Insect remains from Tudor period moat fills at Worcester House, Stepney Green, London

(Museum of London Site Code XRV10)

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Canterbury Archaeological Trust Report **2014/24**

March 2014

Introduction

The flots from three 10-litre samples wet-sieved primarily for recovery of plant macrofossils were submitted by Museum of London Archaeology (MoLA) for examination of insect remains. The samples were from the fills of the moat of Worcester House, a late medieval – Tudor period moated mansion. The fills themselves were dated to the Tudor period. It was hoped that analysis of insect remains, if present in sufficient numbers, might provide additional information to that obtained from the plant macrofossils on deposit formation and the local environment.

Methods

The flots were boiled in water with 15ml washing soda (sodium carbonate) and washed onto 0.3mm mesh. Since the retents were small, insect remains could easily be extracted without the use of paraffin flotation. Beetles (Coleoptera) and bugs (Hemiptera) were removed onto moist filter paper and identified as closely as possible using a low-power zoom microscope (x7 – x45) with reference to modern comparative insect material and standard published works. The state of preservation of the remains was also recorded. Minimum numbers of individuals and taxa of beetles and bugs were estimated, and taxa were divided into broad ecological groups for interpretation following Kenward *et al*. (1986) and Kenward (1997) (see Table 1 for an explanation of the groups used). For interpretation, aquatic beetles and bugs were subtracted from the rest to provide data on terrestrial ecology. Any waterside taxa were included among the terrestrial group. Nomenclature follows Duff (2012) for Coleoptera and Nau (2006) for Heteroptera. The abundance of other categories of invertebrates in the flots was recorded subjectively on a three-point scale as present, common or abundant. The insect material from each sample is currently stored in vials of industrial methylated spirits (IMS).

Results

Small to moderately-sized beetle and bug assemblages (27 – 40 individuals) were recovered from two of the samples. A single beetle sclerite was recovered from the third sample. The insect remains were predominantly uneroded with only a few sclerites showing significant thinning and a tendency towards paleness, but some taxa were represented only by fragmentary material, some of which could not be closely identified. Insects and other invertebrate remains recovered from the samples are described below and their implications discussed. Although interpretation of the beetle and bug remains is based only on two relatively small assemblages, the results were consistent between the two samples and largely corroborated by the evidence from the plant assemblages (Anne Davis, plant report).

Habitats and food preferences of plant-associated beetles and bugs are listed in Table 2, the proportions of terrestrial insects assemblages belonging to the various ecological

groups shown in Table 3, and lists of insects and other invertebrate macrofossils recorded from the two productive samples in Table 4.

Fills 277 and 276 of the moat (samples {24} and {22} respectively)
Remains of fresh water invertebrates were well-represented in the two samples from the moat fills. Water flea ephippia (*Daphnia*: resting eggs) were particularly common, and aquatic beetles, water boatmen (Corixidae), statoblasts (the dormant overwintering stage) of two species of crystal moss animals (Bryozoa: *Cristatella mucedo* and *Lophopus crystallinus*), and a caddis (Trichoptera) larval case were all present. All clearly indicated that the ditch had contained water, but since water fleas produce ephippia at certain times of the year, particularly in the autumn or at times of environmental stress such as seasonal reductions in water level (Scourfield and Harding 1966, 3), and statoblasts are very resistant to desiccation, the presence of both groups does not necessarily indicate permanently aquatic conditions. The general condition of the invertebrate and plant remains in the deposits however, suggests that water was probably present in the moat for much of the time, and that these deposits remained fairly wet throughout even if there were significant, perhaps seasonal reductions in standing water. Aquatic beetles and bugs were proportionally better represented in the sample from fill 277, accounting for over a quarter (26%) of the insect assemblage compared to 14% in the somewhat larger assemblage from fill 276. The water beetles that were identified closely were indicative of still or slowly flowing, shallow water - *Colymbetes fuscus* and *Hydrobius fuscipes* are ubiquitous in such conditions – and the tiny aquatic weevil *Tanysphyrus lemnae* indicated a growth of duckweed (*Lemna*) on the water surface. Fragmentary remains of a lesser silver water beetle (*Hydrochara caraboides*) provided more specific hints of conditions within the moat. This beetle is currently of very local distribution in Britain, but was formerly more widespread. Where it can still be found it generally breeds in shallow, stagnant, open, fish-free waters with a floating raft of densely matted vegetation at their centre, and areas of shallow, open water with isolated stands of emergent vegetation (Guest 1996; Foster 2010).

The majority of the taxa in both insect assemblages were from terrestrial habitats. A recent modern study of insect material in accumulations of sediment in small water bodies has indicated that most terrestrial insects arrive from within a 100 – 200 metre radius (Smith *et al*. 2010). However, in an extensive feature such as moat it is possible that there could have been transport of material from its immediate point of origin. Even so, the remains examined here are considered likely to represent the local environs, with much of the data pertaining to the immediate surroundings of the ditch.

