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The Wasps and Bees (Hymenoptera: Aculeata) of Station Wood, Barnby Dun and Rossington Bridge in Watsonian Yorkshire.

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Station Wood, near Barnby Dun, and Rossington Bridge are both very good sites for aculeate wasps and bees. Six species of national importance and three Yorkshire rare species have been recorded from Barnby Dun, and three species of national importance and seven Yorkshire rare species have been recorded from Rossington Bridge. The aims of this paper are to describe the aculeate wasps and bees of the two sites, compare their fauna with other sites around Doncaster, and to use non-parametric statistical procedures to estimate potential species diversity.

Barnby Dun (about 10ha., SE6308) is situated about 6km. north-east of Doncaster and Rossington Bridge (about 18ha., SK6399) about 6km. south-east of Doncaster. Both sites are in the Humberhead Levels natural area and are remnants of former heathlands developed on the glacial sands and gravels overlying Bunter Sandstones. Barnby Dun has habitats of dry and wet heathland with developing birch and oak woodland. Open sandy areas associated with the paths and old quarry provide nesting sites for the subterranean nesters. Tree trunks which have been dumped in the old quarry provide nesting sites for aerial nesters. Hawthorn, bramble and heather provide pollen and nectar resources. The site is surrounded by modern housing, a railway line, sports field and intensive agriculture. The search area was extended to a small area south of the railway line which was greatly disturbed and was gradually being used for new housing. Access is now not permitted to the western part of the site.

Rossington Bridge is a flowery grassy heath, with very little heather left, with a fringe of developing birch and oak woodland. Some wetter areas, particularly around the Mother Drain, are marshy with sallows and alders. Pathways and other disturbed areas provide flat and sloping sandy sites for subterranean nesters. Bramble, hawthorn, gorse and broom provide important pollen and nectar resources. The site, surrounded by housing, fishing ponds and intensive agriculture, is now being managed for horse grazing so restricting access to the public rights of way.

Sampling methods

Between 1987 and 1996, 15 visits were made to both sites distributed throughout the year as follows: April (1 visit), May (3), June (4), July (3), August (3) and September (1). All visits occurred during warm sunny weather. During each, approximately two to three hour, visit all species of aculeate wasps and bees were recorded and usually collected with a hand net for identification (Archer sample). Records were also available from C. Delvin and P. Skidmore (Rossington Bridge, July 1965), S. Foster (Barnby Dun, May, July, 1987; Rossington Bridge, June, July, 1987 - 1992) and J.T. Burn (Barnby Dun, May to August, 1979 - 1988; Rossington Bridge, June to August, 1978 - 1989). The specimens of C. Delvin and P. Skidmore were found at Doncaster Museum while the specimens of S. Foster were seen and identified or identification confirmed by the author. In addition J.T. Burn has made available his records of the Dryinidae and Bethylidae for the two sites. In the following account, the nomenclature follows that of Kloet and Hincks (1978) except for the Dryinidae and Bethylidae.

Species present and seasonal progression of species

A full list of the species is given in the Appendix. At the family level, Table 1 shows the taxonomic distributions of species and records. In addition J.T. Burn recorded Dryinidae: nine species from Barnby Dun and 17 species from Rossington Bridge, and two species of Bethylidae from each site. A record of the Archer sample represents a specimen differing in one of the following three variables: name, sex and day of visit. The solitary wasp family, Sphecidae, and the solitary bee families, Andrenidae and Halictidae, are dominant in terms of number of species and records at both sites, although the Anthophoridae are well represented in terms of the number of records at Barnby Dun.

Table 1
The number of species and records from Barnby Dun and Rossington Bridge

	Barnby Dun			Rossington Bridge		
	No. spp (Archer)	No. records (Archer)	Total* spp.	No.spp. (Archer)	No. records (Archer)	Total* spp.
Solitary wasps						
Chrysididae	2	2	4	2	4	4
Mutillidae	0	0	0	1	1	1
Pompilidae	5	10	5	7	16	7
Eumenidae	2	2	3	1	1	3
Sphecidae	17	56	20	17	57	23
Total solitary wasps	26	70	32	28	79	38
Solitary bees						
Colletidae	4	7	4	5	7	6
Andrenidae	16	53	16	12	28	12
Halictidae	13	27	13	14	32	14
Melittidae	0	0	0	0	0	1
Megachilidae	1	2	2	0	0	0
Anthophoridae	9	24	10	7	10	7
Total solitary bees	43	113	45	38	77	40
Total solitary wasps and bees	**69**	**183**	**77**	**66**	**156**	**78**
Social species						
Vespidae	3		3	4		4
Apidae	10		10	9		9
Total social species	13		13	13		13
Total wasps and bees	**82**		**90**	**79**		**91**

