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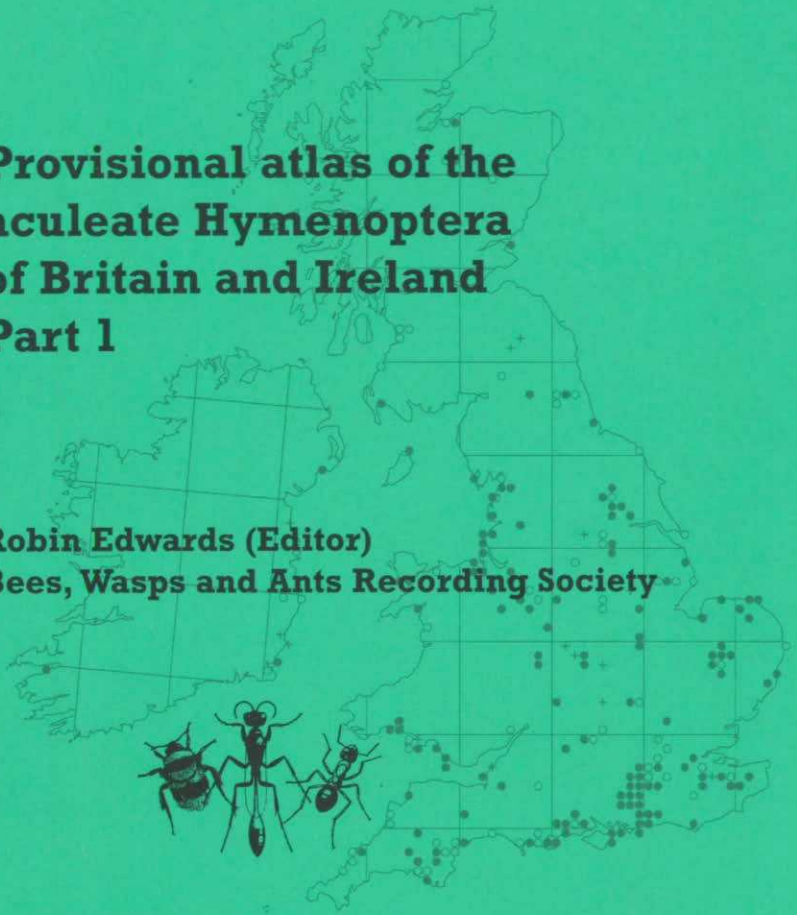
Provisional atlas of the aculeate Hymenoptera of Britain and Ireland Part 1

Robin Edwards (Editor)
Bees, Wasps and Ants Recording Society



Centre for Ecology and Hydrology
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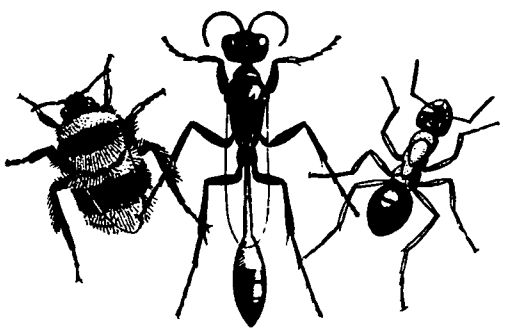
Provisional atlas of the aculeate Hymenoptera of Britain and Ireland

Part 1



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The Trustees of the Natural History Museum, London, and the Curator of the Hope Entomological Collections, Oxford, have assisted by making their collections of aculeates available for study by our recorders.

The maps have been drawn on computer using the DMAP mapping package developed by Dr Alan J Morton.

The completed draft was read in its entirety by Mike Edwards, George Else, Stuart Roberts and Paul Harding. The Editor is grateful for their help in reducing errors to a minumum.

Finally, we are indebted to Paul Harding at the Biological Records Centre, and his colleagues in the Institute of Terrestrial Ecology Publications Department at Merlewood for organising, computer setting, printing and distributing the Atlas.

INTRODUCTION

Recording the distribution of the aculeate Hymenoptera (bees, wasps and ants) started in the early 1970s, when some work on bumble bees was carried out by the Bee Research Association (now the International Bee Research Association, IBRA). In 1973, maps for the Vespidae (Vespinae and Eumeninae) were published in Philip Spradbery's book Wasps, followed by David Alford's Bumblebees in 1975. A provisional atlas of the ants of the British Isles by Keith Barrett appeared in 1977, and this was closely followed by an atlas for the social wasps in 1978 by Michael Archer. Both were revised and re-published in 1979. Archer's maps were updated to the end of 1978 in *Social wasps* by Robin Edwards (1980). Following his studies in Cambridge, David Alford, in collaboration with IBRA and the Biological Records Centre (BRC), compiled data for an atlas for the bumble bees (Anon 1980). Bumble bee distribution maps have also appeared in the second edition (1991) of Oliver Prŷs-Jones and Sarah Corbet's *Bumblebees*, based on the same data.

The BRC at ITE Monks Wood helped to set up a number of recording schemes, including those for bumble bees, mason wasps, social wasps and ants which were later amalgamated into the Bees, Wasps and Ants Recording Scheme (BWARS). BWARS was started in 1978 with an initiative from the Biological Records Centre (John Heath) and Nature Conservancy Council (Alan Stubbs). George Else (of the Natural History Museum, London) ran the whole scheme virtually on his own until 1986, when the first committee emerged from a public meeting. However, it was not until the autumn of 1989 that the first distribution maps appeared in a BWARS Newsletter.

In January 1995, the recording scheme was changed to a formally constituted society, the Bees, Wasps and Ants Recording Society, which is run by a steering group of volunteer entomologists who meet annually. The acronym, 'BWARS', was retained. Early in 1996, a revised *Starter pack* was published for the Society by BRC, containing hints on collecting and recording, and other useful information for members.

By April 1996, sufficient records had been accumulated to allow the publication of this new *Provisional atlas* which covers Britain, Ireland and the Channel Islands. It includes maps and profiles of 55 species of ants, wasps and bees. Map 01 shows the coverage of the records: of particular note here is the paucity of records from some areas, especially Ireland, which is primarily due to a shortage of collectors rather than a lack of insects. The overall coverage should be born in mind when viewing the maps of individual species.

SYSTEMATIC LIST OF SPECIES MAPPED

The classification used here is largely that of Gauld and Bolton (1988). Map Numbers are given for each species.

HYMENOPTERA ACULEATA

CHRYSIDOIDEA

EMBOLEMIDAE

02 *Embolemus ruddii* Westwood, 1833

VESPOIDEA

MUTILLIDAE

Mutillinae

03 *Mutilla europaea* Linnaeus, 1758

FORMICIDAE

04 *Formica exsecta* Nylander, 1846
05 *Formica rufa* Linnaeus, 1758
06 *Lasius fuliginosus* (Latreille, 1798)

POMPILIDAE

Pepsinae

07 *Auplopus carbonarius* (Scopoli, 1763)
08 *Cryptocheilus notatus* (Rossi, 1792)

Pompilinae

09 *Evagetes dubius* (Vander Linden, 1827
10 *Evagetes pectinipes* (Linnaeus, 1758)
11 *Anoplius caviventris* (Aurivillius, 1907)
12 *Aporus unicolor* Spinola, 1808
13 *Homonotus sanguinolentus* (Fabricius, 1793)

Ceropalinae

14 *Ceropales variegata* (Fabricius, 1798)

VESPIDAE

Eumeninae

15 *Odynerus melanocephalus* (Gmelin in Linnaeus, 1790)
16 *Odynerus reniformis* (Gmelin in Linnaeus, 1790)
17 *Odynerus simillimus* Morawitz, F., 1867
18 *Odynerus spinipes* (Linnaeus, 1758)
19 *Symmorphus bifasciatus* Linnaeus, 1761

20 *Symmorphus connexus* (Curtis, 1826)
21 *Symmorphus crassicornis* (Panzer, 1798)
22 *Symmorphus gracilis* (Brulleé, 1832)

Vespinae
23 *Vespa crabro* Linnaeus, 1758
24 *Dolichovespula media* (Retzius, 1783)
25 *Dolichovespula saxonica* (Fabricius, 1793)

APOIDEA

SPHECIDAE

Crabroninae
26 *Crabro cribrarius* (Linnaeus, 1758)
27 *Crabro peltarius* (Schreber, 1784)
28 *Crabro scutellatus* (Scheven, 1781)
29 *Ectemnius borealis* (Zetterstedt, 1838)
30 *Ectemnius cavifrons* (Thomson, 1870)
31 *Oxybelus argentatus* Curtis, 1833
32 *Oxybelus mandibularis* Dahlbom, 1845
33 *Oxybelus uniglumis* (Linnaeus, 1758)

Sphecinae
34 *Ammophila pubescens* Curtis, 1836
35 *Ammophila sabulosa* (Linnaeus, 1758)
36 *Podalonia affinis* (Kirby, 1798)
37 *Podalonia hirsuta* (Scopoli, 1763)

Philanthinae
38 *Cerceris arenaria* (Linnaeus, 1758)
39 *Cerceris quadricincta* (Panzer, 1799)
40 *Cerceris quinquefasciata* (Rossi, 1792)
41 *Cerceris ruficornis* (Fabricius, 1793)
42 *Cerceris rybyensis* (Linnaeus, 1771)
43 *Cerceris sabulosa* (Panzer, 1799)
44 *Philanthus triangulum* (Fabricius, 1775)

APIDAE

Colletinae
45 *Colletes cunicularius* (Linnaeus, 1761)
46 *Colletes floralis* Eversmann, 1852
47 *Colletes halophilus* Verhoeff, P.M.F., 1943
48 *Colletes marginatus* Smith, F., 1846
49 *Hylaeus pectoralis* Förster, 1871

Megachilinae

50 *Anthidium manicatum* (Linnaeus, 1758)
51 *Stelis punctulatissima* (Kirby, 1802)
52 *Osmia inermis* (Zetterstedt, 1838)
53 *Osmia pilicornis* Smith, F., 1846
54 *Osmia uncinata* Gerstaecker, 1869
55 *Osmia xanthomelana* (Kirby, 1802)

Anthophorinae

56 *Ceratina cyanea* (Kirby, 1802)

DISTRIBUTION MAPS AND SPECIES ACCOUNTS

Map 01 (right) shows the 10 km squares from which records of target species have been received. The map also serves as a guide to areas from which there are no records, where surveys are essential before the database can be updated and further, more accurate, maps produced.

Maps 02–56 show the distribution of the individual species. Records are presented for three collecting periods:

+ before 1900
o 1900–69
• 1970–95.

It should be mentioned here that plus signs and open circles do not necessarily mean that the species has declined since 1900 or 1969. They may indicate that the locality has not been visited, or that the species was not looked for.

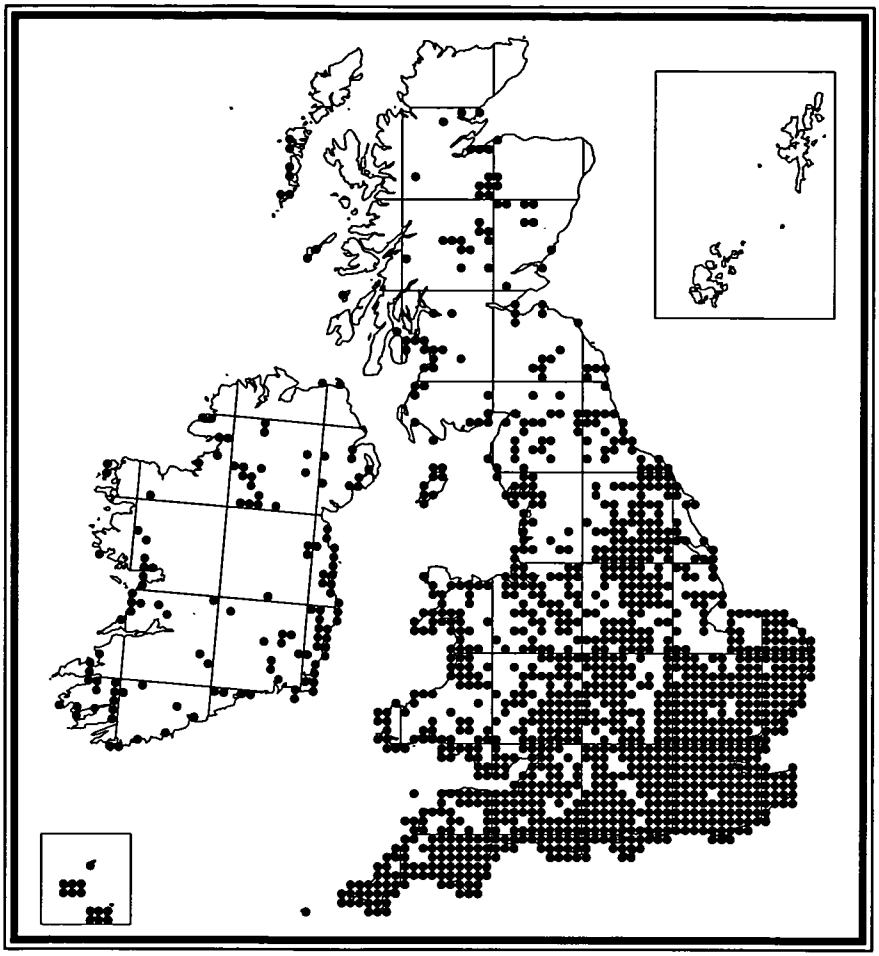
SPECIES ACCOUNTS

Each account has information (where available) on the following subjects:

General notes
Distribution in Britain and Ireland
Status (in Britain only)
Habitat
Flight period
Pollen or prey collected
Nesting biology
Flowers visited
Parasites
Map compiler/s
Author/s of profile

Threat statuses (for Britain only) were identified for some species in the British *Red Data Book* (RDB) (Shirt 1987), in which the data sheets for aculeate Hymenoptera were compiled by G R Else and the late G M Spooner. Some of these RDB statuses were proposed for revision by Falk (1991) in a national review of scarce and threatened aculeates; such proposed changes being prefixed with a p – thus pRDB. Species with restricted distributions, that failed to meet the RDB criteria of threatenedness, were also listed by Falk (1991) as Nationally Notable (now referred to as Scarce). Two degrees of Nationally Notable status were recognised – Na (thought to occur in 30 or fewer 10 km squares) and Nb (thought to occur in between 31 and 100 10 km squares). For a full explanation of all the RDB and Nationally Notable/Scarce statuses see Ball (1994).

Map 01 COVERAGE MAP



Plant names are given only in the vernacular form in the species accounts. Readers requiring scientific names should turn to page 135. All botanical names are as given in Stace (1995).

In the text, county names are those in current use. However, due to alterations to the boundaries over the years, some places have changed from one county to another, Bournemouth being a good example. The Watsonian Vice-counties for places mentioned in the text are therefore given in the Gazetteer on pages 133 and 134.

Map 02 *Embolemus ruddii* Westwood, 1833

[Embolemidae]

The Embolemidae is a small family with 10–15 species worldwide. *E. ruddii* is the only species in Britain. Notes on identification may be found in Perkins (1976).

Distribution in Britain and Ireland

The species has a widespread distribution in Britain, but is not known from Ireland.

Status (in Britain only)

It is not listed in the *Red Data Book*, despite the paucity of records, as its true distribution is incompletely known.

Emergence period

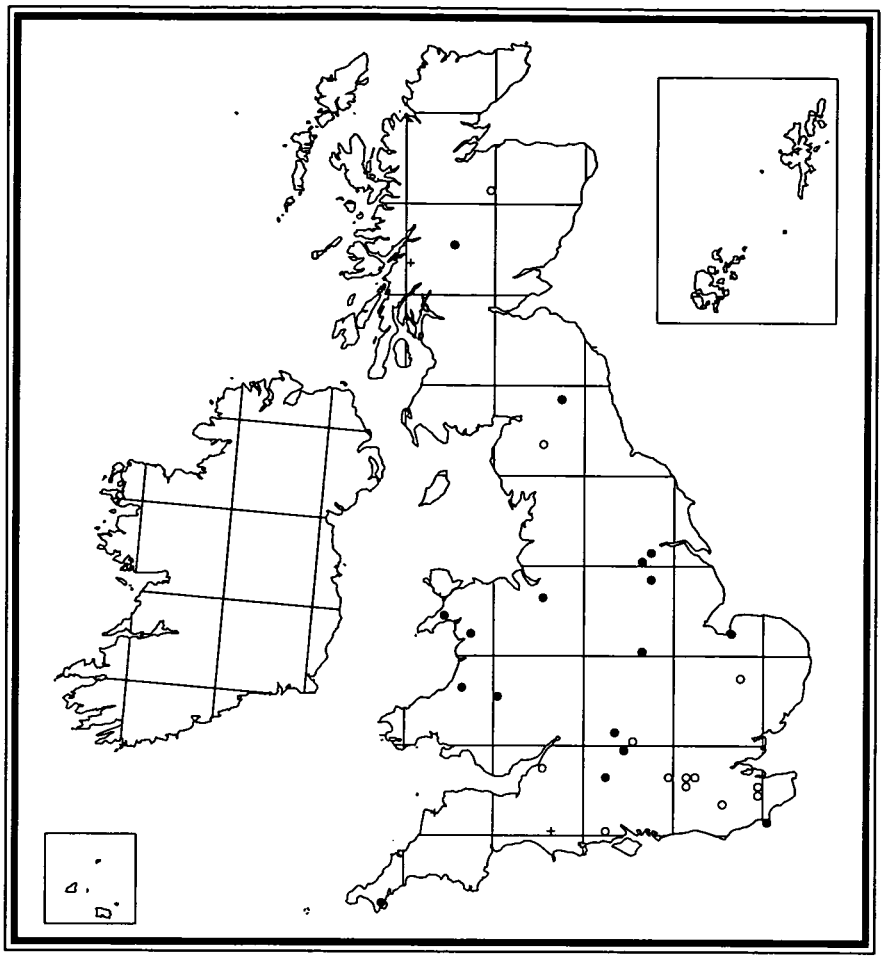
Females (wingless) have been recorded from May to September. The winged males, however, have not been seen in the earlier months. The females are believed to overwinter as adults.

Nesting biology

Almost nothing is known about this species. Females have been collected in or near nests of ants and moles, and one was found on Sphagnum moss.

The host is unknown. However, a North American species apparently develops in a homopteran bug (Bridwell 1958).

Map compiled by: J T Burn and S P M Roberts.
Author of profile: J T Burn.



Map 03 *Mutilla europaea* Linnaeus, 1758

[Mutillidae: Mutillinae]

This is the larger of the two species of British mutillids (the other being *Smicromyrme rufipes*). Unlike many aculeate wasps, the female is apterous, a feature which gives it an ant-like appearance, and leads to its being called a 'velvet ant'. The male, however, is fully winged and capable of sustained flight.

Distribution in Britain and Ireland

Mutilla europaea has a largely disjunct distribution within Britain, being widespread in southern England, absent from much of central England and apparently from the whole of Wales, but found sporadically in northern England and in central Scotland. There are no records from Ireland. The species may be decreasing, and the late G M Spooner (pers. comm.) considered it to be extinct in Cornwall.

Status (in Britain only)

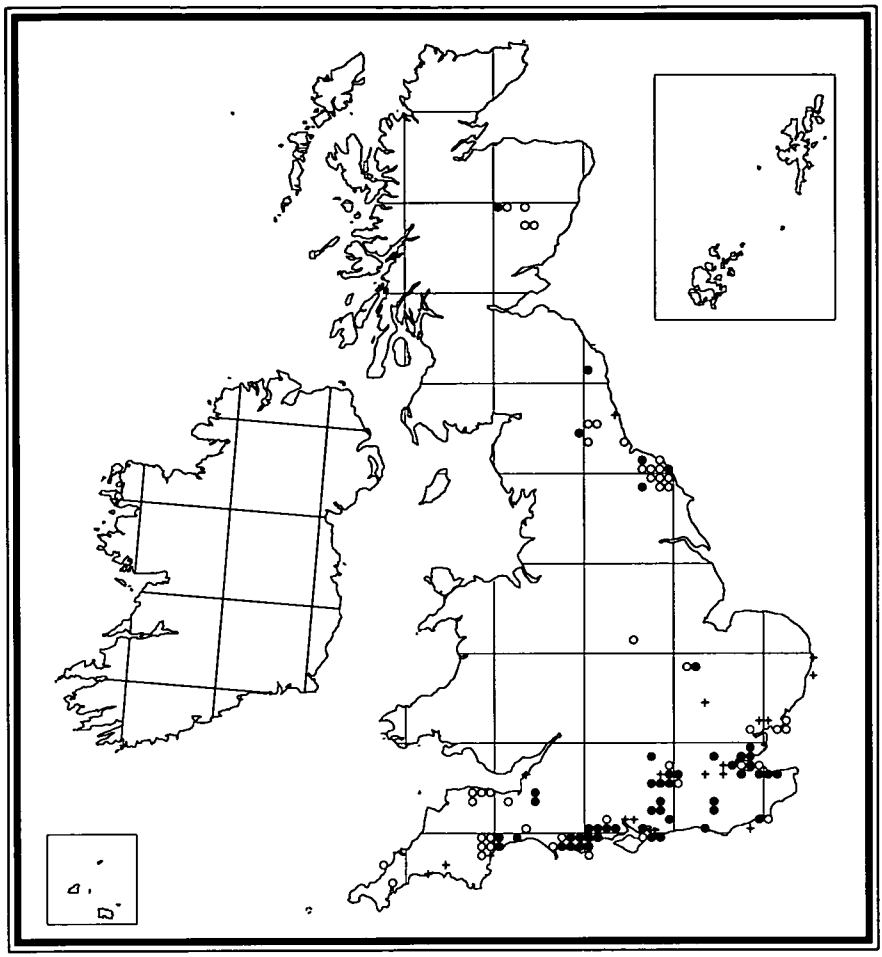
Falk (1991) listed the species as Nationally Notable (Nb).

Habitat

The species is very local, but generally distributed, occurring for example on heaths, moors, chalk grassland and in woodland. It is perhaps most closely associated with lowland heaths, especially in Hampshire (New Forest) and Dorset, where females are often observed as they scuttle across sandy paths. In Dorset many females have been collected using pitfall traps set as part of survey programmes for various terrestrial invertebrates (S P M Roberts, pers. comm.). Care should be taken when handling females as they apparently have painful stings. When disturbed, both sexes stridulate quite loudly. This is achieved by rubbing a raised, median, submarginal tooth (the plectrum) on the underside of tergum 2, over a file of dense, transverse rows of fine ridges at the base of tergum 3.

Nesting biology

Mutillid wasps are parasitoids of the resting stages of other insects, including aculeate Hymenoptera, Diptera, Coleoptera and Lepidoptera. *M. europaea* parasitises various bumble bees (*Bombus* spp.) and also occasionally enters honey bee (*Apis mellifera*) hives. Alford (1975) summarised our incomplete knowledge of its biology. The female oviposits inside bee cocoons containing prepupae or young pupae. The *Mutilla* larva eats these immature stages, then spins a cocoon within that of the host. The size of the emerging wasp depends partly on the size of its host: *Mutilla* emerging from honey bee cells are generally smaller than those from bumble bee cells. On emergence, the adult *Mutilla* feeds on the host honey stores. Females overwinter as adults, but males leave the host nest soon after emergence and do not survive beyond the autumn. Females sometimes remain in the host nest throughout the winter. This is not always the case, however: in late



March 1973, D Appleton found two hibernating females at the roots of low herbage on a chalk grassland site in southern Hampshire.

Flowers visited

Males are occasionally found taking nectar from flowers such as wild parsnip. Females do not usually visit nectar sources, though a very small individual was found by S P M Roberts on common fleabane blossom in Dorset.

Map compiled by: M E Archer and S P M Roberts.
Authors of profile: G R Else and J P Field.

Map 04 *Formica exsecta* Nylander, 1846

[Formicidae: Formicinae]

Despite its generic name, this species is not classed as a wood ant.

Distribution in Britain and Ireland

Formica exsecta exhibits a highly disjunct population in Britain with records confined to southern England and the Scottish Highlands. In England there are two foci for these records: one stretches across the lowland heaths of Dorset (not including Purbeck), and the New Forest from Poole/Bournemouth to Ringwood and Brockenhurst, including Parkhurst Forest on the Isle of Wight. The other is centred around the lowland heaths of the Bovey Valley in east Devon with outlying records for nearby Lustleigh Cleave and for Morwenstow on the north Cornish coast.

The majority of Scottish records for *F. exsecta* are from the Caledonian forests of the mid-Spey valley with outlying records in Easter Ross and Easterness (Highland), and around Loch Rannoch (Tayside).

