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FRIERNHAY STREET, EXETER - MACROSCOPIC PLANT AND ANIMAL REMAINS FROM THE SECOND FORTRESS DITCH.

by Vanessa Straker

Introduction

In 1981, the Exeter Archaeological Field Unit excavated a site in Friernhay Street and exposed part of the defences of the Roman fortress. Part of a rampart with timber towers at 30 metre intervals was revealed and in front of the rampart, beyond a berm of about a metre wide, was a ditch with a 'v' shaped profile. This is thought to have been originally c. 3 metres wide and 1.5 metres deep. This was filled in and replaced by a ditch with a punic profile (the second ditch), which was open for some 10-15 years before the legion was transferred to Caerleon in about A.D. 75. The second ditch, which silted up rapidly between the late first and early second centuries A.D. in the early stages in the development of the civilian settlement, was eventually about 10 metres wide and over 3 metres deep (Henderson, 1984). The fill of the ditch was sampled by Martin Bell who collected four samples from the lowest layers; their position is indicated on the section drawing (page 12). Samples 2,3 and 4 were largely composed of grey silty clay with black organic traces, some sand (sample 4) and inclusions such as small pebbles, charcoal and shell fragments. Sample 1 which was the lowest in the sequence appeared similar but contained far less biological remains. This layer may have derived from a deposit that formed rapidly from mineral material eroded from the ditch side. A low organic content can sometimes result in poor preservation as some decay is required before anaerobic conditions, which will preserve organic matter, are created. If there is only a little organic material it will suffer proportionally more decay than if there had been more organic matter to use up the oxygen rapidly in decay. More suitable conditions appear to have developed as the ditch silted up as the plant and animal remains in samples 2 to 4 indicate. The samples were analysed to attempt to determine the nature of the fortress ditch in terms of its local environment and to look for any economic plants that would have formed part of the diet of those living in the town and been thrown into the ditch as waste. As there has been no previous work on macroscopic plant remains from Roman Exeter, the samples from Friernhay Street have an added significance; indeed on Jones' map (Jones,1981) showing the location of archaeological records of Roman crop plants, there are very few records for the south-west in general and little data has been added since 1981.

Laboratory analysis

One kilogram sub-samples were wet sieved, using a minimum mesh size of 250 microns. They were sorted using a binocular microscope and found to contain abundant plant and animal remains, notably seeds, cereal chaff, bran, moss, ostracods, cladoceran ephyppia, earthworm eggs and arthropods. These were extracted and stored in alcohol. In this report, only the macroscopic plant remains, insects and ostracods will be commented upon.

Macroscopic plant remains

Many plants, particularly those often associated with disturbed ground, can tolerate a wide range of different ecological conditions. Their ecological preferences, which are taken from Clapham, Tutin and Warburg (1962) are detailed in Table 1. With the exception of sample 1 the deposits contained abundant plant remains. As Table 1 shows, many of the plants represented are those of damp habitats which might be expected to colonise a damp ditch or fringe a river bank, such as Sedges and Rushes. The

numerous cladoceran ephyppia (water flea eggs) and the aquatic insects show that the ditch contained standing water. Its submergent to emergent vegetation included Fool's Watercress and Water Crowfoot, while Water Pepper and Lesser Spearwort probably grew along the water's edge. Tall herbage such as Hemlock, Dock, Nettles and Meadow Sweet grew, perhaps, on the moist soil of the bank. Seeds from various open habitats such as grassland and disturbed ground are present. Buttercups, Self Heal and Hawkbit provide examples of the grassland species. Plants associated with such disturbed habitats as occur around settlements are abundant, including Elder, Chickweed, Thistles, Hemlock and Nettles. The only definite crop plants represented are cereals, but it is possible that the Wild Strawberries and the Elderberries were collected as food. Some of the plants associated with disturbed habitats are also more specifically found with the remains of crop plants, notably cereals and are common as arable weeds.

