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SILBURY HILL, WILTSHIRE
INSECT REMAINS FROM THE 2007-08 TUNNELLING OF SILBURY HILL

ENVIRONMENTAL STUDIES REPORT

Mark Robinson

ARCHAEOLOGICAL SCIENCE

ENGLISH HERITAGE

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INSECT REMAINS FROM THE 2007-8 TUNNELLING OF SILBURY HILL

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SUMMARY

This report presents the results of the analyses of insect remains recovered from samples taken as part of the 2007-8 excavations at Silbury Hill that formed part of the Silbury Conservation Project. It details the remains recovered from the late Neolithic phases of the monument and discusses the habitats these represent, including comparison with the assemblages recovered from the 1968-9 excavations and with the modern beetle fauna of Wiltshire.

ARCHIVE LOCATION

The archive will be deposited at the Alexander Keiller Museum

DATE OF RESEARCH

2007-9

Cover

Mangold flea beetle (*Chaetocnema concinna*) recovered from collapsed organic mound deposits near the centre of the Hill © *English Heritage*

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INTRODUCTION

When Silbury Hill was tunnelled in 1968-69, those who visited the excavation found the preservation of organic remains in the turf stack remarkable, in particular commenting that the blades of grass were still green and that iridescent remains of beetles could be seen. The author neither visited the excavation nor watched any of the television programmes which followed its progress. However, in the 1970s and 1980s the author had long conversations about the biological remains with several of those who were involved including Dr M C D.Speight, who began the investigation of the insect remains, Professor G W Dimbleby and Professor J.G Evans. The insects became available to the author for study in the 1990s and were fully analysed, the results being published almost 30 years after the excavation (Robinson 1997). They gave a unique insight into the insect fauna and environment of the Chalk of the Avebury area during the Neolithic. Few Neolithic insect assemblages have been analysed, the one from Silbury being one of the largest. It is the only one from an environment which retained little woodland and is also the only Neolithic insect assemblage from the Chalk of Wessex.

The re-excavation of the tunnels into Silbury Hill in 2007-08 provided an opportunity to review the results of the earlier work. The sample size was unknown and the efficiency of the extraction of the remains uncertain. The samples from 1968-69 were located to their horizontal position within the turf stack or the Old Land Surface but the complexities of the monument had not been appreciated. Thorough sampling was undertaken for insect remains in 2007-08.These samples were assessed and found to have the potential to address some of the limitations of the earlier work. They also have the potential to address new research questions posed as a result of the recent excavations.

METHODS

The insect samples were initially evaluated by Mrs G Campbell at English Heritage, Fort Cumberland to establish which contained insects. Those samples which proved to be productive were sub-sampled and wet-sieved down to 0.18mm as described for macroscopic plant remains. These sub-samples were sorted under a binocular microscope down to 0.5mm and insect remains picked out. In addition, further sub-samples from some of these samples were washed over onto a 0.2mm sieve and sorted down to 1.0mm. The unsorted fractions of all the sub-samples were subjected to paraffin flotation for the recovery of insect remains down to 0.2mm. Table 1 gives the details of the samples and the preservation of insect remains within them.

The insect remains were identified with reference to the Hope Entomological Collections at the University Museum of Natural History, Oxford and the minimum number of individuals represented by the sclerites calculated for each sample. The results have been listed by phase in Tables 2 to 13. The nomenclature follows Kloet and Hincks (1977) to aid comparison with the earlier work. Where there are differences from the checklist of Duff (2008), the synonymy is given in Appendix 1.

Along with the identifications is given a short description of the habitat or food of each species. The abbreviations follow those used in Robinson (1997): B: bankside/water's edge; C: carrion; D: disturbed/bare ground; F: dung; G: grassland; M: marsh; T: terrestrial and occurring in several habitats; V: decaying plant remains; W: woodland or scrub. Less usual habitats are given in brackets.

A wide range of sources has been used for ecological information about the Coleoptera. The main references are as follows: Donisthorpe (1939), Fowler (1887-1913), Hoffmann (1950; 1954; 1958), Hyman (1992; 1994), Joy (1932), Koch (1989a; 1989b; 1992), Paulian (1959) and the Royal Entomological Society (1953-97). Other references are given in Lambrick and Robinson (1979) and Robinson (1983).

Details for Homoptera are from Le Quesne (1969). Details for Formicidae are from Bolton and Collingwood (1975) and Collingwood (1979).

Analysis of the data

The results for the Coleoptera are displayed in Fig. 1, showing the relative abundance of different species groups. The species groups used follow Robinson (1991, 278-81) and the group to which a species belongs is shown in the tables of results. Not all the Coleoptera have been classified into a group. Each species group is expressed as a percentage of the minimum number of individuals of terrestrial Coleoptera. Most of the samples did not contain sufficient individuals for the results to be displayed by sample so they have been presented by phase. However, for Phase 4, it was possible to display the results separately for the mini-mound, the gully and the lower mound.

Figure 1: Species groups expressed as a percentage of the total terrestrial Coleoptera. Members of the species groups are given in Tables 2-13. Not all the terrestrial Coleoptera have been classified into groups.

