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## The wasps and bees (Hymenoptera: Aculeata) of two farms, Manor and Hopewell House, in Watsonian Yorkshire

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Manor Farm (SE7665) is situated about 6km south of Malton on the Yorkshire Wolds while Hopewell House Farm (SE3759) is about 2.5km north-east of Knaresborough in the Vale of York. Both are commercial farms with Manor in arable for cereal production and Hopewell House mainly in arable for cereal production with some grazing for sheep and horses.

The field margins and triangular corners at Manor Farm have been tilled and planted with various wild flower and 'tussocky' grass mixtures or natural plant regeneration has been allowed. Hedges divide the fields and wild flowers grow in the uncultivated areas around the farm buildings. These plants (e.g. Hawthorn *Crataegus monogyna*, brambles *Rubus fruticosus*, dandelions *Taraxacum officinale*, White Dead-nettle *Lamium album*, Hogweed *Heracleum sphondylium*, Knapweed *Centaurea nigra*, Spear Thistle *Cirsium vulgare* and Creeping Thistle *Cirsium arvense*) provide pollen for bees, nectar for wasps and bees and attract prey for wasps. Vertical and horizontal dead wood with bramble in sunny situations was found in some field margins, providing nesting sites for aerial nesters as well as sunning and mating areas. The walls of some of the farm buildings had crevices which were also used by aerial nesters. In the spring male *Andrena* bees were observed on mating circuit flights along hedgerows in sunny situations. A nearby active sandstone quarry (Fox Covert Quarry) was observed to have nesting aculeates, particularly *Colletes daviesanus* nesting in large aggregations on the bare faces of the quarry and flying onto the farm field margins for food resources.

At Hopewell House Farm food resources for wasps and bees (e.g. Blackthorn *Prunus spinosa*, sallows *Salix sp.*, brambles, dandelions) are provided by flowery field margins, hedges with shrubs and trees, a marsh and flowery grassland in sunny situations around the farm buildings. Small vertical banks at the sides of farm tracks and larger vertical banks in uncultivated areas around the farm buildings provide nesting sites for subterranean

nesters. Dead wood in the marshy area around a pond and the crevices in some of the farm buildings provide nesting sites for the aerial nesters.

**Methods**

Nine visits were made to Manor Farm although, due to poor weather conditions, two visits were extras needed to complete the survey of the farm. Consequently seven surveys (11 April, 4+5 May, 8 May, 9 June, 24 June, 4+7 July, 3 August) were carried out between 2002 and 2009. Six visits resulting in five surveys (23 April, 20 May, 17 June, 5+8 July, 1 August) were made to Hopewell House Farm during 2010. Four visits were made to Fox Covert Quarry (8 May, 9 June, 7 July, 3 August) between 2002 and 2003. All species of aculeate wasps and bees were recorded during each survey and often collected with a hand net for later identification.

**Results**

Table 1 shows the number of species found and a full list is given in the Appendix. At Manor Farm 21 of the 44 and at Hopewell House Farm 15 of the 18 solitary aculeates were only found during one visit, indicating the difficulty of finding specimens. Most were found at flowers, sunning on leaves or when flying on mating circuits. At Hopewell House Farm chrysids were found searching crevices in walls in which their host *Ancistrocerus* could be nesting.

Table 1. The number of aculeate wasp and bee species recorded at Manor and Hopewell House Farms.

| | **Manor** | **Hopewell House** |
|---|---|---|
| Solitary wasps | 22 | 7 |
| Social wasps | 2 | 4 |
| Solitary bees | 22 | 11 |
| Social bees | 12 | 9 |
| Total no. species | 58 | 31 |

Parasitic solitary aculeates including cleptoparasites (e.g. *Chrysis impressa*, *Nomada marshamella*) and social parasites (e.g. *Bombus vestalis*) were found. There were both aerial nesters (e.g. *Ancistrocerus oviventris*, *Trypoxylon clavicerum*, *Osmia rufa*, *Megachile willughbiella*) and subterranean nesters (*Lindenius albilabris*, *Crabro cribrarius*, *Andrena scotica*, *Lasioglossum calceatum*).