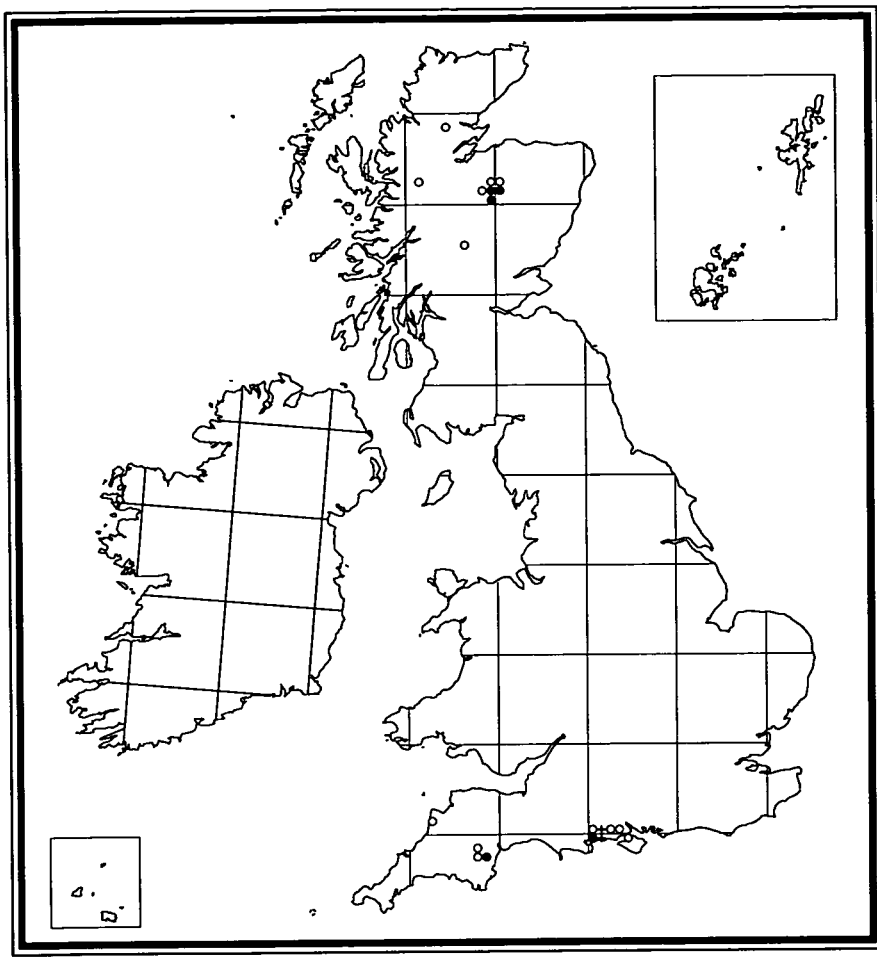
Recent records suggest a fairly stable population in Scotland around Loch Morlich and in Abernethy forest, and its extinction from Dorset, Hampshire and the Isle of Wight (the last record for this area was at Talbot Heath near Bournemouth in 1977). The remnant population in the Bovey Valley appears to be just viable.

Status (in Britain only)

Formica exsecta is listed as Rare (RDB3) in Shirt (1987) and as Endangered (RDB1) by Falk (1991). The threats to the species are many and complex but are based on the loss of habitat through destruction and inappropriate management. Examples of these may include: agricultural, industrial and urban development; afforestation of heaths and intensive timber production with few open rides and clearings; management of heath to produce a dense, single-age heather monoculture; excessive bracken and scrub encroachment over heath leading to the shading out of nests. Threats may also include the subsequent invasion of competitive species, eg wood ants (ie ants of the *Formica rufa* group), following habitat change. Efforts have been made to determine the 'health' and status of the populations in Devon and in Scotland (Hoare *et al.* 1994) in order to ensure their long-term viability.

Habitat

Nests are found in fairly open heath or moor, as well as woodland rides and clearings, and roadside verges. They are often built around a grass tussock (eg purple moor-grass), or other supportive structure.



Nesting biology

The nest mounds of *F. exsecta* are formed of vegetation fragments, like those of wood ants, but the fragments tend to be finer and the nests are usually smaller (on average about the size of half a football). They are usually in isolation but occasionally occur in small groups. The workers forage from these to low-growing shrubs and trees for aphid honeydew and also to capture or scavenge insects. New colonies are formed by colony fission or semi-social parasitism of other *Formica* species by newly mated queens. There may be one or more queens per colony and very large polygynous colonies have been recorded on the continent: these appear to be rare in Britain.

Map compiled by: S Hoy and S P M Roberts.
Author of profile: S Hoy.

Map 05 *Formica rufa* Linnaeus, 1758

[Formicidae: Formicinae]

Distribution in Britain and Ireland

Formica rufa is one of four British species of 'wood ant' and is confined to England and Wales. There is some indication that there has been a contraction of the range of *F. rufa,* especially in northern, central and eastern England and parts of Wales. In many parts of its southern range the species is, however, still locally common and even expanding.

The apparent indication of a contraction of the range may be due, in part, to a lack of recording effort in certain areas. Comparing this map with that for post-1961 records produced by Barrett in 1979, the main areas for increased recording effort would appear to be: Cumbria; the Forest of Dean and English/Welsh border counties; Berkshire and Hampshire and parts of East Sussex and east Surrey (these last four counties are not usually noted for their lack of records). There is also a possibility that some of the historical records for this species in northern and central Britain have arisen through confusion with *Formica lugubris* (there is, in fact, an overlap of the two species in northern England). Confirmation of these is needed although the possibility that *F. lugubris* has taken over some sites from *F. rufa* should not be ruled out.

Status (in Britain only)

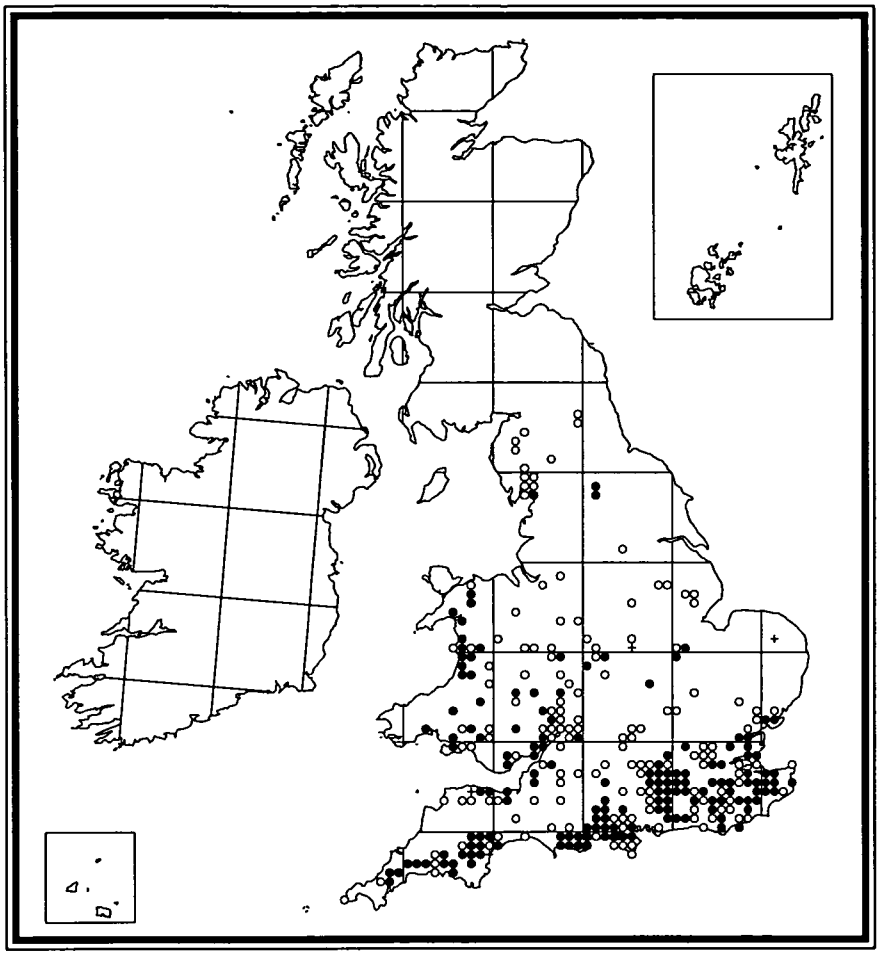
This is not a listed species, but the main threats to *F. rufa* appear to be the loss and fragmentation (through agricultural and urban development) or inadequate management of suitable natural or semi-natural woodland. A series of poor summers and deliberate or accidental damage to nests may be enough to destroy an isolated and vulnerable colony, and this has undoubtedly occurred at some of its former sites. The fortunes of the species may also change with the structure and density of tree cover at any site. The species can expand into developing scrub and also plantation forestry but only if the latter is appropriately designed, managed, exploited and close to an existing population.

Habitat

Deciduous, mixed and coniferous woodlands; occasionally spreading out on to scrubby heath, open rides and verges.

Nesting biology

The large nest mounds of wood ants will be familiar to many people. They are composed of fragments of vegetation collected by the ants. There may be up to 400 000 individuals in a nest. Occasionally, several nests may be inter-connected, forming one large colony.



Where the species is present in any numbers it can have a significant influence on the ecology of its woodland habitat. The ants are major predators and scavengers of woodland insects and feed extensively on aphid honeydew. Their colonies also support a wide range of often rare myrmecophilous arthropods.

New colonies are established by the fission of colonies with more than one queen; there is also occasional founding by newly mated queens of colonies with other *Formica* species through semi-social parasitism.

Map compiled by: S Hoy and S P M Roberts.
Author of profile: S Hoy.

Map 06 *Lasius fuliginosus* (Latreille, 1798)

[Formicidae: Formicinae]

Distribution in Britain and Ireland

This species, the 'jet-black ant', is not rare in southern England and Wales but always tends to be locally uncommon, with often only a few isolated nests known to recorders in any one locality.

There appears to be contraction in the range of *L. fuliginosus* in northern and central England and also in the south of the Irish Republic. The species has so far not been found in Scotland. It is quite likely, however, that this paucity of records is due to a lack of recent recording effort in certain areas, notably: Cumbria, Lancashire, Cheshire, Avon, Gloucestershire, Leicestershire and Cambridgeshire; Isle of Man and Ireland.

Unlike *Formica rufa* there are probably more local populations yet to be discovered as, despite its conspicuous features (quite large, shiny black workers foraging in long trails), this species often goes unnoticed.

Status (in Britain only)

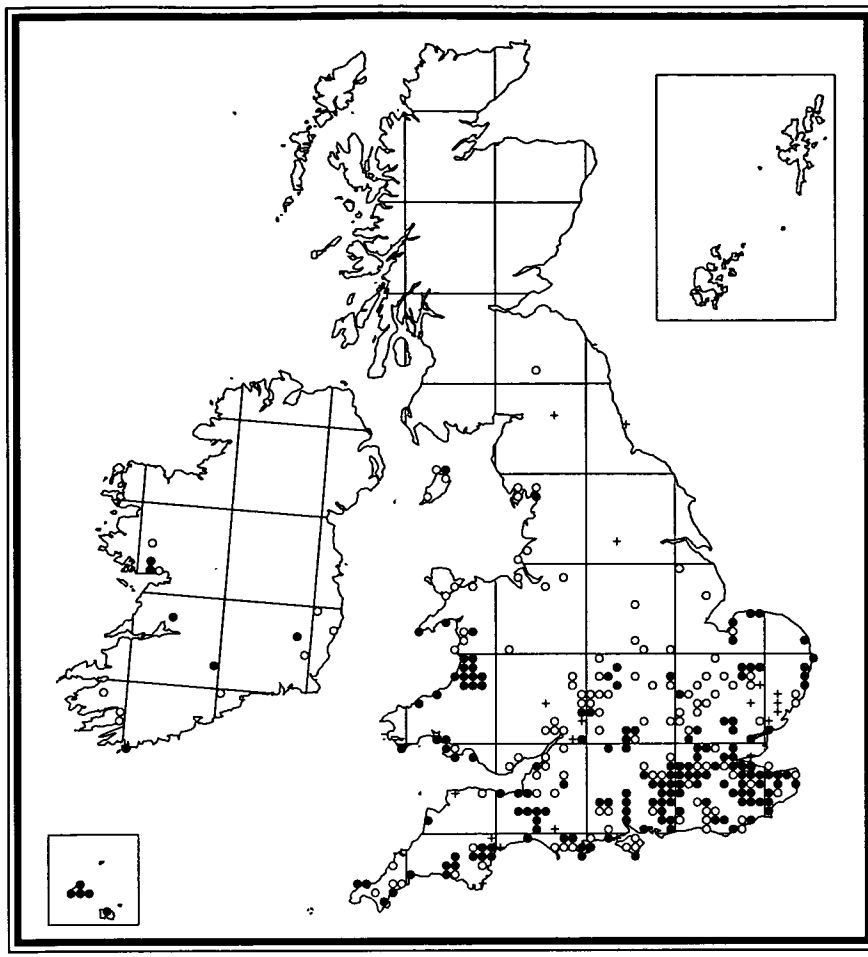
This species is not currently threatened. However, the abundance of their host species and the availability of suitable, undisturbed old trees, hedgerows and dead timber for nesting could become limiting factors.

Nesting biology

Due to its complex biology, *Lasius fuliginosus* seems to lead a precarious existence. It is a semi-social parasite of a semi-social parasite; that is, the species establishes its colonies in those of the *Lasius umbratus* group which are in turn founded in colonies of the *Lasius niger/flavus* species complexes. The chances of success for a founding queen under these circumstances may well result in the highly localised distribution of colonies seen in the field. Occasionally, nests are found with the black *L. fuliginosus* and yellow or brown host workers still intermixed.

The workers often forage on trails leading some distance from the nest to trees where they tend Homoptera for honeydew. Most of their diet appears to come from this source and they rarely seem to take insect prey; however, dead aphids are occasionally seen being carried back in workers' mandibles and they will take dead insects if offered. The nests themselves are made from a type of carton (wood fragments cemented together with saliva), usually in the hollow of a partially rotted tree, log or stump, or within a hedge bank or wall.

Map compiled by: S Hoy and S P M Roberts.
Author of profile: S Hoy.



Map 07 *Auplopus carbonarius* (Scopoli, 1763)

[Pompilidae: Pepsinae]

Distribution in Britain and Ireland

A generally scarce species although perhaps especially prone to under-recording through its secretive and elusive nature. It is essentially a southern species, although an old record for 'Bridgenorth' (Saunders 1896) may refer to Shropshire.

Status (in Britain only)

The species is not listed in the *Red Data Book* (Shirt 1987), but is recognised as a Nationally Notable (Nb) species in Falk (1991).

Habitat

The wasp tends to inhabit woodland, especially that with streams and marshy areas which provide wet mud and clay for nesting materials.

Flight period

Apparently single-brooded; May to September.

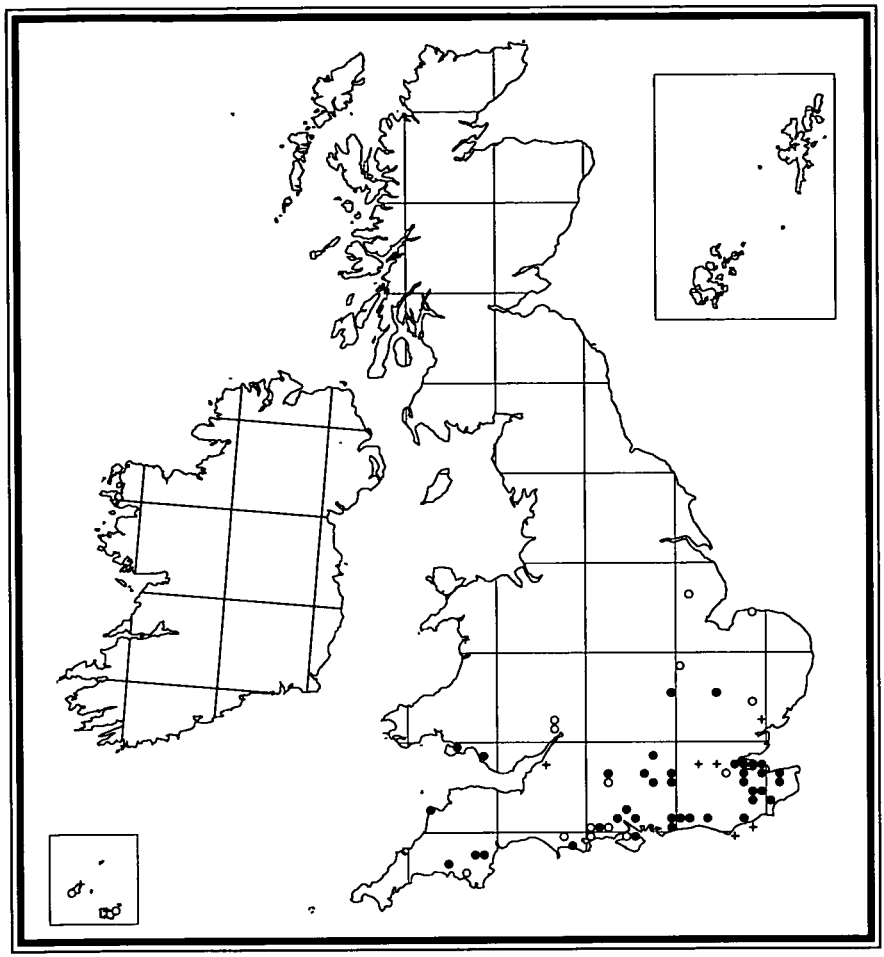
Prey collected

These are most frequently spiders in the family Clubionidae, but there are other records for gnaphosids, salticids, agelenids, thomisids, lycosids, segestriids and anyphaenids.

Nesting biology

The nesting behaviour (which is summarised by Richards and Hamm (1939) and Day (1988)) is rather more complex than that of most pompilids and demonstrates tremendous versatility on the part of the female. The nests are built in cavities in a great variety of situations, non-British reports citing nests beneath stones, in stone walls, in tree stumps (often in old beetle burrows), under bark and in crevices of tree trunks, in empty galls of cynipid wasps, in empty burrows of earthworms or cicadas, in old snail shells, in beehives, in an old cloth in a garden, behind a door frame, in a loft and in an old mirror in a garden. The nests may sometimes be mixed with those of other aculeates such as *Anthophora* bees and *Ancistrocerus* wasps and, indeed, *A. carbonarius* may use old nest holes of these species.

Females construct small, barrel-shaped cells which are laid on their side. These are manufactured from small pellets of clay obtained from damp areas, such as river banks or beneath stones, and carried to the nest site between the mandibles and a group of specialised hairs on the basal mouthparts. Water is also collected separately, probably to aid nest building. Completed nests may consist of ten or more cells (as many as 34 on one occasion) arranged in a block. These nest cells, constructed prior to prey capture, are stocked with a wide variety of spiders



obtained from amongst vegetation. One prey item is placed in each cell. The wasp may fly with small prey individuals (unusual in the Pompilidae where the prey is usually dragged along the ground).

Flowers visited

These wasps may occasionally visit flowers such as spurge (G M Spooner, unpublished).

Map compiled by: S J Falk and S P M Roberts.
Author of profile: S J Falk.

Map 08 *Cryptocheilus notatus* (Rossi 1792)

[Pompilidae: Pepsinae]

One of our largest pompilids, and until recently, regarded as one of our rarest.

Distribution in Britain and Ireland

Modern records are almost entirely confined to coastal sites in south-west England and the heaths of Dorset and the New Forest, Hampshire. The number of recent records from Dorset is particularly encouraging. It appears to have disappeared from south-east England, though there is a recent record for Pamber Forest (north Hampshire).

Status (in Britain only)

This species is listed in the *Red Data Book* (Shirt 1987) as Rare (RDB3) and provisionally upgraded to Vulnerable (pRDB2) in Falk (1991). Work for this *Atlas* has revealed that it is more widespread than previously thought.

Habitat

The wasp utilises a variety of habitats including coastal landslips and unimproved cliff tops, sandy heathland and sandpits.

Flight period

The species is probably single-brooded; May–September.

Prey collected

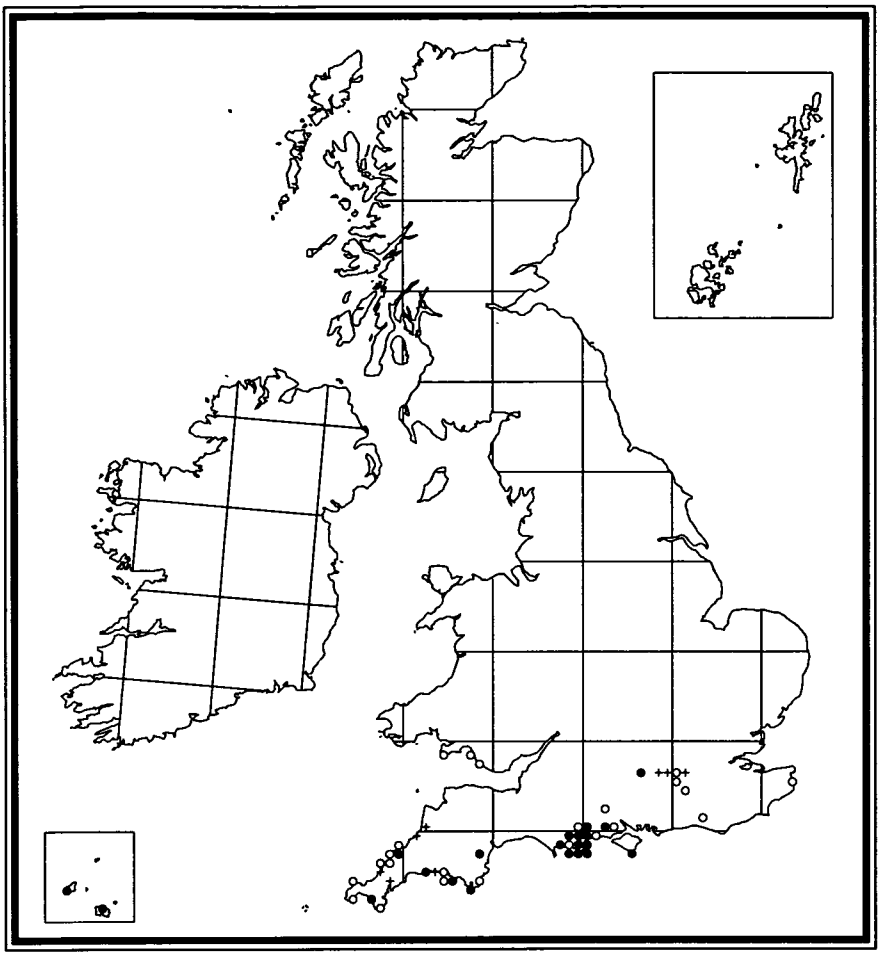
The nest cells are mostly provisioned with large web-building spiders such as *Agelena* and *Tegenaria* (both Agelenidae) and *Amaurobius* (Amaurobiidae), though gnaphosids and lycosids are also reported.

Nesting biology

The nesting habits have been described by Richards and Hamm (1939) and Day (1988). Multi-celled nests are made in existing cavities. In Poland, this species has been observed nesting in July in the burrows of small mammals, especially moles. These burrows acted as entrance chambers for the cells, which were excavated near to one another (though not actually joined). The female is very faithful to her nest, and is difficult to drive away. She uses the chamber for shelter during bad weather and at night. Similar observations have been made in central France.

Flowers visited

Wild carrot, wild parsnip and yarrow are among those recorded.



Map compiled by: S J Falk and S P M Roberts.
Author of profile: S J Falk.

Map 09 *Evagetes dubius* (Vander Linden, 1827)

[Pompilidae: Pompilinae]

Distribution in Britain and Ireland

Though regarded as nationally scarce, this species can be relatively frequent on the heaths of Dorset, Hampshire, W Sussex, Surrey and the East Anglian Brecks (Suffolk and Norfolk). Other records exist for Essex and Sidmouth, Devon. On the Channel Islands, it is recorded from Jersey, with recent information for two sites (M E Archer).

Status (in Britain only)

Falk (1991) placed this species in the Nationally Notable category (Nb).

Habitat

A strong association with heathland is shown, although it can occasionally turn up in some sandy habitats (such as sandpits), and railway cuttings.

Flight period

Possibly single-brooded; May (or perhaps late April) until September.

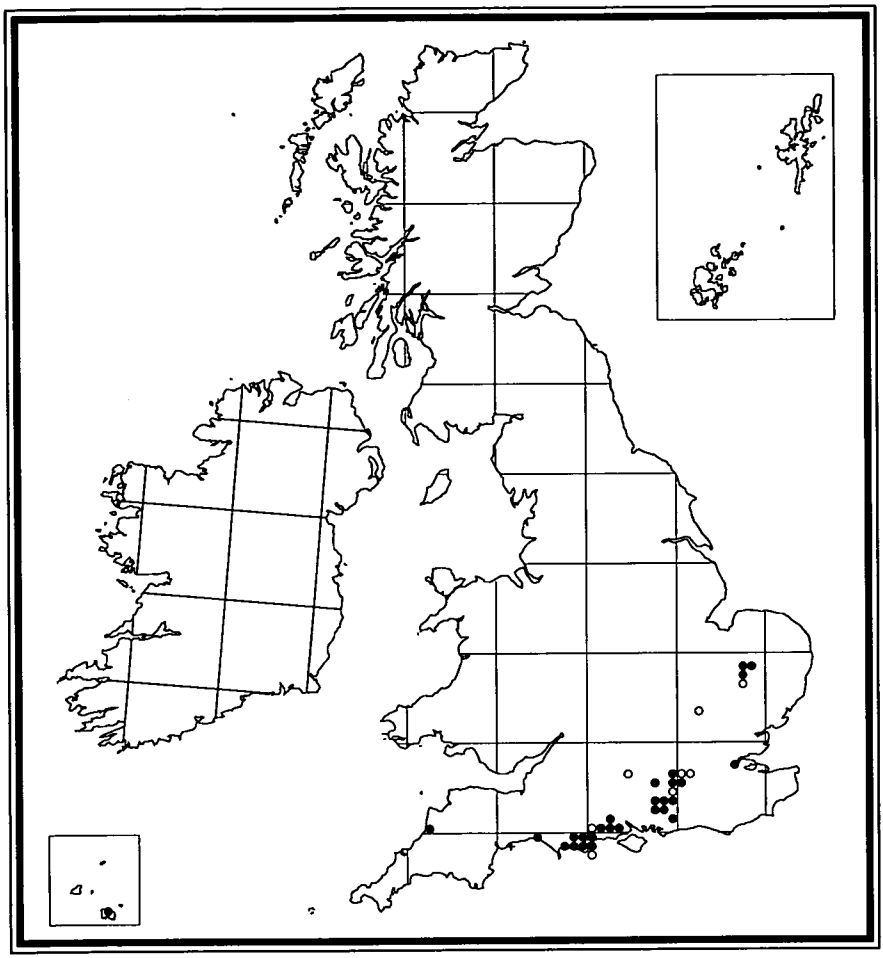
Nesting biology

Like other *Evagetes*, this species is probably a cleptoparasite of fossorial pompilid species, though there are a number of dubious accounts of it hunting spiders and digging its own nests (see Richards & Hamm 1939). Also, there are questionable reports of it cleptoparasitising non-fossorial pompilids such as *Arachnospila minutula* and *A. spissa*.