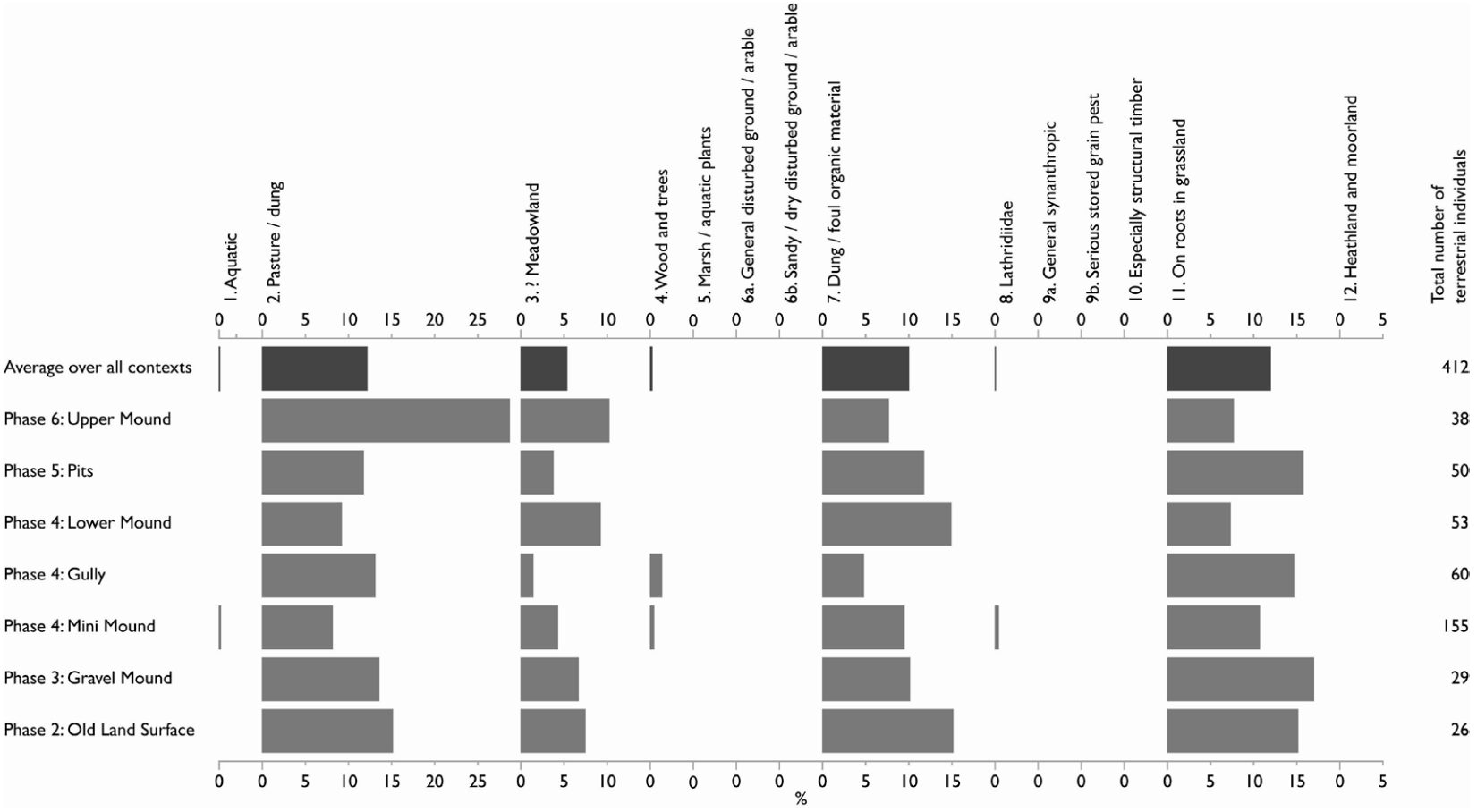

Table 1: Sample Details

Sample no	Context no	Component sub-sample	Vol (litres)	Wght (kg)	Description	Phase	Preservation
9821	4041	-	3.8	3.58	From possible hearth on Old Land Surface	2	Very poor, few
9815	4041	-	3	3.00	Old Land Surface below Mini-Mound	2	Poor, small fragments
9238	4041	-	2	1.98	From single turf from Old Land Surface below edge of gravel mound	2	Poor
9814	3069	-	2	2.19	Top of gravel mound into which Pit 3067 is cut	3	Very poor, very few
9820	4166	-	2	1.92	Dark silty layer on top of Gravel Mound - possible soil horizon	3	Good
9425	4181	9808 9809 9826	13	13.56	organic Mini-Mound	4	Good, quite large fragments
9338	4070	9811 9812	5	5.49	Bottom fill of gully adjacent to Mini-Mound	4	Mediocre to good but fragmentary
9813	4173	-	2	2.14	Top fill of gully adjacent to Mini-Mound	4	Mixed, some good but fragmentary
9824	3046	-	2	1.97	Lower Organic Mound	4	Poor
9200	4156	-	2	2.10	Turf within Lower Organic Mound	4	Good but fragmented
9362	3075	-	1.5	1.23	Turf above Old Land Surface, south facing section from Bay 2 in West Lateral	4	Poor, small fragments
9823	3070	-	2	2.44	Primary fill of Pit 3067 in Main Tunnel	5	Poor, small fragments
9244	3066	9817 9818	5	5.02	Main fill of Pit 3067 in Main Tunnel	5	Good but small fragments
9340	3073	9810	4	4.14	Fill of pit in West Lateral	5	Mediocre to poor,

Sample no	Context no	Component sub-sample	Vol (litres)	Wght (kg)	Description	Phase	Preservation
		9816					fragmentary
9335	3078	-	2	1.91	Single turf in the Upper Organic Mound	6.1	Good but very fragmentary
9825	3083	-	2	2.21	Upper organic Mound	6.1	Variable, mediocre to poor, small fragments
9375	3061	-	2	2.31	Upper Organic Mound	6.1	Mostly good
9822	3084	-	2	2.09	Organic layer within further dump layers	6.2	Very poor, fragmentary and very few

RESULTS

Phase 2 Old Land Surface (OLS), Tables 2-3

Insect remains were found in three samples from Context 4041 Old Land Surface: Sample 9821 a possible hearth area, Sample 9815 from below the Mini-Mound and Sample 9238 from below the Gravel Mound. These samples contained few insects and the remains were poorly preserved. The Coleoptera were all species of grassland habitats including *Mecinus pyraster* which feeds on *Plantago lanceolata* (ribwort plantain) and *P. media* (hoary plantain), *Phyllopertha horticola* whose larvae feed on the roots of grassland plants, *Megasternum obscurum* which occurs in a range of decaying organic material including animal droppings and scarabaeoid dung beetles of the genus *Aphodius* which generally occur in animal droppings on pasture.

Phase 3 Gravel Mound, Tables 4-5

Preservation was poor in Sample 9814 from Context 3069, the top of the Gravel Mound and there were very few insect remains. In contrast, Sample 9820 from Context 4166, a mixed soil layer which was deposited over the top of the Gravel Mound, had much better preservation and a higher concentration of insect remains. The Coleoptera were from a similar range of grassland habitats as those from the Phase 2 samples. They included *Agrypnus murinus* which has larvae that occur on the roots of grassland plants, *Sitona lepidus* which feeds on Leguminosae particularly *Trifolium* spp. (clovers), *Xantholinus glabratus* which readily occurs in the droppings of herbivores and various scarabaeoid dung beetles such as *Geotrupes* sp. and *Onthophagus* sp. Sample 9820 also contained eleven ants from the genus *Myrmica* including *M. scabrinodis* gp. Most were workers but there was one queen. Remains of other insects were very few although there were a couple of Hemiptera (true bugs) including the grass-feeding *Aphrodes bicinctus* and a Diptera (fly) puparium.

Table 2: Coleoptera from Phase 2

	Old Land Surface			Habitat	Species Group
Sample	**9821**	**9815**	**9238**		
sub-sample of	**9435**	**9434**	**N/A**		
Context number	**4041**	**4041**	**4041**		
Sample weight (kg.)	**3.58**	**3.00**	**1.98**		
Phase	**2**	**2**	**2**		
HYDROPHILIDAE					
Megasternum obscurum (Marsh.)	2	1	1	FVC	7
STAPHYLINIDAE					
Stenus spp.	2	1	1	TM	
Tachyporus sp.	-	1	-	T	
SCARABAEIDAE					
Aphodius spp. (not *villosus*)	1	1	2	mostly F	2
Phyllopertha horticola (L.)	1	1	-	larvae on roots in permanent grassland	11
ELATERIDAE					
Agrypnus murinus (L.)	1	-	-	G	11
Agriotes sp.	-	1	-	larvae mostly on roots of grassland plants	11
CHRYSOMELIDAE					
Longitarsus sp.	1	-	-	various herbs	
APIONIDAE					
Apion spp.	-	1	-	various herbs	3
CURCULIONIDAE					
Barynotus obscurus (F.)	1	-	2	various herbs	
Sitona sulcifrons (Thun.)	-	1	-	Leguminosae, mostly *Trifolium* spp.	
Liparus coronatus (Gz.)	-	-	1	Umbelliferae	
Mecinus pyraster (Hbst.)	1	-	1	*Plantago lanceolata* L. and *P. media* L.	
Total	10	8	8		

Table 3: Other insects from Phase 2

		Old Land Surface			Habitat
Sample		9821	9815	9238	
Context number		4041	4041	4041	
sub-sample of		9435	9434	N/A	
Sample weight (kg.)		3.58	3.00	1.98	
Phase		2	2	2	
DIPTERA					
Diptera indet.	- puparium	1	1	1	T

Table 4: Coleoptera from Phase 3

	Gravel Mound		Habitat	Species Group
Sample	9814	9820		
sub-sample of	9247	9252		
Context number	3069	4166		
Sample weight (kg.)	2.19	1.92		
Phase	3	3		
CARABIDAE				
Calathus fuscipes (Gz.)	-	2	WDG - often in meadowland	
C. melanocephalus (L.)	-	1	GD(W)	
HYDROPHILIDAE				
Megasternum obscurum (Marsh.)	-	3	FVC	7
STAPHYLINIDAE				
Xantholinus glabratus (Grav.)	-	2	GDFV	
X. linearis (Ol.)	-	1	WGV(FC)	
Philonthus sp.	1	3	FVC(T)	
Aleocharinae indet.	-	1	TFVC	
GEOTRUPIDAE				
Geotrupes sp.	-	1	F	2
SCARABAEIDAE				
Aphodius cf. *sphacelatus* (Pz.)	-	1	FVC	2
A. villosus Gyl.	-	1	V(F)	
Aphodius spp. (not *villosus*)	-	1	mostly F	2
Onthophagus sp. (not *ovatus*)	-	1	F(C)	2
Phyllopertha horticola (L.)	1	1	larvae on roots in permanent grassland	11
ELATERIDAE				
Agrypnus murinus (L.)	1	1	G	11
Agriotes sp.	-	1	larvae mostly on roots of grassland plants	11
CHRYSOMELIDAE				
Longitarsus sp.	-	1	various herbs	

	Gravel Mound		Habitat	Species Group
Sample	9814	9820		
sub-sample of	9247	9252		
Context number	3069	4166		
Sample weight (kg.)	2.19	1.92		
Phase	3	3		
APIONIDAE				
Apion spp.	-	1	various herbs	3
CURCULIONIDAE				
Phyllobius or *Polydrusus* sp.	-	1	trees, shrubs and some herbs	
Barynotus obscurus (F.)	1	-	various herbs	
Sitona lepidus Gyll.	-	1	Leguminosae, mostly *Trifolium* spp.	3
Total	4	25		

Table 5: Other insects from Phase 3

		Gravel Mound		Habitat
Sample		9814	9820	
sub-sample of		9247	9252	
Context number		3069	4166	
Sample weight (kg.)		2.19	1.92	
HEMIPTERA - HOMOPTERA				
Aphrodes bicinctus (Schr.)		-	1	grasses
Homoptera indet.		-	1	T
HYMENOPTERA - FORMICIDAE				
Myrmica rubra (L.) or *ruginodis* Nyl.	- worker	1	-	T
M. scabrinodis gp.	- worker	-	4	T
Myrmica sp.	- worker	1	6	T
Myrmica sp.	- female	-	1	T
DIPTERA				
cf. *Scathophaga stercorea* (L.)	- puparium	-	1	fresh dung
Diptera indet.	- puparium	1	6	T

Phase 4 "Mini-mound", Tables 6-7

The preservation of insect remains in Context 4181, the "mini-mound", was good and the sclerites of the Coleoptera tended to be less fragmented than from the other contexts in three sub-samples analysed from Sample 9425. The concentration of coleopteran remains was relatively high and the size of the sub-samples large so the assembly was much larger than from the other samples resulting in a greater range of taxa. There were various

Carabidae (ground beetles) which are often abundant in grassland including *Pterostichus cupreus*, *Calathus fuscipes*, *C. melanocephalus* and *Amara* sp. One, *Cicindela campestris* (tiger beetle), favours sunny habitats with light soil. However, others including *Loricera pilicornis* and *Pterostichus strenuus* prefer damp ground although there was not the full range of Carabidae which might be expected in damp grassland. Two of the Carabidae, *Pterostichus niger* and *Abax parallelepipedus*, are now woodland insects in Southern England. Staphylinidae (rove beetles) which readily occur in grassland were also well-represented including *Stenus* sp., *Xantholinus linearis,* three species of *Staphylinus* including *S. olens* (devil's coach horse) and *Tachyporus* sp.

