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The Insect Fauna of The Roman Well at the Cattle Market Site, Chichester

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During excavations of the Cattle Market Site, Chichester, Sussex, 3 Roman wells were revealed. These afforded a rare opportunity to investigate any preserved insect remains in the south coastal area which is generally deficient in such analyses. Two nearby sites have produced associated small beetle assemblages; those of Roman Fishbourne, Sussex (Osborne 1971) and Saxon pits at Southampton (Buckland et. al. 1979). As deposits at the site were otherwise above the watertable so that their aerobic nature left little likelihood of survival of insect cuticle, any waterlogged organic deposits in the well were the only potential source of such remains to provide evidence about conditions at the site at the time they were incorporated in the well sediments. Well 3 (   ) possessed the only shaft to contain organic silts; these lay beneath layers of rubble and sand. The other wells appear not to have remained fully waterlogged since Roman times. As the deposits appear to have been laid down under water, it is likely that they were disturbed by turbulence when water was drawn off and also to slumping, therefore successive layers probably do not represent an ordered sequence. The position of the silt at the bottom of the shaft and lying below water level despite pumping, also made impossible any systematic sampling and instead, the organic deposit was treated as a single unit. A bulk sample of this was collected straight into clean buckets.

To avoid problems of transporting the semi-liquid silts to the Ancient Monuments Laboratory, London, sample processing and paraffin flotation were undertaken at Chichester following the method described by Coope and Osborne (1967).

A total weight of approximately 20 kgs of well sediment were treated in this way. The paraffin floats, samples of the paraffined residue and of the untreated material were sent to the Laboratory for analysis. Insect remains were extracted under a low-power microscope and the efficiency of the processing was tested by examining the residue samples which were found to contain very few insect sclerites.

The insect assemblage from the well proved to be very rich, principally in Coleoptera (beetle) remains with two families, Carabidae (ground-beetles) and Staphylinidae (rove beetles) predominating. The insects recovered and their minimum totals based upon counts of the commonest element of the recorded sclerites (ie heads, thoraces, wingcases and for certain taxa undersides, (leg parts and pygidia). The nomenclature for the beetles follows Kloet and Hincks (1977).

Chichester Roman Well: Species List of Insect Remains

INSECTA

DERMAPTERA

Forficula auricularia L.	10

HEMIPTERA

HOMOPTERA and HETEROPTERA present*

COLEOPTERA

CARABIDAE

Carabus granulatus L.	1
Nebria brevicollis (F.)	6
Notiophilus biguttatus (F.)	2
Loricera pilicornis (F.)	1
Clivina collaris (Herbst) or *fossor* (L.)	2
Trechus obtusus Er. or *quadristriatus* (Schrank)	2
T. micros (Herbst)	71
Asaphidion flavipes (L.)	2
Bembidion properans Steph.	67
Bembidion sp.	1
Pterostichus cupreus (L.)	1
P. madidus (F.)	8
P. melanarius (Ill.)	19
P. minor (Gyll.)	1
P. niger (Schall.)	1
P. nigrita (Payk.)	1
Abax parallelepipedus (Pill. & Mitt.)	1

Calathus fuscipes (Goeze)	10
C. micropterus (Dufts.)	1
Agonum muelleri (Herbst)	8
Agonum sp.	3
Amara aenea (Deg.)	37
A. apricaria (Payk.)	4
Amara spp.	6
Harpalus rufipes (Deg.)	1
H. affinis (Schrank)	5
Harpalus sp.	3
Dromius spp.	3
Brachinus crepitans (L.)	1
DYTISCIDAE	
Hydroporus palustris (L.)	2
Agabus bipustulatus (L.)	1
Colymbetes fuscus (L.)	1
HYDROPHILIDAE	
Helophorus aquaticus (L.)	3
H. brevipalpis Bed.	27
H. nubilus F.	1
Sphaeridium sp.	1
Cecyon marinus Thom.	2
Cercyon spp.	3
Megasternum obscurum (Marsh.)	27
Cryptopleurum minutum (F.)	3
Hydrobius fuscipes (L.)	1

HISTERIDAE

Acritus nigricornis (Hoff.)	8
Hister merdarius Hoff.	1
Hister sp.	1

HYDRAENIDAE

Ochthebius minimus (F.)	4

PTILIIDAE

Gen. et sp. indet.	1

LEIODIDAE

Catops nigricans (Spence)	2

Silphidae

Silpha obscura L.	1

STAPHYLINIDAE

Micropeplus fulvus Er.	3
Lesteva longoelytrata (Goeze)	6
Omalium caesum Grav.	4
O. rivulare (Payk.)	2
Siagonium quadricorne Kirby	3
Coprophilus striatulus (F.)	12
Carpelimus sp.	5
Platystethus arenarius (Fourc.)	9
P. degener Muls. & Rey	137
P. nitens (Sahlb.)	41
Anotylus nitidulus (Grav.)	10

SCARABAEIDAE

Aphodius ater (Deg.)	2
A contaminatus (Herbst)	3
A. granarius (L.)	38
A. merdarius F.	21
A. rufipes (L.)	4
A. sphacelatus (Panz.)	5
A. testudinarius (F.)	1
Aphodius spp.	21
Oxyomus sylvestris (Scop.)	10
Onthophagus coenobita (Herbst)	4
Phyllopertha horticola (L.)	1

ELATERIDAE

Agrypnus murinus (L.)	1
Melanotus erythropus (Gmelin in L.)	1
Athous bicolor (Goeze)	1
A. haemorrhoidalis (F.)	2
Agriotes sputator (L.)	3

ANOBIIDAE

Grynobius planus (F.)	1
Anobium punctatum (Deg.)	17

PTINIDAE

Tipnus unicolor (Pill. & Mitt.)	1
Ptinus fur (L.)	3
Ptinus sp.	1

LYCTIDAE

Lyctus brunneus (Steph.)	2

NITIDULIDAE

Kateretes rufilabris (Lat.)	9

CUCUJIDAE

Cryptolestes ferrugineus (Steph.)	24

SILVANIDAE

Oryzaephilus surinamensis (L.)	13

CRYPTOPHAGIDAE

Cryptophagus sp.	6

CORYLOPHIDAE

Sericoderus lateralis (Gyll.)	1
Corylophus cassidoides (Marsh.)	1

COCCINELLIDAE

Platynaspis luteorubra (Goeze)	1

LATHRIDIIDAE

Lathridium minutus (L.) or pseudominutus (Strand)	29
Enicmus transversus (Ol.)	4
Corticaria serrata (Payk.)	16
Corticarina sp.	2

COLYDIIDAE

Aglenus brunneus (Gyll.)	1

TENEBRIONIDAE

Tribolium casteneum (Herbst)	4

SALPINGIDAE

Rhinosimus planirostris (F.)	1

CERAMBYCIDAE

Grammoptera ruficornis (F.)	1

BRUCHIDAE

Bruchidius ater (Marsh.)	2

CHRYSOMELIDAE

Gastrophysa viridula (Deg.)	2
Phyllotreta nigripes (F.)	41
P. vittata (F.)	2
P. vittula Redt.	1
Longitarsus spp.	51
Chaetocnema concinna (Marsh.)	15
C. hortensis (Fourc.)	19
Psylliodes attenuata Koch.	4

APIONIDAE

Apion aeneum (F.)	9
Apion spp.	15

CURCULIONIDAE

Otiorhynchus ligneus (Ol.)	1
Strophosomus sp.	1
Sitona hispidulus (F.)	14
S. lepidus Gyll.	10
Sitona sp.	1
Hypera punctata (F.)	1
Hypera sp.	1
Tanysphyrus lemnae (Payk.)	2
Rhyncolus lignarius (Marsh.)	1
Sitophilus granarius (L.)	8
Acalles ptinoides (Marsh.)	1
Ceuthorhynchidius spp.	14
Ceutorhynchus erysimi (F.)	6
C. hirtulus Germ.	2
Ceutorhynchus sp.	1
Rhinoncus pericarpius (L.)	18
Gymnetron veronicae (Germ.)	1

SCOLYTIDAE

Scolytus mali (Bech.)	2
S. rugulosus (Müll.)	3

PLATYPODIDAE

Platypus cylindrus (F.)	3

HYMENOPTERA

FORMICIDAE	9
PARASITICA	4

DIPTERA

TIPULIDAE 11

<u>Gen. et spp. indet.</u> 66

ARANAEA Present, mostly LINYPHIIDAE

* The Hempitera fauna will form the basis of a separate report by Mr R. O'Shea.

Total of Coleoptera taxa: 153

Total of Coleoptera individuals: 1469

Total of insect individuals: 1569

(excluding Hemiptera)

Evidence from the insects of conditions at the site

The major faunal element consists of species which were living naturally in the vicinity, but under conditions that were largely fashioned by man's activities which have dictated the presence of beetles favoured by farming and other practices. A smaller, but significant element is composed of more directly synanthropic beetles which are very, or totally dependent upon man for the provision of shelter and/or specialized food in the form of stored products. Included in this group are a number of species not native to Britain, but which have been accidentally imported in infested cargoes. The overall implications, particularly from the marked synanthropes is that part, and probably all of the assemblage entered the well during its useage by the site occupants. For the purposes of this report, the over-simplified division is made between species living naturally and the marked synanthropes. To avoid repetition, sources of data are given at the end of each section, except for specific references.