Flowers visited

The wasps visit flowers such as those of wild carrot.

Map compiled by: S J Falk and S P M Roberts.
Author of profile: S J Falk.



Map 10 *Evagetes pectinipes* (Linnaeus, 1758)

[Pompilidae: Pompilinae]

Distribution in Britain and Ireland

One of our rarest aculeates with records confined to the Deal–Sandwich sand dunes in east Kent and dunes in Jersey and Guernsey in the Channel Islands. It remains fairly well established at its Kent site (G H L Dicker, pers. comm.), though the lack of records prior to 1966 has led to suggestions that it is a relatively recent colonist there. On the Channel Islands, it was recorded from several sites in Jersey in the 1930s (Richards 1979) and has recently been found at sites in both Jersey and Guernsey by M E Archer.

Status (in Britain only)

Listed as Endangered (RDB1) in Shirt (1987) and Falk (1991).

Flight period

Adults have been recorded in July and August in Kent, and May–September on the Channel Islands.

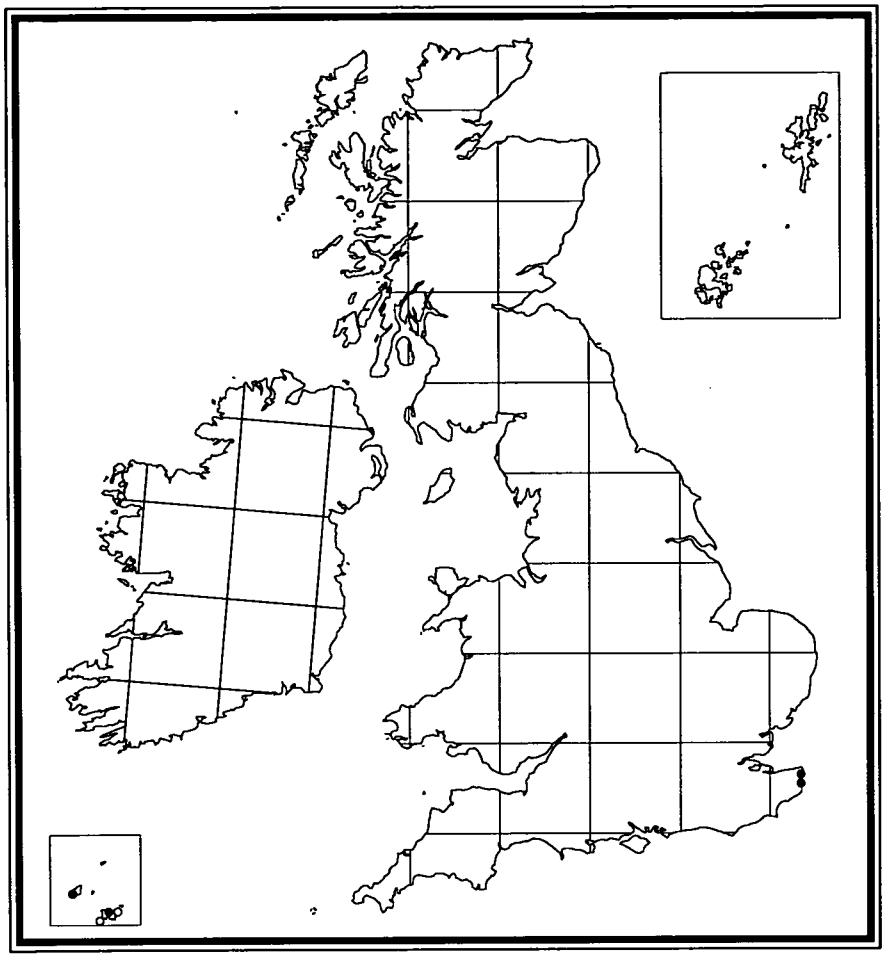
Nesting biology

Evagetes pectinipes is almost certainly a cleptoparasite of the pompilid *Episyron rufipes*, and possibly other pompilids (Day 1988).

Flowers visited

The species is reported to visit the flowers of wild carrot.

Map compiled by: S J Falk and S P M Roberts.
Author of profile: S J Falk.



Map 11 *Anoplius caviventris* (Aurivillius, 1907)

[Pompilidae: Pompilinae]

A medium-sized black pompilid. Most records of this species are old, suggesting a decline, or perhaps just elusiveness on the part of the wasp.

Distribution in Britain and Ireland

A species with a very local distribution in southern Britain, although there is a recent record from Tyddyn Bach, Gwynedd, by J T Burn (pers. comm.), and another from Wrexham, Clwyd, by M Edwards (pers. comm.).

Status (in Britain only)

Listed in Falk (1991) as Nationally Notable (Nb). Work for this *Atlas* has shown that it is more rare than had previously been thought.

Habitat

Anoplius caviventris is associated with rough vegetation that provides plenty of hollow stems of plants such as thistles, umbellifers, brambles and reeds. The habitats involved include marshes, riversides, meadows, heaths and open areas in woods. At Wicken Fen, Cambridgeshire, Spooner (1931) noted that it frequented heaps of dry sedge.

Flight period

Adults are found from May to September, usually running over rough vegetation. It may be easier to record this species by looking for nests, or trap-nesting, rather than searching for adults.

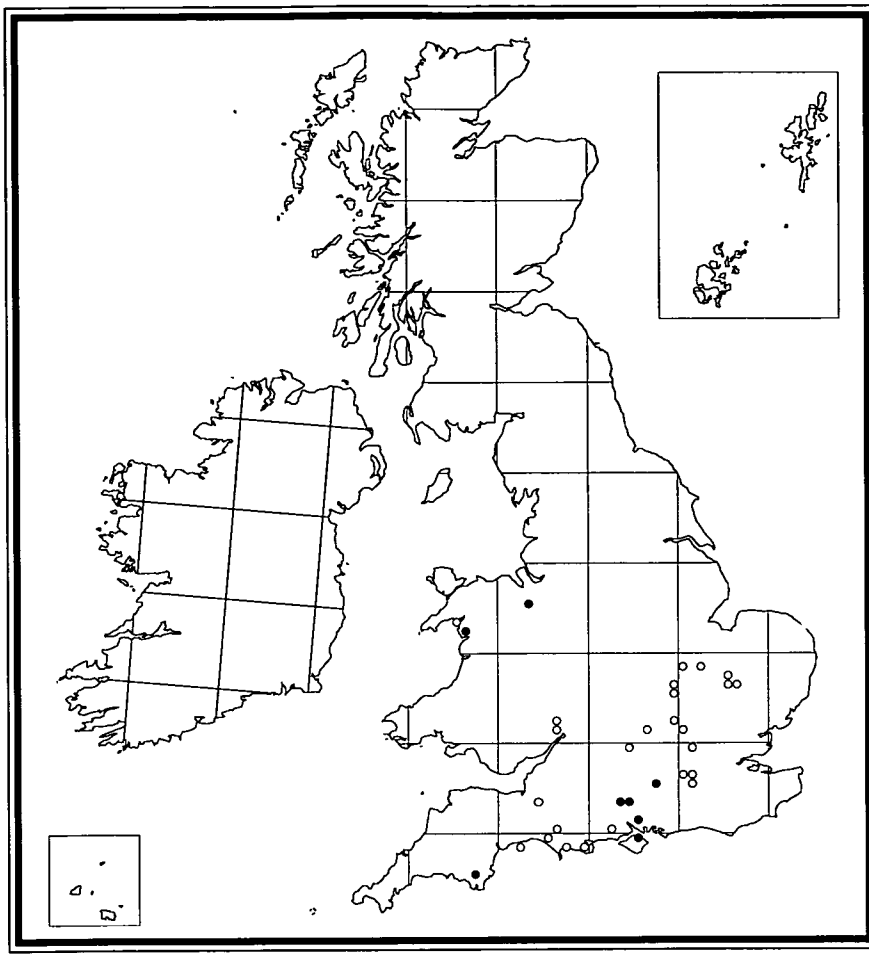
Prey collected

Nest cells are usually provisioned with spiders of the family Clubionidae, but at Chippenham, Cambridgeshire, it was found with *Tibellus maritimus* (Thomisidae) (J P Field, pers. comm.).

Nesting biology

Nesting occurs in dead, hollow stems of the sorts of plants listed above (eg Chambers 1948), and also in deserted aculeate burrows in dead wood (Richards & Hamm 1939). The nest cells are arranged serially with partitions constructed of vegetable detritus (Day 1988). Descriptions of British nests in dead thistle stems, and an old *Ectemnius continuus* (Sphecidae) nest in dead wood, are given by Perkins (1917), Richards and Hamm (1939) and Blair (1944).

Map compiled by: S J Falk and S P M Roberts.
Author of profile: S J Falk.



Map 12 *Aporus unicolor* Spinola, 1808

[Pompilidae: Pompilinae]

Distribution in Britain and Ireland

This particularly distinctive member of our pompilid fauna is generally scarce, but it has been recorded widely in southern England. In Wales, it has been recorded from Bosherton, Dyfed, whilst on the Channel Islands it is known from Sark, Herm, Jersey and Guernsey.

Status (in Britain only)

Listed in Falk (1991) as Nationally Notable (Na).

Habitat

The majority of modern records are coastal, with a suggestion of a decline inland which may be correlated to the widespread loss of inland habitat for the wasp's spider prey. On the coast, the habitat is typically cliffs and landslips, whilst inland, well-grazed downland and heathland are the usual haunt of both spider and wasp. In all these locations, south-facing slopes and banks in sunny locations are important.

Flight period

Apparently single-brooded; June to early September.

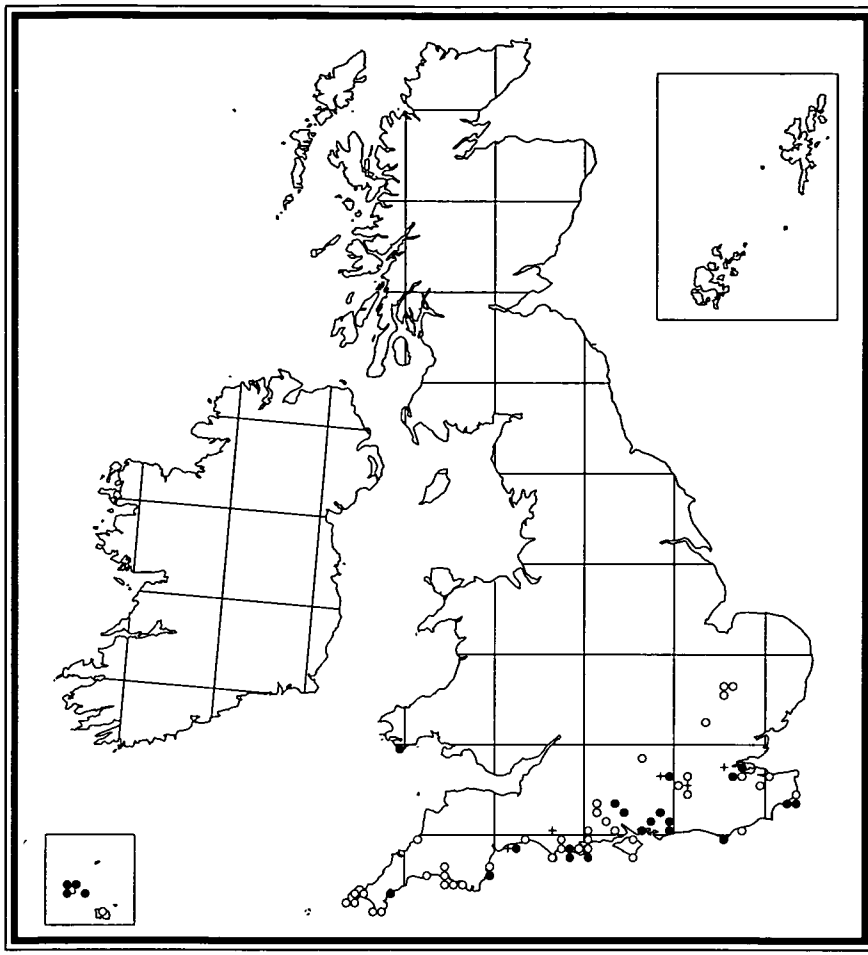
Prey collected and Nesting biology

Aporus unicolor preys on the purse-web spider, *Atypus affinis,* which it locates and paralyses within the spider's characteristic silken burrow. The body shape of the wasp appears to be adapted for gaining entry to the host's nest, with the head and thorax rather elongated, the head flattened and the forelegs powerfully developed. The wasp larva eats the paralysed spider at the bottom of its burrow and pupates amongst the remains of its prey (Else 1975).

Flowers visited

Umbellifers such as wild carrot, wild parsnip and rock samphire.

Map compiled by: S J Falk and S P M Roberts.
Author of profile: S J Falk.



Map 13 *Homonotus sanguinolentus* (Fabricius, 1793)

[Pompilidae: Pompilinae]

Distribution in Britain and Ireland

Records of this wasp are confined to a small number of heathland sites in southern England. In Dorset it has been found at Southaven (1935), Furzebrook (1943), Morden Heath (1956) and Tadnoll Heath (1962). Hampshire records are confined to a forest path between Holiday Hill and Emery Down, New Forest (1900) (Saunders 1900) and Cranes Moor, near Burley (1990) (Else 1992b). Surrey records are all old: Holmwood (1907), Chobham (1914) and Woking (1941).

Status (in Britain only)

Listed as Endangered (RDB1) in Shirt (1987) and Falk (1991).

Habitat

Usually collected by sweeping low vegetation, though G R Else's record was of a male running over a sandy heathland path.

Flight period

Adults have been found from June to August.

Nesting biology

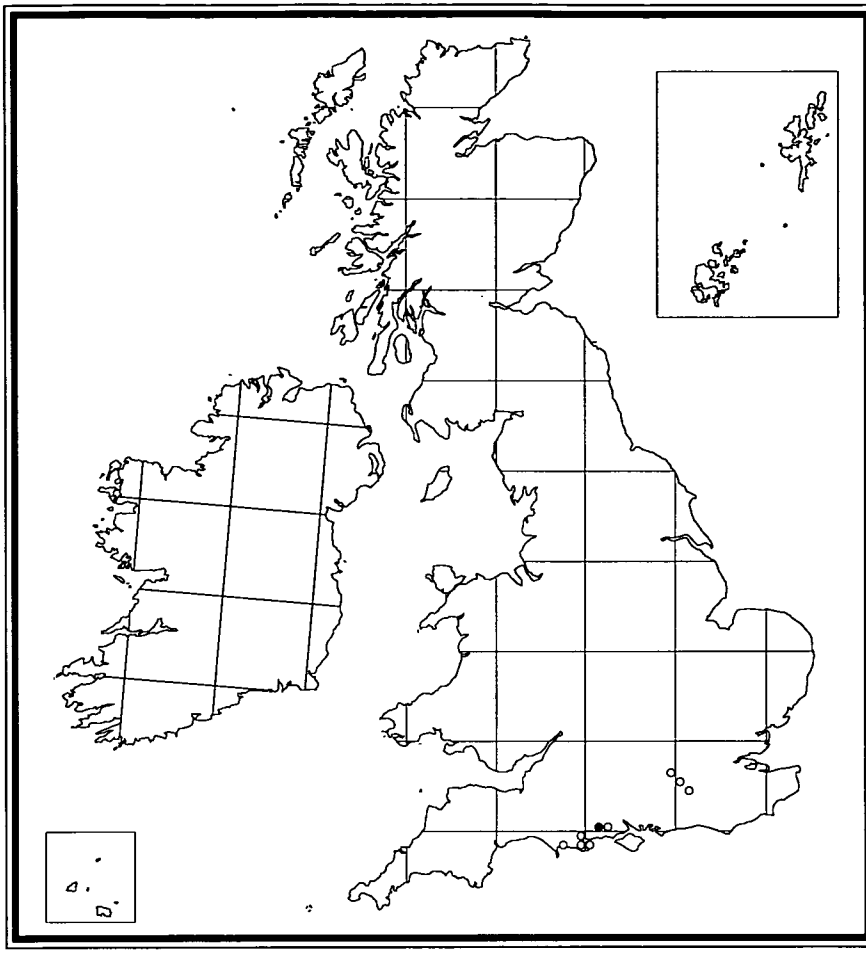
It is clear from the literature that this is an extremely elusive species, and it is possible that rearing the wasp from host webs might be a more effective way of recording it than searching for adults.

The life history has been studied on the Continent (Richards & Hamm 1939; Day 1988). Here, the wasp attacks females of the spider *Cheiracanthium erraticum* (Clubionidae) within their characteristic webs, which are usually constructed in rolled-up leaves or flower heads of grasses. The wasp does not produce a nest of its own and has a morphology which allows it to squeeze through the host's web. Parasitised spiders do not appear to lay eggs but are quite active and will react to disturbance. The spider dies about 11 days after the pompilid larva hatches, by which time it has been sucked dry. In France, Maneval (1936) reports finding early stages of *Homonotus* in four-fifths of *C. erraticum* webs, despite seeing only one adult.

Flowers visited

The species was collected by G M Spooner on wild carrot and either yarrow or sneezewort at Tadnoll, Dorset (S P M Roberts, pers. comm.).

Map compiled by: S J Falk and S P M Roberts.
Author of profile: S J Falk.



Map 14 *Ceropales variegata* (Fabricius, 1798)

[Pompilidae: Ceropalinae]

Distribution in Britain and Ireland

A rare heathland species with records confined to Dorset, Hampshire and Surrey. The most recent capture was at Parley, Dorset, in 1953, and it does not appear to have been taken in the New Forest since 1911 or in Surrey since 1902.

Status (in Britain only)

Listed as Endangered (RDB1) in Shirt (1987) and Falk (1991).

Flight period

Adults of *C. variegata* have been found in July and August. British observers report a male and female flying around a small pine heavily infested with aphids (Hamm 1909); six males and a female sheltering beneath a pine tree with various other aculeates on a very hot day (Nevinson 1911); and a probable male flying over a patch of heather (Mortimer 1897).

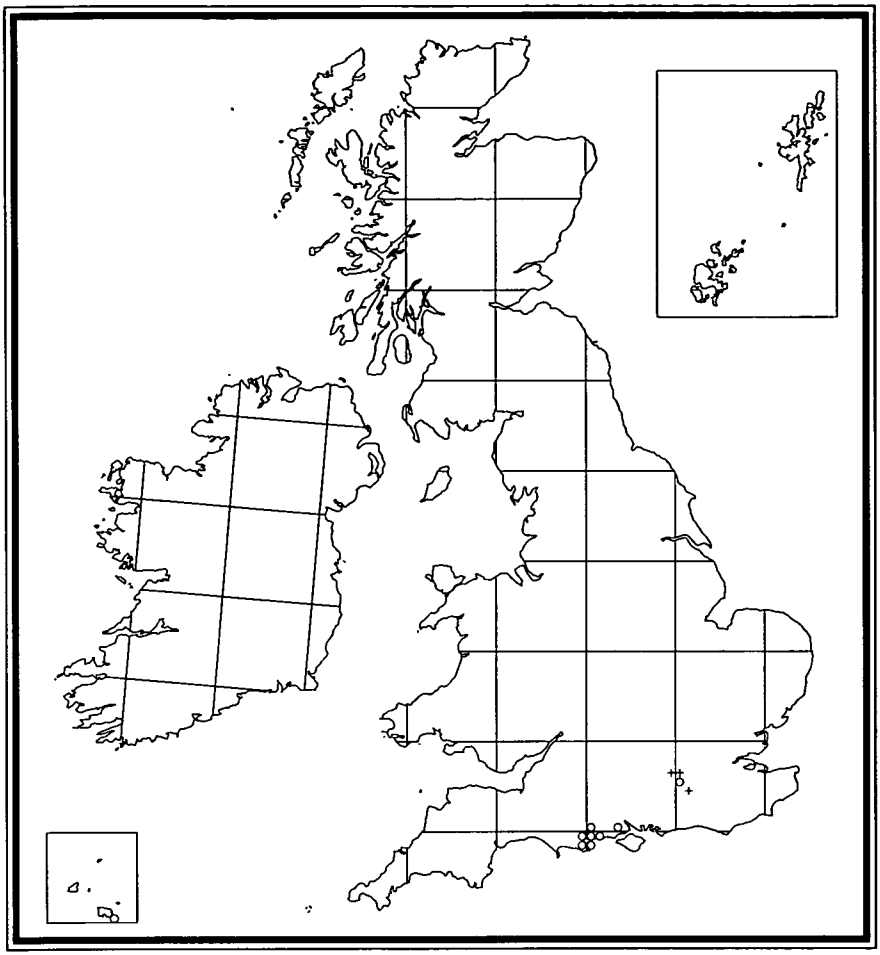
Nesting biology

Nothing has been recorded of its life history. Other *Ceropales* species are well known for the cleptoparasitic habit of intercepting female pompilids of other genera whilst dragging paralysed spiders to their nests. The ceropaline drives off the other pompilid so that she can insert an egg into the lung book of the prey. The *Ceropales* then takes no further interest in the prey, though the original captor of the spider must return and finish provisioning her own nest cell. The *Ceropales* larva hatches first and destroys the egg of the host pompilid prior to feeding on the spider.

Flowers visited

Wild carrot and wild angelica have been recorded.

Map compiled by: S J Falk and S P M Roberts.
Author of profile: S J Falk.



Map 15 *Odynerus melanocephalus* (Gmelin in Linnaeus, 1790)

[Vespidae: Eumeninae]

See *Odynerus spinipes* for literature on this species.

Distribution in Britain and Ireland

The species has been recorded from Devon to Kent and northwards to Northamptonshire.

Status (in Britain only)

Listed in Falk (1991) as Nationally Notable (Na).

Habitat

Open situations on light clayey soils. Grasslands, heathlands, soft rock cliffs, landslips and saltmarsh margins. Also disturbed situations such as brick pits, sand pits and railway embankments.

Flight period

Adults are most likely to be seen during June but have also been seen in late May and July and more rarely in early August.

Prey collected

The cells of *O. melanocephalus* have been observed to be provisioned with weevil larvae and small lepidopterous caterpillars.

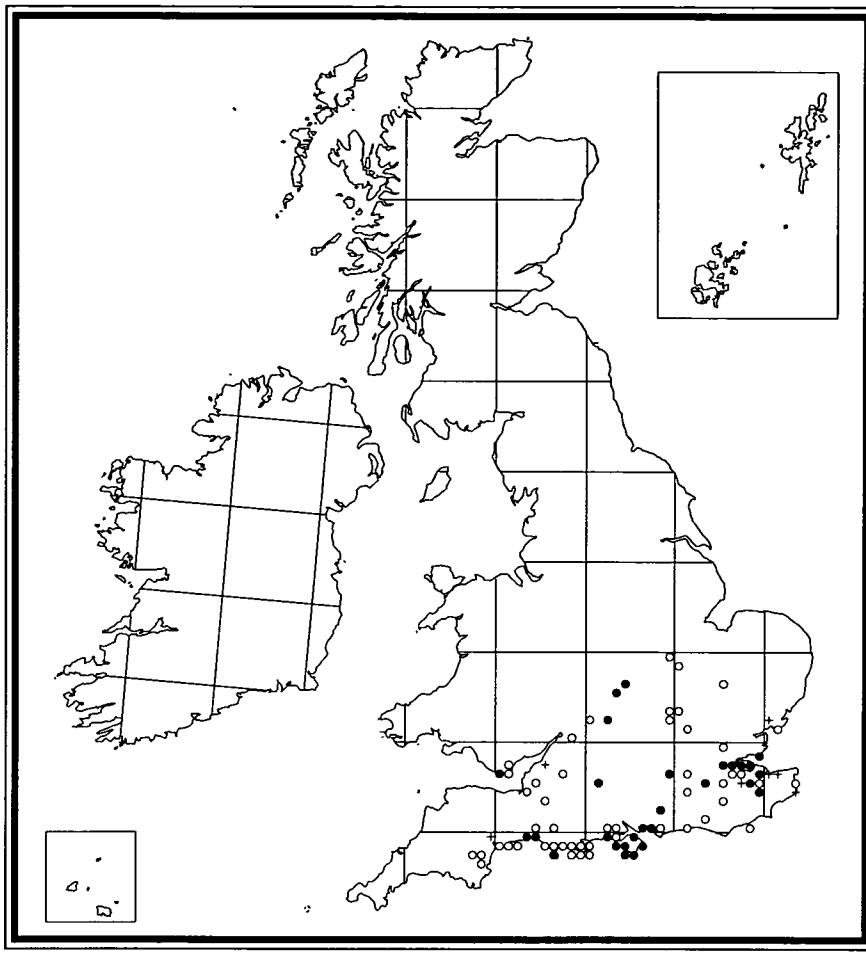
Nesting biology

The nesting areas of *O. melanocephalus* are usually on level, exposed soil with a clay content. The burrow entrance has an associated 'chimney' which is rather short, being about 1 cm long. See *Odynerus spinipes* for further details of nesting biology.