Chafer and elaterid beetles with larvae that are associated with the roots of grassland plants (Species Group 11) comprised 11% of the terrestrial Coleoptera. Most numerous were *Phyllopertha horticola* and *Agrypnus murinus* but there were also *Hoplia philanthus*, two species of *Athous* and two species of *Agriotes*. There was a single example of *Actenicerus sjaelandicus*, whose larvae tend to develop in wetter ground that those of *Athous* spp. Phytophagous Chrysomelidae (leaf beetles), Apionidae and Curculionidae (weevils) comprised around a quarter of the Coleoptera. Some, such as *Barynotus obscurus*, are polyphytophagous on various herbaceous plants but others have a more restricted range of host plants. *Sitona lepidus* was joined by *Hypera punctata* feeding mostly on *Trifolium* spp. and *Mecinus pyraster* was joined by *Gymnetron labile* feeding on *Plantago* spp. (plantain).

The various Scarabaeoidea which feed on the droppings of the larger herbivores under pastureland, as opposed to manure heap, conditions (Species Group 2) comprised 8.4% of the terrestrial Coleoptera. They included *Geotrupes* sp., *Aphodius* cf. *foetens*, *A.* cf. *sphacelatus* and *Onthophagus nutans. O. nutans* is now extinct in Britain (Allen 1965). In addition there were six individuals of *Aphodius villosus*. This is a beetle of sunny situations on sandy or chalky soils where it is regarded as being associated with decaying vegetation matter or dung (Jessop 1986, 19). However, from personal experience it does not seems to be a usual member of the dung fauna so has been excluded from Species Group 2. The hydrophilid and staphylinid beetles of Species Group 7 which occur more generally in dung and also in other sorts of foul organic material comprised 9.7% of the terrestrial Coleoptera. *Megasternum obscurum* predominated but there were also a few examples of *Cercyon* spp. and a single individual of *Anotylus sculpturatus* gp.

There was a slight presence of Coleoptera from other habitats within the grassland environment. There were a couple of carrion beetles: *Silpha tristis* and *Nicrophorus* sp. (sexton beetle). *Nicrophorus* sp. bury dead small mammals on which their larvae develop. There also was an example of the snail-eating beetle *Silpha atrata*. Three water beetles were present: *Colymbetes fuscus*, *Helophorus* cf. *brevipalpis* and *Hydrobius fuscipes*. They are all species of stagnant water which readily fly to colonise temporary bodies of water. There were a few beetles of mouldy plant material as might be expected in grass tussocks such as *Enicmus transverses* but they were not abundant. There was only a single beetle,

Curculio cf. *nucum*, belonging to Species Group 4, wood and tree-dependent Coleoptera. Its larvae develop inside the nuts of *Corylus avellana* hazel).

Sample 9425 also contained remains of insects from three other orders. Most numerous were unidentified puparia of Diptera (flies). However, one puparium resembled that of *Scathophaga stercorea* (yellow dung fly). This fly lays its eggs on fresh dung. There were also ants from two species of *Myrmica*, *M. rubra* or *ruginodis* and *M. scabrinodis* gp. Both nest in a variety of habitats including grassland. The Hemiptera (true bugs) were represented by the grass-feeding *Aphrodes* sp. and *Pentatoma rufipes*, a shield bug which occurs on trees, particularly *Quercus* sp. (oak).

Phase 4 Gully, Tables 6-7

Samples were analysed from Context 4070, the bottom fill of the gully adjacent to the "mini-mound", (Sample 9338) and Context 4173, the top fill of the gully (Sample 9813). Presentation was relatively good although the remains were fragmentary. The range of species was largely the same as from the "mini-mound" itself. The number of species of Carabidae was, however, greatly reduced and the water beetles were absent. *Phyllopertha horticola* and *Agrypnus murinus* retained their presence amongst Species Group 11 weevils which feed on *Plantago* spp. and *Trifolium* spp. were joined by *Cleonus piger*, which feeds on Compositae, usually *Carduus* and *Cirsium* spp. (thistles). There were some host-specific Chrysomelidae including *Chrysolina haemoptera* on *Plantago* spp. and *Hydrothassa glabra* on *Ranunculus* spp. (buttercups). The scarabaeoid dung beetles of Species Group 2 had risen to 13.3% of the terrestrial Coleoptera. *Aphodius villosus* was also well represented. However, the beetles of more general foul organic material, including *Megasternum obscurum* had declined in abundance to 5% of the terrestrial Coleoptera. There was a single member of Species Group 4, the wood and tree-dependent Coleoptera, the wood-boring beetle *Grynobius planus*.

Phase 4 Lower Organic Mound, Tables 6-7

Two discrete turves were analysed from the lower organic mound, Context 4156 (Sample 9200) and Context 3075 (Sample 9362). Preservation in them was good although the quantity of remains was low. Sample 9824 from the general body of the mound, Context 3046, was also analysed. The results were again similar to those from the "mini-mound" although as was also the case for the gully, there was not the great range of Carabidae and the aquatic species were absent. Wood and tree-dependent taxa were also absent.

Table 6: Coleoptera from Phase 4

	Mini Mound	Gully		Lower Organic Mound			Habitat	Species Group
sample/s	9808,9809,9826	9811,9812	9813	9824	9200	9362		
sub-sample of	9425	9338	9339.	9267.	N/A	N/A		
Context number	4181	4170	4173	3046	4156	3075		
Sample weight (kg.)	13.56	5.49	2.14	1.97	2.10	1.23		
Phase	4	4	4	4	4	4		
CARABIDAE								
Cicindela campestris L.	1	-	-	-	-	-	T - light soil, open and sunny	
Carabus monilis F.	2	2	-	-	-	-	WGD	
C. problematicus Hbst.	1	-	-	-	-	-	T - open, dry	
Nebria brevicollis (F.)	1	-	-	-	-	-	WGD	
Loricera pilicornis (F.)	1	-	-	-	-	-	T - mostly moist	
Bembidion sp.	-	1	-	-	-	-	T	
Pterostichus cupreus (L.)	1	-	-	-	-	-	G (DW)	
P. diligens (Stürm.)	-	-	-	1	-	-	MG - wet	
P. niger (Sch.)	1	-	-	-	-	-	W(GD)	
P. strenuus (Pz.)	1	-	-	-	-	-	T - often near water	
P. cf. *strenuus* (Pz.)	1	-	-	-	-	-	as above	
P. cupreus (L.) or *versicolor* (Strm.)	1	2	-	-	-	-	G(DW)	
Abax parallelepipedus (P. & M.)	1	-	-	-	-	-	W(GDC)	
Calathus fuscipes (Gz.)	3	-	-	1	1	-	WDG - often in meadowland	
C. melanocephalus (L.)	2	-	-	1	-	-	GD(W)	
Agonum muelleri (Hbst.)	1	-	-	-	-	-	GD(W)	
Amara sp.	1	-	-	-	-	-	T	
Harpalus cf. *affinis* (Schr.)	1	-	-	-	-	-	DG(W)	
DYTISCIDAE								
Colymbetes fuscus (L.)	1	-	-	-	-	-	A - stagnant	1
HYDROPHILIDAE								
Helophorus cf. *brevipalpis* Bed.	1	-	-	-	-	-	A - but readily leaves water	1

