

THE WASPS AND BEES (HYMENOPTERA: ACULEATA) OF  
ENGLISH HERITAGE SITES IN WATSONIAN YORKSHIRE

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During a meeting of the B.E.N.H.S. Annual Exhibition in London during the autumn of 1995 I became aware of an English Heritage initiative to survey wildlife on their sites. I offered to record the aculeate wasps and bees in Watsonian Yorkshire. Of the sites available, 19 were selected for study. The sites usually had medieval ruins of castles, abbeys and priories but also Roman remains at Aldborough, Anglo-Saxon remains at Stanwick Camp, a deserted medieval village with a ruined church at Wharram Percy and a Victorian building with its gardens at Brodsworth Hall. The sites were distributed between eight Natural Areas although most were located in the Southern Magnesian Limestone and North York Moors and Hills natural areas (fig. 1). The visits were very rewarding with 94 species of aculeate wasps and bees recorded. This represents about one-third of the current Yorkshire fauna (Archer 2002).

## METHODS

Between 1996 and 2002, 60 visits were made to the 19 sites (Table 1). Normally two visits were made, including one in spring and another in summer. One visit was made to Brodsworth Hall, three visits to Pickering Castle, Richmond Castle and Roche Abbey, four visits to Monk Bretton Priory, eleven visits to Wharram Percy and 13 visits to Helmsley Castle. Additional visits were made to Wharram Percy, as this site could be easily included in ongoing survey work in Burdale, and to Helmsley Castle, as Helmsley Castle is next to the National Nature Reserve of Duncombe Park renowned for its invertebrate fauna (Archer 1993). Additional visits to Wharram Percy did not result in the discoveries of any national or regionally important species so will not be considered separately; however national and regionally important species were found at Helmsley Castle and this site will be considered later.

During a visit, which could last up to two hours, all species of aculeate wasps and bees were recorded and collected, if necessary for identification purposes, with a hand net. The visits were distributed throughout the year as follows: April (3 visits), May (17), June (18), July (13) and August (9). In the following account, the nomenclature can be related to that of Kloet & Hincks (1978). An up-to-date checklist can be found on the Bees, Wasps and Ants Recording Society (BWARS) web pages at <http://www.bwars.com>.

## RESOURCES AVAILABLE

The resource needs of aculeate wasps and bees of the sites can be considered in terms of the following habitats and micro-habitats: cut

grassland, uncut grassland and gardens, walls, bare soil between the walls and grassland, banks, shrubs and trees, dead wood and builders' material heaps.

1. Cut grassland. In places, particularly at the top of slopes, the grass-cutter had removed all the grass creating bare soil patches (Monk Bretton Priory, Spofforth Castle, Bylands Abbey and Pickering Castle). These bare patches were likely to be used for subterranean nesting by *Andrena minutula* at Monk Bretton Priory, *A. chrysoseles*, at Spofforth Castle and *A. nigroaenea* at Bylands Abbey.
2. Flowering herbs in uncut grassland and gardens (Mount Grace Priory, Helmsley Castle and Richmond Castle) were important food sources of pollen and nectar besides the prey of the solitary and social wasps. At Conisbrough Castle males and females of *Andrena haemorrhoa* were found copulating in dandelion flowers. Sometimes, uncut areas against the walls allowed the growth of woody herbs whose hollow dead stems would provide tube nesters with nest sites, e.g. *Ancistrocerus gazella* at Helmsley Castle.
3. Walls. The holes and cavities between the stonework were used as nesting sites, e.g. *Lasioglossum cupromicans* and *L. smeathmanellum* at Easby Abbey, *Andrena scotica* at