As Table 1 indicates some waterlogged cereal chaff and much cereal straw was found in samples 2-4 and it is possible that some of the weed seeds found their way into the ditch with the cereal remains; Orache, Shepherd's Purse, Chickweed, Plantain, Sheep's Sorrel and Parsely Piert are likely arable weeds. A notable absence in the Friernhay Street assemblage is Agrostemma githago, Corn Cockle, a formerly prevalent and poisonous cereal field weed frequently encountered in association with cereals on archaeological sites. The cereal chaff comprises glume bases, spikelet forks and rachis fragments of wheat some of which can be identified as spelt wheat on the basis of venation and a pronounced primary keel and reduced secondary keel on the glumes. In most cases, identification has not been taken further than emmer/spelt as poor preservation does not allow more precise determinations to be made. Emmer and, more particularly, spelt wheat are commonly found on Iron Age and Roman sites (Jones,1981). Subsequently, Triticum aestivum s.l., free threshing bread wheat, found in small amounts on Roman and prehistoric sites, became popular and is the main species of wheat grown in today. Bread wheat was not identified in the Friernhay street assemblage, but owing to poor preservation of some of the cereal remains its presence cannot be discounted; spelt and possibly emmer, however, dominate the picture. Emmer and spelt are both hulled wheats requiring a series of processes to free the grain from its enclosing husk. The presence of cereal chaff preserved by waterlogged conditions is unusual, because the structures are very fragile. As the chaff is often exposed to heat as a necessary part of crop processing, and indeed sometimes used as a fuel source, it is more commonly preserved in a carbonised form.

There are many stages involved in rendering the ears of cereals suitable for consumption; parching, pounding, sieving and threshing are some of the stages required for the processing of hulled grain. These have been described by Hillman (1981, 1984), in his discussion of a model constructed on the basis of detailed observations of the processing of similar crops in parts of present day Turkey. This is intended to assist in the archaeological interpretation of crop processing techniques. The waste fractions from crop processing could be used as fuel or fed to humans or animals on occasions. It was suggested that the samples might contain animal dung and from the appearance of sample 3 in particular before sieving, this seemed likely. The fact that that the ditch also contained bran (cereal periderm) rather than complete caryopses, is of interest. This is often taken to imply that human excreta is present as was suggested in the case of the cereal remains from the early second century ditch of the fort at Bearsden, near Glascow. This conclusion, however, was reached because other food plants notably figs, coriander, wild celery, poppy, raspberry, blackberry, bilberry and hazelnuts were present as well as certain sterols which were detected by chemical techniques (Knights et al.1983). The Bearsden samples also contained the eggs of whipworm

(Trichuris) and roundworm (Ascaris), internal parasites of humans (Knights et al., 1983). These parasites were not encountered in the Friernhay Street samples. In the case of the fortress ditch in Exeter, as so few obvious food plants are present apart from the cereals, it is more likely that animal dung, of a herbivore such as horse or cattle is involved. Horse dung has been identified from Roman Lancaster (Wilson, 1979) where parts of flowers, pods and immature seeds of leguminous plants were present in the deposit as well as cereal remains. Wilson (1979, 342) concludes that the animals were feeding on a mixed unripe leguminous crop and also on plants from mature pastureland. It was noted that the cereals represented at Bearsden were principally wheat (Knights et al., 1983) as compared with barley at Lancaster, and barley is more usually fed to animals as fodder crop, perhaps also implying that at Bearsden the wheat bran was more likely to be human in origin. In the case of the Friernhay Street samples where cereal chaff is the main form in which the cereals are represented, presumably the waste fractions of wheat or barley processing are equally likely to have been fed to animals. The possibility that animal dung might be present is also discussed in the section below describing the insect remains.

Insect remains (Table 2)

Although the assemblages, especially from samples 1 and 2, are small, it is still possible to gain some additional information about the ditch and surrounding habitats. All the samples contain remains of aquatic individuals, which lived in the bottom of the ditch and species from a variety of terrestrial habitats, some probably entering the deposit naturally and others with dumped refuse. The insects suggest the presence of some organic material in the ditch and that the area was surrounded by various open habitats. No single habitat predominates amongst the assemblage.