* Additional species from P. Skidmore, S. Foster and J.T. Burn

June and July (and August for Rossington Bridge) were the best months for recording species of solitary wasps, with June and July the best months for the first recording of species (Table 2). The species most evident at both sites were the sphecids *Ammophila sabulosa*, *Crabro peltarius* and *Oxybelus uniglumis*. *Mellinus arvensis* and *Crossocerus quadrimaculatus* were also most evident at Barnby Dun and *Diodontus tristis* and the pompilid *Priocnemis parvula* at Rossington Bridge. All these species are subterranean nesters.

May and June were the best months for both recording and first recording of species of solitary bees at Barnby Dun (Table 2). The species most evident were the subterranean nesting bees: *Andrena cineraria* with its cleptoparaste *Nomada lathburiana*; *A. barbilabris* with *Sphecodes pellucidus*; *A. fulva* with *N. panzeri*; *A. haemorrhoa* with *N. ruficornis*; *A. wilkella* with *N. striata*; and *A. fuscipes* with *N. rufipes*. May, June and July were the best months for both recording and first recording of species at Rossington Bridge (Table 2). Again the species most evident were the subterranean nesting bees: *Andrena barbilabris* with its cleptoparasite *Sphecodes pellucidus*, *Andrena haemorrhoa* and *Lasioglossum leucozonium*. The cleptoparasites of *A. haemorrhoa* (*Nomada ruficornis*) and *L. leucozounium* (*Sphecodes ephippius*) were not found.

Table 2
The number of species and first records of species of solitary wasps and bees recorded per month from the Archer sample at Barnby Dun and Rossington Bridge.

	April	May	June	July	August	September
No. species						
Wasps						
Barnby		3	12	14	7	5
Rossington		4	10	21	12	4
Bees						
Barnby	8	21	22	10	5	
Rossington	6	13	16	13	9	
No. species first recorded						
Wasps						
Barnby		3	12	8	3	
Rossington		4	9	10	4	1
Bees						
Barnby	8	16	12	6	1	
Rossington	6	10	10	10	2	

Species quality
Six species of national importance have been recorded from Barnby Dun: one Red Data Book species (Shirt, 1987), *Nomada lathburiana*; five national notable or scarce species (Falk, 1991), *Chrysura radians*, *Cleptes semiauratus*, *Andrena varians*, *A. humilis* and *N. pleurosticta*. Recent work of the Bees, Wasps and Ants Recording Society (BWARS) (Archer, 2000) indicates that the status of *N. lathburiana* should be downgraded and regarded as a national scarce species.

Three species of national notable or scarce importance have been recorded from

Rossington Bridge: *Hedychridium cupreum*, *Priocnemis schioedtei* and *Crossocerus palmipes*. All the above species are on the northern edge of their range in South Yorkshire except for *Priocnemis schioedtei* and *Crossocerus palmipes* which extends northwards to Scotland.

Table 3 - The regional status scheme for the solitary wasps and bees recorded at Barnby Dun (BD) and Rossington Bridge (RB).

Status	Status value (A)	No. species BD(B)	No. species RB(B)	Quality score BD(AxB)	Quality score RB(AxB)
Common	1	38	31	38	31
Frequent	2	22	17	44	34
Occasional	4	11	22	44	88
Rare	8	0	5	0	40
Nationally scarce	16	6	3	96	48
Total		77	78	222	241

In a Watsonian Yorkshire context, three rarities have been recorded from Barnby Dun: *Chrysura radians*, *Cleptes semiauratus* and *Andrena radians*. In a regional context *Andrena humilis* and *Nomada pleurosticta* have an occasional status and *N. lathburiana* a frequent status (Archer, 1993). By giving each of the 77 solitary species a regional status (Archer, 1993) gives Barnby Dun a regional quality score of 222 (Table 3) and a regional species quality score of 2.9 (222/77). Seven Yorkshire rarities have been recorded from Rossington Bridge: *Hedychridium ardens*, *Arachnospila trivalis*, *Crossocerus palmipes*, *Psen lutarius*, *Cerceris arenaria*, *Melitta leporina* and *Nomada flava*. In a regional context *Priocnemis schioedtei* has a frequent status. By giving each of the 78 solitary species a regional status, Rossington Bridge has a regional quality score of 241 (Table 3) and a regional species quality score of 3.1 (241/78).