	Mini Mound	Gully		Lower Organic Mound			Habitat	Species Group
sample/s	9808,9809,9826	9811,9812	9813	9824	9200	9362		
sub-sample of	9425	9338	9339.	9267.	N/A	N/A		
Context number	4181	4170	4173	3046	4156	3075		
Sample weight (kg.)	13.56	5.49	2.14	1.97	2.10	1.23		
Phase	4	4	4	4	4	4		
Sphaeridium lunatum F. or *scarabaeoides* (L.)	1	1	-	-	-	-	F - esp cow dung (CV)	
Cercyon cf. *atomarius* (F.)	1	-	-	-	-	-	FVC	7
Cercyon sp.	1	-	-	1	-	1	FVC, some species on wet mud	7
Megasternum obscurum (Marsh.)	12	2	1	3	1	2	FVC	7
Hydrobius fuscipes (L.)	1	-	-	-	-	-	A - stagnant	1
HISTERIDAE								
Hister bissexstriatus F.	-	-	-	1	-	-	FV	
Histerinae indet.	1	-	-	-	-	-	FVC	
LEIODIDAE								
Choleva or *Catops* sp.	1	-	-	-	-	-	V - often leaf litter	
SILPHIDAE								
Nicrophorus sp.	1	-	-	-	-	-	C - burying small carcasses	
Silpha atrata L.	1	1	-	-	-	-	mostly under bark or in rotten wood (GDV)	
S. tristis Ill.	1	-	-	1	-	-	C(GDV)	
STAPHYLINIDAE								
Anotylus sculpturatus gp.	1	-	-	-	-	-	FVC	7
Stenus spp.	7	2	2	-	-	1	TM	
Lathrobium sp.	1	-	-	-	-	-	TV(C)	
Rugilus erichsoni (Fauv.) or *orbiculatus* (Pk.)	3	-	-	2	1	-	V(G)	
Xantholinus linearis (Ol.)	3	1	-	-	-	-	WGV(FC)	
X. longiventris Heer	-	-	-	1	-	-	WGV(FC)	
Philonthus sp.	4	1	-	-	1	-	FVC(T)	

	Mini Mound	Gully		Lower Organic Mound			Habitat	Species Group
sample/s	9808,9809,9826	9811,9812	9813	9824	9200	9362		
sub-sample of	9425	9338	9339.	9267.	N/A	N/A		
Context number	4181	4170	4173	3046	4156	3075		
Sample weight (kg.)	13.56	5.49	2.14	1.97	2.10	1.23		
Phase	4	4	4	4	4	4		
Gabrius sp.	-	-	-	1	-	-	WGFVC	
Staphylinus caesareus Ced. or *dimidiaticornis* Gem.	1	-	-	-	-	-	T	
S. aeneocephalus Deg. or *fortunatarum* Woll.	1	1	1	-	-	-	WG	
S. olens Müll.	1	-	-	-	-	-	WG(D)	
Quedius sp.	3	-	-	-	-	-	T	
Philonthus or *Quedius* sp.	-	-	-	2	-	1	TFVC	
Tachyporus sp.	3	-	-	-	1	1	T	
Tachinus sp.	2	-	-	-	-	-	T	
Aleocharinae indet.	4	-	-	1	1	-	TFVC	
GEOTRUPIDAE								
Geotrupes sp.	3	2	1	-	-	-	F	2
SCARABAEIDAE								
Aphodius cf. *foetens* (F.)	1	-	-	-	-	-	F	2
A. cf. *sphacelatus* (Pz.)	3	1	-	1	1	-	FVC	2
A. villosus Gyl.	6	2	2	-	1	-	V(F)	
Aphodius spp. (not *villosus*)	4	2	1	-	1	1	mostly F	2
Onthophagus nutans (F.)	1	-	-	-	-	-	F	2
Onthophagus sp. (not *ovatus*)	1	1	-	-	-	1	F(C)	2
Hoplia philanthus (Fues.)	1	-	-	-	-	-	larvae on roots in permanent grassland	11
Phyllopertha horticola (L.)	7	2	1	-	1	1	larvae on roots in permanent grassland	11
DASCILLIDAE								
Dascillus cervinus (L.)	2	2	-	-	-	-	larvae on grass roots, adults on flowers and bushes	

	Mini Mound	Gully		Lower Organic Mound			Habitat	Species Group
sample/s	9808,9809,9826	9811,9812	9813	9824	9200	9362		
sub-sample of	9425	9338	9339.	9267.	N/A	N/A		
Context number	4181	4170	4173	3046	4156	3075		
Sample weight (kg.)	13.56	5.49	2.14	1.97	2.10	1.23		
Phase	4	4	4	4	4	4		
ELATERIDAE								
Agrypnus murinus (L.)	3	2	-	-	1	1	G	11
Athous haemorrhoidalis (F.)	1	-	-	-	-	-	WG - esp. meadowland, larvae on roots esp. in grassland	11
A. hirtus (Hbst.)	1	-	1	-	-	-	WG - esp. meadowland, larvae on roots esp. in grassland	11
Actenicerus sjaelandicus (Müll.)	1	-	-	-	-	-	damp grassland	
Agriotes obscurus (L.)	2	1	-	-	-	-	larvae mostly on roots of grassland plants	11
A. sputator (L.)	1	1	-	-	-	-	as above	11
Agriotes sp.	1	1	-	1	-	-	as above	11
CANTHARIDAE								
Cantharis sp.	1	-	-	-	-	-	adults often on flowers	
ANOBIIDAE								
Grynobius planus (F.)	-	-	1	-	-	-	dead hardwood	4
NITIDULIDAE								
Omosita colon (L.)	-	1	-	-	-	-	C - dry	
CRYPTOPHAGIDAE								
Atomaria sp.	1	-	-	-	-	-	VT(F)	8
LATHRIDIIDAE								
Enicmus transversus (Ol.)	1	-	-	-	-	-	V(GW)	
CHRYSOMELIDAE								
Oulema sp.	1	-	-	-	-	-	grasses	
Chrysolina fastuosa (Scop.)	-	1	-	-	-	-	Labiatae	
C. haemoptera (L.)	-	1	-	-	-	-	*Plantago* spp.	

	Mini Mound	Gully		Lower Organic Mound			Habitat	Species Group
sample/s	9808,9809,9826	9811,9812	9813	9824	9200	9362		
sub-sample of	9425	9338	9339.	9267.	N/A	N/A		
Context number	4181	4170	4173	3046	4156	3075		
Sample weight (kg.)	13.56	5.49	2.14	1.97	2.10	1.23		
Phase	4	4	4	4	4	4		
C. polita (L.)	1	-	-	-	-	-	Labiatae	
Gastrophysa viridula (Deg.)	1	-	-	-	-	-	*Rumex* and *Polygonum* spp.	
Hydrothassa glabra (Hbst.)	-	-	1	-	-	-	*Ranunculus* spp.	
Longitarsus sp.	2	1	-	-	-	-	various herbs	
Crepidodera ferruginea (Scop.)	1	-	-	-	-	-	mostly Gramineae	
Apteropeda orbiculata (Marsh.)	1	-	-	1	-	-	various herbs esp *Glechoma hederacea* L.	
Cassida sp.	1	-	-	-	-	-	various herbs	
APIONIDAE								
Apion spp.	3	-	1	1	1	1	various herbs	3
CURCULIONIDAE								
Phyllobius roboretanus Gred. or *viridiaeris* (Laich.)	1	-	-	-	-	1	trees, shrubs and some herbs	
Phyllobius or *Polydrusus* sp.	2	2	2	1	-	-	as above	
Sciaphilus asperatus (Bons.)	1	1	1	-	-	-	various herbs	
Barynotus obscurus (F.)	9	1	-	1	-	-	various herbs	
Sitona lepidus Gyll.	2	-	-	-	-	-	Leguminosae, mostly *Trifolium* spp.	3
S. cf. lineatus (L.)	1	-	-	-	-	-	Leguminosae	3
Sitona sp.	1	-	-	1	-	1	Leguminosae	3
Cleonus piger (Scop.)	-	1	-	-	-	-	Compositae, usually *Carduus* and *Cirsium* spp.	
Hypera punctata (F.)	4	1	-	-	-	-	Leguminosae esp. *Trifolium* spp.	
Hypera sp. (not *punctata*)	-	1	-	-	-	-	various herbs	
Liparus coronatus (Gz.)	1	-	-	-	-	-	Umbelliferae	
Rhinoncus sp.	-	-	-	1	-	-	various herbs esp. Polygonaceae	

	Mini Mound	Gully		Lower Organic Mound			Habitat	Species Group
sample/s	9808,9809,9826	9811,9812	9813	9824	9200	9362		
sub-sample of	9425	9338	9339.	9267.	N/A	N/A		
Context number	4181	4170	4173	3046	4156	3075		
Sample weight (kg.)	13.56	5.49	2.14	1.97	2.10	1.23		
Phase	4	4	4	4	4	4		
Ceuthorhynchinae indet.	-	1	-	-	1	-	various herbs	
Curculio cf. *nucum* L.	1	-	-	-	-	-	*Corylus avellana* L. - larvae in nuts	4
Mecinus pyraster (Hbst.)	4	1	-	1	2	-	*Plantago lanceolata* L. and *P. media* L.	
Gymnetron labile (Hbst.)	1	-	-	-	-	-	*Plantago lanceolata* L.	
Total	158	44	16	25	15	13		