Naturally occurring species

i. Ground beetles. The predominance of these very active ground dwellers shows that the well acted as a pit-fall trap for beetles running along the surface. A wall around the well shaft would not prove to be a barrier to these predators which would readily climb it in search of food. Carabid species are largely represented by those which require dry, unshaded soils, and sandy substrates are preferred by a number of them. Amara aenea of which 37 individuals were present, is a marked xerophile and it commonly occurs on sandy soils especially where the vegetation is sparse or short. Another member of the genus, A. apricaria, also prefers dry soils away from shade, and it usually occurs in disturbed or cultivated ground. The two commoner Pterotichus species: melanarius and madidus also display synanthropic habits, preferring fields, unshaded cultivated soils or gardens. Harpalus affinis and H. rufipes occur in similar, dry areas and the latter has been recorded as a pest on strawberries. A beetle which occurs only locally in southern Britain, Brachinus crepitans, is confined to dry, open soils. Its defensive mechanism when attacked by a predator is to emit a burst of noxious spray from the end of the abdomen and this has earned it the title of 'the bombadier beetle'. Dry, or moderately dry conditions, usually in fields or cultivated soils, are required by Calathus fuscipes, of which 10 individuals were recovered. C micropterus, one which occurred, prefers similar ground but it also extends into woodland. Eight examples were present of a further dry arable or grassland species, Agonum muelleri. Rather moister soils might have been available for Carabus granulatus and Asaphidion flavipes, species often found near water, but their low numbers would suggest that damper areas were localized, and the overall implication for dry conditions agrees with the low watertable of the site.

In contrast with the general requirement for sunny, unshaded soils, the most abundant carabid, totalling 71, Trechus micros, displays a cryptic mode of life. It often occurs underground, in cracks and crevices, and it has been recorded from rodent burrows. Its frequency in the deposit would suggest that a breeding colony had become established in the well shaft: teneral specimens, representing adults recently emerged from pupation which have died before the cuticle had hardened and darkened, provide evidence for the full life-cycle taking place in situ. The stone facing inside the well would have provided ample crevices between the joints for habitats, similarly any lid or cover, possibly of wood, could

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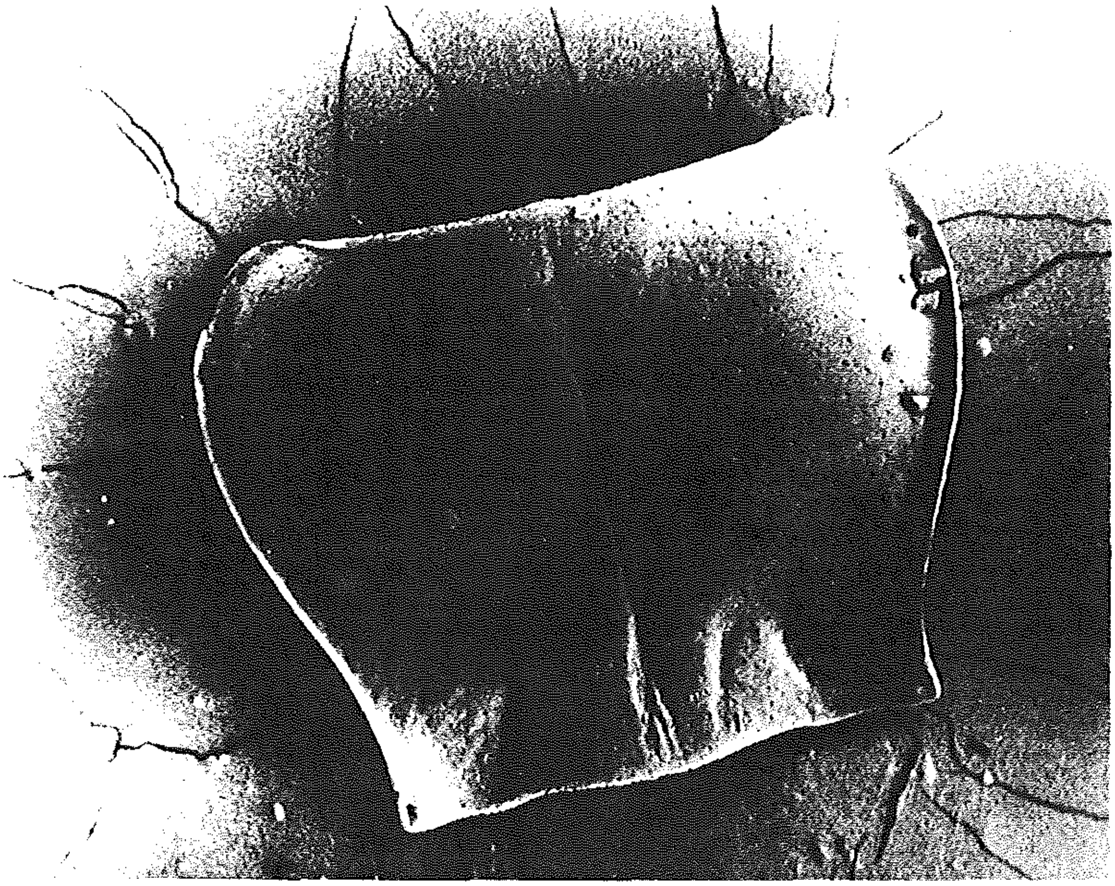

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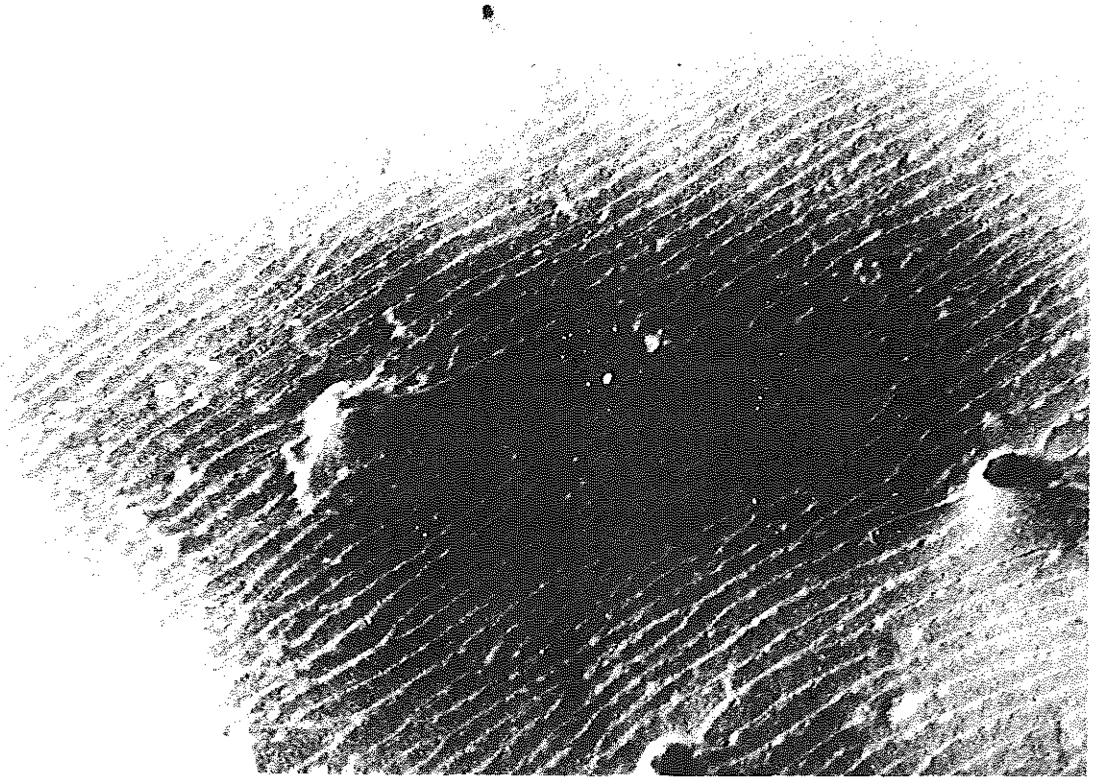

