly large, was rich in invertebrate remains, predominantly fragments of immature insects. Preservation was fairly good (E 1.5-3.0, mode 2.0 weak; F 2.0-3.5, mode 2.5 weak). The deposit was undoubtedly waterlain, for *Daphnia* ephippia were abundant (order of 10²), there were aquatic snails (fragments of planorbids but not identifiable to species), and most of the insects—both beetles and bugs—were aquatics. A rich environment, with well-developed vegetation, is suggested, and there were indications of flowing water from *Oulimnius*, *Limnius* and *Esolus* species. While swamp or waterside species were represented, terrestrial insects were notably rare. A larger subsample (3-5 kg) of this deposit would provide a substantial insect assemblage of use in reconstructing aquatic and waterside habitats.

SECTION 17 – COLUMNS SAMPLES 1 AND 2

Pollen and diatoms

No diatoms were present in the samples. As with the samples from Section 18, the presence of copulae in some samples indicated that diatoms were once present, but, again, it is difficult to draw further conclusions based on this evidence alone.

The results of the pollen analyses are presented as a percentage pollen diagram (Figure 2). With the exception of the samples from 0.47 m and 0.51 m, all the samples assessed contained adequate concentrations of pollen. The samples from 0.47 m and 0.51 m contained only trace organic residues with few palynomorphs present. Preservation was assessed as poor to moderate for the samples from this sequence, but, on the whole, the pollen spectra made ecological sense and it is thought likely that the samples were largely unbiased.

The pollen spectra from the organic silts (0.67 m, 0.83 m and 1.05 m) were dominated initially by *Betula*, which attained 80% in the basal sample, falling to around 40% as percentages of Poaceae increased to 30%. Other trees and shrubs included *Pinus sylvestris* (up to 6%), *Corylus avellana*-type (1-2%) *Salix* (2-3%) and *Juniperus communis* L. (juniper, 1-3%), but these were not dominant components. A sparse range of herbaceous taxa was recorded, including Cyperaceae, *Rumex* (docks), *Artemisia*-type (cf. mugwort), *Thalictrum* (meadow rue), *Helianthemum* (rock-rose) and Caryophyllaceae (pink/campion family). Low peaks of 4% in *Helianthemum* at 0.83 m and *Thalictrum* at 0.67 m represented the highest values for herbs other than Cyperaceae or Poaceae. *Betula* remained dominant following the transition from organic silts to peat at around 0.44 m, with the most marked change being the increase in *Pinus sylvestris* to as much as 16%. A marked rise in Pteropsida (monolete) indet. to up to 70% TLP+spores was also observed at this point. The representation of *Corylus avellana*-type was also enhanced slightly to 3-5%. Few herbs were present, although Lactuceae undiff. was recorded at 2-3% at 0.35 m and 0.39 m.

The Section 17 sequence reflects the presence of birch scrub/woodland around the sampling site. Few other trees were present, aside possibly from some willow and limited extents of juniper, with the *Pinus* curve probably reflecting long distance transport. Some open grassland and sedge communities are suggested, although the Poaceae may also derive from local wetland grasses such as *Phragmites*. The likelihood of the latter source being favoured by the sparse record for other herbs. Those herbs which were recorded include mugwort rock rose, meadow rue and species of dock typical of 'open steppe' communities on disturbed,

possibly skeletal soils. The marked increase in Pteropsida (monolete) indet. at 0.43 m indicates a local expansion of ferns, possibly related to processes associated with the hydrosere succession from open water to semi-terrestrial conditions as the basin infilled. Pine also seems to have begun to expand locally at this time, possibly also as a result of the availability of suitable peaty soils around the basin.

Plant and invertebrate macrofossils

Context 158 [Tin A: 7.5 to 16.0 cm; Tin B: 45.0 to 50.0 cm]

Sample 209/T (1.55 kg sieved to 300 microns with paraffin flotation)

Dark brown, firm (to crumbly), well humified (?slightly woody), detritus peat. Troels-Smith: Ld/Dg4?DI+.

The small residue of barely 50 cm³ comprised clasts of undisaggregated humic material with a little gravel (to 10 mm), and coal, cinders and charcoal (all to 3 mm). A single charred barley grain (*Hordeum*) was also noted. Uncharred plant remains included small numbers of Characeae oogonia, with traces of other aquatics (white water-lily, *Nymphaea alba* L., seed fragments and pondweed, *Potamogeton* sp., fruits) and traces of poplar/aspen buds/bud-scales.