Table 4 - The Archer national status scheme for the solitary wasps and bees recorded at Barnby Dun (BD) and Rossington Bridge (RB).

Status	Status value (A)	No. species BD(B)	No. species RB(B)	Quality score BD(AxB)	Quality score RB(AxB)
Universal	1	48	46	48	46
Widespread	2	23	29	46	58
Scarce	8	4	3	32	24
Rare	16	2	0	32	0
Total		77	78	158	128

To take account of all species and the latest information from BWARS, Archer & Burn (1995) introduced a new national quality scoring system and Archer (1999) gave the latest definitions for the six national statuses. High quality species have a scarce, rare or very rare status while low quality species have a universal, widespread or restricted status. By giving each solitary species a national status, a national quality score (QS) and national species quality score (SQS) can be calculated (Barnby Dun, QS 158, SQS 2.1: Rossington Bridge, QS 128, SQS 1.6) (Table 4).

Table 5 - Species quality characteristics (quality score (QS) and species quality score (SQS)) of solitary wasps and bees recorded from sites near Doncaster

	Crow Wood	Barnby Dun	Blaxton Common	Rossington Bridge
No. solitary species	105	77	109	78
Regional QS	416	222	341	241
Regional SQS	4.0	2.9	3.1	3.1
National QS	266	158	205	128
National SQS	2.5	2.1	1.9	1.6
Area (ha.)	152	10	25	18

Table 5 summarises the quality characteristics of the solitary wasps and bees recorded from sites near Doncaster including Crow Wood (Archer & Burn, 1995) and Blaxton Common (Archer, 1995). Although the quality scores, and the number of solitary and high quality species will be influenced by the areas of the sites, the species quality scores are relatively independent of site area (Archer, 1999), so can be used to compare sites. Crow Wood is the most important of the four sites in a national and Yorkshire context, while the other three sites differ in importance according to whether the national or Yorkshire species quality scores are considered. Compared with Barnby Dun, Rossington Bridge is more important in a regional context but less important in a national context. All four sites are important in a wider Yorkshire context (Archer, 1999) and it is a pity that all four sites have no SSSI protection, and that the sites are being altered to the detriment of the aculeate fauna.

Species-area relationship

A problem in the study of any site is the difficulty of knowing when the species list is sufficiently complete so that comparisons with other sites may reasonably be made. One way to resolve this problem is the use of the species-area relationship where the number of species and the area of the sites, both expressed as natural logarithms (ln), can show a positive linear relationship (Usher, 1986). If the number of species in relation to the area of site falls within the range of other sites which show a statistically significant species-area relationship, then the site may reasonable be compared with other sites. The dots for Barnby Dun and Rossington Bridge fall within the range of 19 sites from the north and north midlands of England (Archer, 1999). Thus the species list for both sites is reasonably complete to compare with other sites in the Doncaster area.

Cleptoparasitic load

The cleptoparasitic load (CL) is the percentage of aculeate species that are cleptoparasites (or parasitoids) on other host aculeates. Wcislo (1987) showed that parasite behaviour among aculeate Hymenoptera correlated with geographical latitude. Thus the parasitic rates are higher in temperate regions as host populations are more synchronised in their life-history characteristics. This finding probably does not hold for desert climates where the occurrence of rainfall would tend to synchronise life-history characteristics. From a review of the literature Wcislo (1987) found that the CLs for bees in Europe varied between 16% and 33%, a range of 17%.

The CLs for the solitary bees from north and north midland sites of England vary between 22% and 37%, a range of 15% (Archer, 1999). The range of values of CL for the northern English sites is similar to the wider European sites (Wcislo, 1987). The CLs for the solitary species of bees from Barnby Dun and Rossington Bridge (Table 6) fall within the range from the northern sites.

Table 6 - The relative frequency of the cleptoparasitic (or parasitoid) species among the solitary wasps and bees recorded from Barnby Dun (BD) and Rossington Bridge (RB).