The only beetle identified that is specifically from marginal habitats was *Cercyon ustulatus* found in damp waterside litter but *Megasternum concinnum* can be found in a wide range of decomposing matter and may also have exploited moist litter at the water margins. The general implications from a number of taxa were for generally rather dry and open conditions beside the moat, and that adjacent land may have been at least partly under cultivation or in agricultural use. *Harpalus affinis* and *Amara aenea*, the two ground beetles (Carabidae) identified closely are both typical of such conditions, being found in gardens, arable fields, wasteland and dry grassland (Luff 2007, 138, 153). About a quarter of the terrestrial insects were strongly associated with herbaceous plants, and the ceutorhynchine

weevils *Parethelcus pollinarius* and *Nedyus quadrimaculatus* indicated that stands of nettles probably grew on the banks of the moat. The ground bug *Scolopostethus* cf. *affinis* is also often associated with nettles, while members of the genus *Sitona*, often known as clover weevils, are associated with wild and cultivated members of the pea family (Fabaceae). There was a hint of occasional trees from *Hylesinus varius*, a bark beetle predominantly associated with ash (*Fraxinus*). *Ptomaphagus*, a small leiodid beetle, can be found in the runs and nests of small mammals, particularly of small rodents, and also above ground on animal corpses (Duff 2012b, 411).

Beetles primarily associated with herbivore dung were relatively well-represented in both assemblages (10-15% of terrestrial insects) by *Geotrupes*, a green/yellow *Onthophagus* species, *Aphodius contaminatus*, *A. prodromus*, and another larger species of *Aphodius*. The relative abundance of these taxa most probably reflects the agricultural nature of the surroundings, which was also deduced from the plant remains, and the use of local grassland for grazing. The study of modern insect remains in small water bodies by Smith *et al*. (2010) suggested that scarabaeid dung beetles may account for over 10% of the terrestrial fauna when there are large or dense populations of grazing animals nearby.

Decomposers with less specialised food requirements were not particularly well represented, and in the sample from context 277 they were restricted to a single *Lithocharis ochracea*. This species is typical synanthope that appears to breed exclusively in artificial habitats such as compost heaps and piles of cut vegetation (Lott and Anderson 2011, 111-112). The decomposer group was somewhat better represented in fill 276 (15% of terrestrial insects) but such proportions do not suggest that any more than small amounts of occupation waste contributed to the fills of the moat. Some of decomposer component may well have arrived in run-off from land adjacent to the moat, particularly if there were episodes of manuring close by.

Moat backfill 275, sample {20}

Aquatic invertebrates were represented in this deposit mainly by poorly preserved water flea ephippia, small numbers of *Cristatella mucedo* and *Lophopus crystallinus* statoblasts and incomplete shell of a freshwater snail. A single beetle found on nettles (*Brachypterus*) was recorded.

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Table 1

Ecological groups used in analysis following Kenward et al. (1986) and Kenward (1997) (not all groups were represented in the Stepney Green insect assemblages)

d – damp ground or waterside taxa
l – wood-associated taxa
g – grain-associated taxa
m – moorland taxa
oa – certain outdoor taxa (unable to live and breed within buildings or in accumulations of organic material)
ob – probable outdoor taxa
rt – generalized decomposers
rd – dry decomposers
rf – foul decomposers
p – strongly plant-associated taxa
ss – strong synanthropes (very rare in natural habitats)
st – typical synanthropes (typically present in man-made habitats but capable of living in natural situations)
sf – facultative synanthropes (found in man-made and natural habitats)
u – uncoded taxa
w – aquatics

Table 2

Habitat and food preferences of strongly plant-associated beetles and bugs recorded from the samples from Stepney Green. Main sources: Morris (1990, 1997, 2012) and Southwood and Leston (1959)

Species	**Food and habitat preferences**
Scolopostethus cf.*affinis*	Often, but not always, associated with nettles (*Urtica*)
Brachypterus sp.	On nettles (*Urtica*)
Apionidae spp.	Most species are found on herbaceous vegetation
Nedyus quadrimaculatus	On nettles (*Urtica*)
Parethelcus pollinarius	On nettles (*Urtica*)
Phyllobius ?*roboretanus*	Polyphagous, found mainly on herbaceous vegetation in grassy and open biotopes, but also frequently on shrubs and bushes, generally not arboreal
Sitona sp(p).	On wild and cultivated member s of the pea family (Fabaceae)
Hylesinus varius	Bark beetle found predominantly on ash (*Fraxinus*)
Tanysphyrus lemnae	Found on duckweeds (*Lemna*)

Table 3
Proportions of different ecological groups of beetles and bugs in moat fills 277 and 276

Ecological groups	***Context 277 sample {24}*** *MNI = 20*	***Context 276 sample {22}*** *MNI = 34*
Waterside/damp ground [d] individuals	5%	0%
Outdoor individuals [oa+ob]	65%	47%
Plant-associated [p] individuals	25%	27%
Wood-associated [l] individuals	0%	3%
Dung-associated individuals	10%	15%
General decomposer [rt] individuals	5%	15%
Synanthropic individuals [st+sf]	5%	3%