The flot consisted mostly of decayed plant material, with only traces of insect remains. No other invertebrates were noted.

Context 159 [Tin A: 0.0 to 7.5 cm; Tin B: 30.0 to 45.0 cm]

Sample 208/T (1.85 kg sieved to 300 microns with paraffin flotation)

Light yellow-brown (locally mid to dark brown), soft to crumbly (working slightly plastic), slightly humic marl, flecked but not clearly banded with mollusc shell. Troels-Smith: Lc4As/Ag+test mol.+.

The residue of about 330 cm³ was of moderate size for the size of the subsample. It comprised undisaggregated marl with abundant snails (largely fragmentary and unidentified). Not surprisingly, given the nature of the sediment, Characeae oogonia were frequent, other aquatic taxa including white water-lily and pondweed. The only truly terrestrial remains were traces of poplar/aspen buds/bud-scales.

The small flot consisted predominantly of numerous planorbid (most probably *Planorbis planorbis* (L.)) and other aquatic snails (including many *Lymnaea peregra* (Müller), some *Valvata piscinalis* (Müller) and a few *Bithynia leachi* (Sheppard)), and there were only

traces of other invertebrate remains. The latter showed variable preservation (E 2.5-4.0) and had no potential for interpretation. As a whole, the snails suggest slow moving or still, thickly weeded (consistent with the aquatic plant remains), hard water.

Context 161 [Tin B: 0.0 to 17.5 cm; Tin C: 30.5 to 50.0 cm]

Sample 206/T (4.4 kg sieved to 300 microns with paraffin flotation)

Very pale to light to mid grey-brown, finely banded, silty marl, with some amorphous organic material. Troels-Smith: Lc3Ld1As/Ag+.

The small residue of about 250 cm³ consisted of herbaceous plant detritus and a little undisaggregated marl. There were a few rather eroded birch fruits and poplar/aspen buds/bud-scales and a small range of other taxa essentially representing aquatic and marsh habitats, though there was no very large and coherent assemblage.

The flot was large (not unexpected in view of the large subsample processed), and contained of the order of several thousand carapaces (as opposed to ehippia) of cladocerans, as well as numerous chironomid (midge) larval head capsules, placing deposition in water. There were a few aquatic beetles, but the terrestrial component was limited. Overall, the impression was of a lake or deep pond sediment. Although chemically in fairly good condition, the beetle remains were often very fragmentary and difficult to see amongst the other debris in the flot (E 2.0-3.0, mode 2.5 weak; F 2.0-5.0, mode 3.0 weak). While the insect remains (other, perhaps, than Chironomidae) have little potential for detailed interpretation (although of some use in a stratigraphic series), the cladocerans from this layer may be valuable as a source of information regarding water quality, and they should perhaps be assessed by an appropriate specialist.

Context 164+165+166 [Tin C: (14.0-14.5) to 22.0 cm]

Sample 203/T (0.8 kg sieved to 300 microns with paraffin flotation)

Dark brown (Context 165 forming a paler band between 164 and 166 but otherwise identical), firm to brittle, silty amorphous organic sediment/mud. Troels-Smith: Ld3As/Ag1 to Ld4As/Ag+.

This small subsample yielded a very large residue of about 525 cm³ of fine plant detritus, the coarser fraction consisting of flakes of undisaggregated humic silt (probably best interpreted as a silty nekron mud). The fine fraction contained some Characeae oogonia and traces of birch fruits and female catkin-scales.

The flot was rather large bearing in mind the small subsample processed, and included abundant midge (Chironomidae) larval head capsules, modest numbers of beetle remains, and a few cladocerans (mostly *Daphnia*). Preservation was rather poor and the remains generally pale and fragmented (E 3.0-4.5, mode 2.5 weak; F 2.0-5.5, mode 3.5 weak, trend to pale 1-4, mode 3 weak). While deposition was clearly aquatic (from the chironomids and cladocerans) there were only traces of aquatic insects, most representing waterside or terrestrial habitats. This fauna would probably have been of considerable interest if better preserved and larger, but, even allowing for the processing of a very large subsample, the invertebrates remain of borderline value except as general indicators and as part of a series.