	No. hosts (H)		No. cleptoparasites (C)		Cleptoparasitic Load CL = 100 x C/(A + C)	
	BD	RB	BD	RB	BD	RB
Solitary wasps	27	32	4*	6	12.9	15.8
Solitary bees	30	28	15	12	33.3	30.0

* *Cleptes semiauratus* not a parasitoid on another aculeate species.

Wcislo (1987) gives no CL values for wasps. However, for the north and north midlands sites of England, CL values for the solitary wasps varies between 10% and 22%, a range of 12% (Archer, 1999). The narrow range of this variation indicates that the argument Wcislo (1987) developed for the bees also applies to the solitary wasps. The CLs for the solitary species of wasps from Barnby Dun and Rossington Bridge (Table 6) fall within this range.

All the social species are host species, except for the *Psithyrus* species, which are social parasites on the *Bombus* species.

Aerial nester frequency

The aerial-nester frequency (AF) is the percentage of host aculeate species that have aerial nest sites. Aerial nesters may use old beetle burrows in dead wood, central stem cavities, e.g. bramble, old snail shells, or crevices in old wall or exposed on the surface of rock or other hard material. Subterranean nesters nest in the soil, usually in burrows dug by themselves, but sometimes holes and crevices are used after being altered.

Table 7 - The nesting habits of the host species of solitary wasps and bees recorded from Barnby Dun (BD) and Rossington Bridge (RB).

	No. aerial nesters (A)		No. subterranean nesters (S)		Aerial nester frequency AF = 100 x A/(A + S)	
	BD	RB	BD	RB	BD	RB
Solitary wasps	12	7	15	25	44.4	21.9
Solitary bees	4	4	26	24	13.3	14.3

The AF for all the British species of solitary bees is 17.9, which is similar to the AFs of solitary bees from Barnby Dun and Rossington Bridge (Table 7). The AF for all British species of solitary wasps is 46.2% which is similar to the AF for Barnby Dun but higher than the AF for Rossington Bridge (Table 7). The low AF for Rossington Bridge could be a consequence of failure to find more aerial-nesting species or the lack of suitable aerial-nesting habitat. Further visits will be needed to resolve this problem.

All the species of social wasps and *Bombus* are subterranean nesters, although *Dolichovespula sylvestris* and *B. pratorum* are known to nest in aerial situations. Aerial nests of wild honeybees, *Apis mellifera*, were not found.

Estimating the potential number of solitary wasp and bee species

Another problem in the study of any site is the difficulty of knowing how many more species are present yet unrecorded. Recent advances in non-parametric statistical procedures offer a way of addressing this problem. The presence/absence quantitative estimate of Chao (in Colwell & Coddington, 1994) is based on the number of species that are observed in one (unique species) or two (two occasion species) samples or visits. The jackknife procedure (Heltshe & Forrester, 1983) only depends on the unique species. Because some aculeate species are only active in the spring or summer it is advisable that samples be taken throughout the months of adult activity. The software to carry out the statistical procedures was provided by Pisces Conservation Ltd.