Flowers visited

Wild carrot, clover and speedwell.

Map compiled by: M E Archer and S P M Roberts.
Author of profile: M E Archer.



Map 16 *Odynerus reniformis* (Gmelin in Linnaeus, 1790)

[Vespidae: Eumeninae]

See *Odynerus spinipes* for literature on this species. See also Olberg (1959).

Distribution in Britain and Ireland

The British records are all from Hampshire and Surrey, and the last record was during 1909 from the New Forest. Although the species appears to be widespread in the Channel Islands, the last record from there was made in 1957.

Status (in Britain only)

The species is believed to be extinct in mainland Britain (RDB1+) and is listed as Extinct in Shirt (1987) and Falk (1991). Its current status in the Channel Islands is unclear.

Habitat

Mostly open heathland with bare soil; also on railway embankments.

Flight period

Adults of *O. reniformis* have been found from late May until early August but most records are from June and July.

Prey collected

Cells have been found to be provisioned with lepidopterous and sawfly larvae, but also in one, a *Hypera* species, a weevil of the family Curculionidae (Nielsen 1932).

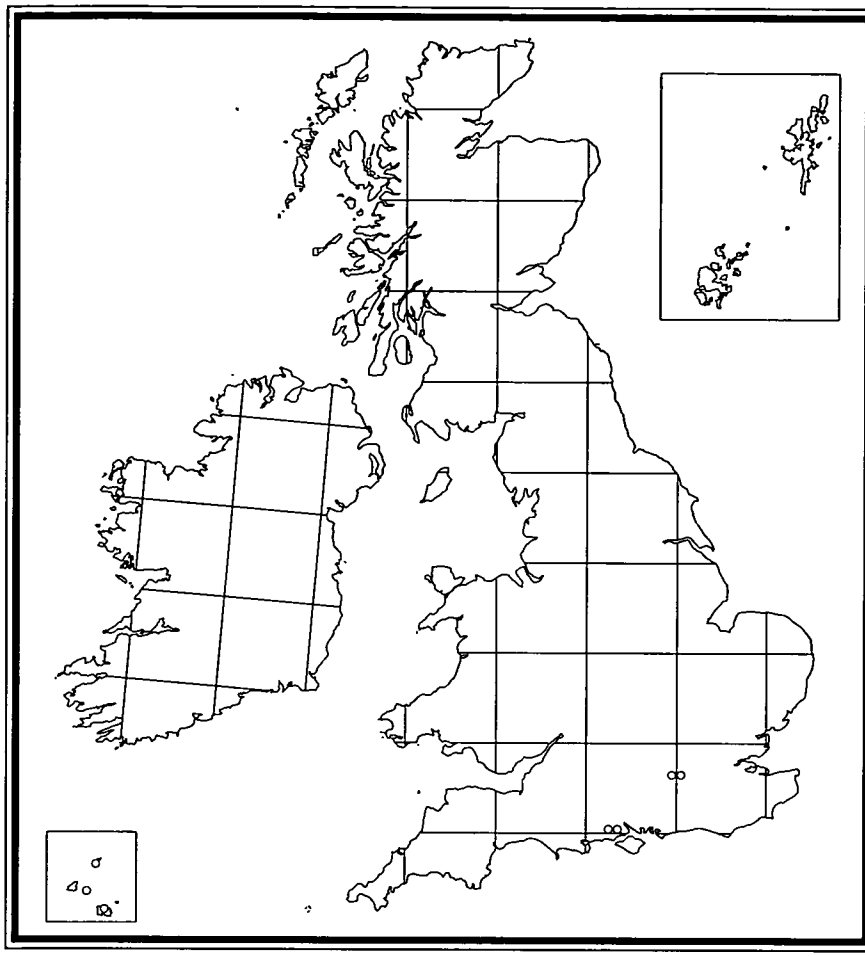
Nesting biology

Nesting areas are associated with sandy soils, being on either level ground or vertical surfaces. It has also been found nesting in the walls of a ruined cottage (Morice 1906). The burrow entrance is about 2 cm, and curved from the vertical when on level ground, or slightly down-curved when projecting from a vertical surface. The nest of *O. reniformis* consists of one to three cells. See *Odynerus spinipes* for further details of nesting biology.

Parasites

Chrysis viridula has been found associated with *O. reniformis* in Europe.

Map compiled by: M E Archer and S P M Roberts.
Author of profile: M E Archer.



Map 17 *Odynerus simillimus* Morawitz, F., 1867

[Vespidae: Eumeninae]

Little is known about the very rare *O. simillimus*. See *Odynerus spinipes* for literature on this species.

Distribution in Britain and Ireland

Odynerus simillimus has been recorded from marshy areas in East Anglia, but until its rediscovery in 1986 (Archer 1989) it was considered to be extinct in Britain.

Status (in Britain only)

Listed as Extinct (RDB1+) in Shirt (1987), but Falk (1991) provisionally placed it in the Endangered (pRDB1) category.

Habitat

Coastal grazing marsh and the fens of East Anglia.

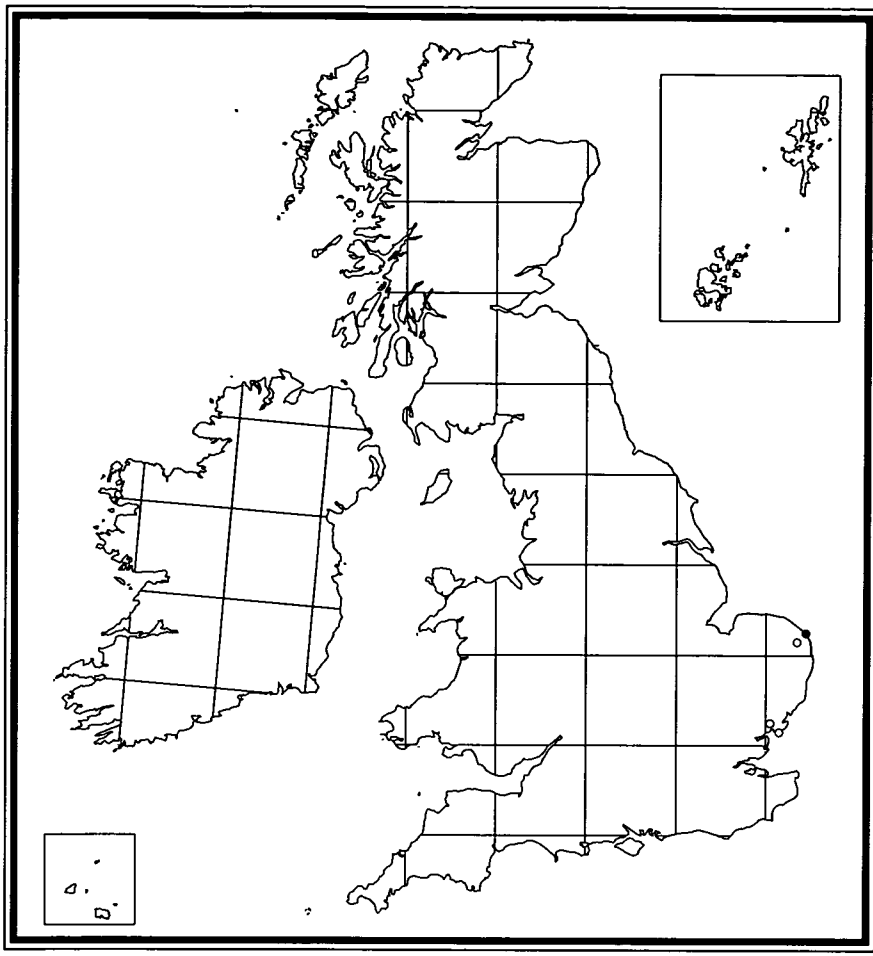
Flight period

The adults of *O. simillimus* have been seen during June and July.

Nesting biology

Probably similar to *O. spinipes* (qv). However, the 'chimney' over the entrance to the burrow is much shorter – only about 5 mm long (Blüthgen 1961; Spradbery 1973).

Map compiled by: M E Archer and S P M Roberts.
Author of profile: M E Archer.



Map 18 *Odynerus spinipes* (Linnaeus, 1758)

[Vespidae: Eumeninae]

Identification keys, distribution and general biology are given in Nielsen (1932), Spradbery (1973), Richards (1980), Falk (1991), and Yeo and Corbet (1995).

Distribution in Britain and Ireland

Odynerus spinipes is distributed throughout much of England and Wales and reaches southern Scotland. It is also found on the Isle of Man and on Guernsey and Herm in the Channel Islands. There are two old records from Ireland.

Status (in Britain only)

This species is not regarded as being threatened.

Flight period

Adults are most likely to be seen in flight in June but also during July. More unusually they may be seen during the second half of May and early August.

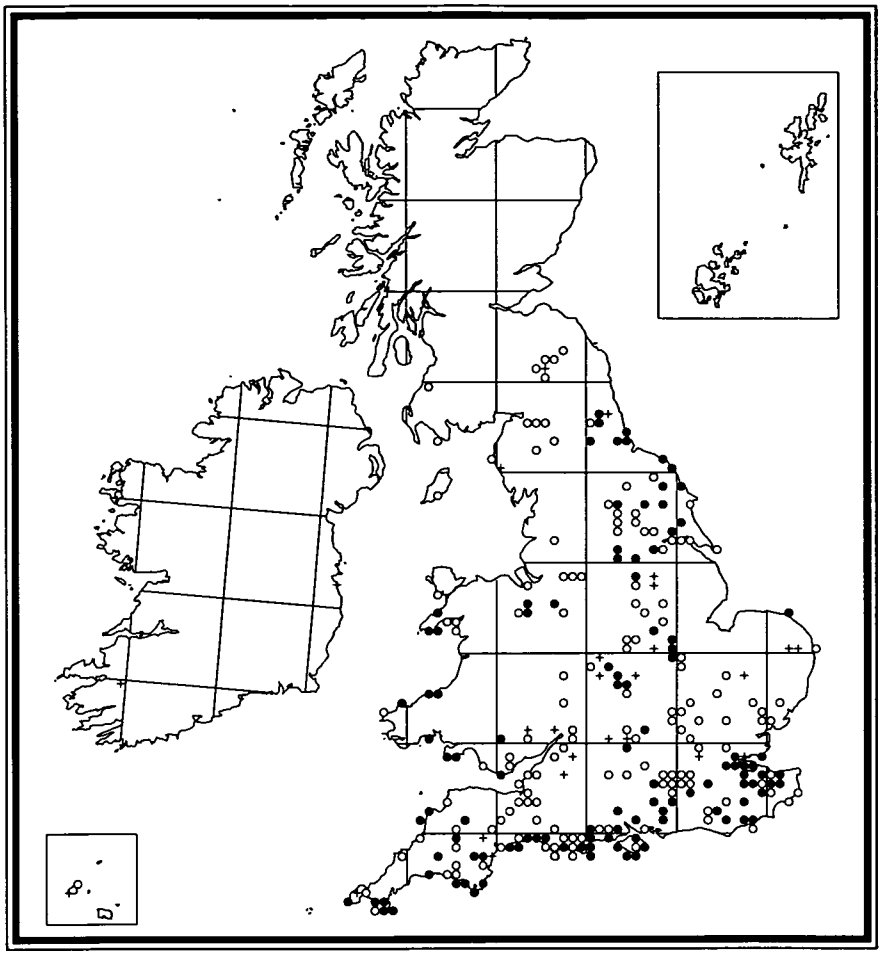
Prey collected

Beetle larvae of the genus *Hyperba* (Curculionidae). During malaxation (chewing) of their prey, the adults also will take the oozing body fluids (Bristowe 1948).

Nesting biology

Mating takes place shortly after the adults emerge, followed by a search for nest sites and preparation and mass provisioning of the cells by the females. Nest sites are in vertical banks of hard earth, often of clay but also of sand. The digging spot is wetted with water and a cluster of five to six cells is excavated just behind the vertical face of the bank (Bristowe 1948). The excavated material is first used to build a 'chimney' up to 30 mm long which curves over and downwards. The function of the chimney is unknown but it could prevent the entry of rain into the burrows which are situated in rather exposed situations. It has also been suggested that the chimney deters potential cleptoparasites and parasitoids. Several females may be found nesting close together in small aggregations, probably due to lack of suitable nesting site habitat.

The female hunts for beetle larvae over the appropriate vegetation. When found, the prey is immobilised by stinging and malaxation. The prey is carried in the mandibles with the help of the forelegs against the underside of the body. Up to about 30 beetle larvae have been found in a cell. The egg, which is suspended from the wall of the cell by a fine filament, is laid before the prey is collected and hatches in a few days. The prey is eaten by the mason wasp larva in a matter of weeks – the probable overwintering stage is the prepupa.



Flowers visited

Those with a short corolla and accessible nectaries are usually chosen. Extrafloral nectaries and honeydew of aphids may also be taken.

Parasites

The parasitic wasp *Chrysis viridula* usually acts as a cleptoparasite, entering either the unsealed cell, or removing the partition of a provisioned cell and laying its egg. The larva on hatching destroys the host's egg before eating the prey. However, it may also act as a parasitoid feeding on the mature larva of its host. Other species of *Chrysis*, *Pseudospinola neglecta* and *Omalus auratus* may be found at *O. spinipes* nests.

Map compiled by: M E Archer and S P M Roberts.
Author of profile: M E Archer.

Map 19 *Symmorphus bifasciatus* Linnaeus, 1761

[Vespidae: Eumeninae]

See *Symmorphus crassicornis* for literature on this species.

Distribution in Britain and Ireland

This wasp, previously known as *Symmorphus mutinensis*(Baldini), occurs throughout Britain and Ireland, including the Channel Islands. So far, however, it has not been recorded from the Isle of Wight. In Scotland it has been recorded as far north as Highland Region.

Status (in Britain only)

This species is not regarded as being threatened.

Habitat

See *Symmorphus crassicornis.*

Flight period

May–October; but mainly from June to August, with July being the peak month.

Prey collected

Larvae of the chrysomelid beetle, *Phyllodecta vulgatissima.*

Nesting biology

Details are given under *S. crassicornis*, but in addition, *S. bifasciatus* has been found nesting in disused plant galls of *Cynips kollari.* Each cell is provisioned with 10–17 beetle larvae.

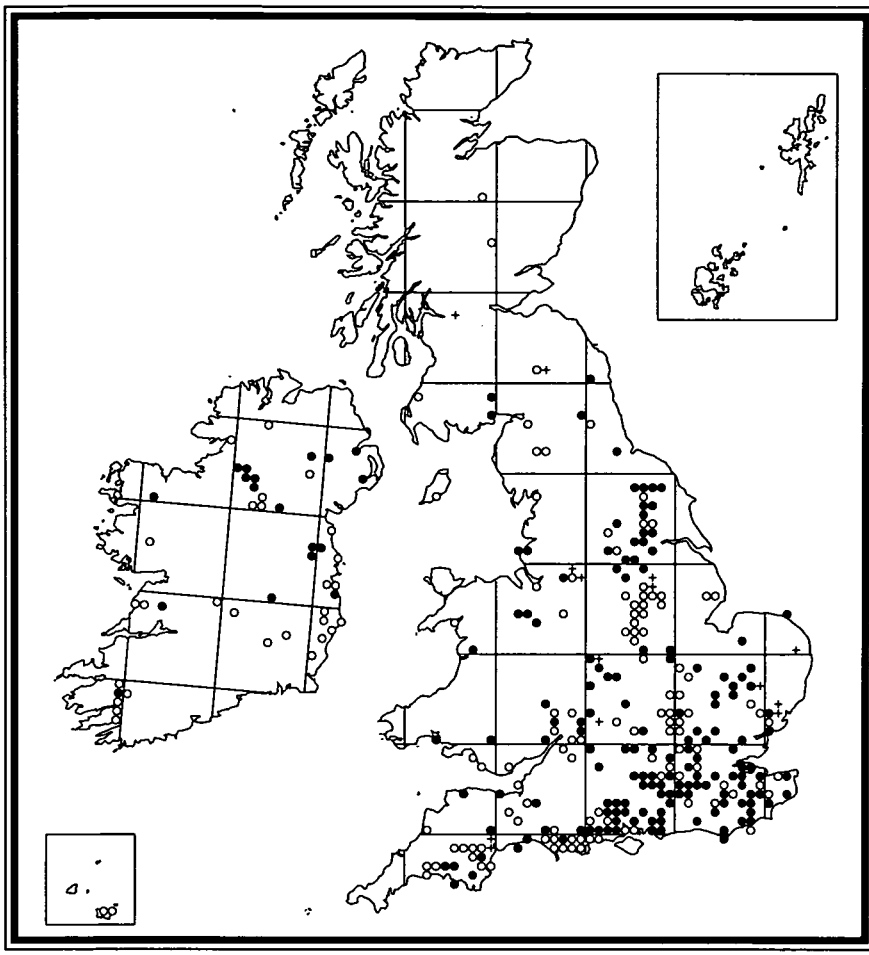
Flowers visited

See *Symmorphus crassicornis.*

Parasites

Chrysis angustula is associated with this species in Europe (Schneider 1991), also *Chrysis ignita.*

Map compiled by: M E Archer and S P M Roberts.
Author of profile: M E Archer.



Map 20 *Symmorphus connexus* (Curtis, 1826)

[Vespidae: Eumeninae]

See *Symmorphus crassicornis* for literature on this species.

Distribution in Britain and Ireland

From Dorset to Kent, and northwards to Oxfordshire and Lincolnshire. Recent records have come from Kent, Hampshire and Oxfordshire.

Status (in Britain only)

The species is listed as Rare (RDB3) in Shirt (1987) and Falk (1991).

Habitat

See *Symmorphus crassicornis.*

Flight period

From May until August, although most records are from July.

Prey collected

Larvae of the chrysomelid beetle *Zeugophora subspinosa* and the gracillariid moth *Gracillaria stigmatella.*

Nesting biology

Principally as given under *S. crassicornis.* The nest of *S. connexus* has been found to consist of four cells, with females being reared from the two innermost cells, and males from the two outer cells. A space, or vestibule, is present between the brood cells and the plug of the burrow entrance to the nest. The prey is carried by just the mandibles, so that it hangs free (cf *S. crassicornis*).

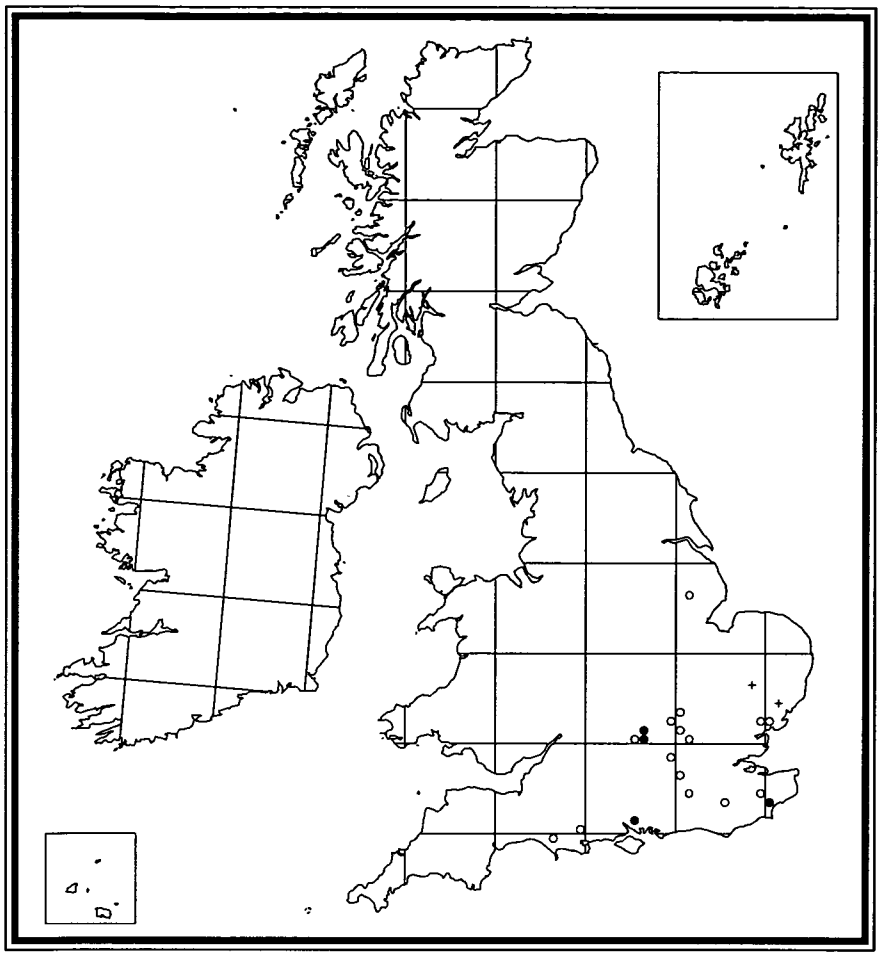
Flowers visited

See *Symmorphus crassicornis.*

Parasites

Chrysis ignita has been associated with *S. crassicornis* in Europe.

Map compiled by: M E Archer and S P M Roberts.
Author of profile: M E Archer.



Map 21 *Symmorphus crassicornis* (Panzer, 1798)

[Vespidae: Eumeninae]

Identification keys, distribution and general biology are given in Spradbery (1973), Richards (1980), Yeo and Corbet (1995), and Falk (1991).

Distribution in Britain and Ireland

Principally a southern species, with an isolated record from south-east Yorkshire. Although this wasp is widespread there are few records, especially since 1950.

Status (in Britain only)

The species is listed as Rare (RDB3) in Shirt (1987) and Falk (1991).

Habitat

Adults seem to prefer damp places, often near streams and ditches (Guichard 1972), and their flight paths are associated with patches of foliage in full sunlight.

Flight period

Late June, July and early August; sometimes early June and late August.

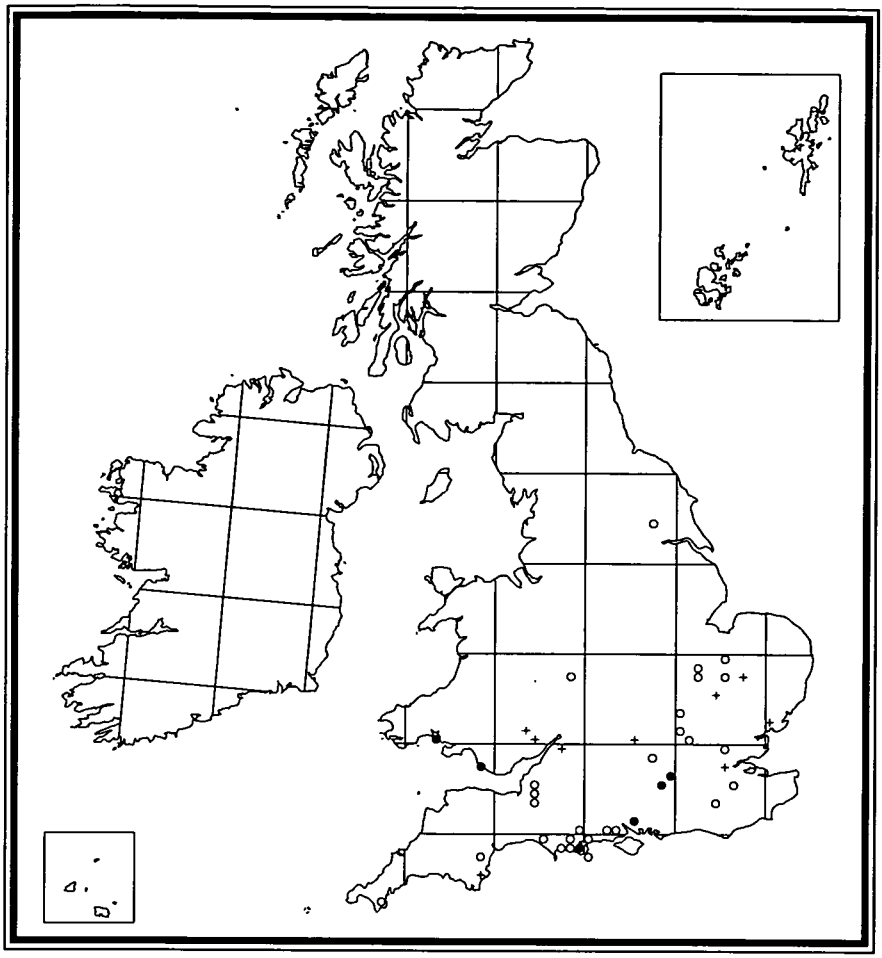
Prey collected

Larvae of the chrysomelid beetle *Chrysomela populi.*

Nesting biology

Species of *Symmorphus* are tube-nesters using existing cavities such as plant stems, eg bramble and elder; vacated burrows of wood-boring insects; straws of thatched roofs; old walls; and even vertical sand banks. When a suitable nesting site has been found, the female clears away any remaining pith and debris. Next she collects clay which is softened with water stored in her crop. Often, a preliminary plug of clay is placed at the end of the burrow before the cells are built. The clay partitions between the cells have a rough, convex inner surface and a smooth, concave outer surface, which probably helps the full-grown larva to orientate itself for its eventual escape as an adult from the cell (as in most, if not all, aculeates with a similar life cycle). The cells are arranged linearly. An egg is laid in each cell before the cell is provisioned.

