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**Assessment of plant and invertebrate macrofossils
from Carse of Stirling (site code: AOC 1681)**

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Summary

Samples collected during excavation of deposits associated with a timber platform or trackway, probably of the period 4000 to 2000 BP, at Carse of Stirling were submitted for evaluation of their content of plant and invertebrate macrofossils. Four samples were examined. Each yielded useful evidence, although preservation of both groups of remains varied. There was no evidence from the biological remains for human activity other than that associated with the initial construction of the feature. The range of plants and invertebrates reflected peatland margins, with pools (perhaps small) and at least some trees. There were hints of variation in the wetness of habitats, but results from plants and insects did not match in this respect.

Further investigation is recommended, to investigate more closely variations in conditions and (for the insects) to attempt to acquire climatic data.

Keywords: CARSE OF STIRLING; LAID TIMBERS; PEAT; PLANT MACROFOSSILS; INVERTEBRATES; INSECT REMAINS

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Assessment of plant and invertebrate macrofossils from Carse of Stirling (site code: AOC 1681)

Introduction

The site adjacent to Station Wood at Carse of Stirling was excavated by AOC (Scotland) Ltd. A series of parallel roundwood timbers and planks was interpreted as probably representing a platform or trackway. Brushwood appeared to have been laid on it. There were no finds. Radiocarbon dating is awaited, but it is likely that the structure is prehistoric, probably of the period 4000 to 2000 BP, although a more recent date is possible (C. Ellis *in litt.* 13.7.98). Samples (GBAs, *sensu* Dobney *et al.* 1992) were submitted to the EAU for evaluation of their content of plant and invertebrate (principally insect), macrofossils.

Methods

Samples from four contexts were examined for macrofossils. Following a description (using a *pro forma*), 0.5 kg subsamples of the sediment were sieved to 300 microns and invertebrate remains extracted using paraffin flotation (Kenward *et al.* 1980, as modified by Kenward *et al.* 1986). Plant macrofossils were examined in a series of sieved fractions. Insects were assessment-recorded (*sensu* Kenward 1992).

Sample-by-sample account

Samples are arranged in context order and information provided by the excavator is given in square brackets. Insect nomenclature follows Kloet and Hincks (1964-77).

Context 002, Sample 3/T [Sample taken from between roundwood timbers in northeastern part of trench]

Laboratory description: A mid to dark brown, crumbly to fibrous, moist, very well humified detritus peat containing very frequent wood bark and twig fragments and stems of *Polytrichum* sp(p). moss. (Troels-Smith description Sh2, D11, Tb1, Dh+, Th+; von Post humification scale H7/H8)

Plant macrofossils: The plant macrofossils from this sample were very well humified. The most frequent remains were degraded stems and broken leaves of *Polytrichum commune* Hedw. together with well rotted dicotyledon leaf fragments. Remains of *Betula* (tree birch) were frequent and included buds-scales, fruits, bark and leaf fragments. Other remains present in the subsample included small fragments of wood, occasional leaves of *Sphagnum palustre* L. and *S. Sect. Acutifolia*, *Sphagnum* spore capsules, seeds of rush (*Juncus* sp(p).), and sclerotia (resting bodies) of a soil fungus (*Cenococcum* sp(p).).

Insect remains: The flot was quite large, and thus time-consuming to sort. Insect remains were fairly abundant, and there were numerous mites. The fauna clearly reflected an area of damp ground with litter and herbaceous vegetation, perhaps among trees (the groundbug *Drymus brunneus*, predominantly found in shady areas; an elaterid is believed to be a species mostly found in woods; and a *Rhynchaenus* weevil, apparently one of the species associated with trees, were all noted). There was probably open water (perhaps just small pools), as two species of *Hydroporus* (three individuals) and a hydrophiline were observed. *Anacaena* species ('several') and *Hydraena* sp. would have lived in very wet moss and litter, or in open water. A *Cyphon* species was abundant ('several') and there were numerous delphacid bugs of at least three species and two *Plateumaris* sp.; these represent a typical group from swamp vegetation. Damp litter (or perhaps just moss tussocks) would have been exploited by a pselaphid and *Olophrum* sp.

Overall, then, the insects probably represent open woodland with swampy vegetation, pooled here and there, and probably plant litter. There were no species particularly favoured by human activity. Drier ground (or at least a less wet patch) was represented only by an *Aphodius* dung beetle.

Analysis of the fauna of a larger subsample (say 3 kg) would provide a clearer view of the local ecology.

Context 005, Sample 7+8/T [Infilling gaps between roundwood timbers; the layer yielded a cache of hazel nutshells]

Laboratory description: A moist, crumbly, dark brown detritus peat rich in wood bark and twig fragments. (Troels-Smith description Sh2, Dh1, D11, Th+; von Post humification scale H8)

Plant macrofossils: The preservation of plant remains from this samples was rather poor; degraded wood fragments and rootlets formed the bulk of the peat. Other constituents included birch bud-scales, frequent birch fruits, occasional *Sphagnum* stems, *Sphagnum* spore capsules and fragments of *Polytrichum commune* leaves. A single woodrush (*Luzula* sp(p).) seed and a cotton-grass (*Eriophorum vaginatum* L.) sclerenchyma spindle were also present, together with several small charcoal fragments. Some much fresher-looking herbaceous rootlets were noted which may be modern.