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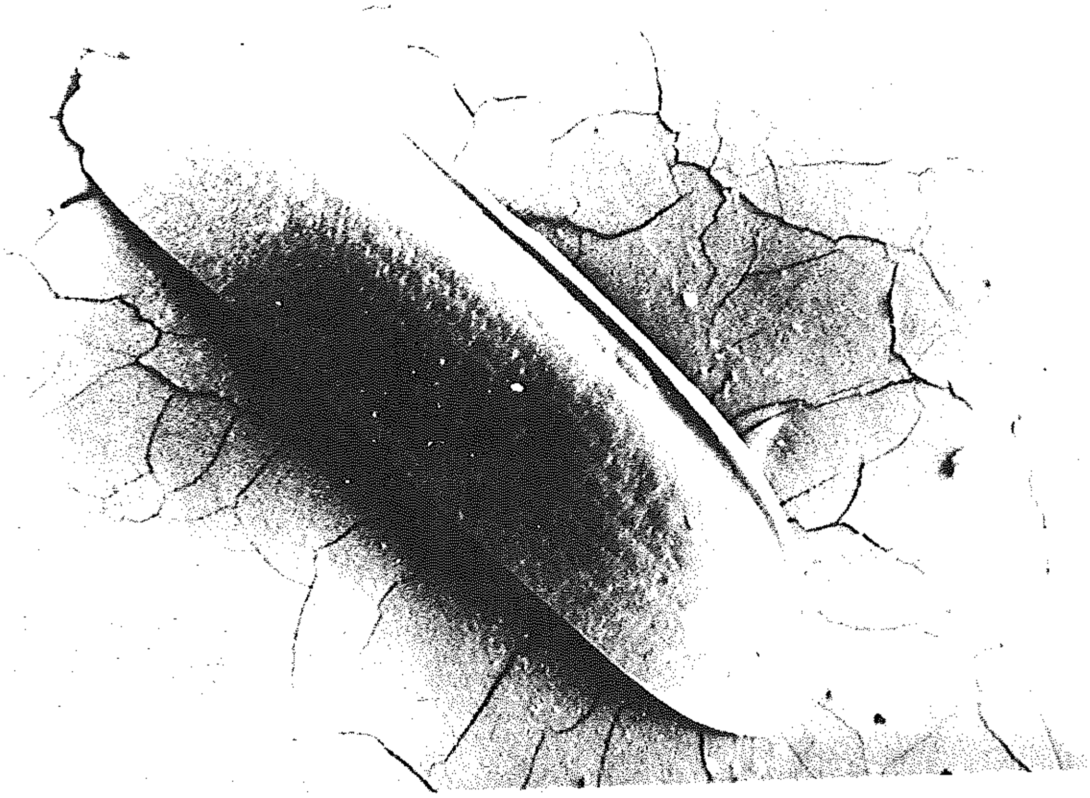

have provided further niches, and would have prevented light penetrating the upper part of the shaft.

In consequence of this subterranian mode of life, T. micros should cautiously be regarded as a potential contaminant. This is particularly the case where poor insect preservation might imply some degree of drying and perhaps cracking of the sediments, but in contrast T. micros looks fresher. Where a deposit has remained very saturated, as at Chichester, beetles are unlikely to penetrate far without drowning. Also, the Roman well shaft was filled with a thick layer of rubble and sand sealing the waterlogged layer. The appearance of T. micros sclerites was identical with other beetle remains. Furthermore, the recently-emerged adults in the deposit suggest the *in situ* incorporation of unsuccessful individuals which had fallen from their pupation sites, and the frequency of the beetle argues against fortuitous post-depositional contamination of the waterlogged Roman silt by T. micros. A pronotum plus a detail of its microsculpture, and an elytron are shown in Figs.1-3. Another instance of large numbers of the species was recorded by Buckland (1982) in the York Roman sewer. (Data from Fowler 1880, Joy 1932, Jeanell 1940, Lindroth 1974).

A proportion of the active staphylinids could owe their presence as pit-fall trap victims, but because of their preponderance in rotting material, they are included in the later section which deals with this habitat.

ii. Aquatic and pond edge beetles. Very few species in these categories were recorded from the well. The true water beetles were restricted to 4 individuals of three very widespread species. Agabus bipustulatus is almost notorious for the frequency with which it is collected away from water; often whilst flying between ponds, lakes or rivers it mistakenly dives towards reflecting objects such as cars. Colymbetes fuscus is also a strong flier. The waterside beetles which live amongst weeds or in wet mud are also poorly represented. 27 individuals were recorded of Helophorus brevipalpis, but again, the species is extremely common, readily flying and swarming, and taking advantage of any natural or artificial water body. Of the remaining 8 hydrophilid taxa, only two live exclusively in water edge habitats, Helophorus aquaticus (3 individuals) and Hydrobius fuscipes (1), and both are very widespread. Hydraenidae are usually indicators of water edge conditions, but the well contained only 4 specimens of one of the commonest species, Ochthebius minimus. There was a single representative of Corylophus cassiodes, a wet mud dweller. Similarly, amongst the plant feeders, only 2 examples occur of a species requiring an aquatic or semi aquatic food plant: Tanysphyrus lemnae lives on surface mats of pondweed (Lemna). During the stage when insects were incorporated in the well sediments, the well functioned normally with no sign of the top of the shaft collapsing inwards to make a hollow around the water source. It is not unusual for occupants of a site to draw water from a 'well' which resembles a pond, particularly when the water table is not far below the surface and in the later stages of the life of a shaft well. Archaeological examples are evidenced by rich aquatic and waterside faunas. The Chichester well, by contrast, acted as a vertically sided, stone-faced structure with the water surface some depth below ground level where sunlight rarely reached it. A roof or cover possibly excluded light for some of the time although the insect total of 1569 (excluding bugs) argues against a permanent lid. Growth of Lemna would be unexpected if these conditions pertained and the two duckweed feeders had perhaps been transported to the site on the feet of a wading bird, a method of dispersal for the plant. The plant could have become established in the well if sufficient light reached the (higher than usual?) water surface. Little opportunity could have existed in the well for water edge weed and mud habitats. If, however, the well surround was subjected to frequent splashing, this might have attracted beetles of wet weed and mud habitats, a few of which then fell into the well. (Data from Balfour-Browne 1948, 1958, Freude, Harde and Lohse 197).

iii. Phytophagous species. Those plant feeders which display definite food-plant requirements (as opposed to the more general feeding habits of polyphages) can be grouped into those which attack cultivated plants and their associated weeds and a significant group of tree feeders. Cruciferae, including cultivated species of beet and the cabbage families generally provide hosts for Phyllotreta spp., the commonest P. nigripes (41 individuals) is found on cauliflower. Two other leaf beetles, Chaetocnema concinna (15) and C. hortensis (19) feed on Polygonum spp., including weed species. Psylliodes attenuata has commonly been collected from Humulus (hop plants). Today Bruchidae are often encountered infesting dried peas, beans, lentils and other foodstuffs and a number of exotic species have been imported on this manner. Other species however infest mainly leguminous plants of both weeds and cultivated varieties, and one such is Bruchidius ater. Malvaceaa, including the mallows, provide some hosts for Apion aeneum (9). The Curculionidae Sitona hispidulus (14) and S. lepidus (10) are also known from legumes. The commonest weevil, Rhinoncus pericarpius (18) includes Polygonum and Rumex species amongst its host plants. Ceutorhynchus erysimi (6) is somewhat polyphagous on various herbs and shrubs, especially Cruciferae, while C. hirtulus (2) has been recorded on Draba verna and various grasses. Gymnetron veronicae (1), as implied by its name, includes the small surface creeping weed Veronica (speedwell) amongst its hosts.

The phytophages with trees as hosts include dead and decaying wood specialists. One such is Rhyncolus lignarius which lives principally in decaying deciduous wood. Bark beetles of the Scolytus genus, although they feed on living deciduous bark, prefer to breed in dead trees. The species found in the well, S. rugulosus (figs. 4 and 5) and S. mali commonly occur under bark of fruit trees, the latter additionally attacks elms. The somewhat rare beetle Platypus cylindrus commonly breeds in oak trees, and a number of records have been made from recently cut oak logs (eg Donisthorpe 1939). Half an elytron and a detail of the projecting strial ridges are shown in figs. 6 and 7. The nearby availability of wood is further indicated by other families. The longhorn beetle Grammoptera ruficorne occurs in a range of deciduous trees, and Rhinosimus planirostris lives as a predator in wood. The large elaterid Melanotus erythropus, characterized by the pronounced mammilate punctures on the smooth cuticle, develops in a variety of trees. One of the staphylinids, Siagonum quadricorne, is a predator in dead wood, particularly of elm. There are also a small group of wood borers which mainly infest timber and these will be discussed later with the other synanthropic species. The woodland element suggests some nearby availability of oak, fruit and other deciduous trees. The excavation recovered evidence that the 3 Roman wells were situated in small, fenced occupation areas with buildings and gardens. Possible hosts could have been provided by the planting of fruit trees (and vines) around homesteads. Although Scolytus are strong fliers, the 5 individuals are more likely to be representatives of a nearby population which had become trapped in the well, rather than chance arrivals from some distance. Mature oak and elm are perhaps less appropriate for the gardens as there is little beetle evidence for shaded soils, but close to the boundary fences, a large pallisade can had been constructed and repaired throughout its life. As tree trunks used for the massive structure were unlikely to have