Further visits would have found more species. A further six species of solitary wasps and seven species of solitary bees were found at Fox Covert Quarry and some of the solitary bees could probably be found on Manor Farm. Meek *et al.* (2002) added one solitary wasp, two social wasps and nine solitary bees at Manor Farm.

A Yorkshire quality coding for solitary aculeates can be based on the number of 1km squares in which each one has been found. As of 2010 there are four categories of more or less equal numbers of species: Rare (wasps, 1-7; bees, 1-10), Occasional (wasps, 8-23; bees, 11-27), Frequent (wasps, 24-44; bees, 29-68), Common (wasps 45-122; bees, 69-238). The solitary wasps and bees are treated separately since bees are represented by more records. Manor Farm has 31 Common, 10 Frequent and 3 Occasional (*Pompilus cinereus*, *Ectemnius sexcinctus*, *Megachile versicolor)* according to this system and Hopewell House Farm has 15 Common and 3 Frequent species.

For the solitary species Archer (1999, 2002) has developed a national quality scoring system of high and low quality scoring species. High quality species have a Scarce (equivalent to Nb), Rare (equivalent to Na) or Very Rare (equivalent to RDB) status while low quality ones have a Universal, Widespread or Restricted status. According to this national system, only Universal and Widespread species were found at Manor and Hopewell House Farms (Table 2) with a Species Quality Score (SQS) of 1.4 at Manor Farm and 1.2 at Hopewell House Farm (Table 2). If the extra species recorded by Meek *et al.* (2002) are added to the Manor Farm list, then this gives a total of 70 (68 solitary) species but the same SQS of 1.4.

Table 2. Archer's National Quality Scores of solitary wasps and bee species recorded at Manor (M) and Hopewell House (HH) Farms.

| **National Status** | **Status Value (A)** | **No. Species (B)** | | **Quality Score (A x B)** | |
|---|---|---|---|---|---|
| | | M | HH | M | HH |
| Universal | 1 | 28 | 15 | 28 | 15 |
| Widespread | 2 | 16 | 3 | 32 | 6 |
| Total | | 44 | 18 | 60 | 21 |

Species Quality Scores: Manor 60/44 = 1.4; Hopewell House 21/18 = 1.2

All the social species are nationally common and widespread but Heath Bumblebee *Bombus jonellus* at Manor Farm and Barbut's Cuckoo Bee *B. barbutellus* at Manor and Hopewell House Farms could be considered as Rare in Yorkshire (Archer, 2002).

**Discussion**

Species Quality Scores (SQS) for semi-natural sites are relatively independent of site size (Archer, 1999). Although the number of species recorded on a site increases with its size, the numbers of high and low quality species increase together so that the SQS remains more or less constant (Archer, 1999). The SQS of semi-natural sites studied in Yorkshire can be placed into one of three classes (Archer, 2011): first class, 2.4-2.9; second class, 1.8-2.3; and third class, 1.2-1.7.

Table 3 shows the SQS of three semi-natural sites, two urban areas and the two farms considered in this study. The urban areas of Sheffield and York, despite having a large number of species, only show a second-class grade due to the relative absence of high quality species (Archer, 2009, 2012). These two areas are important refuges for the commoner, but not for the rarer, species. The SQS of the two farm sites show a third class

grade, again because of the lack of high quality species. Farms, like urban areas, have some conservation function for the commoner, but not the rarer, species. Presumably those semi-natural sites with a higher SQS meet the resource requirements of the High Quality Species which have been lost or greatly reduced and isolated in an urban or farm site. The order of conservation importance is semi-natural, urban and farm sites.