Insect remains: Preservation of insect remains, which were rather abundant, was generally good, although some fossils were significantly more decayed. The broad picture was as for Context 002, although the present assemblage was larger and included more taxa. Water beetles were represented by several *Hydroporus* sp. (including at least two species), *Anacaena* sp. and *Ochthebius* sp. Swampy vegetation supported two *Cyphon* species, one of which was rather common, and probably the abundant Delphacidae. A rather wider range of species likely to have lived in (natural) litter was present.

A larger subsample (perhaps 3 kg) would permit a detailed reconstruction of conditions at the point of deposition, and probably of the environment during use of the structure.

Context 007, Sample 2/T [The peat underlying the timbers, thought to represent the wet ground

surface onto which the wooden structures were laid]

Laboratory description: A well humified, dark brown/black, crumbly to fibrous, moist *Polytrichum* peat containing numerous small wood, bark and twig fragments. (Troels-Smith description Sh1, Tb3, Tl+, Th+; von Post humification scale H7)

Plant macrofossils: *Polytrichum commune* stems and leaves formed the greater part of the moderately well preserved plant remains from this subsample. Birch was represented by frequent bud-scales, occasional fruits, bark fragments and female catkin-scales. Other constituents of the peat included monocotyledon rootlets, small dicotyledon leaf fragments and wood, together with Ericaceae rootlets and occasional leaves of *Sphagnum* Sect. *Acutifolia*.

Insect remains: Preservation of the small group of insect remains was good. The fauna resembled a random subset of the remains found in the samples from Contexts 002 and 005, although subjectively conditions were rather drier than for 002, and possibly even drier than for 005. Swamp fauna still predominated, with abundant *Cyphon* sp. (including *C. ?padi*) and two *Hydroporus* spp.

A notable find was a head of a snake fly, *Raphidia notata*, identified using the key and illustrations of Fraser (1959), no reference material being available. Larvae of *R. notata* live in stumps of dead branches, chiefly of oak, *Quercus* (Fraser *loc. cit.*).

A subsample of 3-5 kg would provide a detailed reconstruction of the local environment.

Context 011, Sample 5+6/T [Peat between (predominantly birch) twigs of the ?brushwood over the planks]

Laboratory description: A crumbly, moist, very well humified, dark brown, detritus peat containing numerous wood, bark and twig fragments. (Troels-Smith description Sh3, D11, Dh+; von Post humification scale H7/H8)

Plant macrofossils: Most of the sample residue consisted of small degraded dicotyledon wood fragments and pieces of bark. In common with the previous three contexts the remains of tree birch were common including seeds, female catkin-scales and bud-scales. Occasional rather degraded *Sphagnum* stems were present; however, no *Sphagnum* leaves were encountered, suggesting a high degree of decomposition. Sclerotia of the soil fungus *Cenococcum* sp(p). were very frequent, indicating aerated conditions. Occasional monocotyledon rootlets, *Eriophorum vaginatum* leaf fragments and *Polytrichum commune* leaf and stem fragments were also present.

Insect remains: Insects were well preserved, although not very abundant. The fauna resembled a random extract from the assemblages from the site as a whole. A specimen of the forest-dwelling ground beetle *Pterostichus oblongopunctatus* was recovered, strengthening the impression that trees or well-developed scrub provided shade.

Discussion

The better degree of preservation of the plant remains from Context 007 and the abundance of *Polytrichum commune* in the sample is consistent with the interpretation that this context presents the wet ground surface onto which the wooden structures were laid. (However, the insect fauna hinted at rather drier conditions.) By contrast, the organic matter in the samples from the three remaining contexts (002, 005 and 011) was more highly humified. The peat from these contexts was generally more finely fragmented and often heavily eroded. Contexts 002, 005 and 011 all contained variable quantities of sclerotia of *Cenococcum* sp(p)., a soil fungus which favours well-aerated peaty soils containing wood remains. Therefore, the peat from these last three contexts either formed well above the zone of permanent waterlogging (although conditions must have remained rather damp to enable continued organic accumulation) or was subsequently dewatered.

Contexts 005 and 011, described as peat from between the twigs of probable brushwood, contained significant amounts of birch remains,

including bark, fruits bud-scales and female catkin-scales. Some larger leaf fragments were recognisable as birch, but many other fragments were too poorly preserved to identify.

The mixture of mosses, including *Polytrichum commune*, *Sphagnum palustre* and *S. Section Acutifolia*, is typical of slightly nutrient-enriched acidic habitats found on thin peats and in the wooded margins of raised bogs. A similar moss flora might be expected to have occurred in the spaces between cut wood laid on the mire surface at the margin of a raised bog.

The insects strongly supported the general interpretation from the plant macrofossils, although differing in points of detail. Recording of invertebrate remains at the level carried out here does not permit subtle differences to be detected, but there was a subjective impression that the various deposits were formed under slightly different conditions; although all the assemblages included water beetles and swamp fauna, the range of taxa probably indicating rather drier habitats including litter and vegetation varied. Detailed analysis of assemblages from larger subsamples (3-5 kg) would allow this impression to be tested, and provide more detail concerning the local environment.

There was no evidence for synanthropic plant or invertebrate species, or of plants or insects that are typical of any habitats other than those which might be associated with peatland margins with pools and trees.

Recommendations

It is suggested that larger subsamples should be analysed for their content of insect remains, and that precise analyses should be made of plant remains from small subsamples, in order to obtain a detailed picture of local ecology and to objectify the apparent differences between the biota of the various layers.

Analysis of large subsamples would also permit a large number of insect fossils to be collected in order to attempt a climatic reconstruction. This

would be worthwhile, whatever the date of the structure.

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