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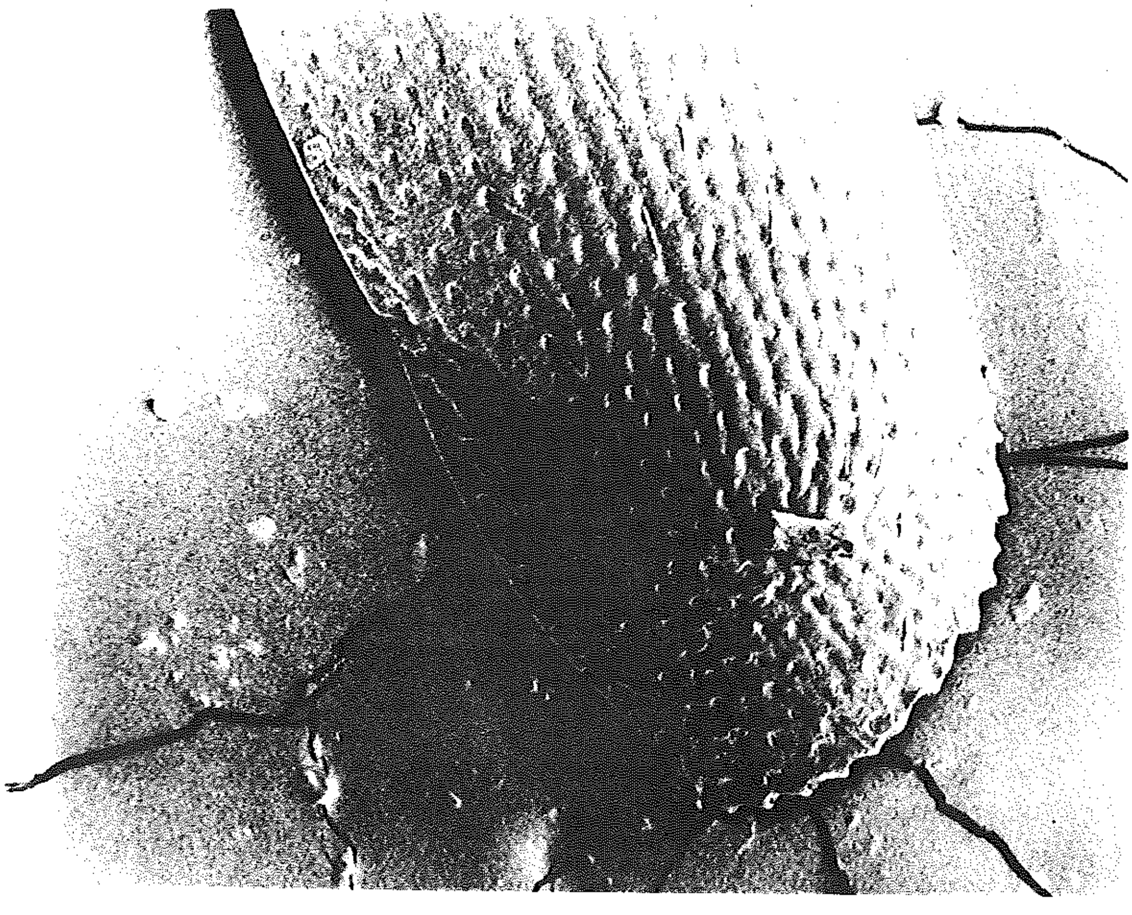

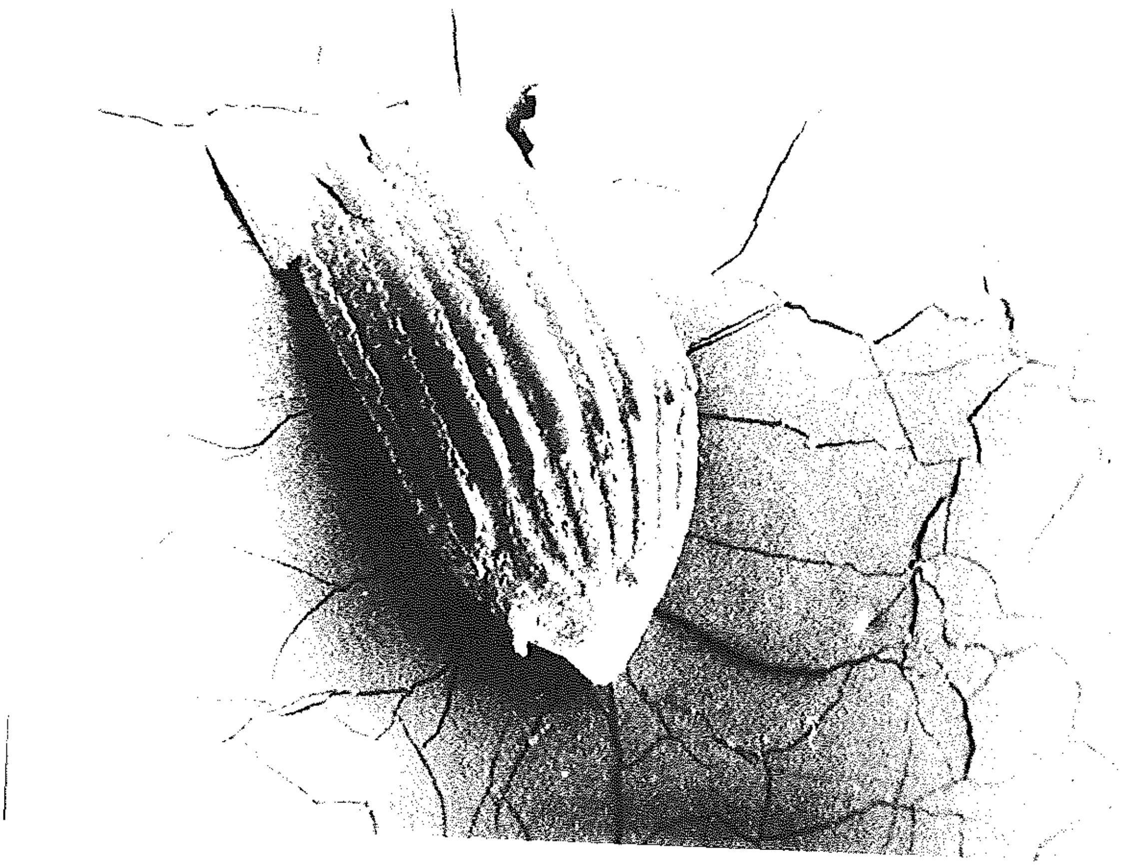

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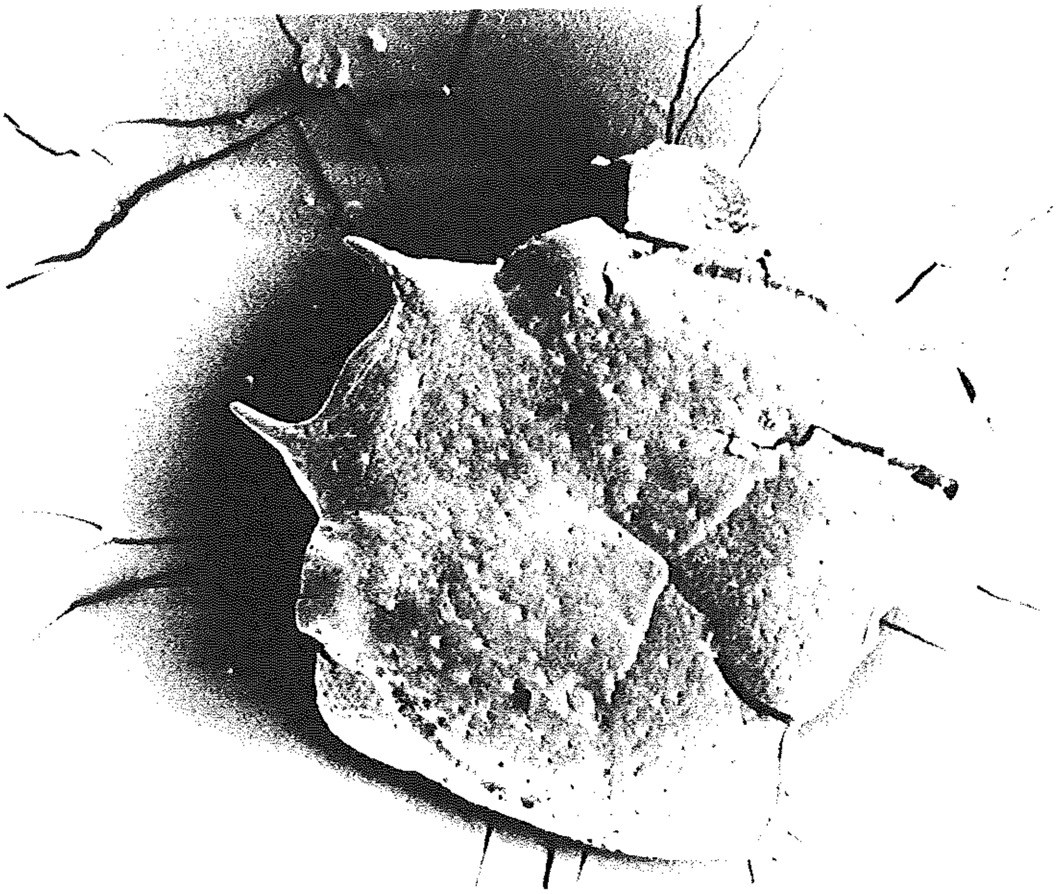
been barked, it is probable that beetles living in them were introduced along with the wood. The known association of P. cylindrus and recently cut oak logs indicates that if the beetle arrived at the site in attacked wood, further felling to repair sections of the pallisade would maintain habitat availability. Other wood and bark feeding beetles could have benefitted from the log structure, and if the repairs were necessitated by the decay of component logs, this identifies one habitat for the rotten wood species.