As far as the environment of the ditch is concerned, insect remains in sample 1 are few and not very well preserved. Chironomid larval head capsules show that at least temporarily the ditch contained water, but there were no aquatic Coleoptera. The other samples contained some water beetles, mostly members of the Hydrophilidae. The best represented species; Helophorus sp. (brevipalpis size), Hydrobius fuscipes and Heleochares sp. tend to favour stagnant water in ponds, ditches etc. Some of the beetles such as Coelostoma orbiculare and Anacaena sp. are amphibious, living amongst decaying vegetation, especially at the edge of water, or under water. The differences between the samples may be in part the result of changing conditions in the ditch as it silted up, as outlined previously. In addition to these considerations, as far as sample 1, the earliest deposit in the sequence is concerned, it is possible that the ditch did not have a well developed fauna at this early stage and there was not time for many insects to fall into the ditch. In later deposits, as conditions became more stable, a fauna of water beetles developed. By the time the latest deposit sampled (sample 4) was laid down, a fauna of water beetles had developed which, in addition to other evidence suggests an aquatic environment. Tanysphyrus lemnae, a weevil which is restricted to feeding on Lemna species (Duckweed) is present in this sample. It is interesting to note that seeds of Lemna are not present in the assemblage although the plant was very probably a component of the vegetation. The composition of the later samples in general indicates that there must have been much decaying plant debris on the sides and bottom of the ditch.

Terrestrial habitats are also represented by the insect assemblage. The phytophagous Coleoptera include Bracypterus urticae, which feeds on Urtica sp. (Nettles); Phyllotreta nigripes and P. vittula which feed mostly on Cruciferae; Agrypnus murinus and Agriotes sp. have larvae which feed on roots in grassland. Both Nettles and members of the Cruciferae are represented as plant macrofossils. Some other phytophagous

insect species give less precise information; Meligethes sp. for example, feeds on pollen. Some members of the Carabidae and Staphylinidae are present in the samples that although they are terrestrial beetles, are not restricted to any particular more specific habitat. The ants, other terrestrial insects, all nest under stones or in soil. Samples 2, 3 and 4 contained a very large number of aphids which were 'mummified', containing cocoons of minute parasitic Hymenoptera such as Aphidius sp. These aphids would have become immobilised on their host plant as a result of this parasitisation. As a group, the terrestrial insects suggest the presence of a range of habitats such as grassland and weedy ground, which is consistent with the evidence from the fruits and seeds.

It was suggested above that the deposits and sample 3 in particular, contained dung. More of the Coleoptera in sample 3 occur in dung than in any other single habitat, but the sample also contained Coleoptera, ants and aphids from other habitats. It is possible that some, though probably not all of them passed through the gut of grazing animals. All the samples, but particularly 3 and 4 contained many fly puparia, though Scathophaga steroraria, the yellow dung fly which lays its eggs on fresh dung in fields was not present. Similarly, Stomoxys calcitrans or Muscina stabulans, stable flies whose larvae feed on straw enriched with animal droppings, are also absent. Puparia of these flies have been found in large numbers on some archaeological sites. It seems possible therefore that the fly puparia were from species living in the decaying plant remains on the ditch edges rather than in dung. The dung beetles from sample 3 include Aphodius contaminatus, other species of Aphodius and Onthophagus sp. which tend to be restricted to dung in the form of droppings in the field. Also found in the assemblages were Cercyon spp. and Anotylus rugosus and A. sculpturatus; these dung beetles are less restricted than those above and are found in manure heaps and compost heaps in addition to dung in the field. In summary, the Coleoptera indicate the presence of the dung of large herbivores, at least in the vicinity of the ditch, but there is no cohesive proof from the insects alone, that sample 3 comprised droppings. The proportion of dung beetles is no higher than has been recorded from many other archaeological contexts where proximity of pastureland was regarded as sufficient explanation for their presence.

The presence of decaying vegetation can be implied by some of insects indicative of a wet ditch environment in general, but various Cryptophyidae, Anthicus floralis/formicarius and some of the Staphylinidae occur in decaying plant remains of a nature suggesting that rubbish was dumped into the ditch. Other insects are more associated with buildings and the activities of people in general. The woodworm beetle, Anobium punctatum, for example, is present and so is Lyctus linearis which tends to infect structural hardwood timbers. Both these species occur away from human influence, but their numbers are greatly increased when man-made timber structures are present. Ptinus fur tends to occur indoors, feeding on mouldy or rank organic material including grain residues, but it has also been found in very different habitats such as birds' nests. Sitophilus granarius, the grain weevil was recorded in sample 2. This species, which feeds on stored grain crops, is considered to be a Roman introduction. By the late first century AD it had reached York where a serious infestation of this pest had occurred (Kenward and Williams, 1979). S. granarius has been recorded from various other Roman contexts in Britain (eg. sites noted by Buckland, 1978; London, Boyd, 1981; Bearsen, Knights et al., 1983 and more recently from fourth century Catsgore in Somerset, Girling, 1984). The Exeter record, although it is only a single occurrence, is important because of its early date and also because it tends to confirm the suggestions that this serious pest might have been spread rapidly throughout England in military grain supplies. If it had arrived in Exeter earlier in the first century when the fortress was being supplied, it is not surprising that it occurs subsequently among presumably locally grown