Bulk sediment samples

Archaeological information, provided by the excavator, is given in square brackets. A brief summary of the processing method and an estimate of the remaining volume of unprocessed sediment follows (in round brackets) after the sample number.

Context 38 [medieval ditch fill]

Sample 5/T (3 kg sieved to 300 microns with paraffin flotation and washover; approximately 15 litres of unprocessed sediment remain)

Moist, mid to dark brown to mid to dark grey-brown, stiff and brittle to crumbly (working soft), very humic silt and fine herbaceous detritus. Fragments of wood and fresh water molluscs were present.

The washover of about 80 cm³ taken to concentrate mollusc consisted mainly of (presumably ancient) fine rootlets with well-preserved achenes of water-crowfoot (*Ranunculus* Subgenus *Batrachium*), snails and quite a lot of beetles not extracted by paraffin flotation. The small residue of about 300 cm³ was mainly woody and herbaceous detritus with a little sand and moderate amounts of whole and fragmentary snail shell, wood fragments (to 25 mm) and (presumably reworked) peat fragments (to 10 mm). Quite a lot of the wood could well be from twigs; all were rather eroded. The seeds present were mostly well-, sometimes very well-preserved, however, the assemblage being dominated by water crowfoot, with Characeae, saw-sedge and celery-leaved crowfoot (*Ranunculus sceleratus* L.). Other taxa, present in smaller amounts, included a number typical of wet ditches though some may have arrived from disturbed habitats in the vicinity. Traces of bone (unidentified fragments) and charcoal were present, but there was otherwise no very strong evidence from the plant remains for human activity,

however. The identifiable snail remains were all of freshwater planorbids, most probably *Planorbis planorbis* (L.) typically found in ditches and small ponds containing weeded hard water.

The flot contained quite large numbers of insects, which were chemically well preserved but often comminuted (E 1.5-3.0, mode 2.5 weak; F 2.0-5.0, mode 3.0 weak), as well as of the order of 100 *Daphnia* ephippia (probably two species at least) and numerous ostracods. A range of aquatic beetles and bugs was noted, all being fairly tolerant of stagnant water, and there were several larval cases of caddis flies (Trichoptera). There were appreciable quantities of terrestrial insects, with hints of grassland (e.g. the chafer *Hoplia philanthus* (Fuessly)) and dung (*Aphodius* and *Geotrupes* species). Dead wood was indicated by *Ptilinus pectinicornis* (Linnaeus) and *Grynobius planus* (Fabricius), both of which occur in structural as well as natural timber. The addition of insects from a further subsample should provide a good range of evidence concerning local environment and land use.

Context 139 [medieval ditch fill]

Sample 6/T (3 kg sieved to 300 microns with paraffin flotation; approximately 16 litres of unprocessed sediment remain)

Moist, mid to dark brown to mid to dark grey-brown (to black internally – giving a sulphide smell when lumps were broken open), brittle to crumbly (working soft), very humic, slightly sandy silt, with fine and coarse herbaceous detritus. Occasional patches of pale grey clay silt (to 12 mm) were present as were fragments of wood (or ?woody root).

The moderately large residue of about 450 cm³ was of woody debris with many snail shell fragments. Preservation of the plant remains was good, with some sulphide blackening and (in some specimens) pyritisation. Although the more frequent remains (Characeae, rush (*Juncus*), white water-lily, persicaria (*Polygonum persicaria* L.), water crowfoot and docks (*Rumex*)) pointed to damp ground and standing water the presence of seeds of cultivated flax (*Linum usitatissimum* L.), with material which may well be stem fragments and stem epidermis of this plant, suggests human activity—most probably in the form of flax retting.

Preservation of invertebrates was variable, from good to poor (E 1.5-4.0, mode 3.0 weak; F 1.5-5.0, mode 3.5 weak). Ostracods were very abundant (order of 10³), and there were numerous ephippia of *Daphnia* and a second characteristic cladoceran (order of 10² in both cases). Further evidence of aquatic deposition came from some pond snails (?*Lymnaea* sp.) and a modest

range of insects, the latter including an Elminthid, suggesting flowing water (probably an inflow, not at the point of deposition). There were some waterside and terrestrial insects, the latter indicating herbaceous vegetation and (somewhere) dung. An additional subsample of perhaps 5 kg would give an interpretatively useful group of insect remains, although fragmentation would slow identification. Very careful processing might allow recovery of less damaged remains, although the fossils may have been broken during deposit formation (drying or the activity of scavengers?) or subsequently (compression of the deposits by overburden or machinery?).