Most of the remaining plant feeders could have lived in the garden areas, although the beetle which lives on hops could have arrived accidentally after harvesting a crop further afield. Othewise, garden plants, vegetables and common (disturbed soil) weeds account for the range of required host plants. (Reitter 1914, 1915, Horion 1940, Duffy 1953, Hoffmann 1954, Freude, Harde and Lohse 1966, 1979, 1981).

iv. Compost/dung/rubbish beetles. 59 of the 153 beetle taxa from the well (ie 39%) live in some form of rotting plant or animal material, including dung. Accumulations of house rubbish or dead garden plants and leaves could have provided immediate habitats at the occupation site. A component must have been of animal origin, perhaps bones from meat, skins or small animal corpses, as carrion is frequently cited in collecting records of certain Staphylinidae and Hister although not exclusively for any species. Two more specialist carrion beetles are Silpha obscura and Catops nigricans

Aphodius, Onthophagus and to a lesser degree Geotrupes species normally breed in dung. Most are strong fliers and at night a number are readily drawn to light. Lighted dwellings not too far from grazing land (present around the Roman town walls) will therefore tend to attract certain _Aphodius_ (and numbers of other insects!) in the absence of immediate livestock. The dung beetle evidence for the well is so substantial, however, with 110 individuals of over 10 species that stabling of some animals, perhaps horses, within the enclosed occupation area must be considered. Supporting the dung beetle evidence, larger numbers were recorded of Staphylinidae and Hydrophilidae which are strongly associated with dung. More than 20 species, which include _Megasternum obscurum_, _Crytopleurum minutum_, _Coprophilus striatulus_, _Platystethus_ and _Anotylus_ species, account for 415 individuals in the deposit. The dung and dung associated species together represent 36% of the recorded beetles. _Platystethus degener_, was the most abundant species at the site, with 137 individuals. A head is shown in fig 8, but identification was made with elytra which were uniformly dark, lacking the paler spots of its close relative, _P. cornutus_. The pronotum of _Anotylus nitidulus_, another dung associated species, is illustrated in fig 10. A total of 71 individuals represent the genus at the site.

Livestock stabled or stalled at the site, as well as attracting the dung fauna, would necessitate hay and feed storage, and the floor sweepings, if stored in piles, would provide an ideal pabulum for numbers of the plant-refuse species. If dung was incorporated, habitats would be extended to the dung fauna and other species which prefer fouler conditions. The decay of the plant (and dung) materials increases the temperature towards the base or the heap which allows a greater number of larval and adult beetles to take advantage of the rubbish and additionally, provides a refuge for species which would otherwise fail to survive outside temperatures. Examples of beetles of plant refuse, haystacks and similar accumulations include _Acritus nigricornis_, an elytron of which is shown in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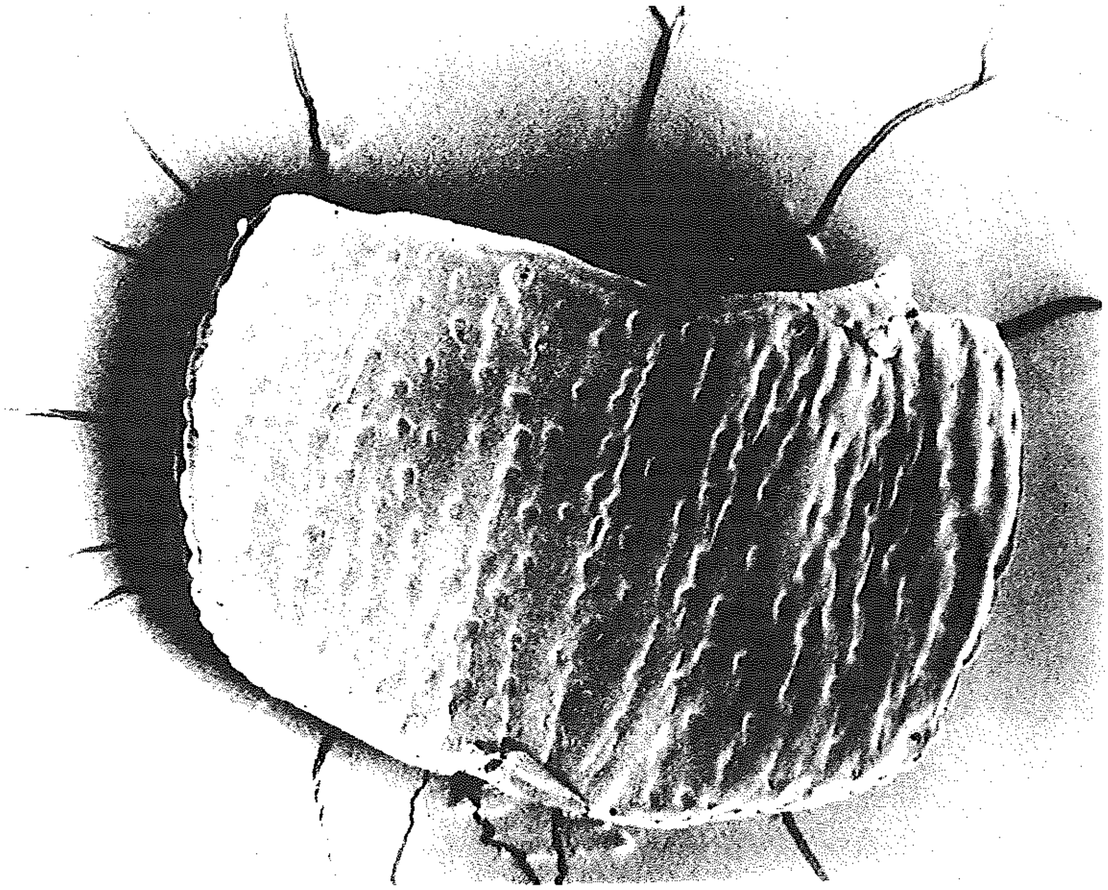
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fig. 10 and the 16 specimens of Corticaria serrata whose pronotum (fig. 11) illustrates the dense puncturation and characteristic pattern of the teeth on the sides. Sericoderus lateralis, like the two preceding species, is a tiny inhabitant of decaying plant material. One of the more intriguing decayed rubbish species is the single example of Aglenus brunneus. This beetle is eyeless and lives crypticly by burrowing into rubbish or decaying cereal residue. It was originally thought to have been introduced to Europe and Britain from America in recent centuries, but the insect investigations of a number of mainly urban archaeological sites in this country have indicated that the species was present from Roman times (Kenward 1975, 1976) and there is one record from an Iron Age pit in an Iron Age/Roman Thames Valley site (Lambrick and Robinson 1979). The species is known to occur in natural surroundings in central and southern Europe, but this is rearly the case in Britain where it appears to need the warm microclimate generated by decaying rubbish. For this reason, accidental importation by Iron Age/Roman shipping of a non-native species did appear to be a logical conclusion. More recently, however, an early Neolithic record from peats adjacent to a trackway has been made (Girling 1984, and in press). The discovery could represent spillage from an infested store of material (cereal etc) carried along the trackway, in which case it is tenable to regard the beetle as imported, but no later than the early Neolithic. The inference from the trackway insects, however, for significantly warmer July temperatures for this prehistoric period does allow the possibility that A. brunneus was a native species, still living in the open at that stage, but which was subsequently forced into the refuges offered by the warmth of accumulated decaying rubbish. (Reitter 1911, 1912, Joy 1932, Horion 1940, Paulian 1959, Britton 1956, Freude, Harde and Lohse 1974, 1976).