cereals. The grain weevil cannot fly and is therefore very dependent upon man for transport; it only attacks stored grain, not cereal fields.

In conclusion, the range of insect remains and abundance of individuals is very much in keeping with the results from Roman rural occupation sites in England. Human 'occupation' is evident as well as the maintenance of an open landscape, though a diversity of habitats is stressed. Some urban insect assemblages have a similar composition, but the Friernhay Street samples do not show the superabundance of synanthropic or pest species that have been recorded from some contexts in Roman York or species associated with 'filth' characteristic of many medieval urban samples, perhaps owing to a small urban community in Exeter after the military presence was removed, or to the nature of the context sampled. Analysis of the fills of rubbish or cess pits of a similar date would make an interesting comparison with the ditch fill.

Ostracods (by Eric Robinson)

Sample 1 : no microfauna recovered.

Sample 2 : abundance of Cypria opthalmica (Jurine).

Sample 3 : abundance of Cypria opthalmica, and a few Candona (probably C.neglecta).

Sample 4 : some Cypria opthalmica, greater number of cladoceran egg cases.

In samples 2, 3, and 4, the main ostracod fauna is of carapaces of Cypria opthalmica, a free-swimming species of ostracod, normally found in ponds or small water bodies with open areas, free from water vegetation. In sample 3, where Cypria was joined by a small number of juveniles of Candona, there is a hint that there was the beginnings of a bottom dwelling, burrowing element to the fauna. No adults were found, however, and conditions may not have developed which were favourable to ostracods.

A feature of all samples was the delicacy of the valves as preserved. Cypria usually has well-calcified valves, capable of fossilisation in most neutral sediments. In sample 2, however, the valves are mere chitin husks, and barely recognisable as Cypria but for the rounded outline and traces of the muscle scar. It would seem that the lime of the valves has been reduced by solution in acid water conditions. The state of the specimens in sample 3 is less reduced, they retain some of the whitish bloom of calcified valves, together with the chitin. This extends to some preservation of the delicate chitin of the limbs of the ostracods, the long antennae extending as wisp-like threads from the front of the valves.

In the fourth sample, there was a greater number of the ephyppia (tough egg cases) of cladocerans. This form was not the customary shape of Daphnia sp., but some other genus of the same group of water-fleas. Sadly, the descriptive literature seldom seems to figure the egg-cases, which usually are much better preserved as sub-fossils than the delicate cases and limbs of the animal itself. At times it seems that rich populations of cladocera could inhibit the flourishing of ostracods in the same water body. This certainly seems to have been the case in the youngest of the four samples.

Overall, the picture conveyed by the four samples is one of a ditch with periodic openwater conditions, supporting a limited ostracod fauna, the earliest becoming reduced by the development of acidic, leaching conditions which effectively destroyed the limey carapaces of the the early fauna. The limited nature of the ostracod fauna suggests that conditions were either polluted or foul, so as to prevent the development of an average list of some ten or twelve species representing swimmers, bottom crawlers and bottom burrowers, that you would find in a natural pond.

The plant and animal remains indicate that the upper layers of the ditch silting became progressively more waterlogged and supported thick vegetation and a water beetle fauna. The preservation of the ostracods suggests increasingly acid and foul or polluted conditions of the ditch waters, though decaying plant matter is indicated by the insects, general site conditions were not as foul as those described from some Roman or medieval urban deposits in other parts of the country. The seeds and insects imply that open habitats such as arable and pastoral land were in close proximity and the presence of the nearby civilian settlement is also reflected by the nature of the ditch flora and fauna.