Discussion and statement of potential

Column samples

The pollen spectra from both Sections 17 and 18 record early Holocene vegetation changes, but there are very good grounds to believe that Section 17 reflects a slightly earlier phase of landscape development. Birch (*Betula*) woodland spread rapidly over the landscape in the earliest Holocene; with a date for this expansion of 10120±180 BP (Birm-405) available from the Bog at Roos in Holderness (Beckett 1981). Pollen evidence from the nearby site of Star Carr in the Vale of Pickering indicates that hazel (*Corylus*) arrived in this area at around 9400 BP, replacing the *Betula* woodland, with elm (*Ulmus*) and then oak (*Quercus*) arriving circa 7500 BP (Day and Mellars 1994). The dominance of *Betula* in the Section 17 diagram, and low values for other tree taxa, thus suggests that this sequence is earlier than that of Section 18. Indeed, it is possible that the sequence reaches back into the Late-glacial. The few herbs recorded in the samples from the laminated organic silts include *Artemisia*, *Helianthemum* and *Thalictrum*, taxa which are typical of the bare, disturbed soils of the Loch Lomond Stadial (Day 1995). Radiocarbon dating would be required to support this hypothesis.

The vegetational changes recorded in the upper part of the Section 18 pollen diagram appear to be largely connected to processes related to the transition from open water,

reflected by the laminated silts, to a peat accumulating system. The poor representation of arboreal taxa such as *Quercus* and *Ulmus*, which elsewhere are recorded in higher percentages by 9000-8500 BP (Birks 1989), is probably a result of the very high values for Cyperaceae, rather than an indication of the delayed expansion of these trees.

No identifiable diatom remains were recovered from the subsamples and the potential for further study is clearly very low.

Plant macrofossil remains preserved by anoxic waterlogging were generally well preserved and usually reasonably abundant and the assemblages often of quite restricted diversity, as might be expected in deposits which were largely detritus peats. Preservation of invertebrate remains was very varied within and between deposits. Some assemblages gave the subjective impression that there may have been general decay, so perhaps the deposits as a whole may be at risk from dewatering. The concentration of invertebrates varied, too, from very low to moderately high (extremely high if crustaceans are included), probably reflecting ecological conditions, rate of sediment accumulation and (in the case of the lake deposits) distance from the shoreline.

All the plant and insect assemblages indicated aquatic deposition, though in some cases in swamp rather than open water; the sequence of insect assemblages from Section 18 seems to show a hydrosere succession leading to swamp with *Myrica* (though there is no specific evidence for that plant from the botanical material).

The only evidence of possible human activity from the subsamples from the columns was the small quantity of charred plant remains and cinder recovered from Context 158 (Section 17, Column Sample 2). Context 158 lay immediately beneath a 19th century dump deposit (Context 157, not assessed) and the possibility of contamination from this layer cannot be discounted.

Bulk sediment samples

The plant and invertebrate remains from the medieval ditch fills indicated that these features held water. In one case (Context 139), some evidence of human activity was suggested, namely flax retting. Additional information regarding local land use and the immediate environment would almost certainly be forthcoming from detailed study of the remains (particularly of insects) from larger subsamples.

Recommendations

Eastern England has proven to be a key area for the study of late-glacial and early Holocene environments, with detailed palaeoecological studies carried out at Roos Bog in Holderness (Beckett 1981), Gransmoor Quarry in the Hull valley (Walker *et al.* 1993), Star Carr in the Vale of Pickering (Day 1995; Day & Mellars 1994) and most recently at Cove Farm Quarry, Westwoodside in the Humberhead levels (Bateman *et al.* 2001). Although lacking the context of the later Holocene, and thus effectively fragmentary records, the Bedale sequences should be regarded as having the potential to provide further information to this picture regarding the timing and nature of early Holocene vegetation changes. More detailed pollen analyses of both sequences are therefore recommended, ideally in conjunction with plant and invertebrate macrofossil analyses and supported by radiocarbon dating of the Section 17 sequence.