The prey is immobilised by stinging and carried by the mandibles and forelegs (cf *S. connexus*). Prey are packed tightly in the cell, avoiding the egg. Usually, the egg takes two or three days to hatch, with the larval stage taking one to two weeks with probably five instars. When feeding is completed the larva may rest for about a day and voids its gut contents at the inner end of the cell before spinning a cocoon which is anchored at the base of the cell. When the species is univoltine, the prepupal stage lasts for six to eight months, the pupal stage for one



week and the newly emerged adult rests in the cell for two to three weeks before emerging. When the species is multivoltine, the prepupal stage lasts about one week.

Flowers visited

Figwort, umbellifers (Apiaceae) and spurge.

Parasites

Chrysis fulgida has been found associated with *S. crassicornis* in Europe (Schneider 1991).

Map compiled by: M E Archer and S P M Roberts.
Author of profile: M E Archer.

Map 22 *Symmorphus gracilis* (Brulle, 1832)

[Vespidae: Eumeninae]

See *Symmorphus crassicornis* for literature on this species.

Distribution in Britain and Ireland
Widespread in southern England, and north to Yorkshire.

Status (in Britain only)
This species is not regarded as being threatened.

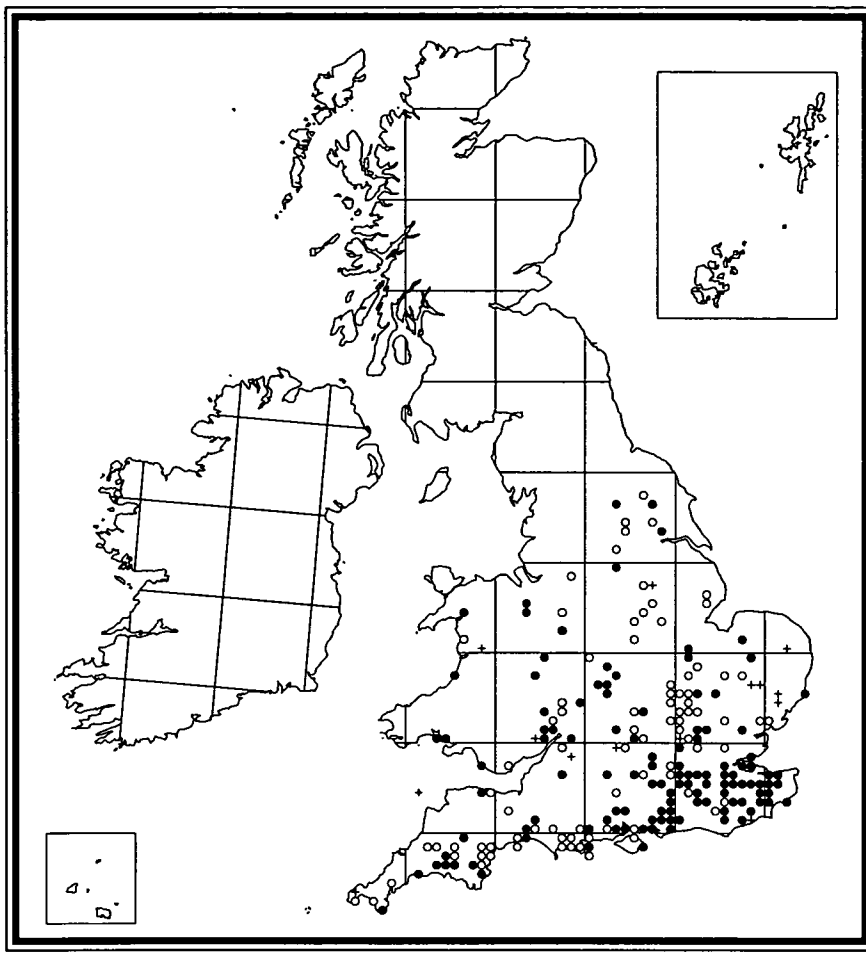
Habitat
See *Symmorphus crassicornis.*

Flight period
Adults of *S. gracilis* are most likely to be found during June and July, but also at the end of May and sometimes during August.

Prey collected
S. gracilis hunts for larvae of the chrysomelid beetle *Chrysomela populi* and, in addition, *Cionus hortulanus*, a weevil associated with figwort.

Nesting biology
See *Symmorphus crassicornis.*

Map compiled by: M E Archer and S P M Roberts.
Author of profile: M E Archer.



Map 23 *Vespa crabro* Linnaeus, 1758

[Vespidae: Vespinae]

Distribution in Britain and Ireland

The 'hornet' occurs in many parts of England and Wales extending from Cornwall to Kent and northwards to Yorkshire. It also occurs on the Isles of Scilly, Isle of Wight and the Channel Islands (Jersey and Guernsey). Hornets are noticeably scarce in Kent and East Sussex, and much less frequent in other parts of south-east England than before 1950. From the 1970s, hornets spread to the north Midlands and Yorkshire: previous records for these localities were at the beginning of the 20th century.

Status (in Britain only)

This species is not regarded as being threatened.

Habitat

Found in many lowland habitats, but particularly associated with ancient deciduous woodland (eg New and Sherwood Forests). Also associated with houses and outbuildings in farming areas and sometimes in more urban situations.

Flight period

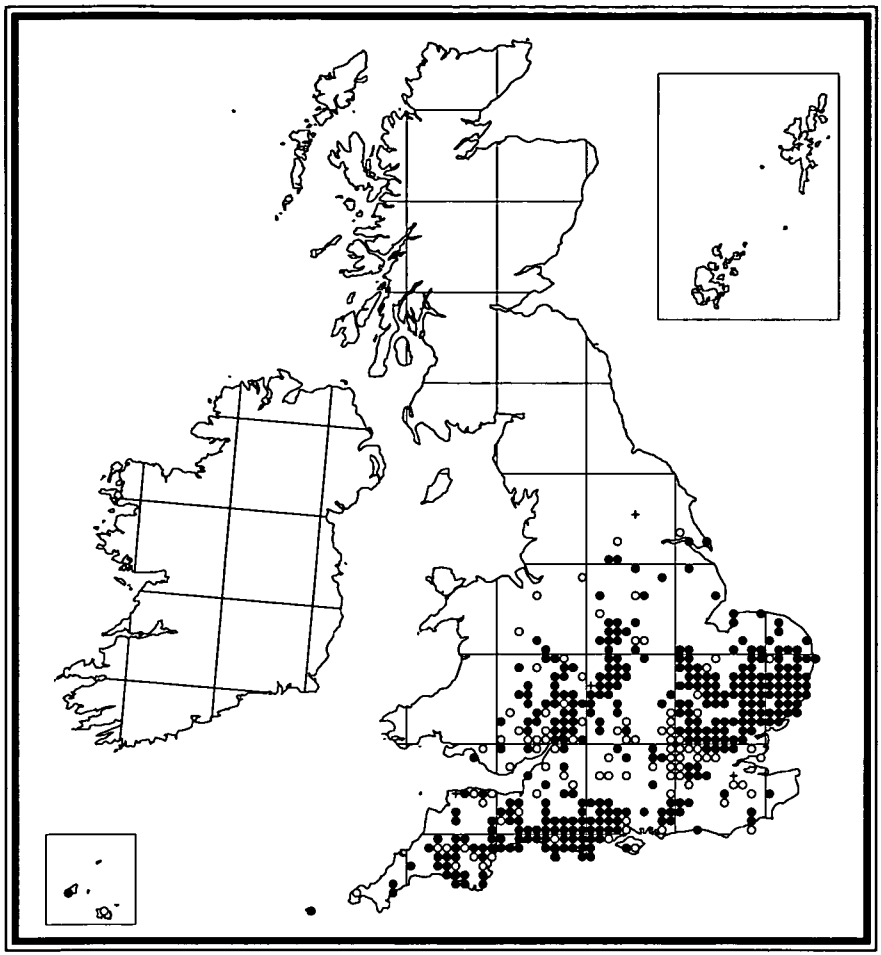
Queens emerge from their overwintering sites from early April. The first workers emerge from late June to early July. Males and females mainly emerge during September. Workers may still be seen in October or occasionally early November.

Prey and other foods collected

The prey of hornets includes other species of social wasps, honey bees, flies, butterflies, moths (hornets can forage in moonlight) and spiders (Pawlyszyn 1994). Prey are often taken from flowers and the vegetation of trees. In addition, exudations (flux) are collected from the damaged roots and branches of oak trees (Bunn 1988b; Pawlyszyn 1994). Ash and lilac twigs are ring-barked to encourage sap flow which is then collected (Edwards 1980). The secretions of aphids on goat willow are also taken (Pawlyszyn 1994).

Nesting biology

Nests are initiated from the middle of May (Bunn 1988a; Pawlyszyn 1994). They are usually in aerial situations, particularly inside hollow trees, but are also in attics and outhouses. Some nests are constructed at the base of tufts of grass and in cavities in the nests of *Lasius flavus*; also a few nests are fully underground. A colony may relocate its nest if the initial nesting cavity becomes too small (Pawlyszyn 1992, 1994). The nest is built from pulp collected from decayed wood (Bunn 1988b). The death of the colony is usually in October, or occasionally November (Bunn 1988a). See also Archer (1993).



Flowers visited

Records of foraging for nectar are few; ivy has been mentioned (Pawlyszyn 1994).

Parasites and Commensals

Hornet nests are well known to contain many species of insects. Amongst these may be mentioned: scavengers, eg *Fannia canicularis* (Diptera) and *Ptinus fur* (Coleoptera) feeding on decaying organic matter; predators, eg *Velleius dilatatus* and *Korynetes caeruleus* (Coleoptera) probably feeding on the brood stages; parasitoids, eg *Sphecophaga vesparum* (Hymenoptera) attacking sealed brood. Fungus-feeders eat the moulds and other fungi that grow on damp nest materials. See also Edwards (1980).

Map compiled by: M E Archer and S P M Roberts.
Author of profile: M E Archer.

Map 24 *Dolichovespula media* (Retzius, 1783)

[Vespidae: Vespinae]

The 'median wasp' is a very large social species, most individuals being second only to the hornet, *Vespa crabro*, in size. Queens of *D. media* also resemble *V. crabro* in their mainly yellowish orange coloration. The gasters of many workers are very dark, with narrow yellow bands. Most colonies are rather docile; others seem to be very aggressive, attacking with little provocation (Welch & Irwin 1995).

Distribution in Britain and Ireland

When recording began, Britain was host to seven species of social wasps. However, in the 1980s a further two species colonised the country: *Dolichovespula media* and *D. saxonica*. The first record of *D. media* in England was a male collected in Friston Forest, East Sussex, by S J Falk in August 1980 (Falk 1982). Five years later, an occupied nest was discovered near Robertsbridge, also in East Sussex. In 1987 a second nest was reported from near Canterbury, east Kent and, since then, the species' range has rapidly increased. By the end of the 1995 season the wasp had been reliably recorded from numerous sites from Kent to Cornwall, northwards to north Wales, Cumbria (Borrowdale in the Lake District) and Durham (Darlington) (Else 1989, 1992a, 1993b, 1994a).

Status (in Britain only)

This species is now quite common and widely distributed so that the statuses allocated in Shirt (1987) – RDB3, and Falk (1991) – Na, no longer apply.

Habitat

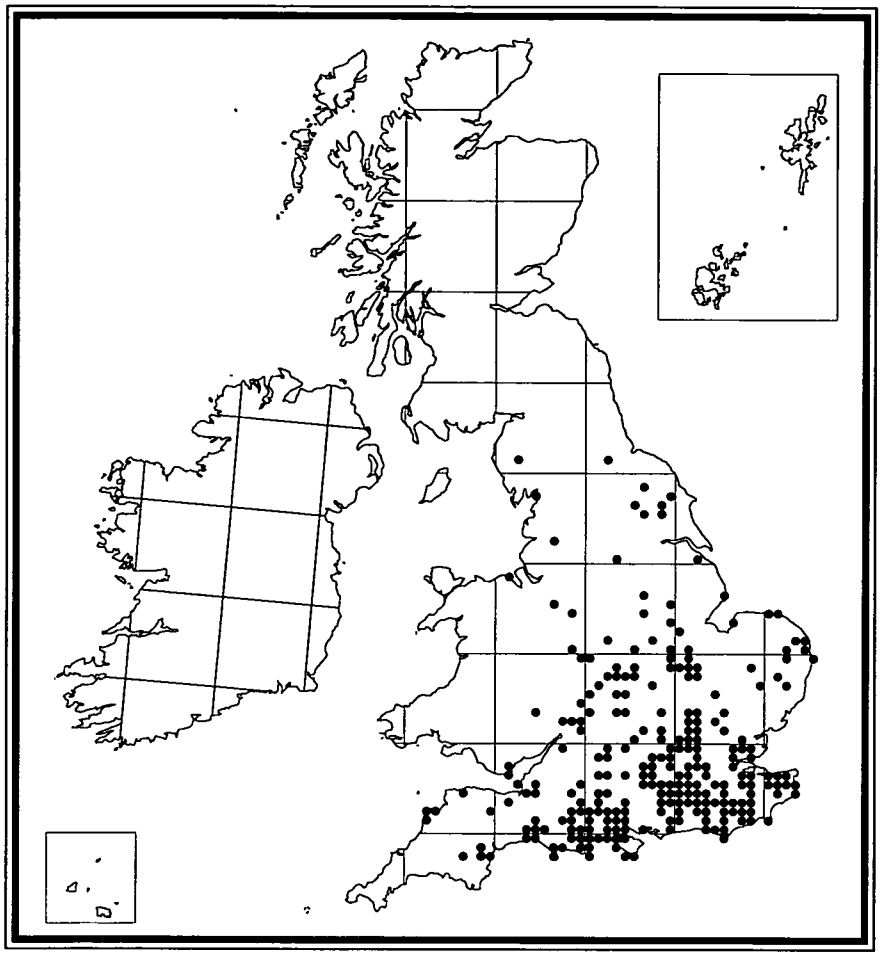
Virtually ubiquitous in lowland areas, though the majority of nest records are from private gardens, sometimes in large cities.

Flight period

No published records in Britain, but probably April–September.

Nesting biology

Nests of *D. media* are built in aerial sites, in nearly all cases suspended from the branches of trees and shrubs, from ground level to a height of several metres. The surrounding foliage usually hides a nest and protects it from rain and direct sunlight. A few nests have been found attached to the walls of houses; other nest sites include a lamp bracket and beneath the eaves of a caravan. Nests are constructed from wood fibres collected from both sound and apparently rotten timber (workers visit weathered fence posts for the purpose). In the spring and early summer, embryo (or queen) nests are unusual (for British wasps) in having a long, spout-like vestibule to the entrance at the bottom of the nest; this feature is lost later. Queens have been found hibernating in and under logs, perhaps indicating that this species prefers a humid site in which to spend the winter.



There is no evidence that this wasp is having an adverse effect on other British social wasps, but workers have decimated a honey bee hive (Whitehead 1996).

Flowers visited

In the spring, queens visit wall cotoneaster, black currant and rhododendron blossom. Later in the season, males and workers visit many other flowers. Workers also feed on honeydew on leaves, sap flows from oak trees ('oak flux'), and exudations from trees containing goat moth (*Cossus cossus*) caterpillars.

Map compiled by: M E Archer, G R Else and S P M Roberts.
Author of profile: G R Else.

Map 25 *Dolichovespula saxonica* (Fabricius, 1793)

[Vespidae: Vespinae]

Specimens of the 'Saxon wasp', the second species of social wasp to have recently colonised England are more difficult to identify in the field than its congener *D. media*. It is a very close relative of *D. norwegica* but lacks the pair of red spots on the second gastral tergum (but beware, these markings are also absent in some *D. norwegica*).

Distribution in Britain and Ireland

The first British record of this wasp was a male collected in the grounds of Juniper Hall Field Centre, near Dorking, Surrey, in July 1987 by G W Allen (in Hammond *et al.* 1989; Allen & Archer 1989). In 1990 the species was reported from Norfolk. Further specimens were encountered in West and East Sussex (including the first nests of this species to be found in Britain), and Norfolk in July and August 1991 (Colvin 1992). At the end of the 1995 season, the species occupied much of south-eastern England (see also Irwin 1991; Else 1993c). It is very likely to extend its range much further in Britain in the future. In some areas, it is locally common. For example, a house in Wotton, near Dorking, Surrey, in 1995, had two nests of this species under the eaves, another in a garden shed and possibly two others in the roof (J D Holloway, pers. comm.). In 1993, 22 nests were reported from the Royal Horticultural Society's gardens (about 100 ha) at Wisley, Surrey (A Halstead, pers. comm.) (the species was first found there in 1992, when two nests were discovered). Indeed, at Wisley it was the commonest wasp which nested there in 1993, far outnumbering *Vespula vulgaris*.

Status (in Britain only)

Not listed in the *Red Data Book*, but placed in the Insufficiently Known category (pRDBK) in Falk (1991). In view of the recent expansion of its range, this status should be revised.

Habitat

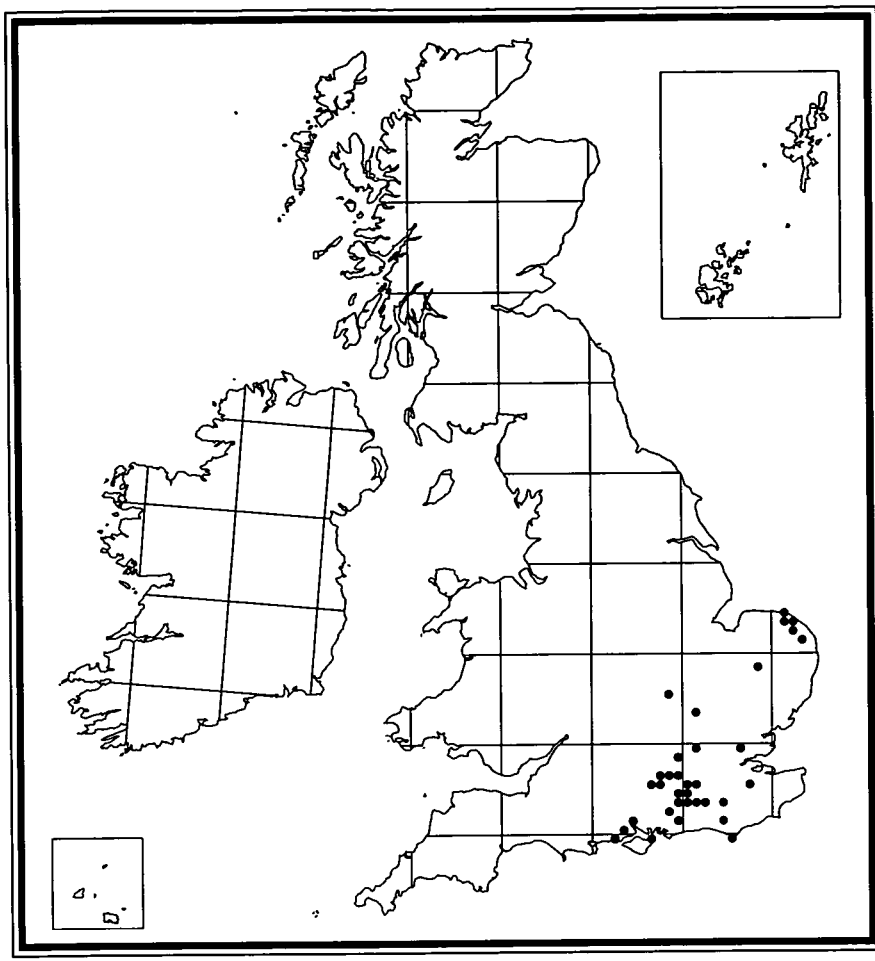
This wasp has been found in both urban and rural areas within south-east England. The species seems to be particularly widespread on heathlands in West Sussex and north Hampshire (M Edwards, pers. comm.).

Flight period

No published records in Britain, but probably April–August.

Nesting biology

Nests occur in aerial locations. There are records of them suspended from the branches of bushes, from beneath the eaves of houses (sometimes in quite built-up areas) (Colvin 1992), beneath rafters and roofs in barns and sheds, under a park



bench, on the sides of buildings, and in a cavity wall. The nest paper is generally pale grey, being built from fibres apparently collected from sound, weathered wood. The nest entrance usually has a thick, lip-like rim. A nest beneath the eaves of a house has been illustrated by Colvin (in Else 1991).

Flowers visited

In the spring, queens have been seen visiting the flowers of bilberry and, in the late summer, workers and males have been collected from wild angelica, wild parsnip and hogweed blossom.

Map compiled by: M E Archer, G R Else and S P M Roberts.
Author of profile: G R Else.

Map 26 *Crabro cribrarius* (Linnaeus, 1758)

[Sphecidae: Crabroninae]

Of the three species of *Crabro* which occur in Britain, *C. cribrarius* is the largest. Male *Crabro* can be readily distinguished from other medium-sized British and Irish sphecids by their conspicuous fore tibial shields.

Distribution in Britain and Ireland

A local species but widely distributed throughout much of Britain and the Channel Islands.

Status (in Britain only)

This species is not regarded as being threatened.

Habitat

This wasp is mainly associated with light, sandy soils, such as lowland heaths and coastal dunes and landslips. However, it is also encountered on heavier soils, being known, for example, from open woodland and chalk grassland.

Flight period

Apparently single-brooded; late June to mid-September.

Prey collected

Paralysed Diptera of the families Therevidae, Asilidae, Empidae, Syrphidae and the superfamily Muscoidea (Richards 1980).

Nesting biology

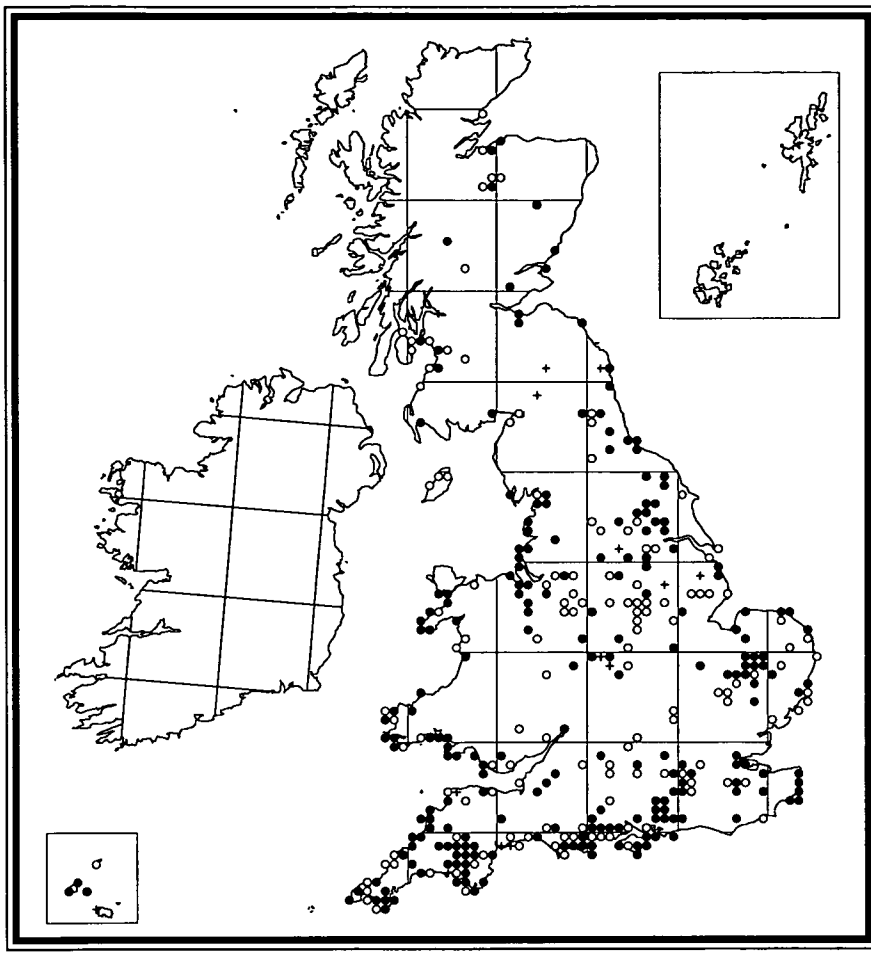
The nest burrows are excavated in the soil and extend for 15–20 cm. Each main burrow ends in a cell, and later two or three cells are constructed at the end of short, lateral branches (Lomholdt 1976). The cells are provisioned with five to eight flies (Lomholdt 1976).

Continental nests have also been found in decayed wood (Kohl 1915): indeed, British specimens of this wasp have occasionally been seen alighting on wood.

Flowers visited

This species mainly visits species of umbellifers (Apiaceae), including wild angelica, wild parsnip, hogweed and wild carrot. It also visits creeping thistle.