Table 7: Other Insects from Phase 4

		Mini Mound	gully		Lower Mound			Habitat
sample/s		9808,9809,9826	9811,9812	9813	9824	9200	9362	
sub-sample of		9425	9338	9339.	9267.	N/A	N/A	
Context number		4181	4070	4173	3046	4156	3075	
sub-samples		9808,9809,9826	9811,9812					
sample weight (kg.)		13.56	5.49	2.14	1.97	2.10	1.23	
Phase		4	4	4	4	4	4	
HEMIPTERA - HOMOPTERA								
Aphrodes sp.		1	-	-	-	-	-	grasses
- HETEROPTERA								
Pentatoma rufipes (L.)		1	-	-	-	-	-	trees esp. *Quercus* sp.
HYMENOPTERA - FORMICIDAE								
Myrmica rubra (L.)	- worker	-	-	-	-	2	-	T
M. rubra (L.) or *ruginodis* Nyl.	- worker	3	2	-	2	1	1	T
M. scabrinodis gp.	- worker	5	-	1	-	2	1	T
Myrmica sp.	- worker	1	-	-	-	-	-	T
Myrmica sp.	- male	4	-	1	-	-	-	T
OTHER HYMENOPTERA								
Hymenoptera indet. (not Formicidae)		-	1	-	-	-	-	T
DIPTERA								
cf. *Scathophaga stercorea* (L.)	- puparium	1	-	-	-	-	-	fresh dung
Diptera indet.	- puparium	21	7	-	5	6	3	T

Phase 5 Pits, Tables 8-9

Two samples were investigated from the pit in the Main Tunnel, Sample 9823 from Context 3070, its primary fill and Sample 9244 from Context 3066, its main fill. Preservation was poor and there were very few remains in Sample 9823 whereas preservation was good in Sample 9244 and there were many more remains. Sample 9340 was analysed from Context 3073, the fill of the pit in the West Lateral. Preservation in it was mediocre to poor. The results for the Coleoptera fell into the pattern shown by the samples from the earlier phases. The same species tended to predominate in the species groups for example *Megasternum obscurum* in Species Group 7 and *Phyllopertha horticola* in Species Group 11. However, aquatic beetles and the tree and wood-dependent Coleoptera of Species Group 4 were absent. *Aphodius villosus* was also absent. The Formicidae from all the samples from the pits included workers of *Lasius flavus* group (yellow ant), which builds mounds in old grassland, as well as ants from the genus *Myrmica*. Sample 9244 contained 22 workers of *Myrmica scabrinodis* gp., possibly from the incorporation of a nest.

Table 8: Coleoptera from Phase 5

	Pits			Habitat	Species Group
Sample/s	99823	9817, 9818	9810, 9816		
sub-samples of	9246.	9244	9340		
Context number	3070	3066	3073		
sample weight (kg.)	2.44	5.02	4.14		
Phase	5	5	5		
CARABIDAE					
Carabus monilis F.	-	1	-	WGD	
Trechus obtusus Er. or *quadristriatus* (Schr.)	-	-	1	T	
Pterostichus cf. *strenuus* (Pz.)	-	1	-	T - often near water	
Calathus fuscipes (Gz.)	-	1	-	WDG - often in meadowland	
Amara sp.	-	-	1	T	
Badister bipustulatus (F.)	1	-	-	T - mostly damp	
HYDROPHILIDAE					
Cercyon cf. *haemorrhoidalis* (F.)	-	1	-	FV	7
Megasternum obscurum (Marsh.)	-	3	1	FVC	7
Cryptopleurum minutum (F.)	-	1	-	FVC	7
STAPHYLINIDAE					
Platystethus arenarius (Fouc.)	-	1	-	FV	7
Stenus spp.	-	1	2	TM	
Lathrobium sp.	-	1	-	TV(C)	
Rugilus erichsoni (Fauv.) or *orbiculatus* (Pk.)	-	1	-	V(G)	
Xantholinus glabratus (Grav.)	-	1	-	GDFV	

	Pits			Habitat	Species Group
Sample/s	99823	9817, 9818	9810, 9816		
sub-samples of	9246.	9244	9340		
Context number	3070	3066	3073		
sample weight (kg.)	2.44	5.02	4.14		
Phase	5	5	5		
X. linearis (Ol.) or *longiventris* Heer	-	1	-	WGV(FC)	
Philonthus sp.	-	1	1	FVC(T)	
Staphylinus caesareus Ced. or *dimidiaticornis* Gem.	-	1	-	T	
Tachyporus sp.	-	1	1	T	
Aleocharinae indet.	-	2	-	TFVC	
GEOTRUPIDAE					
Geotrupes sp.	-	1	1	F	2
SCARABAEIDAE					
Aphodius porcus (F.)	-	1	-	F - in *Geotrupes* burrows	2
Aphodius spp. (not *villosus*)	-	1	-	mostly F	2
Onthophagus sp. (not *ovatus*)	1	1	-	F(C)	2
Phyllopertha horticola (L.)	-	2	1	larvae on roots in permanent grassland	11
ELATERIDAE					
Agrypnus murinus (L.)	-	1	-	G	11
Athous hirtus (Hbst.)	-	1	-	WG - esp. meadowland, larvae on roots esp. in grassland	11
Agriotes sp.	1	1	1	larvae mostly on roots of grassland plants	11
CRYPTOPHAGIDAE					
Atomaria sp.	-	1	-	VT(F)	8
CHRYSOMELIDAE					
Longitarsus sp.	-	2	-	various herbs	
APIONIDAE					
Apion spp.	-	1	-	various herbs	3
CURCULIONIDAE					
Barynotus obscurus (F.)	-	1	-	various herbs	
Sitona sp.	-	1	-	Leguminosae	3
Ceuthorhynchidius troglodytes (F.)	-	1	-	*Plantago lanceolata* L.	
Ceuthorhynchinae indet.	-	1	-	various herbs	
Mecinus pyraster (Hbst.)	-	1	-	*Plantago lanceolata* L. and *P. media* L.	
Total	3	37	10		

Table 9: Other Insects from Phase 5

		Pits			Habitat
Sample/s		99823	9817, 9818	9810, 9816	
Sub-samples of		9246.	9244	9340	
Context number		3070	3066	3073	
Sample weight (kg.)		2.44	5.02	4.14	
Phase		5	5	5	
HEMIPTERA - HOMOPTERA					
Aphodes bifasciatus (L.)		-	1	-	grasses
HYMENOPTERA - FORMICIDAE					
Myrmica rubra (L.) or *ruginodis* Nyl.	- worker	1	-	-	T
M. scabrinodis gp.	- worker	-	22	3	T
Myrmica sp.	- worker	-	3	-	T
Lasius flavus gp.	- worker	1	1	1	mounds in old pasture and at edge of woodland
OTHER HYMENOPTERA					
Hymenoptera indet. (not Formicidae)		-	1	1	T
DIPTERA					
Diptera indet.	-puparium	1	4	3	T

Phase 6.1 Upper Organic Mound, Tables 10-11

Two samples were analysed from the general body of the Upper Organic Mound, Context 3083 (Sample 9825) and Context 3061 (Sample 9375). An individual turf was also analysed, Context 3078 (Sample 9335). The preservation in these samples was variable with some insect fragments in good condition and others with their surfaces eroded. The same general range of taxa were present as in the earlier contexts although the proportion of scarabaeoid dung beetles of Species Group 2 was, at 28.9%, twice as high as from any of the other phases. The weevils from the genera *Apion* and *Sitona* which comprise Species Group 3 were also well represented at 10.5% of the terrestrial Coleoptera. They mostly feed on clovers and vetches. These beetles are favoured by grassland which is managed for hay or only lightly grazed rather than heavily grazed pasture. The phytophagous beetles also included a couple of examples of *Liparus coronatus*, a large weevil which develops on the roots of Umbelliferae. The ants again included *Lasius flavus* gp., as well as *Myrmica* spp.

Phase 6.2 Capping layers, Tables 12-13

Insect remains were very poorly preserved, fragmentary and few in Context 3084 (Sample 9822), an organic layer within the clay capping over the upper organic mound.