No further investigation of these samples for diatoms is recommended.

Further analysis of the plant and invertebrate macrofossil assemblages from the mesolithic lake/swamp deposits would give a more detailed picture of ecological conditions and the hydrosere succession, although information about the wider landscape would be limited. Samples from some of the deposits

would need very careful processing, and sorting and identification of insects would sometimes be laborious. In exploring the lake/swamp deposits further, the assemblages would need to be seen as part of a stratigraphic series, making some of the smaller groups, which would not stand in isolation, more useful.

The macrofossil remains from the medieval ditch deposits have much more potential for reconstruction of local land-use and human activity and certainly deserve detailed analysis (via larger subsamples) providing dating can be refined.

Retention and disposal

All of the remaining sediment, together with the remains extracted from the processed subsamples, should be retained for the present.

Archive

All material is currently stored by Palaeoecology Research Services (Unit 8, Dabble Duck Industrial Estate, Shildon, County Durham), along with paper and electronic records pertaining to the work described here.

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Table 1. 26 Market Place, Bedale, North Yorkshire: summary of the radiocarbon dates (all deposits from Section 18).

| Context | Sample | Location in column sample monolith | Beta Number | Submitted material | Conventional radiocarbon age | Calibration of radiocarbon age to calendar years @ 2-sigma |
|---------|--------|--|-------------|---|------------------------------|--|
| 67 | 311/T | Tin A: 18.0 to 50.0 cm | Beta-187365 | Bark fragments, probably birch (<i>Betula</i>): 335 mg | 7290 +/- 40 BP | Cal BC 6230 to 6050 (Cal BP 8180 to 8000) |
| 71 | 310 | Tin A: 1.0 to 6.0 cm (Tin B: 33.0 to 38.0 cm) | Beta-187366 | Organic sediment: 220 g | 7490 +/- 60 BP | Cal BC 6445 to 6225 (Cal BP 8395 to 8175) |
| 171 | 309/T | Tin B: 20.0 to 32.0 cm | Beta-187367 | Small wood and bark fragments: 65 mg | 7940 +/- 40 BP | Cal BC 7040 to 6670 (Cal BP 9000 to 8620) |
| 172 | 308 | Tin B: 9.0 to 14.0 cm | Beta-187368 | Organic sediment: 115 g | 7960 +/- 50 BP | Cal BC 7055 to 6670 (Cal BP 9005 to 8620) |
| 173 | 307/T | Tin B: 0.0 to 8.0 cm Tin C: 38.0 to 48.0 cm | Beta-187369 | Three small fragments of well preserved hazel (<i>Corylus avellana</i> L.) nutshell: 70 mg | 7940 +/- 40 BP | Cal BC 7040 to 6670 (Cal BP 9000 to 8620) |
| 176 | 301/T | Tin D: 0.0 to 9.0 cm | Beta-187370 | Tree bud-scales, birch female catkin scales, dicotyledonous leaf fragments: 27 mg | 8770 +/- 40 BP | Cal BC 7970 to 7650 (Cal BP 9920 to 9600) |

Table 2. 26 Market Place, Bedale, North Yorkshire: summary of the column sample descriptions. The deposits are listed in stratigraphic sequence from top to bottom with their positions within the individual monoliths recorded from the base of each tin. Where the overlapping of the monoliths has resulted in the same deposit being present in two tins the positions within each are given.