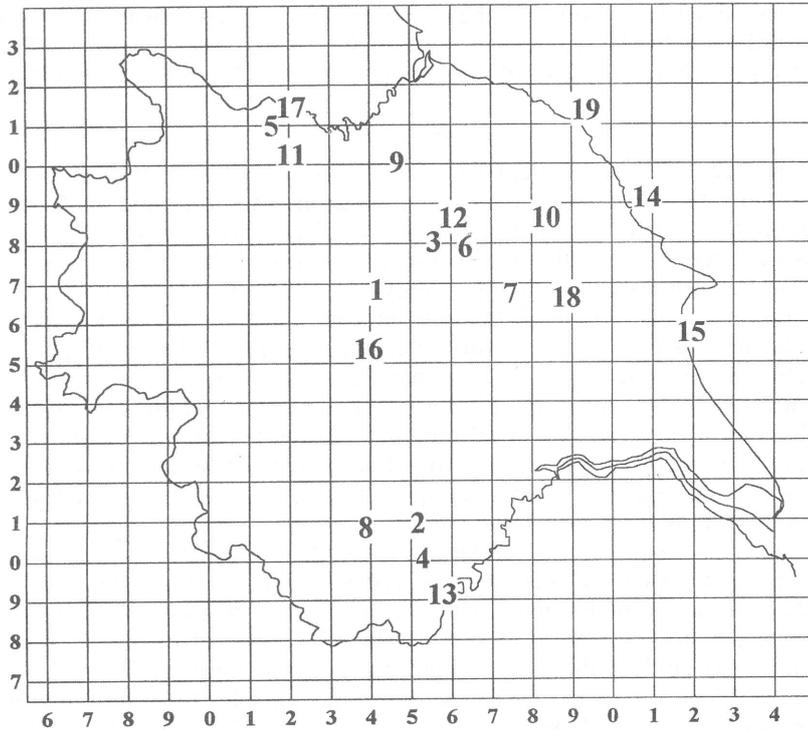


Fig. 1 — The distribution of 19 English Heritage sites in Watsonian Yorkshire. 1, Aldborough; 2, Brodsworth Hall; 3, Bylands Abbey; 4, Conisbrough Castle; 5, Easby Abbey; 6, Helmsley Castle; 7, Kirkham Priory; 8, Monk Bretton Priory; 9, Mount Grace Priory; 10, Pickering Castle; 11, Richmond Castle; 12, Rievaulx Abbey; 13, Roche Abbey; 14, Scarborough Castle; 15, Skipsea Castle; 16, Spofforth Castle; 17, Stanwick Camp; 18, Wharram Percy; 19, Whitby Abbey. 5 and 6 slightly displaced.

- Bylands Abbey, Easby Abbey and Helmsley Castle and mason wasps (Eumeninae) at Wharram Percy and Scarborough Castle. Chrysid wasps, the parasites of mason wasps, were observed searching for the nesting sites of the mason wasps. Communal nesting was shown by *A. scotica*. In a communal nest the females share the same entrance but build their own cells in which to rear their brood (Archer 1980). The walls which were exposed to the sun were used for mating flight circuits and sunning purposes for several species including *Andrena nigroaenea* and *A. scotica* at Bylands Abbey. On the walls of Easby Abbey mud patches were found containing the brood cells of *Ancistrocerus oviventris*. The flowering herbs growing from crevices in the walls, e.g. Rievaulx Abbey and Spofforth Castle, provided food resources of pollen and nectar.
4. The bare soil between the walls and the grassland was used as a nesting site for the subterranean nester *Andrena scotica* at Bylands Abbey.
  5. Dry friable soils in banks provided nesting sites for subterranean nesters of the genera *Andrena* and *Lasioglossum*. These banks were associated with boundaries features (Spofforth Castle), rocky cliffs (Roche Abbey and Helmsley Castle) or earth works (Skipsea Castle). At Skipsea Castle the bare soil slopes had been created by the activities of cattle and burrowing rabbits.
  6. Shrubs and trees, e.g. blackthorn, hawthorn, gorse and sycamore were often important pollen and nectar sources. A nest of *Dolichovespula norvegica* was found amongst the branches of a tree at Mount Grace Priory.
  7. Dead wood in sunny situations with beetle holes provided nesting burrows for aerial nesters, e.g. dead tree stumps at Mount Grace Priory, Helmsley Castle and Roche Abbey, discarded fallen trees at Skipsea Castle and Pickering Castle and undecorated wooden outbuildings at Rievaulx Abbey and Helmsley Castle. At Helmsley discarded planks of wood in a sunny area attracted flies which were hunted by *Oxybelus uniglumis*.
  8. The building material heap of sand and gravel at Helmsley Castle was used for nesting by the subterranean nester *Oxybelus uniglumis*.