Map compiled by: M E Archer and S P M Roberts.
Author of profile: G R Else.



Map 27 *Crabro peltarius* (Schreber, 1784)

[Sphecidae: Crabroninae]

Distribution in Britain and Ireland

Locally common to abundant throughout much of Britain and Ireland.

Status (in Britain only)

This species is not regarded as being threatened.

Habitat

Mainly associated with light, sandy soils.

Flight period

Apparently single-brooded; late May to mid-August.

Prey collected

Prey consist of paralysed Diptera of the families Therevidae, Stratiomyidae and the superfamily Muscoidea (Richards 1980).

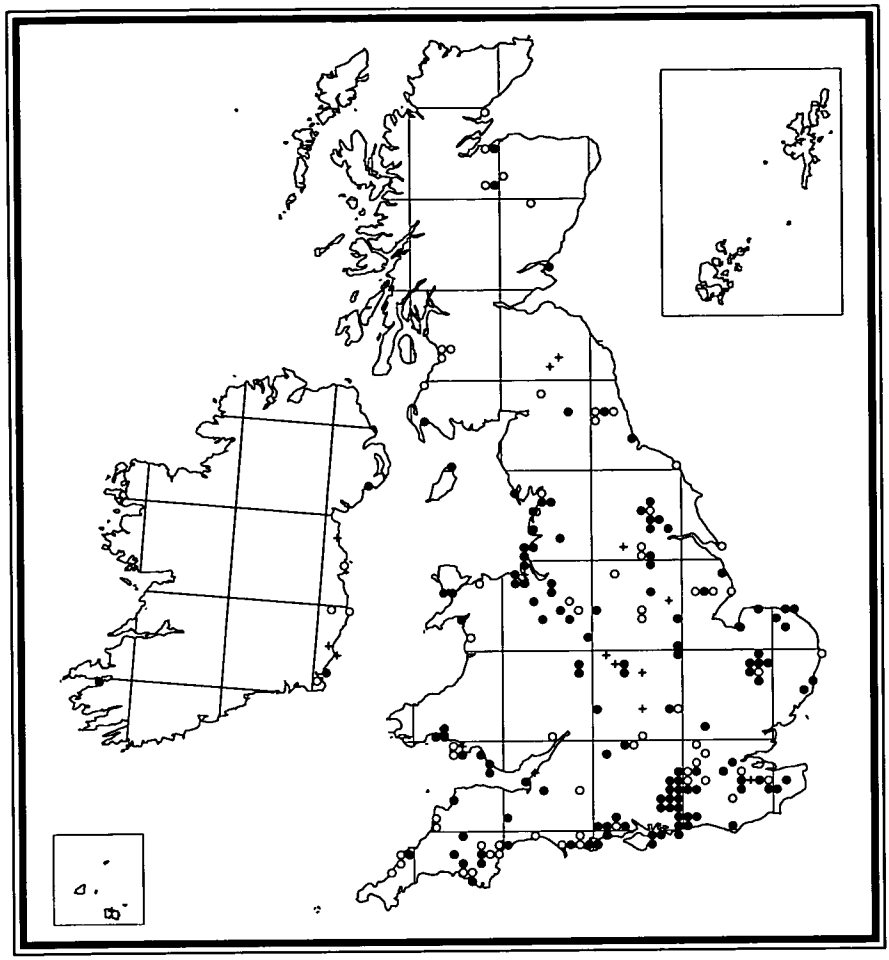
Nesting biology

The nest burrows are about 28 cm in length and are excavated in the soil. A nest consists of up to seven cells, each being provisioned with about nine flies (Lomholdt 1976).

Flowers visited

The species visits wild parsnip, hogweed and wild carrot, also creeping thistle.

Map compiled by: M E Archer and S P M Roberts.
Author of profile: G R Else.



Map 28 *Crabro scutellatus* (Scheven, 1781)

[Sphecidae: Crabroninae]

Distribution in Britain and Ireland

Restricted to southern England.

Status (in Britain only)

The species is listed as Nationally Notable (Na) in Falk (1991). Work for this *Atlas* has shown that it may not be as uncommon as was previously thought.

Habitat

Crabro scutellatus is a very local inhabitant of the diminishing lowland heaths of southern England, its range confined to suitable locations. Males are best sought as they fly around and settle on the foliage of trees and bushes within the habitat.

Flight period

The species flies from mid-June to mid-August.

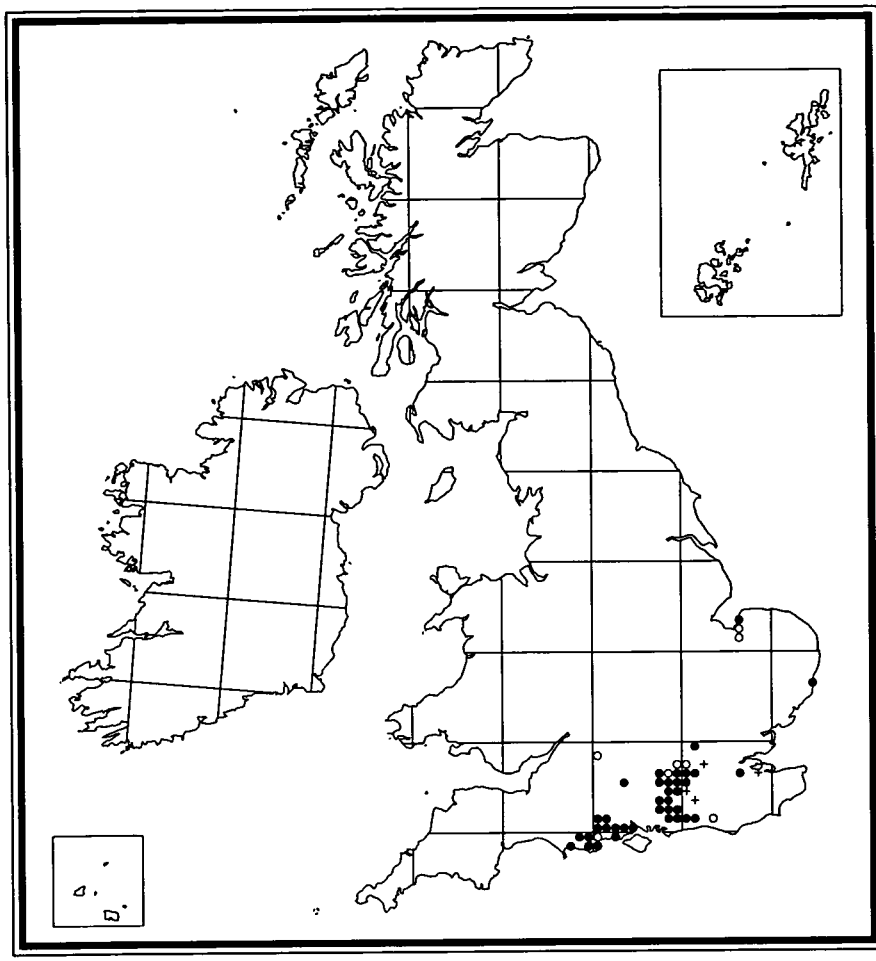
Prey collected

Adult Dolichopodidae (Diptera).

Nesting biology

Requirements are very narrowly defined, and are mainly associated with dry, sloping exposures adjacent to damp heathland and bogland, the habitat of its principal prey. In such areas the nest burrows often form small aggregations. Some nesting sites may be a considerable distance from a source of suitable flies.

Map compiled by: M E Archer and S P M Roberts.
Author of profile: G R Else.



Map 29 *Ectemnius borealis* (Zetterstedt, 1838)

[Sphecidae: Crabroninae]

The genus *Ectemnius* contains some of our larger and more colourful aculeates. All ten British species in this genus have black gasters which are boldly marked with yellow transverse bands or paired lateral spots. Most are locally distributed throughout much of southern England, the number of species and their degree of abundance decreasing northwards. Only three species are known from Ireland (Stelfox 1927) and a similar number from Scotland.

Distribution in Britain and Ireland

Ectemnius borealis has the most restricted range of all the British species in the genus, known only from western West Sussex and east Hampshire, north to the Surrey border.

The species was first recognised as British in 1972, when a short series was collected on Oxenbourne Down, a reserve of the Hampshire Wildlife Trust, a few kilometres south of Petersfield, Hampshire (Else 1974; where the species is cited under its junior synonym, *E. nigrinus*(Herrich-Schäffer)). Further specimens have been encountered there since that year, as well as a nest in a fallen, rotten tree trunk, from which a few individuals were subsequently reared. In 1975 a female was collected in a ride in the adjacent Queen Elizabeth Forest. At the time it was considered that the species may have represented a very recent arrival in England, but this was proved not to be the case as, in 1980, a specimen was shown to G R Else which had been provisionally identified by G M Spooner, on behalf of K M White. The identification was confirmed, and the record was later published (White 1982). This specimen was collected by K M White from a wooden post near Botley, Hampshire, on 14 June 1938. It was flying with the first-known British specimens of the eumenid wasp *Microdynerus exilis*(Herrich-Schäffer).

Status (in Britain only)

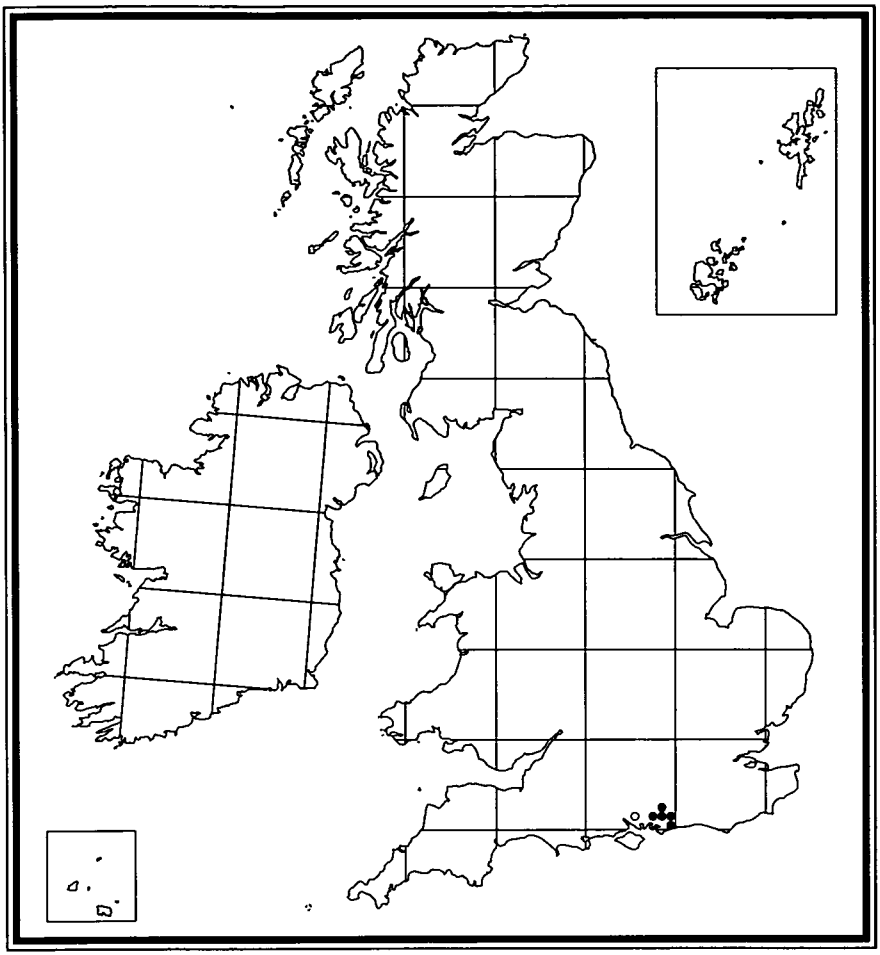
Listed as Rare (RDB3) in Shirt (1987) and Falk (1991).

Flight period

Mid-June to late September. It is presumed to be univoltine, though in Europe Haeseler (1972) showed that it could have two generations a year in favourable sites.

Nesting biology

The biology of this wasp is little known, though nests are built in burrows in dead wood and, presumably, are provisioned with Diptera. Aerts (1955) has also recorded the species nesting in a bramble stem.



Flowers visited
In common with many sphecid wasps, it is attracted to umbellifer (Apiaceae) blossom.

Map compiled by: M E Archer and S P M Roberts.
Author of profile: G R Else.

Map 30 *Ectemnius cavifrons* (Thomson, 1870)

[Sphecidae: Crabroninae]

Ectemnius cavifrons is one of the largest and most common species of its genus in Britain.

Distribution in Britain and Ireland

The map illustrates that this wasp is found throughout much of southern England, Wales and the Channel Islands (Guernsey (Luff 1895; Saunders 1902), Alderney, Sark and Jersey). It also occurs on the Isle of Man. In Scotland the species is known only from the south-east: Lothian Region (Edinburgh). The known Irish distribution is mainly concentrated along the eastern seaboard.

The species is probably under-recorded in many areas, but its basic range is nevertheless evident from the map. It is notable that recent records demonstrate a northwards spread, not only of *E. cavifrons* but also of some other *Ectemnius* species.

Status (in Britain only)

This species is not regarded as being threatened.

Flight period

June–October. In some seasons there may be two broods.

Prey collected

Usually adult hoverflies (Diptera, Syrphidae).

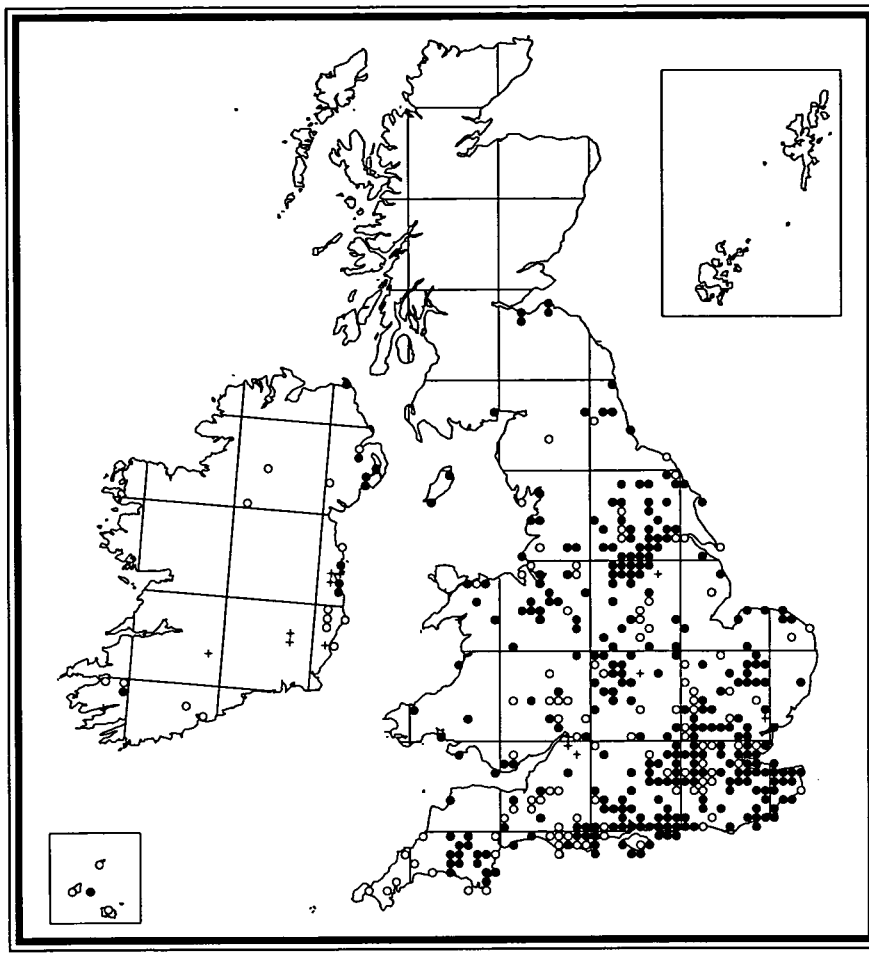
Nesting biology

Ectemnius cavifrons nests in burrows in decaying wood. Aspects of its nesting biology are summarised by Hamm and Richards (1926). Burrows may be excavated by the female, although use of existing burrows of other insects has also been recorded. Burrows are often branched, and may contain as many as 14 cells, each provisioned with 6–12 flies.

Flowers visited

Various species of umbellifers (Apiaceae). Honeydew on leaves is also taken.

Map compiled by: M E Archer and S P M Roberts.
Authors of profile: G R Else and J P Field.



Map 31 *Oxybelus argentatus* Curtis, 1833

[Sphecidae: Crabroninae]

Three species of *Oxybelus* occur in the British Isles. These wasps are superficially very similar to one another (in some localities – eg the Gower, West Glamorgan – they may all fly together). They are rather small, active wasps (body length 5–9 mm) with the body predominantly black with some or all of the abdominal terga marked with a pair of pale yellow or white spots. The female of *O. argentatus* is perhaps the most attractive of the three, its abdomen clothed with rather dense, decumbent, silvery hairs.

Distribution in Britain and Ireland

This species occurs very locally both on the coast (especially on duneland) and on inland heaths in southern England and west Wales. Records for Ireland are from the south-east (the Wexford coast (Stelfox 1933)). It is also known from Jersey.

Status (in Britain only)

Listed in Falk (1991) as Nationally Notable (Na). Atlas work has revealed the species to be well established in most of its historic localities.

Flight period

Late June to the end of August.

Prey collected

Family Therevidae (Diptera).

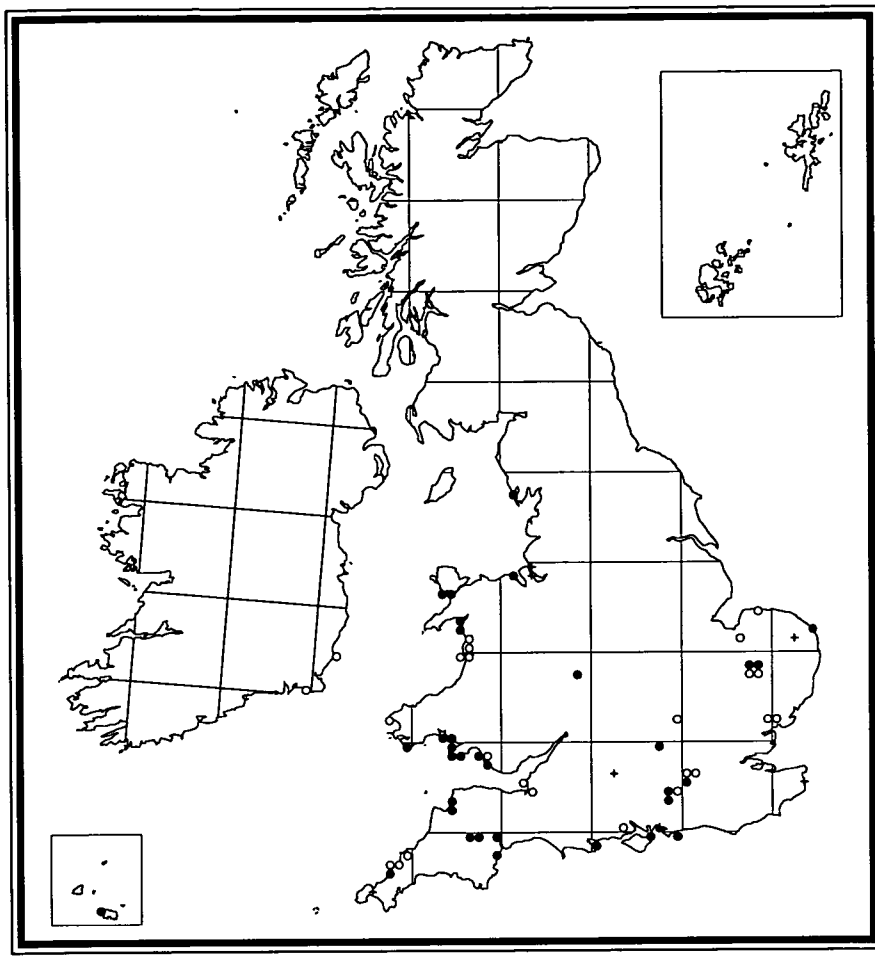
Nesting biology

Very little is known of the nesting behaviour of *O. argentatus*, except that females provision their nests with dipterans, particularly therevids (often *Acrosathe annulata*; formerly referred to as *Thereva annulata*), which are carried impaled on the sting (described and illustrated by Olberg 1959). Other aspects of its biology are likely to be broadly similar to *O. uniglumis*, qv. Some observations on the nesting habits of *O. argentatus* are given by Boreham (1956b).

Flowers visited

On coastal sand dunes it frequently visits sea spurge and thistle flowers. On an inland Hampshire heath both sexes have been found visiting biting stonecrop.

Map compiled by: M E Archer and S P M Roberts.
Authors of profile: G R Else and J P Field.



Map 32 **Oxybelus mandibularis** Dahlbom, 1845

[Sphecidae: Crabroninae]

See *Oxybelus uniglumis* for general notes on this species.

Distribution in Britain and Ireland

A very local wasp, confined to southern England and west Wales, with a similar distribution to *O. argentatus*. There are no records of it from Ireland or the Channel Islands, although it does occur on the Isle of Man.

Status (in Britain only)

The species is provisionally listed as Rare (pRDB3) in Falk (1991). Recent evidence suggests that it may only be scarce.

Habitat

The species is found in similar sites to *O. argentatus*, occurring both on the coast and on dry, inland heaths.

Flight period

End of June to late August.

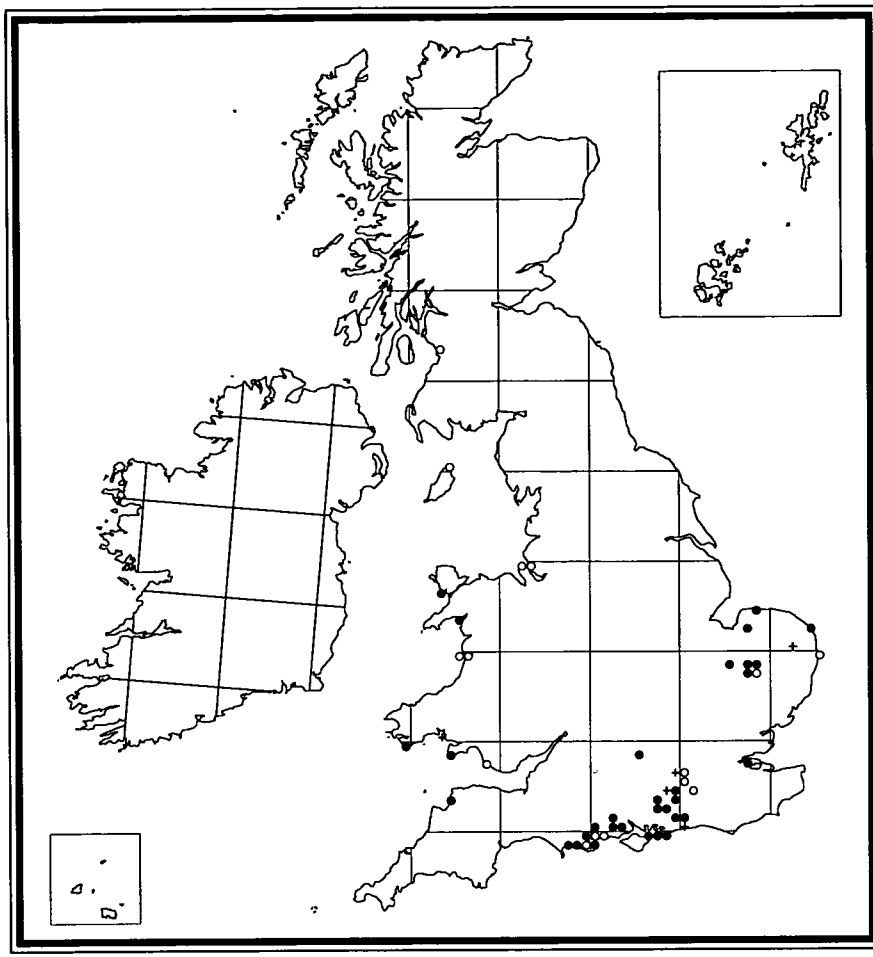
Prey collected

Diptera from the families Muscidae, Sarcophagidae and Tachinidae.

Nesting biology

Little appears to be known of its nesting behaviour, but it is likely to be broadly similar to *O. uniglumis*. In Fennoscandia, nests are provisioned with adult Diptera; each cell containing four to six flies (Lomholdt 1976).

Map compiled by: M E Archer and S P M Roberts.
Authors of profile: G R Else and J P Field.



Map 33 *Oxybelus uniglumis* (Linnaeus, 1758)

[Sphecidae: Crabroninae]

This is the most common of our *Oxybelus* species.

Distribution in Britain and Ireland

Widely distributed in England, but rare in southern Scotland and sporadic in Ireland, where it seems to occur on or near the coast. The map illustrates a species which is grossly under-recorded.

Status (in Britain only)

This species is not regarded as being threatened.

Habitat

Usually associated with open patches of bare, loose sand (it has even been observed in sand bunkers on a golf course). It also occurs on heavier soils, for example in open woodland.

Flight period

The species is univoltine, flying from early June to mid-September.