(i) Section 18 – column sample 3

| Position in column | Context | Sample number | Troels-Smith | Transition | Description | Notes |
|---|---------|---------------|---------------|----------------------|---|---|
| Tin A: 18.0 to 50.0 cm | 67 | 311 | Dl2Dh/Dg2 | grades to... | Dark brown, crumbly, woody detritus | |
| Tin A: 0.0 to 18.0 cm Tin B: 32.0 to 50.0 cm | 71 | 310 | Dh/Dh3Ld1 | grades to... | Dark brown, somewhat crumbly, detritus | |
| Tin B: 20.0 to 32.0 cm | 171 | 309 | Ld3Dg/Dh1 | grades to... | Dark brown, rather crumbly, mix of mud and fine detritus | |
| Tin B: 8.0 to 20.0 cm | 172 | 308 | Ld3Dg/Dh1 | grades to... | Dark brown mud with fine detritus | softer and less crumbly than Sample 309 |
| Tin B: 0.0 to 8.0 cm Tin C: 38.0 to 48.0 cm | 173 | 307 | Ld4?Dg+ | grades to... | Mid to dark brown (somewhat 'banded'), mix of mud and fine detritus | |
| Tin C: 36.0 to 38.0 cm | 174 | 306 | Dh4 | grades to... | Mid to dark brown, 'moss-rich' detritus | moss rich detritus |
| Tin C: (34.0-36.0) to 36.0 cm | 175 | 305 | Ld3Dg1 | sharp boundary to... | Dark brown, soft mud, with a little herbaceous detritus | |
| Tin C: 12.0 to (34.0-36.0) cm | 176 | 304 | Ld4test mol.+ | grades to... | as 303 but locally paler brown | |
| Tin C: 0.0 to 12.0 cm Tin D: 27.0 to 50.0 cm | 176 | 303 | Ld4test mol.+ | | Dark grey-brown, soft (working more or less plastic), mud, with some fine laminations/partings. Snails were present | some fine laminations / partings |
| Tin D: 9.0 to 27.0 cm | 176 | 302 | Ld4test mol.+ | grades to... | Mid grey-brown, soft (working more or less plastic), mud. Snails present | lighter shade of grey-brown |
| Tin D: 0.0 to 9.0 cm | 176 | 301 | Ld4test mol.+ | | Mid yellowish-brown (oxidising mid to dark grey-brown), soft (working more or less plastic), mud, with moderate numbers of snails present | yellow-brown in colour |

(ii) Section 17 – column sample 2

| Position in column | Context(s) | Sample number | Troels-Smith | Transition | Description | Notes |
|---|-------------|---------------|------------------------|------------------------------|---|--|
| Tin A: 16.0 to 50.0 cm | 157 | 210 | Gg1As1Ag2 | grades over lower 5 cm to... | Dark grey-brown, crumbly (working slightly plastic), stony clay silt | humic in lower 5 cm |
| Tin A: 7.5 to 16.0 cm Tin B: 45.0 to 50.0 cm | 158 | 209 | Ld/Dg4?D1+ | very sharp boundary to... | Dark brown, firm (to crumbly), well humified (?slightly woody), detritus peat | |
| Tin A: 0.0 to 7.5 cm Tin B: 30.0 to 45.0 cm | 159 | 208 | Lc4As/Ag+test mol.+ | very sharp boundary to... | Light yellow-brown (locally mid to dark brown), soft to crumbly (working slightly plastic), slightly humic marl, flecked but not clearly banded with mollusc shell | |
| Tin B: 17.5 to 30.0 cm | 160 | 207 | As/Ag4 | very sharp boundary to... | Mottled light to mid grey and brown, soft (working plastic), clay silt to silty clay | |
| Tin B: 0.0 to 17.5 cm Tin C: 30.5 to 50.0 cm | 161 | 206 | Lc3Ld1As/Ag+ | very sharp boundary to... | Very pale to light to mid grey-brown, finely banded, silty marl, with some amorphous organic material | |
| Tin C: 29.5 to 30.5 cm | 162 | 205 | Ld3As/Ag1 to Ld4As/Ag+ | very sharp boundary to... | as 203 but less 'rubbery' | |
| Tin C: 22.0 to 29.5 cm | 163 | 204 | Lc3Ld1test mol.+ | very sharp boundary to... | Pale yellow/mid to dark brown banded marl and mud | |
| Tin C: (14.0-14.5) to 22.0 cm | 164+165+166 | 203 | Ld3As/Ag1 to Ld4As/Ag+ | fairly sharp boundary to... | Dark brown (Context 165 forming a paler band between 164 and 166 but otherwise identical), firm to brittle (and somewhat 'rubbery'), silty amorphous organic sediment/mud | Context 165 appears to be just a lighter coloured band |
| Tin C: (8.0-11.5) to (14.0-14.5) cm | 168 | 202 | As/Ag4?Sh+ | fairly sharp boundary to... | Mid grey-brown, soft (working plastic), ?slightly humic, silt | |
| Tin C: 0 to (8.0-11.5) cm | 169 | 201 | Ga/Gs2As/Ag1Gg1 | | Light grey plastic clay with abundant sand and gravel | |

Figure 1. 26 Market Place, Bedale, North Yorkshire: percentage pollen diagram for Section 18.