TABLE 1. — ENGLISH HERITAGE SITES VISITED.

Site Name	Grid Reference	Natural Area
Aldbrough	SE4066	SML
Brodsworth Hall	SE5007	SML
Bylands Abbey	SE5478	NYMH
Conisbrough Castle	SK5198	SML
Easby Abbey	NZ1800	PDF
Helmsley Castle	SE6183	NYMH
Kirkham Priory	SE7365	NYMH
Monk Bretton Priory	SE3706	CM
Mount Grace Priory	SE4598	NYMH
Pickering Castle	SE8084	VP
Richmond Castle	NZ1700	PDF
Rievaulx Abbey	SE5784	NYMH
Roche Abbey	SK5489	SML
Scarborough Castle	TA0589	NYMH
Skipsea Castle	TA1655	H
Spofforth Castle	SE3651	PDF
Stanwick Camp	NZ1712	TL
Wharram Percy	SE8564	YW
Whitby Abbey	NZ9011	NYMH

SML = Southern Magnesium Limestone, NYMH = North York Moors and Hills,  
 PDF = Pennines Dales Fringe, CM = Coal Measures, VP = Vale of Pickering,  
 H = Holderness, TL = Tees Lowland, YW = Yorkshire Wolds.

## SPECIES PRESENT AND SEASONAL PROGRESSION OF SPECIES

A full list of the recorded species from each site is given in the appendix. At the family level, Table 2 shows the taxonomic distribution from all sites of species and records. A record represents a specimen differing in one of the following three variables: name, sex and day of visit. From the solitary groups the wasp family, Sphecidae, and the bee subfamilies, Andreninae and Halictinae, were the dominant taxa in terms of the number of species and records. Most records were of the social Apinae which represented 44.8% of records.

TABLE 2. — THE NUMBER OF SPECIES AND RECORDS FROM 19 ENGLISH HERITAGE SITES.

	No. species	No. records
Solitary wasps		
Chrysididae	5	24
Mutillidae	1	2
Sapygidae	1	1
Pompilidae	2	5
Eumeninae	4	7
Sphecidae	17	53
Total solitary wasps	30	92
Solitary bees		
Colletinae	5	13
Andreninae	12	102
Halictinae	12	64
Megachilinae	7	25
Anthophorinae	9	37
Total solitary bees	45	241
Total solitary wasps and bees	75	333
Social wasps and bees		
Vespinae	6	30
Apinae	13	295
Total social wasps and bees	19	325
Total aculeate wasps and bees	94	658

Table 3 shows the number of solitary species and when solitary species were first recorded for each month from all sites. The most productive month for wasp species was July and most species were first recorded during June and July. Since June and July are summer months, the solitary wasp species would seem to have to wait until the warmer summer months before the adults can become active. The most distributed wasp species were the subterranean nester *Crossocerus elongatulus* (found at 10 sites), the aerial nester *Ectemnius sexcinctus* (4 sites) and the parasites *Chrysis impressa* (7 sites), *C. ignita* (4 sites) and *Trichrysis cyanea* (4 sites).

Of the social wasps (Vespinae) queens were recorded during May and June and the workers during June, July and August. The most widely distributed social wasp was *Dolichovespula sylvestris* (6 sites).

TABLE 3 — THE NUMBER OF SPECIES, AND WHEN SPECIES WERE FIRST RECORDED, PER MONTH OF SOLITARY SPECIES AT 19 ENGLISH HERITAGE SITES.

	Apr	May	Jun	Jul	Aug
Solitary wasps					
No. species	0	0	13	23	10
No. species first recorded	0	0	13	14	3
Solitary bees					
No. species	4	25	27	14	10
No. species first recorded	4	20	11	5	5

The most productive months for solitary bee species were May and June with May the most productive month for the first recording of species (Table 3). In contrast to the solitary wasps, solitary bee species become active as adults during the spring. The most widely distributed bee species were the subterranean nesting *Andrena haemorrhoa* (14 sites), *A. nigroaenea* (10 sites), *A. scotica* (13 sites), *A. chrysoceles* (7 sites), *Lasioglossum smeathmanellum* (11 sites) and *L. cupromicans* (10 sites), the aerial nesting *Osmia rufa* (6 sites) and the cleptoparasites *Nomada marshamella* (9 sites) and *N. goodeniana* (9 sites).