Corticaria serrata- pronotum x

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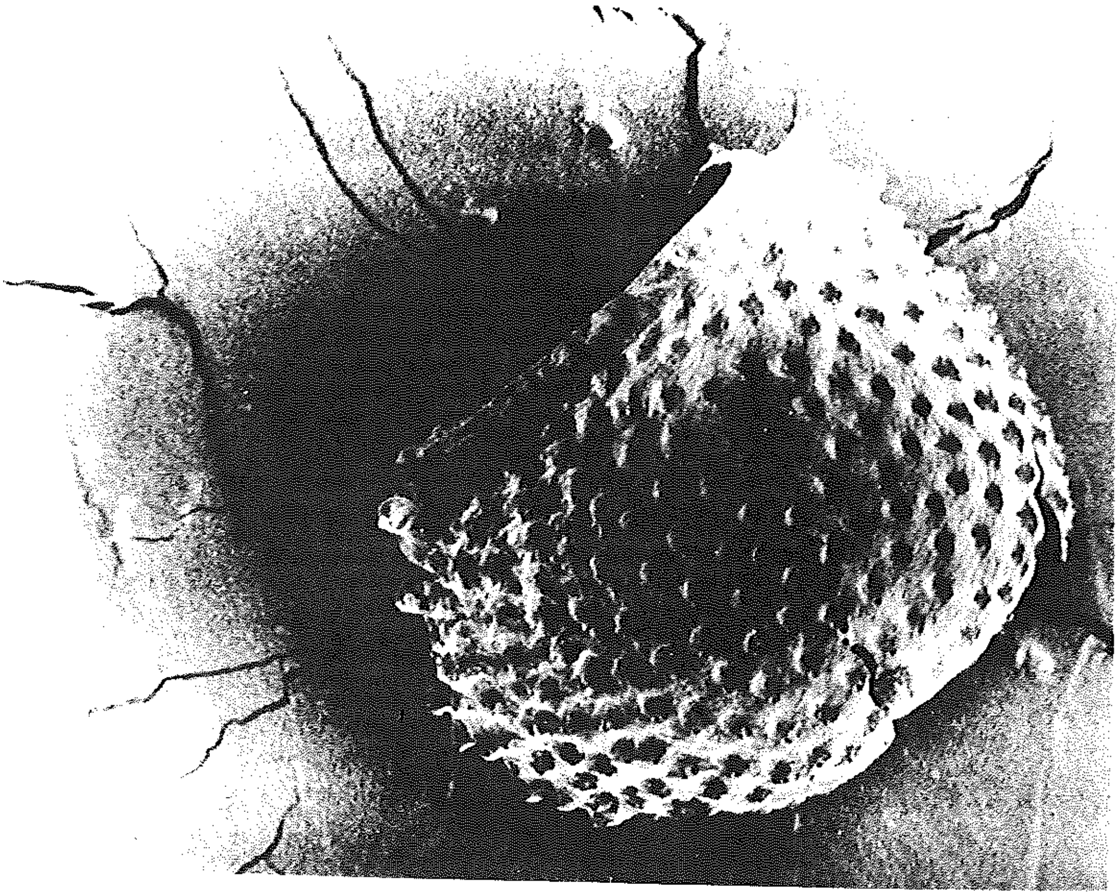

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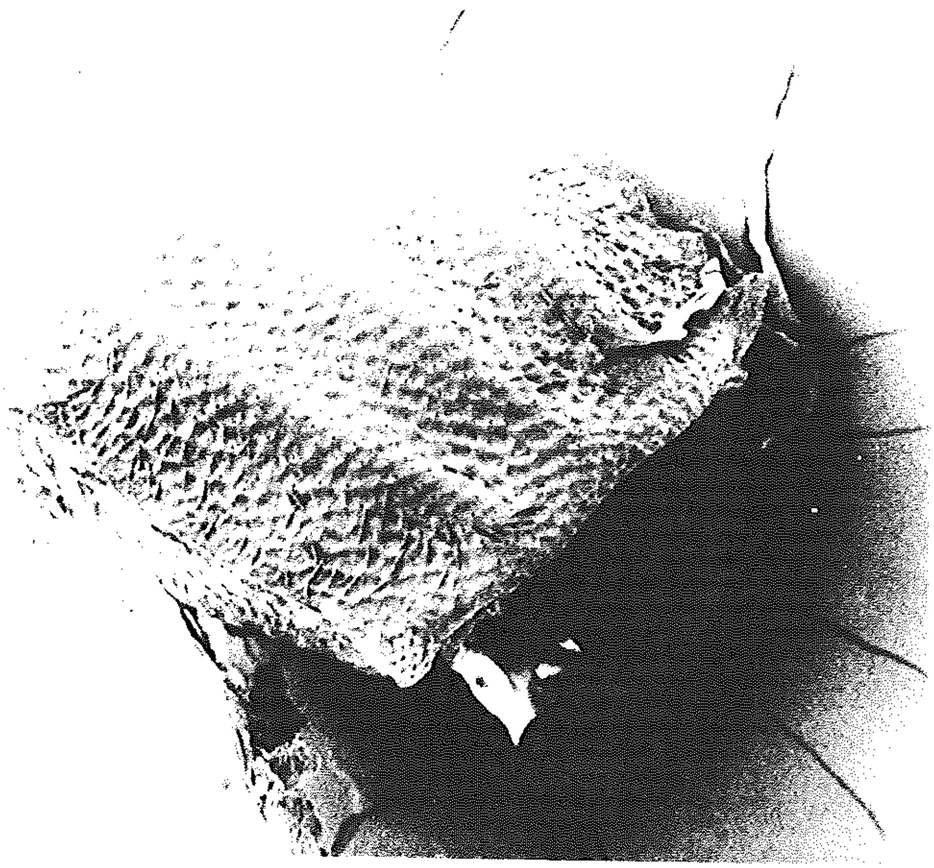
Marked synanthropic species

i. Food pests. Four of the food pests are beetles thought to have been imported to Britain: their archaeological records start with significant numbers in Roman and later deposits, with no prehistoric finds, and 2 of them are unable to survive British winters in the open, indicating that they originated from warmer countries. The beetles are all pests of cereal products, ranging from wheat grain, flour, rye, barley etc, but they infest a number of other food-stuffs. Sitophilus granarius, the 'grain weevil', attacks whole grain, in which larval development takes place. Other foods include acorns and chestnuts (Hoffmann 1954). It is unable to overwinter in Britain in the open (Solomon and Adamson 1955) although it does survive in unheated buildings and it doubtlessly benefits from the heat generated by the decomposition of grain residues. The wings are vestigial and the wingcases are fused, this flightless state not only evidence of its dependence upon man for dispersal from its native home, but also that local movement is fairly restricted away from its food source. The eight examples at the site suggest nearby cereal or dry food storage. Estimates of spoilage of stored cereal attributable to this beetle alone are difficult to estimate for the organized, purpose-built granaries of the Roman period. Modern analogies are difficult because of widespread use of insecticides, but in pre-DDT days in France, losses of up to 10% were recorded. Although the Romans were very aware of insect damage, and attempted to fumigate empty granaries, severe infestations appear to have led to total spoilage of quantities of grain, as evidenced by burnt deposits of severely insect-damaged grain (Osborne 1977, Buckland 1981) which were probably destroyed as a preventative to further spread of the insect. The magnitude of stored cereal spoilage, Buckland's (1978) estimate of a 10% loss is a reasonable figure to consider, signifies that any attempt to determine population size from food stores must take account of insect damage.

Attacks by S. granarius, by penetrating the tough outer coat of whole grain, render the cereal liable to infestation by other pest species. Damp conditions which encourage germination and fungal attack also break down the grains. Oryzaephilus surinamensis, represented by 13 beetles, is commonly found in flour or other processed cereals but can attack damaged whole cereals. Its common name, the 'saw-toothed grain beetle' relates to the series of teeth of the sides of the pronotum, shown and detailed in figs 12 and 13. Unlike the grain weevil, O. surinamensis is capable both of outdoor survival in the British climate and of flight. It has been collected from natural habitats such as fungus (Joy 1932) and birds' nests (Woodroffe 1953). There are also European finds in leaf litter. Buckland (1981) raises the possibility that O. surinamensis could have formed part of the native forest fauna, absence of pre-Roman records reflecting the comparative paucity of insect investigations of prehistoric forest sites. The same author points out that equally, the beetle could spread from infestations in stored products to surrounding habitats, and that if it is a Roman import, (a view I strongly favour), it could have maintained populations in natural habitats when organized grain storage broke down after the departure of the Romans.

Cryptolestes ferrugineus has also been recorded rarely under bark (Donisthorpe 1939), but very widely in flour mills, granaries and stores (Munro 1966). With 24 individuals, it is the commonest food pest at the site, and a head, thorax and elytral detail are illustrated in figs 14-16. Buckland's comments above about O. surinamensis equally apply to this beetle because of its ability to colonise outdoor habitats.