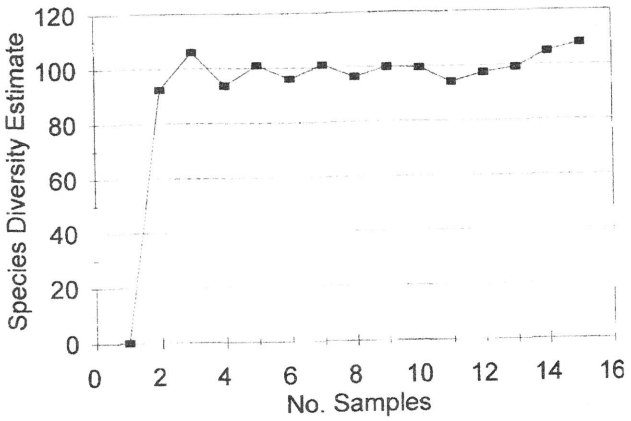

Fig. 1 The Chao presence/absence estimates for Barnby Dun

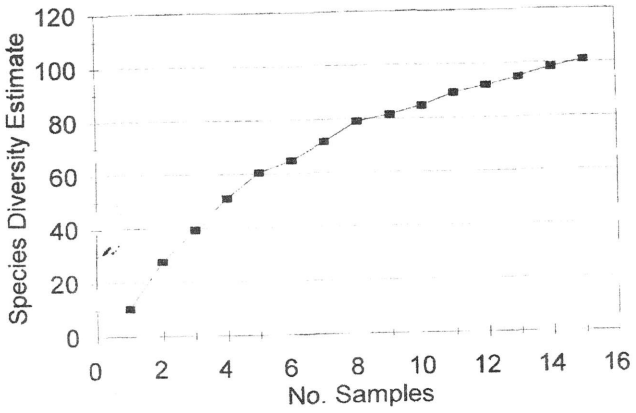

Fig. 2 - The Jackknife estimates for Barnby Dun

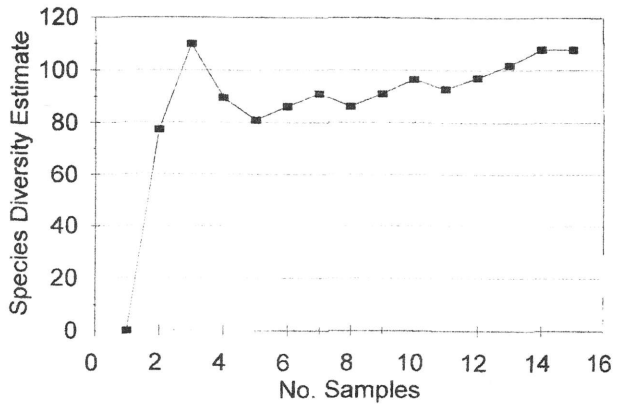

Fig. 3 - The Chao presence/absence estimates for Rossington Bridge

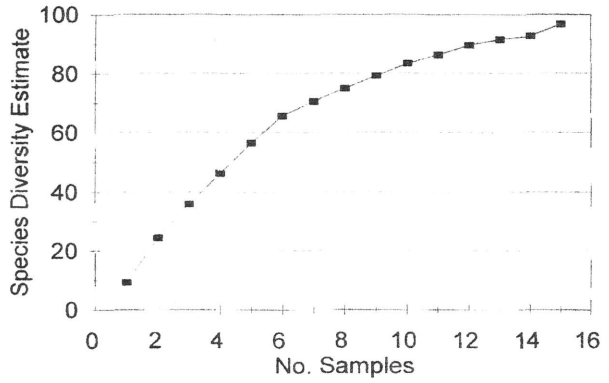

Fig. 4 - The Jackknife estimates for Rossington Bridge

The statistical procedures were run 15 times for the Archer samples of species of solitary wasps and bees. The software takes 1, 2, etc. samples at random 15 times, each time calculating a mean estimate of potential species diversity. With a small number of samples the Chao estimates are erratic, but as more samples are selected the estimates may stabilise giving confidence in the estimates. With an increasing number of samples the jackknife estimates may approach an upper asymptote. The Chao estimates do stabilise and the jackknife estimates approach an upper asymptote (Figs. 1, 2, 3, 4). The final Chao and jackkknife estimates are within about 7% of each other for Barnby Dun and about 11% of each other for Rossington Bridge so giving additional confidence in the estimates (Table 8). Table 6 also gives the 95% confidence limits of the estimates (meaning that there is a 95% chance that the potential number of species falls within this range) and shows that from the Archer sample 64% - 68% of the potential number of species for Barnby Dun and 61% - 68% of the potential number

of species for Rossington Bridge have been recorded Some of these additional species have already been recorded by other workers (Table 1).

Table 8 - Non-parametric estimates of species richness of solitary wasps and bees based on the Archer samples from Barnby Dun (BD) and Rossington Bridge (RB) using presence/absence Chao and Jackknife statistical procedures.

	Chao estimate		Jackknife estimate	
	BD	RB	BD	RB
No. species	69	66	69	66
Estimates	108	108	101	97
95% confidence limits	78-138	75-141	88-114	83-111
% of spp. found	63.9	61.1	68.3	68.0

One possible complication in making estimates is the presence of vagrant species among the unique species. Vagrant species are species that are accidentally present in the samples, being outside their normal range. The presence of unique vagrant species would artificially increase the estimate of the potential number of species. Fortunately none of the recorded species can be regarded as vagrant.