Table 10: Coleoptera from Phase 6.1

	Upper Organic Mound			Habitat	Species Group
Sample	9335	9825	9375		
sub-sample of	N/A	9276	N/A		
Context number	3078	3083	3061		
Sample weight (kg.)	1.91	2.21	2.31		
Phase	6. 1	6.1	6. 1		
CARABIDAE					
Calathus fuscipes (Gz.)	-	1	-	WDG - often in meadowland	
Amara sp.	1	-	1	T	
HYDROPHILIDAE					
Sphaeridium lunatum F. or *scarabaeoides* (L.)	-	-	1	F - esp cow dung (CV)	
Megasternum obscurum (Marsh.)	1	1	-	FVC	7
STAPHYLINIDAE					
Platystethus arenarius (Fouc.)	-	-	1	FV	7
Stenus spp.	1	2	1	TM	
Rugilus erichsoni (Fauv.) or *orbiculatus* (Pk.)	-	1	-	V(G)	
Philonthus or *Quedius* sp.	-	-	1	TFVC	
Aleocharinae indet.	1	-	-	TFVC	
GEOTRUPIDAE					
Geotrupes sp.	1	-	-	F	2
SCARABAEIDAE					
Aphodius cf. *foetidus* (Hbst.)	-	1	-	FV	2
A. cf. *sphacelatus* (Pz.)	1	-	3	FVC	2
Aphodius spp. (not *villosus*)	1	1	3	mostly F	2
Phyllopertha horticola (L.)	-	-	1	larvae on roots in permanent grassland	11
DASCILLIDAE					
Dascillus cervinus (L.)	-	1	-	larvae on grass roots, adults on flowers and bushes	
ELATERIDAE					
Agrypnus murinus (L.)	-	1	1	G	11
APIONIDAE					
Apion spp.	-	2	1	various herbs	3
CURCULIONIDAE					3
Phyllobius roboretanus (Gred.) or *viridiaeris* (Laich.)	1	-	-	trees, shrubs and some herbs	
Barynotus obscurus (F.)	-	1	1	various herbs	
Sitona sulcifrons (Thun.)	-	1	-	Leguminosae, mostly *Trifolium* spp.	3
Liparus coronatus (Gz.)	-	2	-	Umbelliferae	
Total	8	15	15		

Table 11: Other Insects from Phase 6.1

		Upper Organic Mound			Habitat
Sample		9335	9825	9375	
sub-sample of		N/A	9276	N/A	
Sample		9335	9825	9375	
Context number		3078	3083	3061	
Sample weight (kg.)		1.91	2.21	2.31	
Phase		6. 1	6.1	6. 1	
HYMENOPTERA - FORMICIDAE					
Myrmica rubra (L.) or *ruginodis* Nyl.	- worker	-	-	2	T
M. scabrinodis gp.	- worker	2	2	1	T
Lasius flavus gp.	- worker	2	-	1	mounds in old pasture and at edge of woodland
OTHER HYMENOPTERA					
Hymenoptera indet. (not Formicidae)		1	-	-	T
DIPTERA					
Diptera indet.	- puparium	1	5	12	T
Diptera indet.	- adult	-	-	1	T

Table 12: Coleoptera from Phase 6.2

	Clay Capping	Habitat	Species Group
Sample	9822		
sub-sample of	9320		
Context number	3084		
Sample weight (kg.)	2.09		
Phase	6.2		
CURCULIONIDAE			
Sciaphilus asperatus (Bons.)	1	various herbs	
Total	1		

Table 13: Other Insects from Phase 6.2

		Clay Capping	Habitat
Sample		9822	
sub-sample of		9320	
Context number		3084	
Sample weight (kg.)		2.09	
Phase		6.2	
HYMENOPTERA - FORMICIDAE			
Myrmica rubra (L.) or *ruginodis* Nyl.	- worker	1	T
DIPTERA			
Diptera indet.	- puparium	2	T

INTERPRETATION

The Origin and Preservation of the Insect Remains

Allowing for differences in preservation between the contexts, all the samples contained a broadly similar range of insect remains. In the case of the Old Land Surface samples, the insects almost all appeared to represent those which were living on the ground surface, amongst the nearby vegetation and in the soil itself at the time of burial, along with dead insects which had been incorporated into the soil before burial. The insects from the various mound deposits were likewise almost all from the ground surface, vegetation and soil of wherever the turves were cut. The insects from the pits did not display any obvious faunal elements which lived in the pits, all could either have fallen in or been amongst soil used to backfill the pits.

As will be argued below, the environmental conditions at Silbury were conducive to insect life such that insects from more local origin would have been outnumbered those of more distant origin in the deposits. While some of the insects are very mobile species, there is no reason to doubt the argument made for the origin of the insect assemblages at Runnymede, that is of the order of 50% of the Coleoptera had their origins within a radius of 50m of their point of deposition (Robinson 1991, 316). Some insects would probably have had very local origins, for example the workers of the Formicidae (ants).

Some insects could be seen from their ecological requirements as having more distant origins. Sample 9425 included some aquatic beetles although as argued below, they temporarily became part of the local fauna. A single example of the wood-boring beetle *Grynobius planus* in Sample 9813 could have emerged from an imported piece of wood. Likewise the weevil *Curculio nucum* in Sample 9425 could have been brought to the site in a nut.

The preservation of insect remains ranged from good to very poor. Although the deposits were not below the permanent water table, their water-retentive nature and the volume of the mound sufficiently reduced the diffusion of air to the core of the mound to create the conditions more commonly found in fully waterlogged archaeological contexts. Preservation in the samples from the Old Land Surface was worse than that from some of the samples from the various mound deposits. This was possibly because there was a very limited diffusion of oxygen through the chalk bedrock whereas some of the turves in the mounds were better protected, being buffered against decay by organic material above and below. However, even the better-preserved remains were more fragmented than is often the case with waterlogged archaeological material, possibly the result of expansion and contraction of deposits as their water-content fluctuated seasonally. The preservation of remains in some of the samples was rather mixed. It is thought likely that

this was the result of the remains including the death assemblage already present in the soil at the time of burial as well as some of the contemporaneous fauna.

The Grassland Environment

The vast majority of insects were either indicative of open habitats or were taxa which readily live under open-country conditions. The Coleoptera comprised a balanced fauna of light to medium-grazed unimproved grassland on a well-drained rendzina or brown-earth soil. No other single habitat could accommodate almost all the insect taxa listed in Tables 2-13 and indeed turves were found in the mounds. There were representatives of all the components to such a grassland habitat: Carabidae (ground beetles) and Staphylinidae (rove beetles) which hunt over the ground surface, Elateridae (click beetles) and certain Scarabaeidae (chafer) with larvae which feed on the roots of grassland plants, and phytophagous beetles including certain Chrysomelidae (leaf beetles) and Curculionidae (weevils) which feed on the above-ground parts of vegetation. Table 14 lists the host plants indicated by the phytophagous Coleoptera. Some of the Coleoptera spend different parts of their life cycle in different components of the grassland environment for example the larvae of the weevils that were present from the genus *Sitona* feed on the root nodules of members of the genera *Trifolium* spp. (clovers), *Vicia* spp. (vetches), *Lathyrus* spp. (vetchlings) etc while the adults feed on the leaves of these plants (Morris 1997).

Table 14: Host Plants as Indicated by the Phytophagous Coleoptera. Key: + present, - absent, OLS Old Land Surface, LOM Lower Organic Mound, UOM Upper Organic Mound

Taxon	Phase	2 OLS	3 Gravel Mound	4 Mini-Mound and Gully	4 LOM	5 Pits	6 UOM
Ranunculus spp.	docks	-	-	+	-	-	-
Leguminosae esp. Trifolium spp.	clovers	+	+	+	-	-	+
Umbelliferae		+	-	+	-	-	+
Polygonum and Rumex spp.	knotgrass and docks	-	-	+	-	-	-
Corylus avellana L.	hazel	-	-	+	-	-	-
Labiatae	dead nettle etc	-	-	+	-	-	-
esp. Glechoma hederacea L.	ground ivy	-	-	+	+	-	-
Plantago lanceolata L.	ribwort plantain	-	-	+	-	+	-
P. media L. and P. lanceolata L.	hoary and ribwort plantain	+	-	+	+	+	-
Compositae esp. Carduus and Cirsium spp.	thistles	-	-	+	-	-	-
Gramineae	grasses	-	-	+	-	-	-

The majority of the Coleoptera with underground larvae, for example *Agrypnus murinus*, are favoured by well-drained soils without seasonal waterlogging. There was only a single example of the elaterid *Actenicerus sjaelandicus*, whose larvae tend to develop in the soil of damp meadowland (Harde 1984, 174). The Carabidae (ground beetles) were mostly species which readily occur on (although are not restricted to) well-drained soil such as *Calathus fuscipes* whereas the species of *Bembidion* which are commonly found on moist soils were almost if not entirely absent. There were, however, a few examples of *Pterostichus diligens* and *P. strenuus*, which tend to be associated with wet habitats.