The queens of the host bumble bees (Apinae) were recorded during April, May and June and again during August. The workers were recorded from April until August and the males during June, July and August. The most distributed species were *Bombus lapidarius* (17 sites), *B. pascuorum* (16 sites), *B. terrestris* (15 sites) and *B. lucorum* (13 sites). The queens of the cuckoo bumble bees were recorded during May and June and again during August. The males were recorded during June, July and August. The most widely distributed species were *Bombus bohemicus* (12 sites) and *B. vestalis* (8 sites).

#### WHAT IS THE CONSERVATION VALUE OF THE SITES?

Currently 297 species of aculeate wasps and bees are known from Watsonian Yorkshire (Archer 2002) so that the 94 species (Table 2) recorded from the combined sites represents 32% of the Yorkshire list.

At a national level *Argogorytes fargei* (Helmsley Castle) was given a RDB status (Shirt 1987) although Falk (1991) suggested its status should be downgraded to a national scarce status (Na). Falk (1991) also suggested that *Hylaeus signatus* (Monk Bretton Priory) should have a national scarce status (Nb). Recent investigations by members of BWARS (Edwards 1998) indicate that *Chrysis viridula* (Conisbrough Castle) should also have a national scarce status.

With the help of the latest information from BWARS, all the solitary species can be given a national status score (Archer 2002). The definitions of the six statuses used are given in Archer (2002). Adding the status scores for the 75 solitary species from the combined sites gives the

national Quality Score, while dividing the Quality Score by the number of species found on the combined sites gives the national Species Quality Score (SQS) of 1.7 (Table 4).

TABLE 4 — THE ARCHER NATIONAL QUALITY SCORES OF THE SOLITARY WASP AND BEE SPECIES RECORDED FROM 19 ENGLISH HERITAGE SITES.

National Status	Status values (A)	No. species (B)	Quality Score (A x B)
Universal	1	48	48
Widespread	2	23	46
Restricted	4	1	4
Scarce	8	2	16
Rare	16	1	16
Total (Quality Score)		75	130
Species Quality Score (Quality Score/B)			1.7

SQSs have been determined for 27 Yorkshire sites and range from 1.2 to 2.9. These sites can be divided, depending on their SQSs, into three groups: first class 2.4–2.9, second class 1.8–2.3 and third class 1.2–1.7. The combined sites would be considered third class.

At the Yorkshire level the solitary species can be divided between four statuses: Common, Frequent, Occasional and Rare (Archer 2002). The combined sites have 36 Common, 28 Frequent, ten Occasional and one Rare species (*Melecta albifrons* – Helmsley Castle). All the species of social wasps (Vespinæ) and social bees (Apinæ) must be considered nationally Universal species and at a Yorkshire level Common species except *Bombus jonellus* (Helmsley Castle) which is Rare.

Thus the English Heritage sites in Yorkshire should not be seen as a refuge for national Very rare and Rare species and regionally Rare species but rather as a refuge for nationally Universal and Widespread species and regionally Common and Frequent species.

#### CLEPTOPARASITIC LOAD

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

For 27 sites from north and north Midlands of England, the author found that CLs for solitary bees vary from 22.5% to 40%, a range of 17.5% (Archer 2003). The CL of the combined sites at 22.2% falls at the lower end of this range (Table 5).

Weislo (1987) gave no CLs for solitary wasps but from 28 sites from the north and the north Midlands of England CLs vary from 10.3% to 24.4%, a range of 14.1% (Archer 2003). The CL of the combined sites at 26.7% slightly extends this range (Table 5).

TABLE 5 — THE RELATIVE FREQUENCY OF THE CLEPTOPARASITIC SPECIES AMONG THE SOLITARY SPECIES FROM 19 ENGLISH HERITAGE SITES.