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Table 1. Macroscopic plant remains

Family and latin name	common name	sample 1	sample 2	sample 3	sample 4	ecological preference
SEEDS						
ALISMATACEAE						
Sagittaria sagittifolia	Arrow-head	1	-	-	-	A
BETULACEAE						
Alnus/Betula sp.	Alder/Birch	-	-	-	3	
Betula sp.	Birch	-	-	-	1	H, W
CAPRIFOLIACEAE						
Sambucus nigra L.	Elder	-	-	2	16	W, S, D, (e,m)
CARYOPHYLLACEAE						
Stellaria media agg.	Chickweed	-	897	343	5	Da
Stellaria sp.	Stitchwort, Chickweed	-	16	-	-	
gen. et sp. indet. A		-	27	-	-	
gen. et sp. indet. B		-	27	-	-	
gen. st sp. indet. C		-	4	-	-	
gen.et sp. indet. general		-	-	2	3	
CHENOPODIACEAE						
Atriplex sp.	Oraches	-	-	2	3	Da
Chenopodium cf. album	Fat Hen	-	14	2	-	D, (e)
Chenopodium rubrum/botroydes		2	-	6	-	
Chenopodium sp.		-	3	-	-	V
COMPOSITAE						
Carduus sp.	Thistle	-	-	18	-	G, S, Da
Cirsium sp.	Thistle	-	-	4	-	G, S, Da
Cirsium/Carduus sp.	Thistle	-	7	-	17	G, S, Da
Leontodon sp.	Hawkbit	-	1	4	2	G, (b)
Sonchus asper (L.) Hill	Sow Thistle	-	1	1	7	Da
gen. et sp. indet.		-	-	2	1+	
CRUCIFERAE						
Capsella bursa-pastoris (L.) Medic.	Shepherd's Purse	-	3	-	-	Da, (m)
gen. et sp.indet. A		-	5	-	-	
gen. et sp.indet. B		-	1	-	-	
CYPERACEAE						
Carex spp.	Sedges	14+	2	5	3	M, V (damp)
cf. Cyperus fuscus (no reference material available)		-	36	5	-	
cf. Scirpus sp.	Sedges	-	-	-	3	
gen. et sp. indet.		-	++	1	-	
FUMARIACEAE						
Fumaria sp.	Fumitory	+	-	-	-	Da
GRAMINEAE						
Avena sp. (carbonised)	Oat	-	-	1	-	C
gen.et sp. indet.	Grasses	2	69	105	35	G, V
HYPERICACEAE						
Hypericum spp.	St John's Wort	2	3	-	-	D, G, S, W

JUNCACEAE						
Juncus spp.	Rushes	20	8	8	30	H, M
LABIATAE						
Prunella vulgaris L.	Self Heal	-	1	6	-	D, G, (m)
LINACEAE						
Linum catharticum L.	Purging Flax	3	-	1	-	G, H (m, b)
PAPAVERACEAE						
Papaver cf. *somniferum*	Opium Poppy	-	-	1	-	C, (e), (m)
PLANTAGINACEAE						
Plantago major L.	Great Plantain	-	1	-	-	Da, (open)
POLYGONACEAE						
Polygonum aviculare agg.	Knotgrass	5	25	15	2	Da, (m)
Polygonum hydropiper L.	Water-Pepper	-	28	-	-	V(esp. B, damp, shallow water)
Polygonum persicaria L.	Red Shank	-	12	7	-	B(ponds), Da
Polygonum spp.	Docks	-	6	16	-	Da
Rumex acetosella agg. (fruits)	Sheep's Sorrel	5	6	5	3	Da, G, H (a)
Rumex conglomeratus Murr. (fruits with perianths)	Sharp Dock	-	1	-	1	G, W(damp)
Rumex obtusifolius L. (fruits with perianths)	Broad-leaved Dock	-	3	-	2	D, S
Rumex sp. (fruits with perianth)	Dock	-	c. 30	29	2	D, G, H, W
Rumex sp. (fruits only)	Dock	-	52	1	28	D, G, H, W
Rumex sp. (perianths only)	Dock	-	c.25	4	-	D, G, H, W
Rumex sp. stem fragments	Dock	-	9	1	4	D, G, H, W
PORTULACACEAE						
Montia cf. *fontana*	Blinks	3	-	-	2	B, Da, G(damp, a)
RANUNCULACEAE						
Ranunculus acris/repens/bulbosus	Buttercups	-	2	4	4	G
Ranunculus sub-genus *Batrachium*		-	2	-	-	A
Ranunculus flammula L.	Lesser Spearwort	-	1	-	-	V(wet), (m)
ROSEACEAE						
Aphanes sp.	Parsley Piert	1	1	-	1	Da, G
Filipendula ulmeria (L.) Maxim.	Meadow Sweet	-	-	3	-	B, M, W, G
Fragaria vesca L.	Strawberry	-	5	-	-	G(b), W, S, (e)
Potentilla spp.	Tormentils	-	2	-	-	V
gen. et sp. indet.		-	-	14	-	
SCROPHULARIACEAE						
Rhinanthus sp.	Yellow Rattle	-	1	-	1	G, Da
Veronica hederifolia L.	Ivy Speedwell	+	-	-	-	Da
SOLANACEAE						
Hyoscyamus niger L.	Henbane	-	1	-	1	D(sandy, m)
UMBELLIFERAE						
Apium nodiflorum (L.) Lag.	Fool's Watercress	-	-	1	-	M (Shallow water)
Apium sp.		-	1	-	-	
Conium maculatum L.	Hemlock	-	6	19	17	B, W (damp)
cf. *Oenanthe* sp.	Dropwort	-	-	-	1	