12



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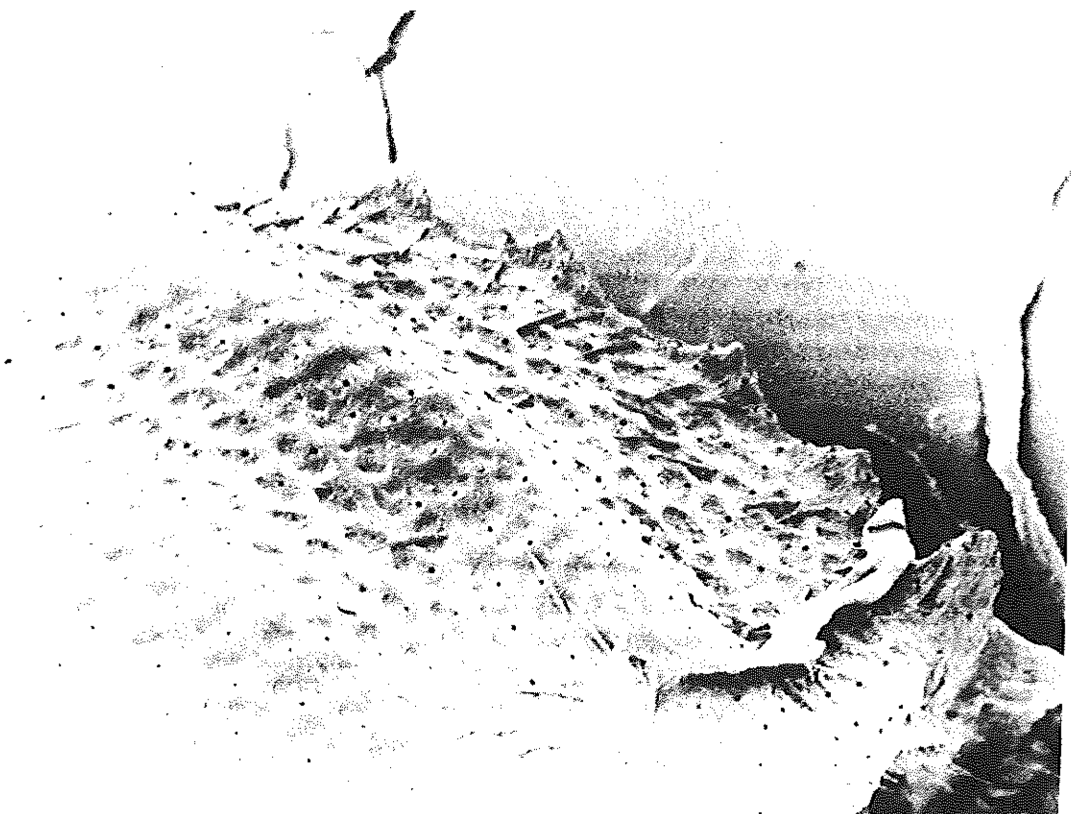

The least represented food pest import is Tribolium castaneum (4), this possibly reflecting its status as a secondary pest following insect or fungus damage of stored cereals. Under good storage conditions, it is less of a nuisance than species such as S. granarius and O. surinamensis.

ii. Other household pests. Other species which will feed on dry food stuffs and household detritus are native species which have taken advantage of the shelter and concentrations of suitable food. Ptinus fur and Lathridius minutus or pseudominutus have both occurred in prehistoric deposits. Both are common in houses, the latter often in crumbling plaster on walls. The 29 individuals probably found shelter in the buildings.

iii. Timber pests. These members of the well fauna are wood borers which today are regularly found in trees in the wild but because of their preference for dry wood, man has greatly increased their habitat resources by his virtual dependence on timber for building, fencing and fuel etc. Every occupation site and town must have vastly increased the dry wood niches available for beetles with this preference and their enormous population increase has brought a number of species to pest status. The most widespread of these pests is Anobium punctatum, the 'wood worm' or 'furniture beetle'. Together with Xestobium rufovillosum (Deg.), the 'death watch beetle' (not present in the well fauna), A. punctatum constitutes the greatest nuisance species, causing untold damage to wood. Death watch is especially notorious for boring into, the thus weakening, beams, other structural timbers and panels, usually of oak. The wood worm beetle, on the other hand is completely indiscriminate in its tastes, equally attacking deciduous and coniferous wood, wickerwork and even books. For this reason, it is the most widespread of the timber pests and is now cosmopolitan due to transport by man. It appears to have

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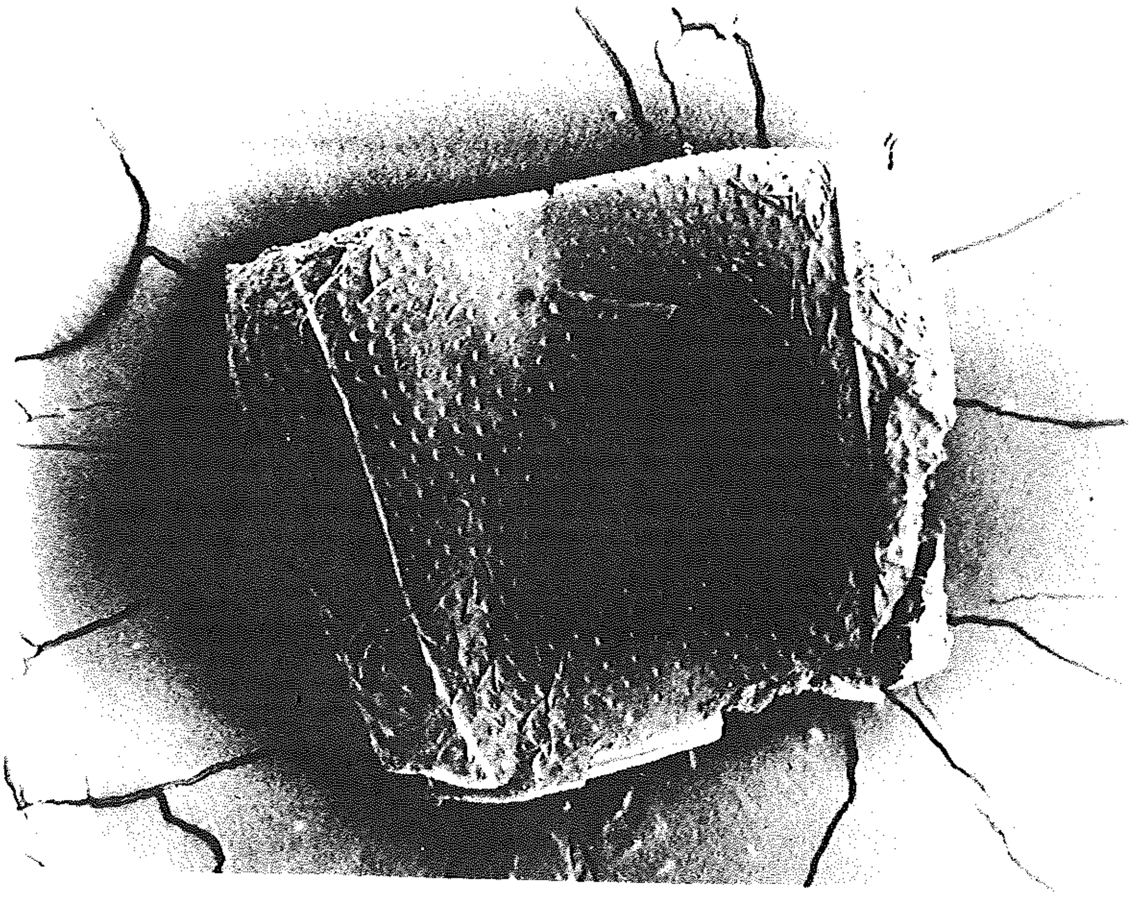

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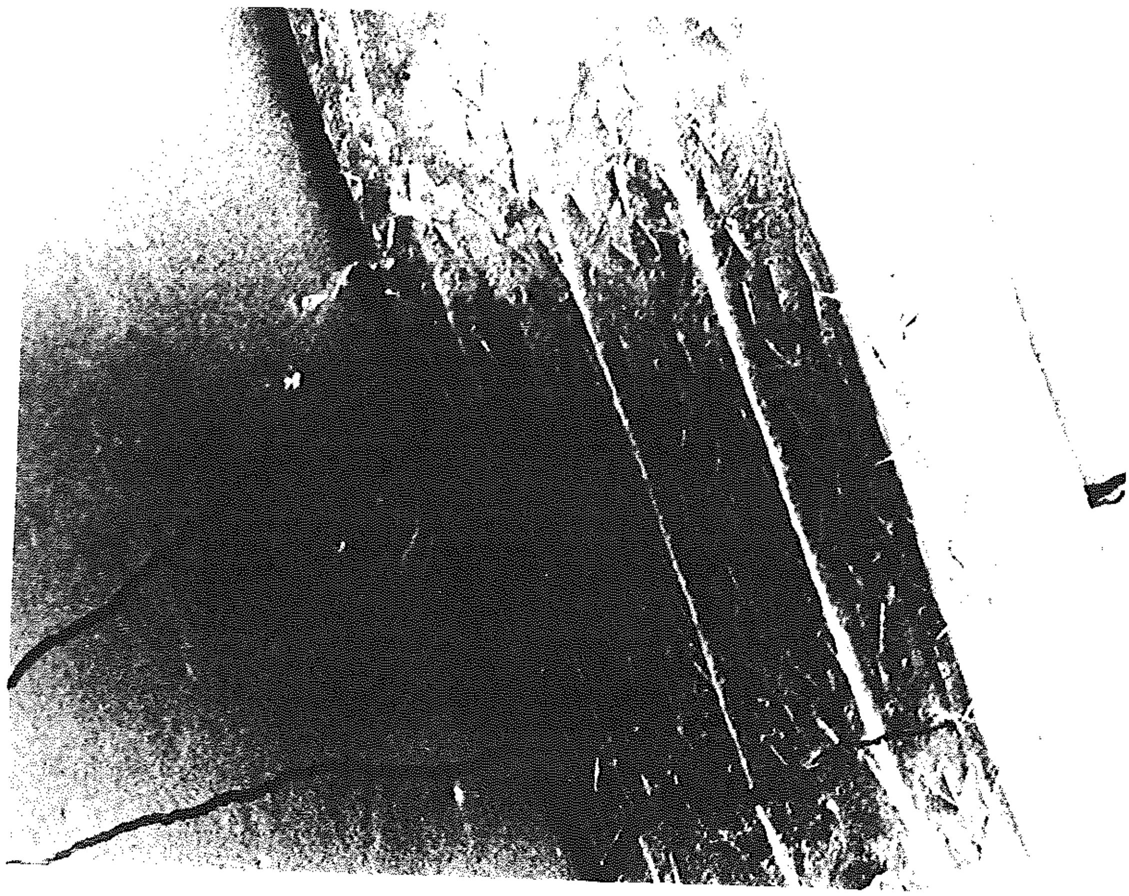