	No. hosts (H)	No. cleptoparasites (C)	Cleptoparasitic load CL = $100 \times C/(H+C)$
Solitary wasps	22	8	26.7
Solitary bees	35	10	22.2

#### AERIAL NESTER FREQUENCY

The aerial nester frequency (AF) is the percentage of host aculeate species that have aerial nest sites. Aerial nesters mainly use old beetle burrows in dead wood and central stem cavities such as dead bramble. Subterranean nesters nest in the soil, usually in burrows dug by them, but sometimes existing holes and crevices are used after being altered.

The AFs for solitary wasp from 21 sites in Watsonian Yorkshire vary from 0.05% to 90.0% (Archer 2003) and for British species the average AF is 46.2%. The AF for the combined sites of 68.2% (Table 6) is very high compared with the British AF. This indicates the increased presence of aerial nesters whose nesting sites are walls and dead wood.

TABLE 6 — THE NESTING HABITS OF THE SOLITARY SPECIES RECORDED FROM 19 ENGLISH HERITAGE SITES.

	No. aerial nesters (A)	No. subterranean nesters (S)	Aerial nester frequency AF = $100 \times A/(A+S)$
Solitary wasps	15	7	68.2
Solitary bees	12	23	34.3

The AFs for the solitary bees from 21 sites of Watsonian Yorkshire vary from 7.1% to 30.0% and for British species is 17.9% (Archer 2003). Again the AF for the combined sites of 34.3% is very high compared with the British AF and again this indicates the increased presence of aerial nesters.

#### THE SPECIES OF SOLITARY WASPS AND BEES OF HELMSLEY CASTLE

Of the 36 species of solitary wasps and bees recorded from Helmsley Castle, 18 species, i.e. 50%, have not been found at Duncombe Park (Archer 1993 and unpublished). Because the area of Helmsley Castle is so small in comparison with Duncombe Park, why should so many new species been found?

1. Aculeate resources are found at Helmsley Castle but not at Duncombe Park. The sand gravel heap at Helmsley Castle was used as a nesting site for *Oxybelus uniglumis*. *O. uniglumis* is a Common species in Yorkshire so it is unlikely that it was missed at Duncombe Park. *O. uniglumis* requires a dry sandy soil for nesting, a micro-habitat that was not found at Duncombe Park, although along parts of the river bank the soil was silty and dry. The same argument applies to *Gorytes quadrifasciatus* and *Argogorytes fargei* which were found in the area of the sand and gravel heap, although their nesting sites were not found.
2. Some species are so rare that they are very unlikely to be found. The record of *Melecta albifrons* was only the third record for Yorkshire. That this species was found at Helmsley Castle and not Duncombe Park was really due to chance since its host, *Anthophora plumipes*, was readily found at Duncombe Park, Helmsley Castle and in the front gardens of houses at Helmsley.
3. Many of the new species were only found on one occasion so they could have been tourist species or perhaps rare residents. If the tourist or rare resident species were males they would probably be looking for females or food resources and, if females, looking for suitable nesting sites or food resources. The grouping of food resources as herbaceous flowers therefore could have increased the likelihood of these species being recorded. The grouping of flowering herbs at Duncombe Park was much less in evidence (except in places near to the house) than at Helmsley Castle.

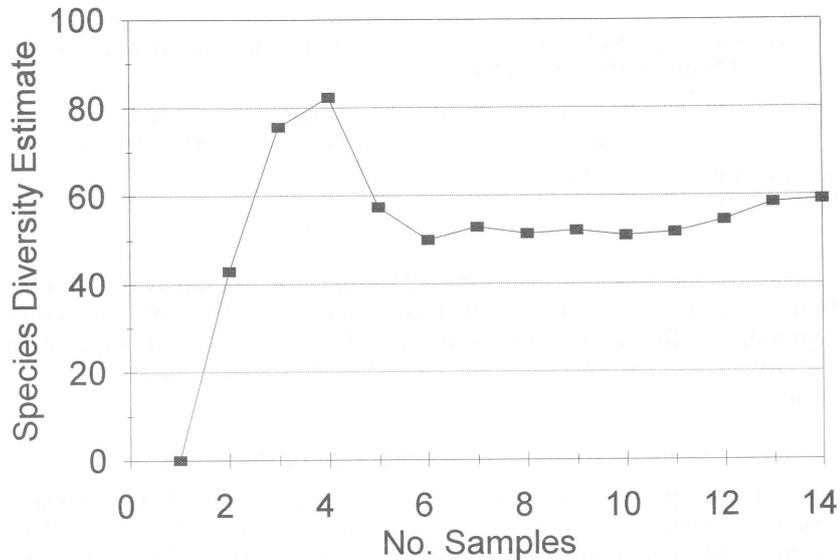


Fig. 2 — The Chao presence/absence species diversity estimate for Helmsley Castle.