Table 3. The species quality scores (SQS) of graded sites in Watsonian Yorkshire

| Site (no. species) | SQS | Grade |
|---|---|---|
| Semi-natural Strensall Common (98) | 2.5 | First class |
| Semi-natural Duncombe Park (71) | 2.2 | Second class |
| Semi-natural Cornelian Bay (59) | 1.7 | Third class |
| Urban Sheffield (134) | 2.0 | Second class |
| Urban York (145) | 2.0 | Second class |
| Manor farm (44) | 1.4 | Third class |
| Hopewell House farm (18) | 1.2 | Third class |

**Conclusions**

No species of national importance were found at Manor and Hopewell House Farms. Two bumblebees of regional importance (Yorkshire) were found at Manor and Hopewell House Farms. The conservation interest of Manor and Hopewell House Farms is as refuge areas for the commoner bees and wasps, but in this respect they are of less importance than urban areas.

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**Appendix**
'M' represents records from Manor Farm and 'HH' from Hopewell House Farm.

Solitary wasps:
*Chrysis angustula* (M), C. *ignita* (M, HH), C. *impressa* (M), *Trichrysis cyanea* (M), *Pompilus cinereus* (M), *Ancistrocerus oviventris* (M), *A. parietinus* (HH), *A. trifasciatus* (M), Club-horned Wood-borer Wasp *Trypoxylon clavicerum* (M), Slender-bodied Digger Wasp *Crabro cribrarius* (M, HH), *C. peltarius* (HH), *Crossocerus annulipes* (M), *C. cetratus* (M), Blunt-tailed Digger Wasp *C. dimidiatus* (HH), Slender Digger Wasp *C. elongatulus* (HH) *C. megacephalus*, (M), *C. ovalis* (M), *C. podagricus* (M), *C. quadrimaculatus* (M), *Ectemnius cavifrons* (M), *C. ruficornis* (M), *E. sexcinctus* (M), *Lindenius albilabris* (HH), *Mimumesa dahlbomi* (M), Mournful Wasp *Pemphredon lugubris* (M), Horned Black Wasp *Passaloecus corniger* (M), Field Digger Wasp *Mellinus arvensis* (M).

Social wasps: Saxon Wasp *Dolichovespula saxonica* (HH), Tree Wasp *D. sylvestris* (M, HH), German Wasp *Vespula germanica* (M, HH), Common Wasp *V. vulgaris* (HH).

Solitary bees: *Colletes daviesanus* (M), Gwynne's Mining Bee *Andrena bicolor* (HH), *A. barbilabris* (M), *A. chrysosceles* (M, HH), *A. clarkella* (M), *A. denticulata* (HH), *A. fucata* (M), Tawny Mining Bee *A. fulva* (HH), Early Mining Bee *A. haemorrhoa* (M, HH), *A. nigroaenea* (M, HH), *A. lapponica* (M), *A. scotica (*M, HH), *A. semilaevis* (M), *Halictus tumulorum* (HH), *Lasioglossum albipes* (M), Slender Mining Bee *L. calceatum* (M, HH), *L. rufitarse* (M), *L. smeathmanellum* (M), *Sphecodes geoffrellus* (M), Red Mason Bee *Osmia rufa* (M, HH), *Megachile versicolor* (M), *M. willughbiella* (M), *Nomada flava* (M, HH), Gooden's Nomad Bee *N. goodeniana* (M), Marsham's Nomad Bee *N. marshamella* (M), *N. ruficornis* (M).

Social bees: Garden Bumblebee *Bombus hortorum* (M, HH), Heath Bumblebee *B. jonellus* (M), Red-tailed Bumblebee *B. lapidarius* (M, HH), White-tailed Bumblebee *B. lucorum* (M, HH), Common Carder Bee *B. pascuorum* (M, HH), Early Bumblebee *B. pratorum* (M, HH), Buff-tailed Bumblebee *B. terrestris* (M, HH), Barbut's Cuckoo Bee *B. barbutellus* (M, HH), Gypsy Cuckoo Bumblebee *B. bohemicus* (M), Four Coloured Cuckoo Bee *B. sylvestris* (M), Vestal Cuckoo Bee *B. vestalis* (M, HH), Honey Bee *Apis mellifera* (M, HH).