Conclusions

1. Barnby Dun with 90 recorded species and Rossington Bridge with 91 recorded species are both very good sites for aculeate wasps and bees. Both sites have species of national importance.
2. The number of recorded solitary species is that expected in relation to the area of both sites.
3. The species quality scores of both sites indicate that Barnby Dun is more important in a national context and Rossington Bridge more important in a regional context.
4. The species diversity estimates indicate that on average about another 28 species from Barnby Dun and 25 species from Rossington have yet to be recorded.
5. The cleptoparasitic loads for the solitary wasps and bees support Wcislo's proposal.
6. The number of recorded aerial-nesting species of solitary wasps from Rossington Bridge is relatively low.

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Appendix

BD = Barnby Dun.
RB = Rossington Bridge.
Records of Dryinidae and Bethylidae due to J.T. Burn.

Dryinidae - *Aphelopus atratus* (Dalman) (RB), *A. melaleucus* (Dalman) (BD,RB), *A. nigriceps* Kieffer (RB), *A. serratus* Richards (BD,RB), *Anteon brachycerum* (Dalman) (BD,RB), *A. exiguum* (Haupt) (RB), *A. flavicorne* (Dalman) (BD,), *A. fulviventre* (Haliday) (RB), *A. gaullei* Kieffer (RB), *A. infectum* (Haliday) (BD,RB), *A. jurineanum* Latreille (BD,RB), *A. pubicorne* (Dalman) (BD,RB), *A. scapulare* (Haliday) (RB), *Gonatopus bicolor (*Haliday*)* (RB), *G clavipes* (Thunberg) (BD,RB), *G. distinguendus* Kieffer (RB), *G. lunatus* Klug (RB), *Lonchodryinus ruficornis* (Dalman) (BD,RB),

Bethylidae - *Bethylus cephalus* Förster (BD,RB), *B. fuscicornis* (Jurine) (RB), *Cephalonmia formiciformis* Westwood (DB).

Chrysididae - *Elampus panzeri* (Fab.) (RB), *Hedychridium ardens* (Latreille in Coquebert) (RB), *H. cupreum* (Dahlbom) (=*integrum*) (RB), *Chrysis angustula* Schenck (BD), *C. impressa* Schenck (BD,RB), *Chrysura radians* (Harris) (=*pustulosa*) (BD), *Cleptes semiauratus* (Linn.) (BD).

Mutillidae - *Myrmosa atra* Panzer (RB).

Pompilidae - *Priocnemis parvula* Dahlbom (RB), *P. schioedtei* Haupt (RB), *P. perturbator* (Harris) (BD), *Pompilus cinereus* (Fab.) (RB), *Arachnospila anceps* (BD,RB), *A. trivalis* (Dahlbom) (RB), *A. spissa* (Schiødte) (BD), *Evagetes crassicornis* (Shuckard) (BD,RB), *Episyron rufipes* (Linn.) (BD,RB).

Eumenidae - *Ancistrocerus gazella* (Panzer) (BD,RB), *A. oviventris* (Wesmael) (RB), *A. parietinus* (Linn.) (BD), *A. trifasciatus*(Müller) (BD,RB).

Vespidae - *Dolichovespula sylvestris* (Scopoli) (RB), *Vespula rufa* (Linn.) (BD,RB), *Paravespula germanica* (Fab.) (BD,RB), *P. vulgaris* (Linn.) (BD,RB).

Sphecidae - *Astata pinguis* (Dahlbom) (BD,RB), *Tachysphex pompiliformis* (Panzer) (RB), *Trypoxylon attenuatum* Smith (BD), *T. clavicerum* Lepeletier (BD), *Crabro*

cribrarius (Linn.) (RB), *C. peltarius* (Schreber) (BD,RB), *Crossocerus elongatulus* (Vander Linden) (RB), *C. ovalis* Lepeletier & Brullé (BD), *C. palmipes* (Linn.) (RB), *C. pusillus* Lepeletier & Brullé (RB), *C. tarsatus* (Shuckard) (RB), *C. wesmaeli* (Vander Linden) (RB), *C. annulipes* (Lepeletier & Brullé) (BD), *C. megacephalus* (Rossius) (BD), *C. quadrimaculatus* (Fab.) (BD,RB), *Ectemnius cavifrons* (Thomson) (BD,RB), *E. cephalotes* (Olivier) (BD,RB), *Lindenius albilabris* (Fab.) (BD,RB), *Entomognathus brevis* (Vander Linden) (BD), *Oxybelus uniglumis* (Linn.) (BD,RB), *Psen dahlbomi* (Wesmael) (DB), *P. equestris* (Fab.) (RB), *P. lutarius* (Fab.) (RB), *Pemphredon lugubris* (Fab.) (BD), *Diodontus luperus* Shuckard (RB), *D. tristis* (Vander Linden) (Vander Linden) (BD,RB), *Passaloecus insignis* (Vander Linden) (RB), *P. singularis* Dahlbom (BD,RB), *Ammophila sabulosa* (Linn.) (BD,RB), *Mellinus arvensis* (Linn.) (BD,RB), *Argogorytes mystaceus* (Linn.) (BD), *Cerceris arenaria* (Linn.) (RB).