The common theme of the three explanations is that the presence or increased concentration of resources needed by the aculeate wasps and bees made them more visible to the recorder. It was, therefore, felt worthwhile to attempt a species diversity estimate of solitary species for Helmsley Castle using the Chao presence/absence species richness estimator (Archer 2003). The final estimate, using all the samples, of the potential number of species that could be found at Helmsley Castle is 59 species (95% confidence range 34–84 species) and is stable (fig. 2). With this estimate, the 36 species actually found would only represent 61.0% of the potential species. From previous experience, stable estimates are found only after in excess of 75% of the potential species have actually been found. This latter finding could lead to a loss of confidence in the estimate and indicate that further samples should be taken to determine if the species estimate remains stable and near the same high level or whether it needs to be re-adjusted downwards.

#### CONCLUSIONS

1. The 94 species of aculeate wasps and bees found at the 19 English Heritage sites represent 32% of the Yorkshire list. The sites should be seen as refuges for the common rather than rare species.
2. The sites are examined in terms of the resource needs of the aculeate wasps and bees via the following habitats or micro-habitats: cut grassland, uncut grassland and gardens, walls, bare soil between walls and grassland, shrubs and trees, dead wood and builders' material heaps.
3. Cleptoparasitic loads support the hypothesis of Weislo.
4. Aerial nesters are particularly significant due to the presence of nesting sites in walls, plants stems and dead wood.
5. 50% of the solitary wasp and bee species found at Helmsley Castle were not found in the adjacent Duncombe Park N.N.R. Three explanations are suggested for this observation.

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## APPENDIX

The distribution of aculeate wasps and bees on English Heritage sites in Watsonian Yorkshire.

Abbreviations as follow: Aldborough (A), Brodsworth Hall (BH), Bylands Abbey (BA), Conisbrough Castle (CC), Easby Abbey (EA), Helmsley Castle (HC), Kirkham Priory (KP), Monk Bretton Priory (MBP), Mount Grace Priory (MGP), Pickering Castle (PC), Richmond Castle (RC), Rievaulx Abbey (RA), Roche Abbey (RoA), Scarborough Castle (SC), Skipsea Castle (SkC), Spofforth Castle (SpC), Stanwick Camp (StC), Wharram Percy (WP), Whitby Abbey (WA).

**Chrysididae:** *Pseudomalus auratus* (L.) (WP), *Chrysis ignita* (L.) (BA, SC, SpC, WP), *C. impressa* Schenck (A, HC, KP, MGP, PC, RA, WP), *C. viridula* L. (CC), *Trichrysis cyanea* (L.) (KP, MGP, RA, RoA).

**Mutillidae:** *Myrmosa atra* Panzer (EA, KP).

**Sapygidae:** *Sapyga quinquepunctata* (Fab.) (WP).

**Pompilidae:** *Dipogon variegatus* (L.) (HC, SC, WP), *Evagetes crassicornis* (Shuckard) (HC).

**Eumeninae:** *Ancistrocerus gazella* (Panzer) (HC), *A. oviventris* (Wesmael) (EA, WP), *A. scoticus* (Curtis) (SC), *Odynerus spinipes* (L.) (HC, WP).

**Vespiniae:** *Dolichovespula media* (Retzius) (MGP), *D. norwegica* (Fab.) (HC, MGP, RC), *D. sylvestris* (Scopoli) (BA, HC, MGP, RC, SC, WP), *Paravespula germanica* (Fab.) (HC, MBP, MGP, PC, SC, SkC), *P. vulgaris* (L.) (BH, HC, PC, RC), *Vespula rufa* (L.) (HC).