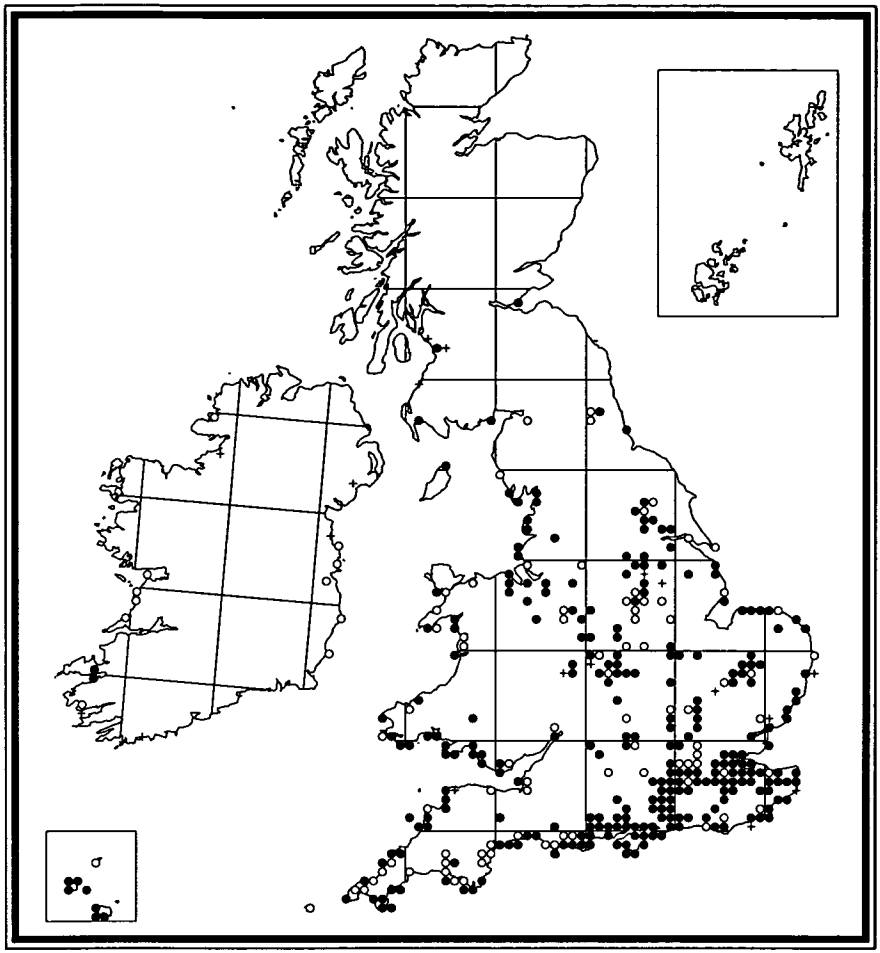
Prey collected

Diptera, mostly muscids.

Nesting biology

Many observations have been made on the nesting behaviour of this species (Hamm & Richards 1930; Boreham 1956a; Peckham, Kurczewski & Peckham 1973; Peckham & Hook 1980). The following observations were made by J P Field at a small sandpit on the edge of Sunningdale Golf Course, Surrey. The wasp burrows in flat or sloping (not vertical), bare, sandy soil. The oblique burrows are 2–12 cm long and take about two hours to dig. At the end of digging, the female quickly closes her nest by scraping sand into the entrance, and begins hunting. Prey is captured in mid-air and on vegetation, and stung once in the thorax behind a front leg base (Steiner 1979). Females fly to a spot near the nest with the prey carried under the body; then the prey is impaled on the sting for the last metre or two (very unusual in solitary wasps). Nest provisioning is described and illustrated by Olberg (1959).

Each cell is provisioned with 2–16 paralysed flies, the number depending partly on their size. Provisioning a cell takes about 90 minutes. After taking the last fly in, the female arranges the flies in the cell, oviposits on them, then digs the next cell. There are usually two or three cells in a nest. The most successful females can provision 34 cells in a day.



Parasites

Females of the parasitic miltogrammine fly *Senotainia conica* wait close to *Oxybelus* nests, continually looking in different directions for arriving wasps. The *Senotainia* runs into the nest behind the *Oxybelus* then flies out a second later, probably after depositing a single maggot directly on to the impaled fly. The maggot destroys the *Oxybelus* egg then feeds on the prey. Two other British miltogrammines, both *Metopia* species, may also be seen. The females larviposit into open aculeate burrows instead of following provisioning females. *Oxybelus* nests are protected by being closed whenever the female is away hunting, so the only opportunity a *Metopia* has is during the few seconds between the wasp entering with a fly and leaving again.

Map compiled by: M E Archer and S P M Roberts.
Authors of profile: G R Else and J P Field.

Map 34 *Ammophila pubescens* (Curtis, 1836)

[Sphecidae: Sphecinae]

This is a very close relative of *Ammophila sabulosa*; in many of its sites it flies with its congener, and may be locally abundant.

Distribution in Britain and Ireland

Restricted mainly to the southern counties of England, with most records from West Sussex, Hampshire, east Dorset, Berkshire and Surrey. Has also occurred in west Wales, Oxfordshire, east Kent, Suffolk, Worcestershire, Nottinghamshire, and Lancashire, also Jersey (Saunders 1902).

Status (in Britain only)

Not listed in the *Red Data Book* (Shirt 1987) or in Falk (1991). In view of its restricted distribution and dependence on a threatened habitat, this wasp may now be under threat.

Habitat

Dry heathlands. In Jersey, it occurs on coastal dunes.

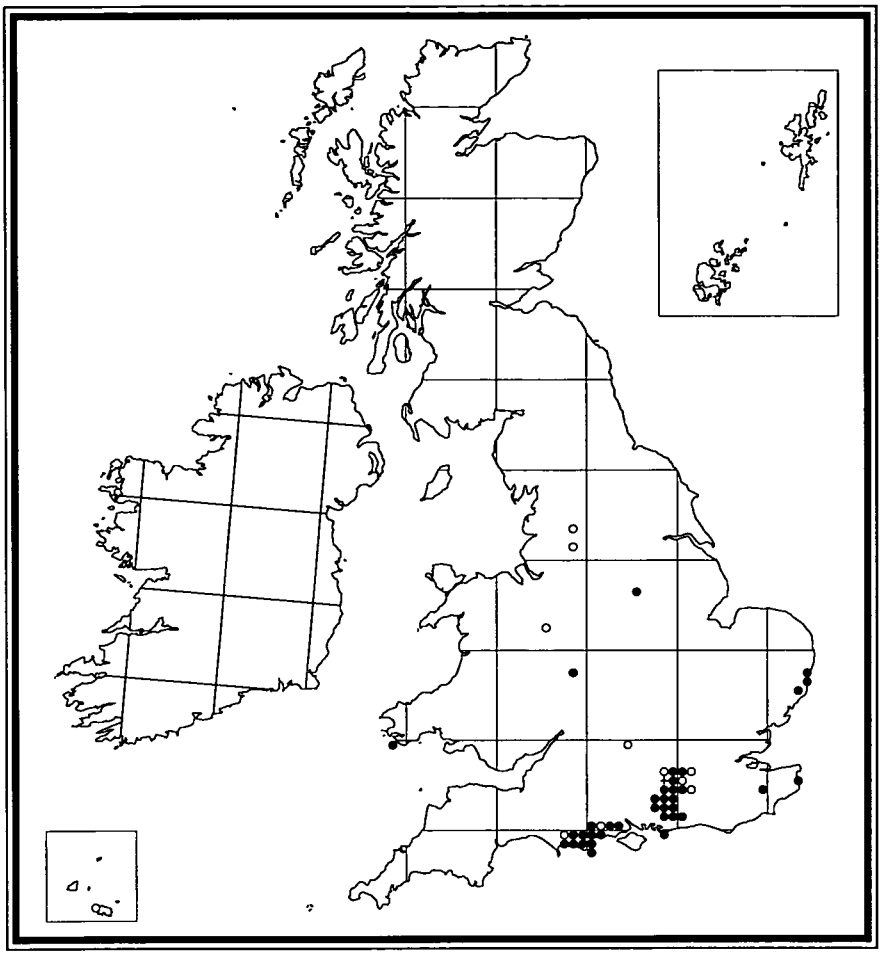
Prey collected

Usually larvae of Lepidoptera; rarely those of sawflies (Symphyta).

Nesting biology

Unlike *A. sabulosa*, this is one of several *Ammophila* species known to provision its cells progressively and maintain more than one nest simultaneously. It was the subject of one of the classic early studies of animal behaviour in The Netherlands (see Baerends 1941; Tinbergen 1958 – the species was then misidentified as *A. campestris*). Nests are short, unicellular burrows dug in the sand, and often occur in aggregations. Each is provisioned with about six larvae. As in *A. sabulosa*, the first caterpillar is carried into the cell and oviposited on. However, instead of completing the provisioning of this first nest before the egg hatched, Baerends found that typically a female would next dig a second burrow, provision it with one caterpillar, and oviposit. She would then re-open the first burrow and, if her inspection revealed that its egg had hatched, would proceed to add one to three further prey for the developing wasp larva. The second burrow would then be inspected and further provisioned. Finally, each burrow would be inspected again, and three to seven further prey added, before final closure and the digging of new burrows. Occasionally, a third burrow would be dug before the first two had been provisioned. See Olberg (1959) for additional text and illustrations.

The observations above indicate that a female is capable of remembering the locations of two or three separate nests simultaneously. Baerends used ingenious



experiments to show that females use landmarks to learn the location of each nest. Artificial trees were placed near the nesting area and left until the wasps had learned to use them as landmarks. When a tree was experimentally moved, say 5 m to the west, then the wasp searched for its nest 5 m west of its real position. It thus appeared to locate its nest from the nest's position relative to the landmark. These experiments, together with others using artificial nests, partly explained how a female could achieve the incredible feat of caring for two or three nests simultaneously, each at a different stage of development and therefore requiring different amounts of food.

Flowers visited

Mainly bramble, heather and bell heather.

Map compiled by: M E Archer and S P M Roberts.
Authors of profile: G R Else and J P Field.

Map 35 *Ammophila sabulosa* (Linnaeus, 1758)

[Sphecidae: Sphecinae]

This is a conspicuous and relatively large solitary species.

Distribution in Britain and Ireland

Found throughout much of Britain, though more often seen in southern England. Of special note are the Scottish records; also, the limited distribution of the species in Ireland, which may not be entirely a result of under-recording in that country.

Status (in Britain only)

This species is not regarded as being threatened.

Habitat

This wasp inhabits heathland, dunes and other coastal areas.

Flight period

June–September.

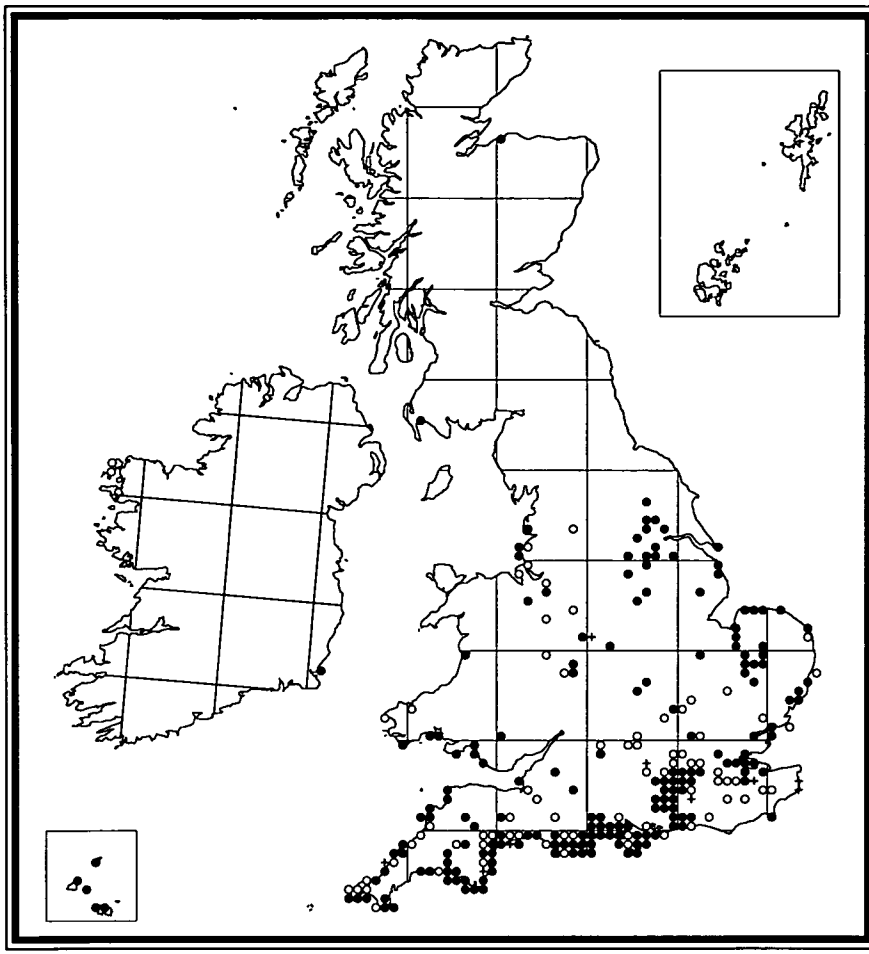
Prey collected

Various Lepidoptera larvae; rarely sawfly larvae (Richards 1980).

Nesting biology

A detailed study of the behaviour and ecology of marked *A. sabulosa* females has been made at a Breckland heathland site (Field 1992). Nests usually occur at relatively low densities. Normally, a female digs a short burrow, ending in a horizontal cell, in bare or sparsely vegetated sand. Later, she temporarily closes the nest entrance using sand and tiny stones, then hunts for lepidopteran caterpillars in vegetation. About half of all cells are provisioned with just one large caterpillar, which is carried back on foot as it is sometimes more than ten times as heavy as the wasp. Other cells are provisioned with two to five smaller caterpillars (see Olberg 1959).

An egg is laid on the first caterpillar provisioned and rarely hatches before permanent closure of the nest burrow. After the last caterpillar has been interred the wasp permanently closes the burrow with a much deeper plug of sand, and camouflages the entrance with debris so that it is invisible to the human eye. All nests are unicellular. The whole nesting cycle, from searching for a digging site to closing the nest permanently after provisioning, takes an average of eight to ten hours of activity. Marked females each dug and provisioned up to ten nests during a summer.



Parasites

One of the most interesting aspects of this species' behaviour is that almost all females, as well as digging their own burrows and hunting for prey, parasitise the freshly provisioned nests of other *A. sabulosa.* When a female detects a conspecific's nest she digs through the closure plug and enters. If the nest is empty, she quickly comes out and re-closes it; but if it contains prey, she either steals one of the prey items, or eats the host's egg, replacing it with her own (brood-parasitism). Some 28% of eggs laid in their own nests are later destroyed by conspecific brood-parasites and prey thieves. Some nests are brood-parasitised up to four times, each time by a different female. Miltogrammine flies (*Metopia* spp.) destroy another 5% of *A. sabulosa* eggs, so that overall only about two-thirds survive to hatch.

Map compiled by: M E Archer and S P M Roberts.
Author of profile: J P Field.

Map 36 *Podalonia affinis* (Kirby, W., 1798)

[Sphecidae: Sphecinae]

Distribution in Britain and Ireland

A very local species, being mainly restricted to south-east England; there are also a few records from Dorset, Lincolnshire, South Yorkshire and Merseyside. In Ireland, it is found in coastal sites in Wicklow and Wexford. On the Channel Islands it is known from Herm (Luff 1905b), Alderney, Guernsey, Sark and Jersey.

Status (in Britain only)

Listed as Rare (RDB3) in Shirt (1987) and Falk (1991). Recent work indicates that it may be more widespread than previously thought.

Habitat

Most British sites are coastal (especially duneland); inland habitat invariably consists of dry heathland.

Flight period

Females fly from the end of May to late September; males from late June to August.

Prey collected

Principally large noctuid caterpillars; sometimes the smaller larvae of the noctuid *Eremobia ochroleuca* (the dusky sallow moth).

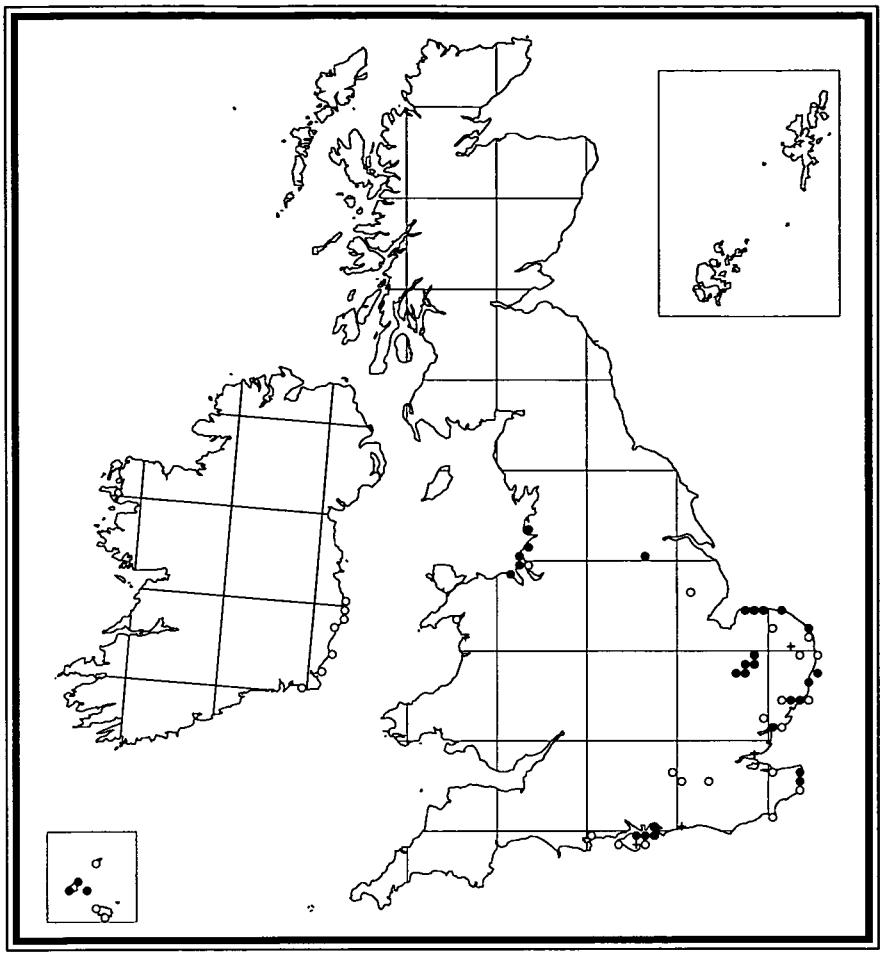
Nesting biology

Essentially very similar to that of *P. hirsuta* (Richards 1980; Palmer & Stelfox 1931; Olberg 1959).

Field (1993) found that females sometimes dig their burrows before prey capture (once five days before), and sometimes after, in the latter case leaving prey in a grass tuft during digging. The owner of one of the nests was seen stealing an *Eremobia* larva from an *A. sabulosa* nest, and another *Podalonia* female opened a second *Ammophila* nest but found that it was empty. Prey was also stolen from two *Podalonia* nests, but the species of thief involved is unknown. Larvae in three of Field's nests provisioned in July spun cocoons which overwintered to produce females in the second half of June of the next year. Two others produced males in August of the same year as the provisioning, suggesting that there may be a partial second generation.

Flowers visited

Bramble and hemlock water-dropwort, among others.



Parasites

Podalonia nests are sometimes brood-parasitised by *Ammophila* species – the prey is not stolen, but, instead, the original egg is chewed off the prey and replaced with an *Ammophila* egg.

Miltogrammine fly maggots (probably all *Metopia* species – one *M. campestris* was reared) had destroyed four to six of the eggs from 14 nests excavated by Field. In one bizarre case, a fly larviposited on to prey while it was left lying outside a nest during a long fight between two *Podalonia* females.

Map compiled by: M E Archer and S P M Roberts.
Authors of profile: G R Else and J P Field.

Map 37 *Podalonia hirsuta* (Scopoli, 1763)

[Sphecidae: Sphecinae]

Distribution in Britain and Ireland

The range of *P. hirsuta* extends along the southern and western coasts from West Sussex to Lancashire. There are also a few scattered inland localities. An apparently separate population is found on the Norfolk coast. Its range may overlap with that of *P. affinis*. The species is also present on Guernsey (Luff 1904, 1905a) and Jersey, but on the latter it is difficult to distinguish from the very similar *P. luffii* (a species not known from mainland Britain).

Status (in Britain only)

Listed in Falk (1991) as Nationally Notable (Nb).

Habitat

A mainly coastal species and one which is often locally common on sandy soils.

Flight period

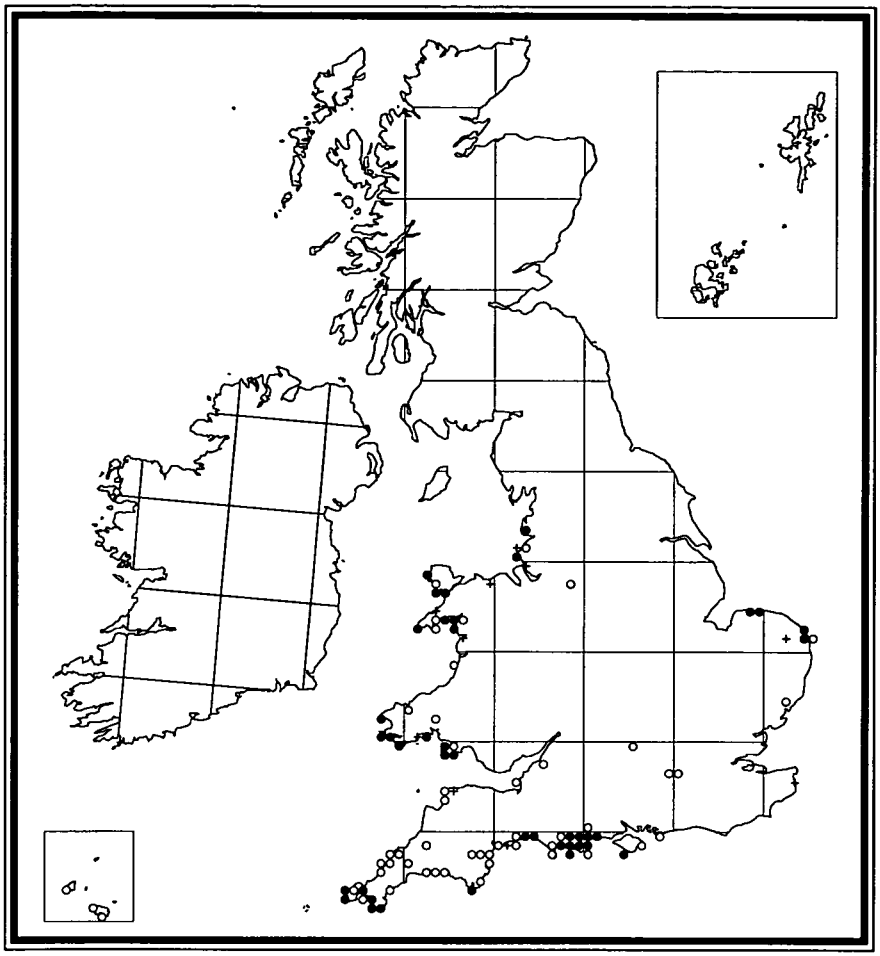
Females fly from late March to mid-September, males from the end of June to the beginning of September. Maneval (1939) showed that females (but not males) overwinter as adults, presumably after mating. Autumnal clusters of up to several hundred females have sometimes been found in rock crevices and other protected situations in continental Europe. Given the long flight period, it would be interesting to know whether the offspring of overwintering females themselves overwinter without nesting, as in the pompilid *Anoplius viaticus*, or whether some of them nest to produce a second generation which overwinters.

Prey collected

As in most *Podalonia* species, many of the prey of *P. hirsuta* are large, naked 'cutworm' noctuid larvae which spend daylight hours in underground burrows and therefore have to be dug out by the female wasp. Diurnally active prey species have also been recorded, however, including some that are hairy.

Nesting biology

In most *Podalonia* species, including *P. hirsuta*, the prey is generally captured before nest construction, whereas in *Ammophila* this sequence is usually reversed, though there are exceptions to this generalisation in both genera (see under *P. affinis*). The unicellular nest is invariably provisioned with one large caterpillar, whereas more than one is often used by *Ammophila*. While the wasp is digging her burrow, the paralysed caterpillar is typically left in a small tuft of vegetation, which probably reduces the risk of it being discovered by predators, such as ants, or of desiccating on the hot sand. The burrow is oblique and 6–7 cm long. When it is complete, the prey is pulled into the cell, oviposited on, then



the nest entrance closed using sand and debris. Steiner (1975) reports that females commonly open other females' nests and carry off their prey, as also occurs in *Ammophila.*

Flowers visited

Bramble, willow and thyme.

Parasites

Bougy (1935) records a species of *Hilarella* (Diptera: Miltogramminae) parasitising *P. hirsuta* in continental Europe.

Map compiled by: M E Archer and S P M Roberts.
Authors of profile: G R Else and J P Field.

Map 38 *Cerceris arenaria* (Linnaeus, 1758)

[Sphecidae: Philanthinae]

Ecological studies in the Norfolk Brecklands (Field & Foster 1995; Willmer 1985a,b) and Europe (Hamm & Richards 1930) make this one of the best-known British aculeates.