There were very few insect remains from other orders apart from puparia of Diptera (flies) and worker Formicidae (ants). Unfortunately, hardly any of the Diptera puparia could be identified but their abundance was unexceptional for a grassland soil. The ants were mostly from the genus *Myrmica* sp., which occur in a variety of terrestrial habitats but there was also a slight presence of *Lasius flavus* gp. (yellow ant) in most of the samples from Phases 5 and 6. *L. flavus* constructs mounds in old grassland.

The droppings of larger herbivores were suggested by a range of scarabaeoid dung beetles. They were mostly species of *Aphodius*, whose larvae develop in the individual droppings, but there was also a presence of species of *Geotrupes* and *Onthophagus*. The members of these genera excavate tunnels beneath droppings and stock them with dung on which they lay their eggs. Dung-inhabiting hydrophilid beetles included a couple of individuals of *Sphaeridium lunatum* or *scarabaeoides* and many individuals of *Megasternum obscurum* supported the evidence of the scarabaeoid dung beetles. A couple of the samples contained fly puparia resembling those of *Scathophaga stercorea* (yellow dung fly). The adults are predators which swarm over fresh dung, particularly cow-pats, while their larvae feed on dung.

Other elements of the grassland fauna included a very few beetles of decaying vegetation as would have occurred at the base of grass tussocks such as *Atomaria* sp. and several carrion beetles. The carrion beetles were no more than might be expected from the occasional presence of a dead small animal or bird. Indeed it was observed that a vole molar was present in Sample 9425 along with an example of *Nicrophorus* sp. (sexton beetle), a beetle which buries corpses on which it lays its eggs.

The chafer and elaterid beetles of Species Group 11, which have larvae that feed on the roots of grassland plants, comprised 12.1% of the terrestrial Coleoptera from the current excavation, ranging from 7.5% to 17.2% from the different phases. Such a value confirms that grassland predominated in the environs of Silbury Hill. The scarabaeoid dung beetles of Species Group 2 comprised 12.4% of the terrestrial Coleoptera ranging from 8.4% to 28.9% from the different phases. This suggests a significant presence of domestic animals grazing the grassland (Robinson 1991, 278-80). The abundance of the beetles of Species Group 7, beetles which feed on a wide range of foul organic material in addition to droppings on pasture, comprised 10.2% of the terrestrial Coleoptera ranging from 5.0% to

15.4% from the different phases. Such a value is appropriate given the presence of domestic animals (Robinson 1991, 280). However, the weevils of Species Group 3 comprised 5.6% of the terrestrial Coleoptera, ranging from 1.7% to 10.5% from the different phases. Members of this group mostly feed on grassland clovers, vetches, vetchlings and other grassland trefoils (such as *Lotus corniculatus,* bird's foot trefoil) and they are favoured when grazing is not so heavy as to create a closely cropped sward. They probably reach their greatest abundance in hay meadows but there can also be quite high values in grassland which is neither grazed nor cut. The Silbury results, although not high enough to suggest hay meadow, imply that some of these grassland plants were able to grow tall enough to flower (Robinson 1991, 280). It is uncertain whether the grassland environs of Silbury were uniformly of pasture with a tall sward or whether there were more heavily grazed areas and other areas that were entirely ungrazed.

It was noted that single individuals of three species of water beetles were found in Sample 9425 from Context 4181, the "mini-mound". They were all beetles of stagnant water which readily take to the wing to colonise other temporary bodies of water. They are able to detect the water from the plane of polarisation of sunlight reflected from the surface. Whilst one explanation for the occurrence of these beetles is that there was a pond that contributed to the background rain of insects which died where the turf was growing, a more satisfactory explanation is that an episode of flooding of the grassland left temporary puddles which the beetles colonised. The surrounds of Silbury have occasionally flooded in recent times (Whittle 1997, 7). Perhaps the Carabidae of damp grassland resided in hollows where water tended to collect.

Other Environments and Habitats

The excavation showed that the Old Land Surface had experienced truncation and it was noted that some of the Coleoptera can occur in other open habitats as well as grassland. However, there was no specific element to the insect fauna which could be linked to a bare to disturbed ground environment with a sparse vegetation of annual and biennial weeds. Members of the two species groups of disturbed ground, Species Groups 6a and 6b, were absent. Ground beetles of the genus *Amara* were not particularly numerous. Neither were there the leaf beetles and weevils which feed on weeds of disturbed ground, for example *Phyllopertha* spp. on Cruciferae including *Capsella bursa-pastoris* (shepherd's purse) and *Chaetocnema concinna* on Polygonaceae especially *Polygonum aviculare* agg. (knotgrass).

There was only a slight presence of insects associated with trees and woodland, Species Group 4 comprising 0.5% of the terrestrial Coleoptera. The ground beetles included *Pterostichus niger* and *Abax parallelepipedus* which are usually regarded as woodland insects in Southern England. However, as was argued following their discovery in the assemblages from the 1968-69 tunnelling, they are regarded as having lived in grassland at Silbury in the Neolithic (Robinson 1997, 43). *P. niger* has occasionally been recorded from damp grassland in Wiltshire (Darby 2009, 72). It is possible that the single example of the

dead-wood boring beetle *Grynobius planus* and the nut-feeding weevil *Curculio* cf. *nucum* were from a localised area of scrub or a hedge but in the absence of insects associated with herbaceous vegetation of woodland edge or hedgerows such as the nettle-feeder *Brachypterus urticae* it is thought more likely they had a distant origin. Likewise a single example of the shield bug *Pentatoma rufipes*, which is usually associated with oak trees, was perhaps of chance occurrence.

The woodworm beetles of Species Group 10 and the synanthropic beetles of Species Groups 9a and 9b which tend to be associated with indoor habitats and stored products were absent. The insect results gave no indication of human settlement in the vicinity of the early stages of the Silbury monument complex.

Climate

The Neolithic insect fauna of Silbury was largely one which would have been appropriate to the area in the 20th century prior to the impact of extensive cultivation and re-seeding of permanent pasture. There were some southern elements to the fauna, for example the weevil *Liparus coronatus*. The only species which is now extinct in England, *Onthophagus nutans*, had a well documented decline unrelated to climate change from being common in some localities near London in the early 19th century to the last capture in 1926 in Dorset (Allen 1965). Although there was no evidence that the Neolithic climate was much different from that of the 20th century, the occurrence of *Cicindela campestris* and *Aphodius villosus* suggested that some of the site had a sheltered and sunny aspect.

The Differences between the Context groups and Phases

The differences between the assemblages from Phase 2, the Old Land Surface and the subsequent phases need have been due to no more than the poor conditions of preservation of the remains from the Old Land Surface in contrast with those from the other phases. Some of the differences in the results between phases were probably due to small sample sizes. For example, the scarabaeoid dung beetles of Species Group 2 were more than twice as abundant in the samples from Phase 6.1 than from any of the other samples. There was no reason to believe that the grassland from which the turves of the upper mound had been cut was much more heavily grazed than the grassland of earlier phases, indeed the weevils from Species Group 2 which favour meadowland rather than pasture were also at their most abundant in this phase. The insects from the pits of Phase 5 did not provide any evidence that they held a greater concentration of decaying organic material than was present on the surrounding grassland. However, it is thought likely that the presence of a few water beetles in the "mini-mound" was a true reflection of differences between the insect faunas. It is also possible that the occurrence of ants of the *Lasius flavus* group in most of the samples from Phase 5 onwards (they were absent from the earlier samples), was a true reflection of slight changes in the grassland, although their numbers were very low.

Comparison with the Results from the 1968-69 Excavation

The current investigation resulted in the discovery of the remains of 95 taxa of Coleoptera and nine taxa of insects of other orders. They were mostly identified to species. 32 of the coleopteran taxa were completely new for Silbury and two more were more closely identified. Two new species of other insects, both Hemiptera, were found. 84 r taxa of Coleoptera and eight taxa of other orders were identified from the 1968-69 excavation. 21 of the coleopteran taxa were not found in the current work and two more were only represented by identifications taken no further than genus in the current work. Two taxa of other insects, both Hemiptera, were not found in the current work.

The substantial overlap between the taxa of insects from the two pieces of work is unsurprising for basically the same deposits were being analysed even though their complexity was not fully appreciated in 1968-69. The species which were not found from both episodes of work were mostly represented by single individuals, there does not seem to be evidence that any insect which was well represented in the Silbury deposits was missed by either episode of excavation. However, it is likely that the recent work was more effective in recovering the full range of taxa in the samples. The minimum number of 415 individuals of Coleoptera from the current work belonged to 95 taxa whereas the 848 individuals from the earlier work only comprised 84 taxa.