**Sphécididae:** *Trypoxylon clavicerum* (Lepelletier & Serville) (RoA, WP), *T. figulus* (L.) (HC, RA, SpC), *Crossocerus annulipes* (Lepelletier & Brullé) (MGP), *C. elongatulus* (Vander Linden) (A, EA, HC, KP, MBP, MGP, RC, RoA, SC, WP), *C. megacephalus* (Rossius) (A), *C. ovalis* (Lepelletier & Brullé) (RoA), *C. podagricus* (Vander Linden) (MGP, RC), *Ectemnius cavifrons* (Thomson) (PC), *E. cephalotes* (Oliver) (SkC, WP), *E. sexcinctus* (Fab.) (HC, MBP, PC, RC), *Oxybelus uniglumis* (L.) (HC), *Mimumesa dahlbomi* (Wesmael) (MGP), *Pemphredon inornata* Say (RoA), *Passaloecus corniger* Shuckard (WP), *Mellinus arvensis* (L.) (HC), *Gorytes quadrifasciatus* (Fab.) (HC), *Argogorytes fargei* (Shuckard) (HC).

**Colletinae:** *Hylaeus brevicornis* Nylander (HC), *H. communis* Nylander (RoA, WP), *H. hyalinatus* Smith (CC, HC, KP, RA), *H. signatus* (Panzer) (MBP), *Colletes daviesanus* Smith (RC).

**Andreninae:** *Andrena barbilabris* (Kirby) (EA, MBP), *A. chrysoceles* (Kirby) (BH, EA, HC, PC, RA, SpC, WP), *A. cineraria* (L.) (SpC), *A. fucata* Smith (SC), *A. fulva* (Müller in Allioni) (A, EA, SC, SkC, SpC), *A. haemorrhoea* (Fab.) (A, BA, CC, EA, HC, KP, MBP, PC, RA, RoA, SC, SkC, SpC, WP), *A. minutula* (Kirby) (MBP), *A. nigroaenea* (Kirby) (BA, CC, HC, KP, PC, RoA, SC, SkC, WP, WA), *A. semilaevis* Pérez (=saundersella Perkins) (EA, HC, PC, SC), *A. scotica* Perkins (A, BA, EA, HC, KP, MBP, MGP, RC, RoC, SC, SkC, SpC, WA), *A. subopaca* Nylander (BH, ), *A. wilkella* (Kirby) (RA).

**Halictinae:** *Halictus rubicundus* (Christ) (BH, MBP, PC, SkC), *H. tumulorum* (L.) (PC, RA), *Lasioglossum albipes* (Fab.) (BH, HC, PC, SpC), *L. calceatum* (Scopoli) (MBP, PC, RC, WP), *L. cupromicans* (Pérez) (CC, EA, HC, KP, PC, RA, SkC, SpC, WP, WA), *L. fratellum* (Pérez) (BA, WP), *L. leucopus* (Kirby) (WA), *L. smeathmanellum* (Kirby) (BA, CC, EA, HC, KP, MBP, PC, RC, SC, SpC, WA), *L. villosulum* (Kirby) (HC, PC, RoC, SC, SpC), *Sphécodes ephippius* (L.) (MBP), *S. geoffrellus* (Kirby) (HC, SC, WP), *S. hyalinatus* von Hagens (HC).

**Megachilinae:** *Chelostoma florissomme* (L.) (EA), *Osmia caerulea* (L.) (EA, HC, RC), *O. leaiana* (Kirby) (HC), *O. rufa* (L.) (A, HC, PC, RA, SC, WA), *Megachile centuncularis* (L.) (HC), *M. circumcincta* (Kirby) (HC), *M. willughbiella* (Kirby) (BA, HC).

**Anthophorinae:** *Nomada fabriciana* (L.) (MBP), *N. flavoguttata* (Kirby) (EA, PC), *Nomada goodeniana* (Kirby) (BH, BA, HC, KP, MBP, RA, RoA, SC, WP), *N. marshamella* (Kirby) (BH, CC, EA, HC, MBP, MGP, RoA, SkC, WP), *N. panzeri* Lepeletier (KP, SC, WP), *N. ruficornis* (L.) (KP, MBP), *Anthophora furcata* (Panzer) (HC), *A. plumipes* (Pallas) (HC), *Melecta albifrons* (Forster) (HC).