URTICACEAE						
Urtica dioica L.		Stinging Nettle	-	63	180	100	S, F, G, W (e)
Urtica urens L.		Small Nettle	-	14	1	1	Da (light soils)
unidentified seeds (general)			9	1	6	8	
unidentified A			-	16	-	-	
unidentified B			-	1	-	-	
unidentified C			1	1	-	-	
WATERLOGGED CEREAL CHAFF (except * carbonised)							
Avena sp.	floret	Oat	-	-	1	-	
Triticum dicoccum/spelta	glume bases	Emmer/Spelt	-	-	49	-	
Triticum dicoccum/spelta	spikelet fork	Emmer/Spelt	-	-	1	1	
Triticum spelta	glume base*	Spelt Wheat	-	-	-	1	
Triticum spelta	glume bases	Spelt Wheat	-	-	1	10	
Triticum sp.	glume bases	Wheat	-	1	-	45	
Triticum sp.	spikelet forks	Wheat	-	-	-	3	
Triticum sp.	rachis fragment	Wheat	-	-	-	1	
Triticum sp.	rachis fragment*		-	-	1	-	
cf. cereal rachis fragments			-	4	-	2	
fragments of cereal stems and glumes			-	-	1	10	
bran fragments			+	+	+	+	

Key: A - aquatic; B - bankside; C - cultivated; D - disturbed ground, waysides, waste places; Da - disturbed ground including arable; G - grassland, pasture; H - heathland, moors; M - marsh, ditches; S - scrub, hedgerows; W - woodland; V - varied; (a)- prefers acid soils; (b) - prefers basic soils; (e) - edible; (m) - possible medicinal use. Numbers refers to numbers of fruits/seeds; + denotes fragments.

Table 2.