Colletidae - *Colletes daviesanus* Smith (BD,RB), *C. fodiens* (Geoffroy in Fourcroy) (RB), *C. succinctus* (Linn.) (BD), *Hylaeus communis* Nylander (BD,RB), *H. confusus* Nylander (RB), *H. brevicornis* Nylander (RB), *H. hyalinatus* Smith (BD,RB).

Andrenidae - *Andrena clarkella* (Kirby) (RB), *A. fucata* Smith (BD,RB), *A. fulva* (Müller in Allioni) (BD,RB), *A. lapponica* Zetterstedt (BD), *A. varians* (Rossius) (BD), *A. scotica* Perkins (BD,RB), *A. bicolor* Fab. (BD), *A. angustior* (Kirby) (RB), *A. cineraria* (Linn.) (BD), *A. nigroaenea* (Kirby) (BD,RB), *A. denticulata* (Kirby) (RB), *A. fuscipes* (Kirby) (BD), *A. haemorrhoa* (Fab.) (BD,RB), *A. tarsata* Nylander (RB), *A. barbilabris* (Kirby) (BD,RB), *A. chrysosceles* (Kirby) (BD), *A. humilis* Imhoff (BD), *A. minutula* (Kirby) (BD), *A. subopaca* Nylander (RB), *A. saundersella* Perkins (BD), *A. wilkella* (Kirby) (BD,RB).

Halictidae -*Halictus rubicundus* (Christ) (BD,RB), *H. tumulorum* (Linn.) (RB), *Lasioglossum leucozonium* (Schrank) (BD,RB), *L. albipes* (Fab.) (RB), *L. calceatum* (Scopoli) (BD,RB), *L. fratellum* (Pérez) (BD), *L. nitidiusculum* (Kirby) (BD), *L. punctatissimum* (Schenck) (BD,RB), *L. rufitarse* (Zetterstedt) (BD), *L. villosulum* (Kirby) (RB), *L. cupromicans* (Pérez) (RB), *L leucopum* (Kirby) (BD,RB), *Sphecodes ephippius* (Linn.) (BD), *S. geoffrellus* (Kirby) (=*fasciatus*) (BD,RB), *S. gibbus* (Linn.) (RB), *S. monilicornis* (Kirby) (BD,RB), *S. pellucidus* Smith (BD,RB), *S. puncticeps* Thomson (BD,RB).

Melittidae - *Melitta leporina* (Panzer) (RB).

Megachilidae - *Osmia rufa* (Linn.) (BD), *Osmia leaiana* (Kirby) (BD).

Anthophoridae - *Nomada fabriciana* (Linn.) (RB), *N. flava* Panzer (RB), *N. flavoguttata* (Kirby) (BD), *N. goodeniana* (Kirby) (BD,RB), *N. lathburiana* (Kirby) (BD), *N. leucophthalma* (Kirby) (BD), *N. marshamella* (Kirby) (BD,RB), *N. panzeri* Lepeletier (BD,RB), *N. pleurosticta* Herrich-Schäffer (BD), *N. ruficornis* (Linn.) (BD), *N. rufipes* Fab. (BD), *N. striata* Fab. (BD), *Epeolus cruciger* (Panzer) (RB), *E. variegatus* (Linn.) (RB).

Apidae - *Bombus lucorum* (Linn.) (BD,RB), *B. terrestris* (Linn.) (BD,RB), *B. lapidarius* (Linn.) (BD,RB), *B. pratorum* (Linn.) (BD,RB), *B. hortorum* (Linn.) (BD,RB), *B. pascuorum* (Scopoli) (BD,RB), *Psithyrus bohemicus* (Seidl) (BD,RB), *P. sylvestris* Lepeletier (BD,RB), *P. vestalis* (Geoffroy in Fourcroy) (BD), *Apis mellifera* Linn. (BD,RB).