Small taxa did not appear to have been substantially under-represented in the earlier work in comparison with the current work. However, if a comparison is made between the relative abundance of the species groups for the two pieces of work, it is evident that Species Groups 3 and 7 had more than twice the percentage value from the earlier work. It is suggested that this was an artefact of the recovery of insect remains from the samples rather than a true reflection of differences in the Neolithic environment. The most plentiful fragments of members of Species Group 3 from 1968-69 were elytra of weevils of the genus *Apion* while the most numerous fragments of Species Group 7 from 1968-69 were elytra of the hydrophilid beetle *Megasternum obscurum*. The elytra of these beetles are particularly resistant to fragmentation. It is argued that the earlier sorting work tended to favour intact sclerites (skeletal elements) leading to the over-representation of these taxa and hence their species groups. Overall the insect remains from the 1968-69 excavations appeared to be more intact than those from the current investigation and this is therefore attributed to the extraction process rather than that there was some deterioration of remains in the ground over the past 40 years. A more thorough sorting of the samples for fragmentary remains of insects also provides a satisfactory explanation as to why more taxa were found in the current work from a smaller total number of individuals.

On the basis of a comparison between the concentration of insect remains in a modern sample of turf and the number of insect remains in the samples from the turf stack, it was estimated that the individual samples analysed for insects from the 1968-69 excavation was of the order of 1-2kg (Robinson 1997, 41). On the basis of the concentration of

insects in the current samples from the "mini-mound" and the lower/upper organic mound, the sample size from the 1968-69 excavations can be revised to at least 3kg and possibly as much as 4kg if allowance is made for the under-representation of more fragmentary remains.

The results from the current work confirmed one unusual aspect of the insect assemblage from the 1968-69 excavation, the very high proportion of *Megasternum obscurus* in Species Group 7. While it has been noted that *M. obscurum* was over-represented in the earlier work, it is usually found in company with the staphylinid beetles *Platystethus arenarius*, *Anotylus rugosus* and *A. sculpturatus* gp. in a ratio of at least one, usually more, staphylinid to three *M. obscurum*. The ratio from the current work was 1:10.

Comparison with the Modern Fauna of Wiltshire

Silbury Hill lies within the area where much beetle collecting was undertaken during the late 19th and early 20th century by the boys and masters of Marlborough College. All but 25 of the 116 taxa of Coleoptera identified from both episodes of excavation at Silbury were recorded as being found in the Marlborough area (Meyrick 1938). Table 15 lists those Coleoptera from the Silbury excavations for which there are no modern records from Wiltshire (Darby 2009). It is probably significant that four of the seven species are scarabaeoid dung beetles. They are one of the groups of beetles of non-wooded terrestrial environments in Britain which seem to have shown the greatest change since the Neolithic.

Table 15: Coleoptera from the Silbury Hill excavations for which there are no modern records from Wiltshire (Darby 2009) Key: + present, - absent

	1968-69	2007-08
Ochthephilum fracticorne (Pk.)	+	-
Aphodius cf. *foetidus* (Hbst.)	+	+
A. porcus (F.)	+	-
Onthophagus fracticornis (Press.)	+	-
O. nutans (F.)	-	+
Chrysolina haemoptera (L.)	+	+
Cleonus piger (Scop.)	+	+

Comparison with other Insect Assemblages

The insect results from the 1968-69 excavation were compared with those from eighteen other Mesolithic and Neolithic sites in England (Robinson 2000, 29). Silbury Hill stood out as having by far the lowest proportion of members of Species Group 4, wood- and tree/shrub-dependent Coleoptera. Silbury Hill retains this position with only 0.5% of the terrestrial Coleoptera from the current work belonging to this group. The next two lowest values for Species Group 4 were from South Stanwick Long Barrow ditch, at 2.4% and the Godmanchester Cursus at 3.7%. Both these sites were monument complexes. No other Neolithic insect assemblages have been published with such low proportions of woodland insects.

The grassland beetles of Species Groups 3 and 11 were particularly well represented at Silbury in comparison with the other Neolithic sites as might be expected given the open landscape (Robinson 2000, 29). However, the volume for the dung-feeding scarabaeoid beetles of Species Group 2 was, at 12.4% of the terrestrial Coleoptera, at an intermediate level well above the 3.7% recorded for the Godmanchester Cursus, which was perhaps set amidst largely unmanaged rough grassland, but well below the 33.9% from Phase 2B of Etton Causewayed Camp where it was argued that domestic animals were concentrated within the enclosure. These comparisons help confirm that the developing Neolithic monument at Silbury was set amidst pasture grazed by domestic animals.

A comparison was made between the results from the 1968-69 excavations with those from the middle Bronze Age Wilsford Shaft, another site of open chalk pasture (Robinson 1997, 47). It was noted that although scarabaeoid dung beetles were well represented at both sites, members of the genus *Aphodius* outnumbered members of the genus *Onthophagus* by a factor of about 10 at Silbury whereas their numbers were about equal from the Wilsford Shaft. In the current work, *Aphodius* spp. still greatly outnumbered *Onthophagus* but by a factor nearer to 6. This supports the evidence that is emerging that a high proportion of *Onthophagus* spp. was not a feature particular to prehistoric pasture on the Chalk but was a feature of some middle Bronze Age sites (Robinson, 2013). The only insect now extinct in England found in the current work, *Onthophagus nutans,* was present at Wilsford (Osborne 1969; Osborne 1989). Unfortunately, the Wilsford Shaft remains the only prehistoric site on the Chalk of Southern England with insect results suitable for comparison with those from Silbury.

CONCLUSIONS

The work on insects from the 2007-08 excavation has served to enhance the value of the results from the 1968-69 tunnelling. It has shown that while there was probably under-representation of those insect taxa with sclerites which tend to fragment, there was no group of insects present in the deposits which were entirely unrepresented in the earlier work. The recent excavation revealed the early stages of the monument to have been more complex than had previously been appreciated. However, the insect analysis did not show any environmental differences between the phases.

The only species groups which were regarded as unusually well-represented amongst the remaining Coleoptera from the 1968-69 excavation, the meadowland weevils of Species Group 3 and the beetles of foul organic material of Species Group 7 (Robinson 1997, 43-44) were shown by the current work to have been indeed over-represented. However, some other apparent anomalies were confirmed, for example the occurrence of *Pterostichus niger* and *Abax parallelepipedus* in grassland faunas (Robinson 1997, 43) and the high proportion of *Megasternum obscurum* relative to *Anotylus sculpturatus* gp. (Robinson 1997, 44).

The overall picture given by the earlier work can still be regarded as holding true: the early stages of the Silbury Hill monument sequence and the turves from which the mounds were constructed were set amidst / from an open landscape of herb-rich pasture. There was no evidence for the close proximity of a settlement and any woodland or scrub was distant. There is still no reason to doubt the suggestion (Robinson 1997, 46) that the circumneutral soil of the Old Land Surface supported a grazed variant of the *Cynosurus cristatus – Centaurea nigra* grassland (MG5) and the turves were cut from chalk pasture of *Festuca ovina – Avenula pratensis* grassland (CG2) of the National Vegetation Classification (Rodwell 1992, 60-73, 140-65).

Silbury Hill remains unique as an example of a Neolithic site on the Chalk from which it has been possible to study substantial assemblages of insect remains. It is also important because the results are associated with a major ceremonial complex and it is the only Neolithic site in England where the insect fauna was from a fully cleared landscape.

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APPENDIX 1

Taxa of Coleoptera from Silbury Hill Differently Classified by Duff (2008) from Kloet and Hincks (1977)

Kloet and Hincks (1977)	Duff (2008)
Pterostichus cupreus (L.)	*Poecilus cupreus* (L.)
Pt. versicolor (Sturm)	*Po. versicolor* (Sturm)
Badister bipustulatus (F.)	*Badister bullatus* (Schr.)
Cercyon atomarius (F.)	*Cercyon impressus* (Sturm)
Megasternum obscurum (Marsh.)	*Megasternum concinnum* (Marsh.)
Xantholinus glabratus (Grav.)	*Megalinus glabratus* (Grav.)
Staphylinus aeneocephalus (Deg.)	*Ocypus aeneocephalus* (Deg.)
S. fortunatarum (Woll.)	*O. fortunatarum* (Woll.)
S. olens Müll.	*O. olens* (Müll.)
Aphodius villosus Gyl.	*Euheptaulacus villosus* (Gyl.)
Onthophagus nutans (Laich.)	*Onthophagus verticicornis* (F.)
Athous hirtus (Hbst.)	*Hemicrepidius hirtus* (Hbst.)
Crepidodera ferruginea (Scop.)	*Neocrepidodera ferruginea* (Scop.)
Apion spp.	Apionini indet.
Phyllobius viridiaeris (Laich.)	*Phyllobius virideaeris* (Laich.)
Cleonus piger (Scop.)	*Cleonis pigra* (Scop.)
Hypera punctata (F.)	*Hypera zoilus* (Scop.)
Ceuthorhynchidius troglodytes (F.)	*Trichosirocalus troglodytes* (F.)
Gymnetron labile (Hbst.)	*Mecinus labilis* (Hbst.)






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