Coleoptera BEETLES	1	2	3	4	TO
Trechus obtusus Er. or quadristriatus (Schr.)	-	1	1	-	2
Benbidion cf. guttula (F.)	1	-	-	-	1
B. lunulatum (Fouc.)	-	-	1	-	1
Amara sp.	-	-	-	1	1
Harpalus affinis (Schr.)	-	-	-	1	1
Hygrotus inaequalis (F.)	-	-	1	-	1
Heleophorus porculus Bed. or rufipes (Basc)	-	-	-	1	1
Heleophorus sp. (brevipalpis size)	-	1	3	3	7
Coelostoma orbiculare (F.)	-	-	-	1	1
Sphaeridium sp.	-	-	-	1	1
Cercyon unipunctatus (L.)	-	-	-	1	1
Cercyon sp. (not above)	-	-	3	4	7
Megasternum obscurum (Marsh.)	-	-	-	1	1
Cryptopleurum sp.	-	-	1	-	1
Hydrobius fuscipes (L.)	-	-	2	2	4
Anaecaena sp.	-	-	-	1	1
Laccobius sp.	-	-	-	1	1
Helochares sp.	-	3	2	4	9
Histerinae gen. et sp. indet.	-	-	1	1	2
Ochthebius sp.	-	-	-	1	1
Limnebius aluata (Bed.)	-	-	-	1	1
Ptenidium sp.	-	1	-	-	1
Ptiliidae gen. et sp. indet. (not above)	1	-	1	1	3
Omalium sp.	-	-	-	1	1
Carpelimus sp.	-	-	1	-	1
Platystethus arenarius (Fouc.)	-	-	-	1	1
P. cornutus gp.	-	-	-	1	1
P. nitens (Sahl.)	-	-	-	2	2
Anotylus rugosus (F.)	-	-	1	-	1
A. sculpturatus (Grav.)	-	-	1	1	2
Stenus sp.	1	-	1	1	3
Rugilus sp.	-	-	1	-	1
Gyrohypnus fracticornis (Mull.)	-	1	-	-	1
Xantholinus linearis (Ol.) or longiventris Heer	1	-	-	-	1
Philonthus intermedius B.&L. or laminatus Creutz.	-	-	-	1	1
P. cf. politus (L.)	-	-	-	1	1
Philonthus sp.	-	1	-	-	1
Tachyporus sp.	1	-	-	-	1
Tachinus sp.	-	-	1	-	1
Aleocharinae gen. et sp. indet.	2	1	3	2	8
Aphodius contaminatus (Hbst.)	-	-	1	-	1
A. foetidus (Hbst.)	-	-	-	1	1
Aphodius spp. (including other spp.)	1	1	2	3	7
Onthophagus ovatus L.	-	-	-	1	1
O. similis (Scrib.)	-	1	-	-	1
Onthophagus sp. (not ovatus)	-	-	1	1	2
Agrypnus murinus (L.)	-	-	1	-	1
Agriotes lineatus (L.)	-	1	-	-	1
Agriotes sp.	-	-	-	1	1
Cantharis sp.	-	-	-	1	1
Anobium punctatum (Deg.)	-	-	1	3	4
Ptinus fur (L.)	-	-	1	1	2
Lyctus linearis (Goez.)	-	-	-	1	1
Malachius sp.	-	-	-	1	1
Brachypterus urticae (F.)	-	1	-	1	2
Meligethes sp.	-	-	-	1	1
Omosita colon (L.)	1	-	-	-	1

Omosita sp.	-	-	-	1	1
Atomaria sp.	-	1	-	1	2
Cryptophagidae gen. et sp. indet. (not Atomaria)	-	1	-	3	4
Anthicus floralis (L.) or formicarius (Goez.)	-	-	1	-	1
Phyllotreta nigripes (F.)	-	-	1	-	1
P. vittula Redt.	-	1	1	-	2
Longitarsus sp.	-	-	1	-	1
Chaetocnema sp. (not concinna)	1	-	-	-	1
Apion sp.	-	-	1	1	2
Tanysphyrus lemnae (Pk.)	-	-	-	1	1
Sitophilus granarius (L.)	-	1	-	-	1
Curculionidae gen. et sp. indet. (not above)	3	-	1	2	6
TOTAL	13	17	38	62	130

FORMICIDAE ANTS		1	2	3	4
Myrmica laevinodis Nyl. or ruginodis Nyl.	worker	-	-	7	-
Myrmica sp.	worker	-	-	-	1
Myrmica sp.	male	-	-	1	-
Lasius flavus gp.	worker	-	-	-	1
L. niger gp.	worker	-	1	5	2
Lasius sp. (not fuliginosus)	female	-	-	1	-
TOTAL		0	1	14	4

OTHER INSECTS		1	2	3	4
Aphidoidea gen. et sp. indet.	APHIDS	-	26	68	48
Heteroptera gen. et sp. indet.		-	-	1	1
Forficula auricularia L.		-	-	-	1
Hymenoptera gen. et sp. indet.		-	2	5	9
Chironomidae gen. et sp. indet.	larval head capsules	+	+	+	+
Diptera gen. et sp. indet.	puparia	2	12	57	101
Diptera gen. et sp. indet.	adults	-	-	2	14