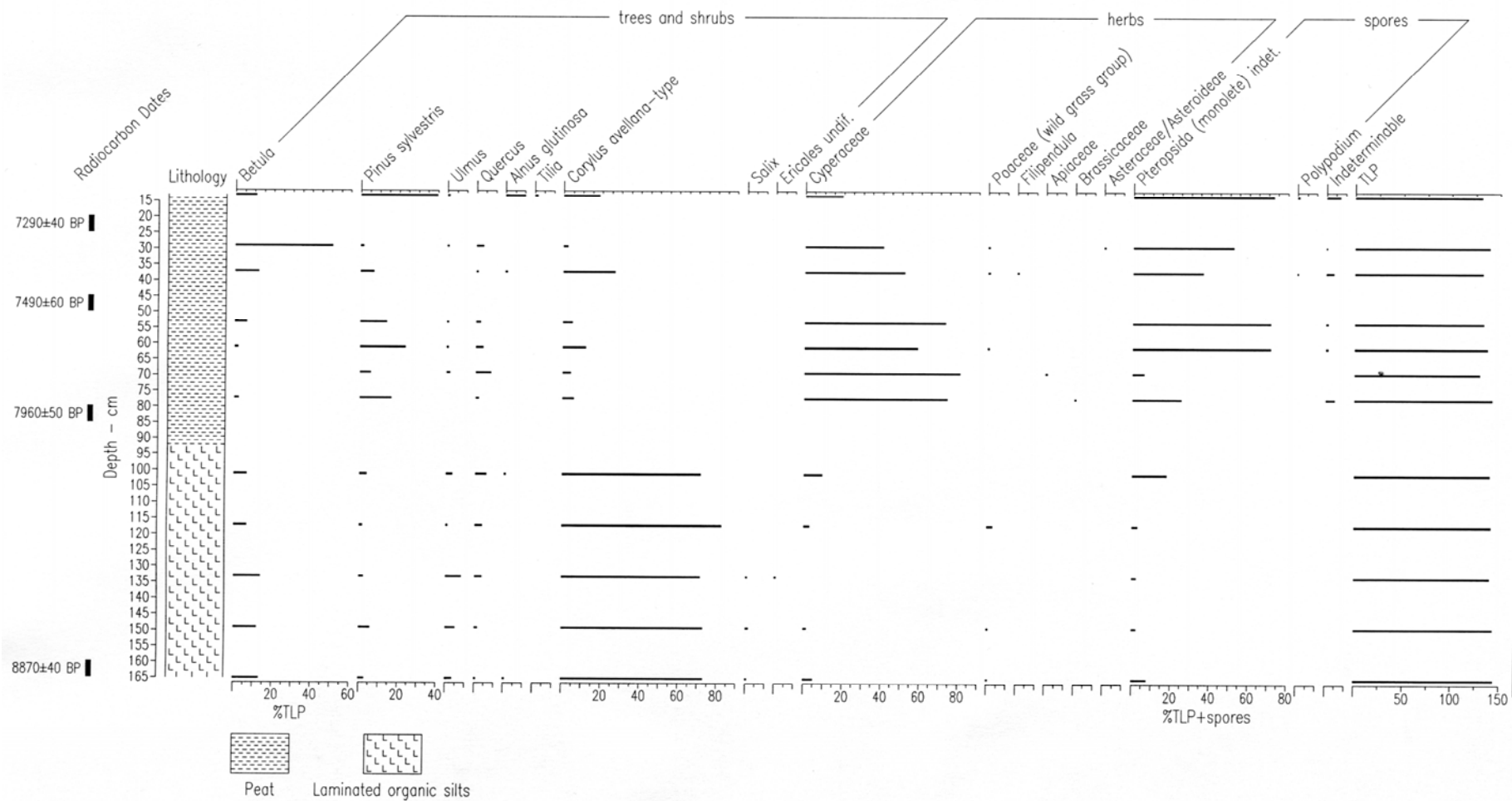


Figure 2. 26 Market Place, Bedale, North Yorkshire: percentage pollen diagram for Section 17.