**Apinae:** *Bombus hortorum* (L.) (CC, HC, KP, MGP, PC, RA, RoA, WP), *B. jonellus* (Kirby) (HC), *B. lapidarius* (L.) (A, BH, BA, CC, EA, HC, KP, MBP, PC, RC, RA, RoA, SC, SkC, SpC, WP, WA), *B. lucorum* (L.) (BA, CC, EA, HC, MBP, MGP, PC, RC, RoA, SC, SkC, WP, WA), *B. pascuorum* (Scopoli) (A, CC, EA, HC, KP, MBP, MGP, PC, RC, RA, RoA, SC, SkC, SpC, WP, WA), *B. pratorum* (L.) (A, HC, MBP, MGP, RC, RoA, SC, WP), *B. terrestris* (L.) (A, BA, EA, HC, KP, MBP, MGP, RC, RA, RoA, SC, SkC, SpC, StC, WP), *B. barbutellus* (Kirby) (MGP), *B. bohemicus* (Seidl) (A, BA, HC, MBP, MGP, PC, RC, RA, SC, SkC, StC, WP), *B. campestris* (Panzer) (HC, PC), *B. sylvestris* (Lepeletier) (A, PC), *B. vestalis* (Geoffroy in Fourcroy) (CC, HC, MBP, MGP, RC, RoA, SpC, WP), *Apis mellifera* L. (A, BH, BA, CC, EA, HC, KP, MBP, MGP, PC, RC, RA, RoA, SC, SkC, SpC, WP, WA).

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November 3rd, 2003.

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#### REVIEW

'PROVISIONAL ATLAS OF THE BRITISH AQUATIC BUGS (HEMIPTERA, HETEROPTERA)' by T. HUXLEY. 118pp A4. Biological Records Centre, Huntingdon. ISBN 1 870393 67 8. 2003. Price £8 incl p&p.

Employing the familiar format of ten-kilometre square dot maps, this atlas shows the distribution of every resident British species of surface- and subsurface-dwelling aquatic Hemiptera. Irish distribution is not covered. A bold, black dot represents a reliable record made in the period 1970 to mid-2001 (or, rarely, later) and an open dot shows one made prior to 1970. Many literature records are insufficiently precise as to locality, dubious or known to be incorrect. These are discussed in the text accompanying each map or (apart from misidentifications) indicated in the tables of distribution by vice-county. Vice-county boundaries are shown on the maps themselves. Analyses of data in the introductory pages show that records have been received from three-quarters of British ten-kilometre squares and that coverage has been remarkably uniform. Consequently, the maps may be expected to give a very good idea of the actual distribution of British waterbugs in the last third of the twentieth century. The Atlas will serve as a dependable baseline against which to measure any future changes in range.

As each species is accorded a page to itself, there is room for comments on British distribution, habitat preferences and hints on identification, these often accompanied by figures.

The check list on pp 9–11 omits the Irish breeding, circumpolar *Sigara fallenoidea* (Hungerford) but includes *Limnopus rufoscutellatus* (Latreille) (not mapped), noted on p.12 as an occasional migrant to Britain. *Micronecta griseola* Horváth (also not mapped) is noted as awaiting formal introduction as British (for which see S.E. Brooke & B.S. Nau, 2003, *Entomologist's Monthly Magazine*, **139**: 229–231). The check list indicates synonyms including, helpfully, some alternative generic placements but the Atlas does not follow current European workers in placing *Sigara concinna* (Fieber) in the genus *Paracorixa* Poisson. The authorship of *Gerris costae* (Herrich-Schaeffer) is wrongly attributed to Wagner & Zimmerman, who described the ssp. *poissoni*, its only British subspecies. Strangely, *Deltocephalus panzeri* and *Palus panzeri* are cited as alternative combinations for *Corixa panzeri* Fieber; in fact, *Palus* (originally *Deltocephalus*) *panzeri* (Flor) is a valid species in Cicadellidae. — W.R. DOLLING.