16

undergone a vast population explosion with the first sizeable organized settlements; one such dating from the Iron Age produced large numbers of A. punctatum (Girling 1979). Lyctus brunneus, (the 'powder post beetle' because infestations can reduce the wood to sawdust) has similarly been widely dispersed by man because structural timbers provde an ideal substitute for its naturally occurring habitats. There is some uncertainty of the status in this country of L. brunneus and A. punctatum; both occur in archaeological assemblages, but the latter has one or two isolated prehistoric records. Further work is needed to determine whether in Britain they are native or (early) imported species, the latter suggested by their strong association with man. Grynobius planus lives in both trees and timber such as fence posts. It is not as tied to man as the two preceding species; if its numbers have increased with the availability of timber, it is not on the scale of A. punctatum.

The P. cylindris records, previously discussed in relation to the pallisade, provide further evidence of the use of wood at the site. It is impossible to guage the degree of synanthropy exhibited by individual species, but there is a correlation between increased population levels and dependence upon man. P. cylindris displays a low degree of correlation because the cut logs it will invade are freshly felled, still with bark, and initially not greatly different from dying or dead trees in their natural state. (Joy 1932, Hickin 1960, Freude, Harde and Lohse 1969, 1980).

Conclusions

The Chichester well insect assemblage provides some detailed information directly referable to certain aspects of the site and activities therein, and a more general overall account of the occupation area and its surrounds. The main conclusions are that the build-up of the organic silts in the well relate to its use during occupation rather than after abandonment. The well was a vertical stone faced shaft, and as such, acted as a trap for insects active on the surface. It could have had a cover or roof, but the numbers of insects in the well sediments rule out a permanent, closely fitting lid. The well itself supported a breeding population of T. micros, but the other ground beetles mainly require dry, unshaded sandy substrates with preferences for the disturbed soils of cultivated land and for fields. The vegetation in the main would be available in gardens, with some cultivated plants of the cabbage type and pea or bean family, a number of weeds and grass. Planted fruit trees in the gardens are a distinct possibility. At some distance, probably beyond the town boundaries, were areas of grazing land and perhaps hop cultivation because beetles associated with this plant appear to be the only ones whose hosts were unlikely to be present in the garden. Transport of hops from a greater distance is also a possibility. The relatively low numbers of phytophagous beetles indicate that the well was not overhung by trees or other vegetation and that the immediately adjacent area was probably free of plants. This raises the possibility of a paved area although, if present, the ground beyond was perhaps splashed enough by water spillage to produce muddy patches. Trees and wood are much in evidence, with the 'semi-natural' logs with bark utilized in the pallisade providing habitats beyond those of natural trees and the timbers of the buildings and fences of the occupation areas.

The normal household activities of food preparation, cleaning and gardening produced refuse of which certain species quickly took advantage, but there is also sufficient evidence of dung and possible stable or livestock-stall flooring to suggest that animals were housed within the occupation area; horses are perhaps the likeliest.

Food storage is also evident from numbers of pest species predominantly of cereals. These stores could represent the food requirements of each occupation area, the possibility has been raised by the site director, Mr Alec Down (pers. comm.) that as the port town probably acted as a tax and toll collection centre, payment in kind could have been in the form of cereals or other food stuff, in which case, more organized storage would have been required in the vicinity. This well fauna not only provides data about conditions at one 4th century Roman site, the evidence of geology and related hydrology of the freely drained substrata are generally applicable to the wider area. Together with Osborne's (1971) investigation of Fishbourne, the insects offer some insight into south Britain in Roman times.

References

Britton, E.W. (1956) Scarabaeidea. Handbooks for the identification of British Insects. Royal Entomological Society: London.

Buckland, P.C. (1976) The Environmental Evidence from the Church Street Roman Sewer System. Archaeology of York Fascicule 14/1. The York Archaeological Trust, Council for British Archaeology: London.

Buckland, P.C. (1978) Cereal production, storage and population: a caveat. In: S. Limbrey and J.G. Evans (Eds.) The Effect of Man on the Landscape: the Lowland Zone, 43-45. Council for British Archaeology: London.

Buckland, P.C. (1981) The early dispersal of insect pests of stored products as indicated by archaeological records. Journal of Stored Products Research 17, 1-12.

Buckland, P.C., Holdsworth, P. and Monk, M. (1976) The interpretation of a group of Saxon pits in Southampton. Journal of Archaeological Science, 3, 61-69.

Coope, G.R. and Osborne, P.J. (1968) Report on the coleopterous fauna of the Roman well at Barnsley Park, Gloucestershire. Transactions of the Bristol and Gloucestershire Archaeological Society, 86, 84-87.

Donisthorpe, H. St J.K. (1939) A prelminary list of the Coleoptera of Windsor Forest. Allen: London.

Duffy, E.A.J. (1953) Scolytidae and Platypodidae. Handbooks for the identification of British Insects. Royal Entomological Society: London.

Fowler, W (1889-96) Coleoptera of the British Islands vols 3, 4 and 5 Reeve: London.

Freude, H., Harde, K.W. and Lohse, G.A. (1961-1981) Die Käfer Mitteleuropas, Band 2 - 11 ~~and~~ , Goeke and Evers: Krefeld

Girling, M.A. (1979) The fossil insect assemblage from the Meare Lake Village. Somerset Levels Papers, 5, 25-32.

Girling, M.A. (1984) A second insect assemblage from the Sweet Track. Somerset Levels Papers, 10, 79-90.

Girling, M.A. (in press). The status of Aglenus brunneus (Gyll.) (Col. Colydiidae) in Britain in the light of prehistoric records.

Hickin, N.E. (1968) The insect factor in wood decay. Hutchinson: London.

Hinton, H.E. (1960) The insects of stored products, Vol I. : London.

Hoffmann, A. (1954) Coleoptérès Curculionides. Faune de France, 59. Lechevalier: Paris.

Horion, A. (1949-61) Faunistik der Mitteleuropaischen Käfer, Stuttgart or Uberlingen-Bodensee.

Jeanell, R. (1940) Coleoptéres Carabiques. Faune de France . Lechevalier: Paris.

Joy, N.H. (1932) A Practical Handbook of British Beetles. Witherby: Edinburgh and London.

Kenward, H.K. (1975) The biological and archaeological implications of the beetle, Aglenus brunneus (Gyllenhalli) in ancient faunas. Journal of Archaeological Science, 2, 85-94.

Kenward, H.K. (1976) Further archaeological records of Aglenus brunneus (Gyll.) in Britain and Ireland, including confirmation of its presence in the Roman period. Journal of Archaeological Science, 3, 275-277.

Kloet, G.S. and Hincks, W.D. (1977) A Checklist of British insects (2nd Ed.) Coleoptera and Strepsiptera. Royal Entomological Society: London.

Lambrick, G. and Robinson, M.A. (1979) Iron Age and Roman Riverside Settlements at Farmoor, Oxfordshire. Council for British Archaeology Research Report 32: London.

Munro, J.W. (1966) Pests of Stored Products. Hutchinson: London.

Osborne, P.J. (1971) The insect fauna from the Roman harbour. In B.W. Cunliffe, Excavations at Fishbourne, 1961-69, 393-396. Report of the Research Committee of the Society of Antiquaries, 17: London.

Palm, T. (1959) Die Holz und Rindenkäfer der sud und mittelschwedischen, Laubbäume. Opuscula Entomdogiska, Supplement 16.

Paulian, R. (1959) Coleoptērēs Scarabeides. Faune de France, 63, Lechevalier: Paris.

Reitter, E. (1910-1915) Fauna Germanica, B and 3, 4 and 5: Stuttgart.

Solomon, M.E. and Adamson, E. (1955) The powers of survival of storage and domestic pests under winter conditions in Britain. Bulletin of Entomological Research, 46, 311-355.

Woodroffe, G.E. (1953) An ecological study of the insects and mites in the nests of certain birds in Britain. Bulletin of Entomological Research 44, 739-772.