Distribution in Britain and Ireland

A locally common and very widely distributed species throughout much of southern Britain. It also occurs on the larger Channel Islands.

Status (in Britain only)

This species is not regarded as being threatened.

Habitat

This wasp is associated with sandy soils and can be locally common to abundant on inland heaths and commons, and on the coast (especially dunes and landslips).

Flight period

In Britain the species is univoltine, and in the south is typically active from the end of June/early July until mid- to late August.

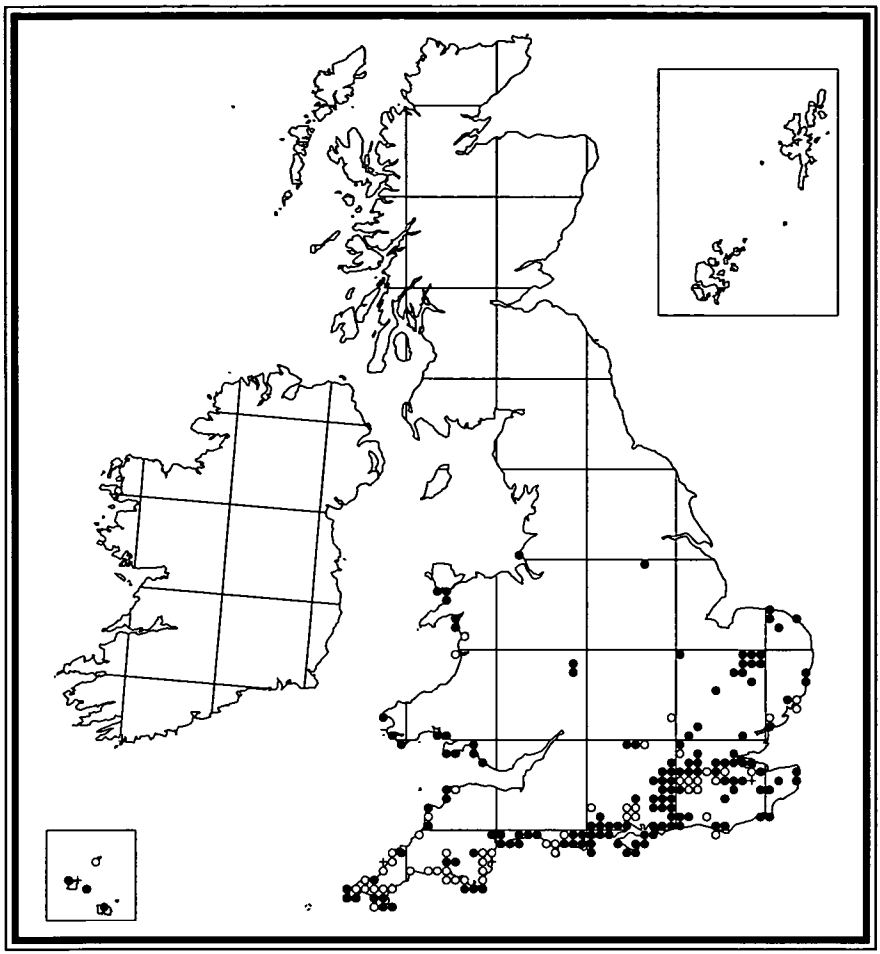
Prey collected

Adult weevils (Curculionidae), particularly *Otiorhynchus* and *Strophosomus* in Britain. Other beetle families have been recorded elsewhere (Lomholdt 1976).

Nesting biology

Nests are deep burrows dug in the soil, from which side-tunnels radiate leading to cells at depths of 20–25 cm. In sandy areas, dense aggregations containing thousands of nests may form. Each cell is provisioned with 3–14 prey, the number depending on prey size and sex of offspring. A colony of 1000 nests must cull around 100 000 weevils each year (Willmer 1985a). Paralysed weevils are carried in flight, and are probably stored temporarily somewhere in the burrow until enough have been accumulated to fill a cell. The prey are then moved into a cell and an egg laid on one of them.

Nests are left open and unoccupied through most of the day, and nest-less 'searcher' females often usurp them. Some searchers, on entering a nest, immediately close it at the entrance with a plug of soil: when the owner returns, she tries to dig through the closure, but sometimes fails to do so. The old owner then becomes a searcher, and has to find another female's nest to usurp, or occasionally that of a different species, such as the bee *Dasypoda altercator*. Some 10–15% of nests are usurped each day, each nest being sequentially occupied by



many different females. Usurpers are not always successful, however, and may be evicted or killed by the owner (Field & Foster 1995).

Flowers visited

On hot days, females visit flowers (eg white melilot), more for water than sugars.

Parasites

In the Brecklands, *C. arenaria* cells rarely appear to be parasitised by chrysidid wasps or miltogrammine flies (Field & Foster 1995). Elsewhere, the chrysidid, *Hedychrum niemelai*, is a cleptoparasite.

Map compiled by: M E Archer and S P M Roberts.
Authors of profile: G R Else and J P Field.

Map 39 *Cerceris quadricincta* (Panzer, 1799)

[Sphecidae: Philanthinae]

Distribution

A very rare wasp, with records from Essex and Kent only. However, it is encouraging to note that there have been a number of recent records from Kent.

Status (in Britain only)

Currently listed as Endangered (RDB1) in Shirt (1987) and Falk (1991).

Habitat

The species is apparently associated with light, sandy soils in which it excavates its nesting burrows. For example, G H L Dicker (pers. comm.) found specimens flying over exposed sand at the training area of the Royal School of Military Engineering at Upnor, Kent, between 1977 and 1984.

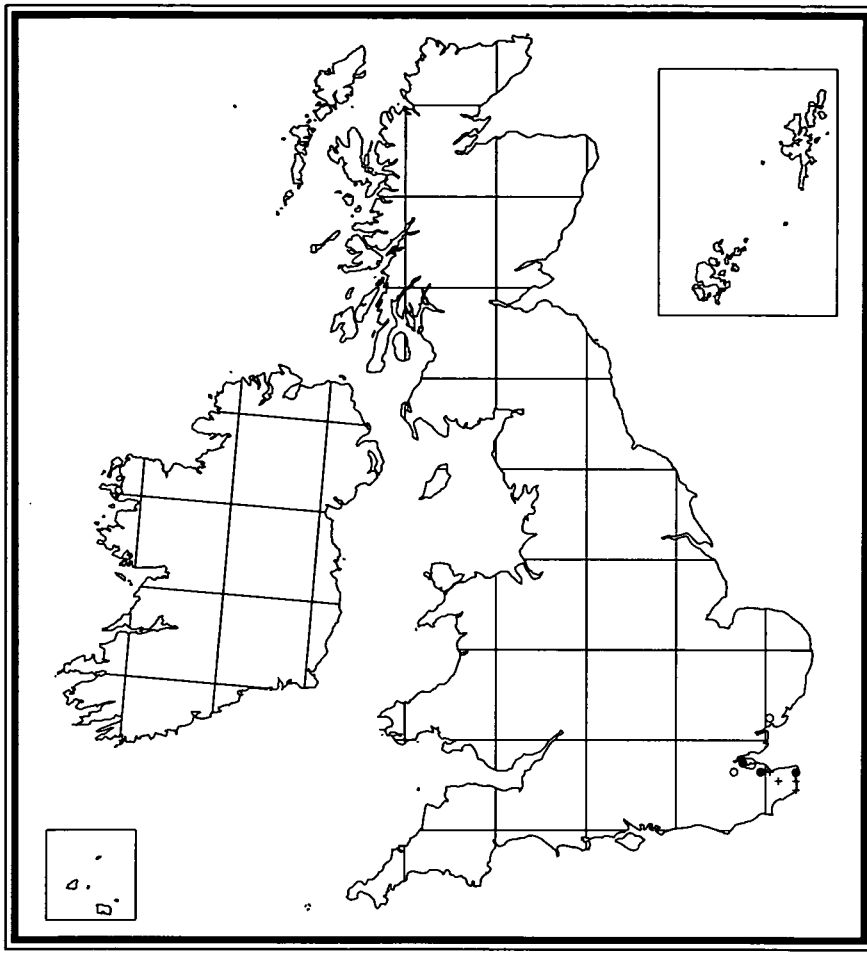
Flight period

Single-brooded; mid-July to mid-September.

Nesting biology

Apparently not known. The cells are provisioned with weevils (Richards 1980). Falk (1991) erroneously listed, under the name *Cerceris quadricincta*, prey records cited by Lomholdt (1976) for *C. quadrifasciata*, a species not known from the British Isles.

Map compiled by: M E Archer and S P M Roberts.
Author of profile: G R Else.



Map 40 *Cerceris quinquefasciata* (Rossi, 1792)

[Sphecidae: Philanthinae]

This species is a very close relative of *C. ruficornis* and care is necessary to distinguish between them, particularly when identifying males.

Distribution in Britain and Ireland

Although widely distributed in southern England (especially in the south-east), this is a rare species. The majority of records are old, the most recent including individuals collected in Kent, Essex, Suffolk, Norfolk and Oxfordshire.

Where found, this wasp may be quite common; for example, O W Richards collected a long series at Studland cliffs towards Old Harry Rocks, Dorset, in July 1939 (specimens in the Natural History Museum, London).

Status (in Britain only)

Listed as Rare (RDB3) in Shirt (1987) and Falk (1991).

Flight period

The species flies from mid-July to late August.

Prey collected

Small curculionid beetles.

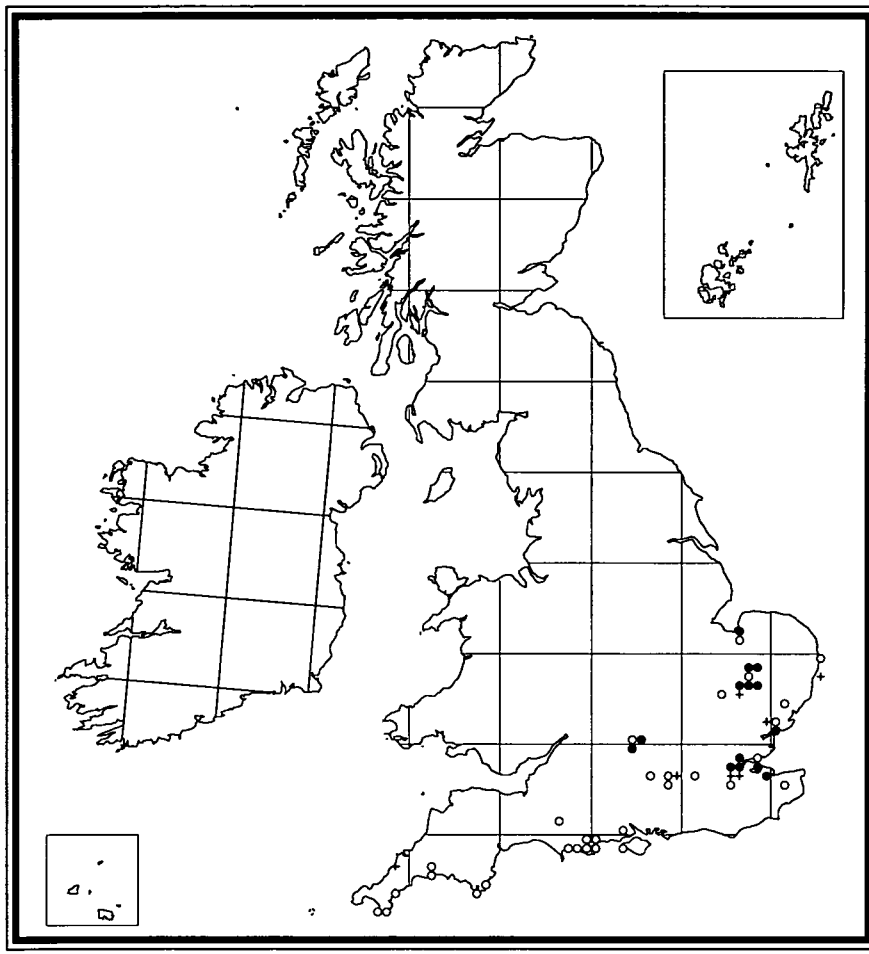
Nesting biology

The biology of this species is much less well known than that of *C. arenaria,* but is likely to be very similar. Nests are often aggregated and tend to occur in relatively hard sandy soil, such as paths (Hamm & Richards 1930). Prey is again primarily weevils, but generally smaller species (eg *Apion, Sitona*), so that each cell often contains 50 or more specimens, there being up to ten cells per nest (Grandi in Lomholdt 1976).

Flowers visited

Bramble and creeping thistle.

Map compiled by: M E Archer and S P M Roberts.
Authors of profile: G R Else and J P Field.



Map 41 *Cerceris ruficornis* (Fabricius, 1793)

[Sphecidae: Philanthinae]

Distribution in Britain and Ireland

In Britain, the range extends from east Kent to west Cornwall, and in the east, northwards to Lincolnshire (where it is rare). It is also present on the larger Channel Islands.

Status (in Britain only)

Not listed in Shirt (1987) or Falk (1991). The restricted distribution and its precise habitat requirements suggest that it may be under threat.

Habitat

This wasp is sometimes locally common on sandy heathland in southern England (there are numerous records from coastal heaths in Cornwall). Other biotopes, such as coastal cliffs, are occasionally utilised.

Flight period

The species is active from mid-June to late September.

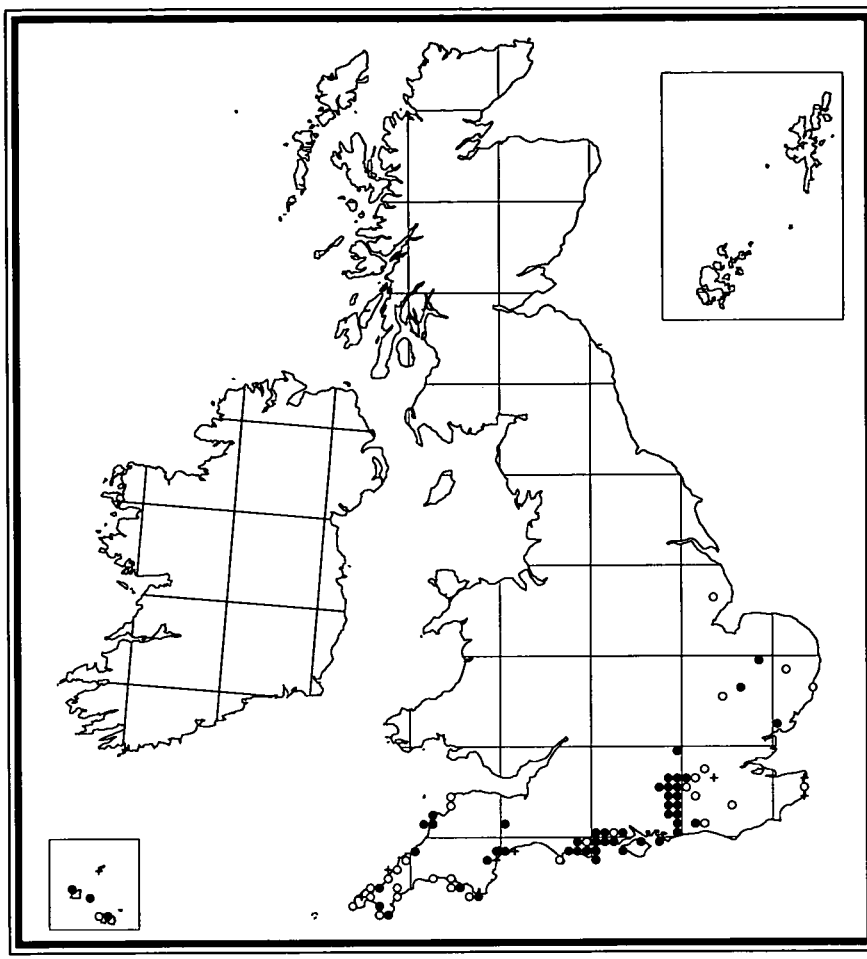
Prey collected

As in *C. arenaria, C. ruficornis* also preys mainly on adult curculionids, with occasional beetles of other families such as Chrysomelidae (Hamm & Richards 1930; Lomholdt 1976). The unusual shape of the female clypeus (a projecting, down-curved flange) is likely to be associated with the method of carrying the prey.

Nesting biology

On heaths, specimens are generally encountered singly as they fly low over the vegetation. Very little appears to be known of the biology of this species, as nests are rarely found. Although it is likely to be broadly similar to *C. arenaria*, it seems not to nest gregariously in the manner of that species or *C. rybyensis*.

Map compiled by: M E Archer and S P M Roberts.
Authors of profile: G R Else and J P Field.



Map 42 **Cerceris rybyensis** (Linnaeus, 1771)

[Sphecidae: Philanthinae]

Cerceris arenaria and *C. rybyensis* are the most common and most widely distributed species in their genus in Britain.

Distribution in Britain and Ireland

Often locally common in southern England, though, surprisingly, there appear to be no confirmed records from Wales. *C. rybyensis* also occurs in the Channel Islands and there is an unconfirmed record from south-west Scotland (Ayr (Richards 1980)). In the collection of the Natural History Museum, London, there is a male of this species labelled 'Barons Court, Ireland' and collected on 18 July 1968 by F Wilson. This record is presumed to refer to Baronscourt in county Tyrone, and not to Baroncourt in county Tipperary.

Status (in Britain only)

This species is not regarded as being threatened.

Habitat

Commonly associated with sandy soils, both on the coast and inland, and often nesting together with *C. arenaria*. It may also be associated with chalk grassland and heavier soils. An unusual record is from a suburban garden in Greater London.

Flight period

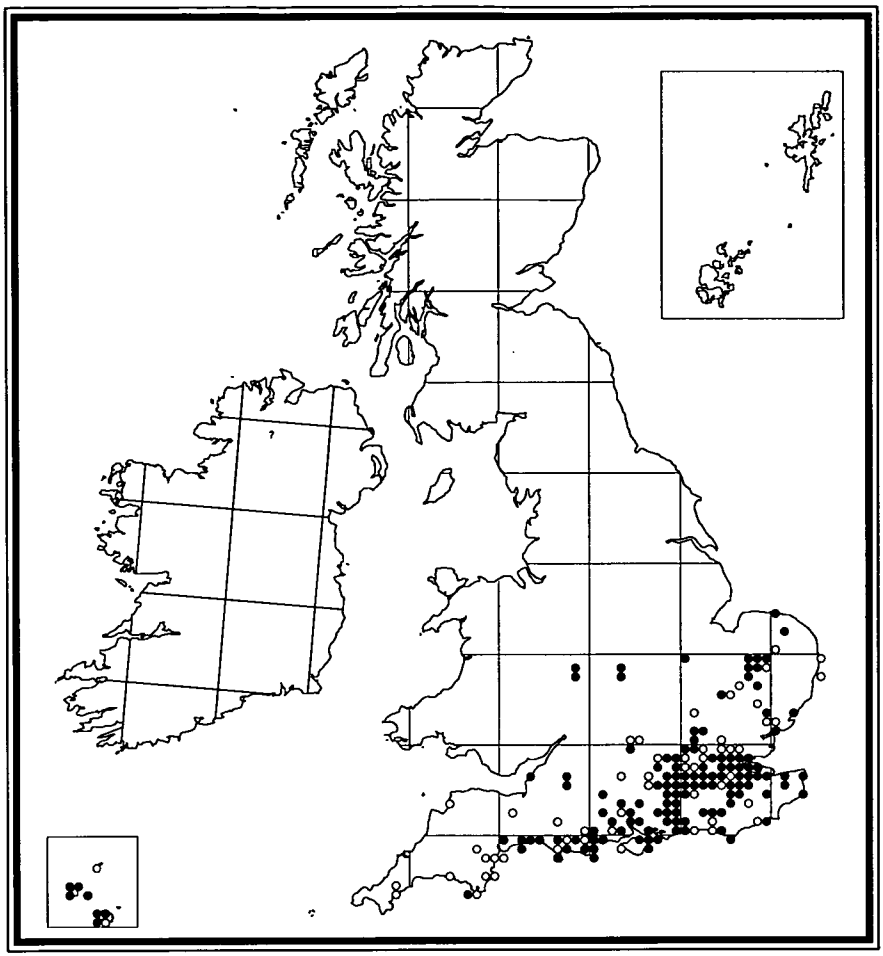
Apparently single-brooded; late June to early September.

Prey collected

The prey consists of small and medium-sized bees of various genera, which are paralysed by stinging. The neck is also squeezed, between the wasp's mandibles (malaxation); the prey dies in about two days (Lomholdt 1975). According to Hamm and Richards (1930), this wasp hunts only bees returning to their nests with pollen, but clearly there are exceptions, as some of the above species included females free of pollen and a few males. The number of prey items per cell varies from five to eight, depending on prey size (Lomholdt 1975).

Nesting biology

Females of this wasp frequently nest in quite dense aggregations, usually on level, exposed compacted soil. For example, sites have included an unsurfaced road and an abandoned sand quarry in Dorset, and soil between the paving stones of a patio in Greater London. The nest consists of a deep (10–15 cm) burrow, from which short lateral burrows branch off and terminate in single cells. The upper section of the main burrow is more or less vertical, but the lower part may run horizontally (Lomholdt 1975). Nests of this species are described and illustrated by



Grozdanic and Vasic (1968) and Olberg (1959). The mature larvae spin tough, silken cocoons in which they overwinter.

Flowers visited

Hogweed, wild carrot, Jersey thrift, marigold, yarrow and creeping thistle.

Parasites

Amobia signata (Diptera, Sarcophagidae) has been observed following a female *C. rybyensis* (C R Vardy, pers. comm.). This fly is known as a cleptoparasite of many Sphecidae (including *Cerceris*), Apidae and Vespidae; it is apparently confined to southern Britain.

Map compiled by: M E Archer and S P M Roberts.
Author of profile: G R Else.

Map 43 *Cerceris sabulosa* (Panzer, 1799)

[Sphecidae: Philanthinae]

Distribution in Britain and Ireland

The inclusion of this species on the British list is based on a probable vagrant from the Continent – a female collected by F Smith at Kingsdown, near Deal, east Kent, in August 1860 (not 1861 as quoted by Saunders (1896) and Richards (1980)). The specimen survives in the Smith Collection at Oxford under the species synonym, *C. emarginata* (Panzer, 1799).

Status (in Britain only)

As no records of this insect have been made since 1860, it is listed in the Appendix category (No records in the 20th century) of the *Red Data Book* (Shirt 1987) and Falk (1991).

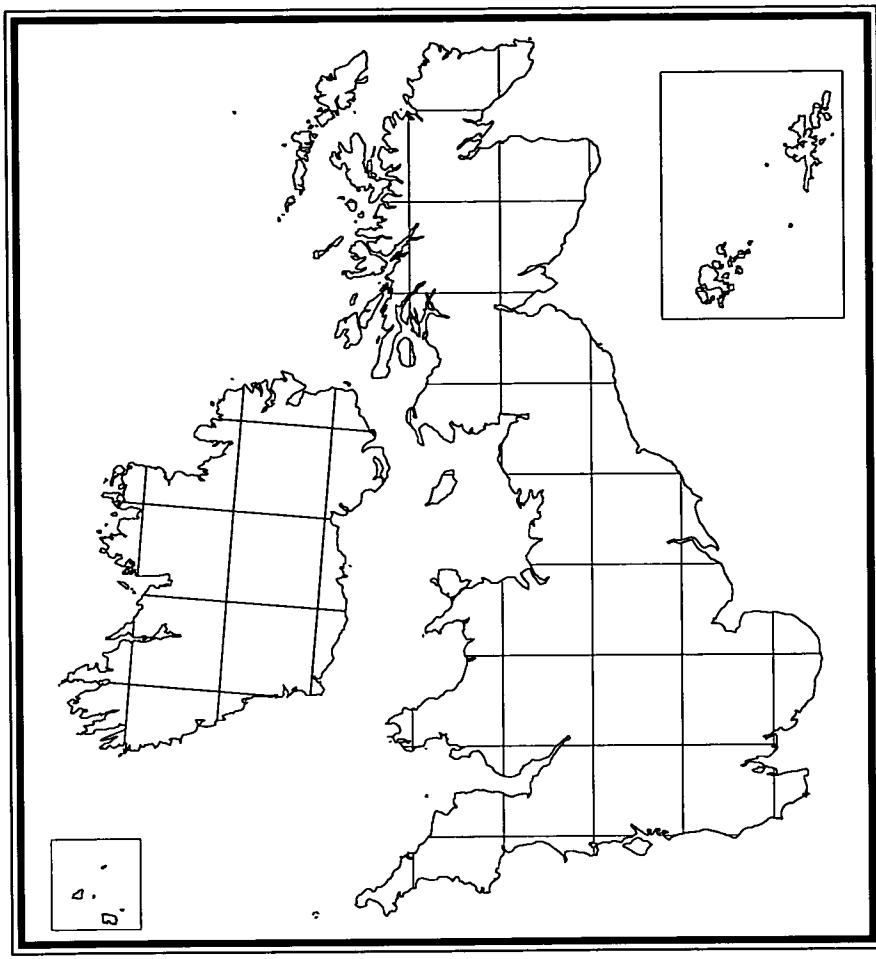
Prey collected

C. sabulosa is one of a large group of *Cerceris* species that preys on adult bees, particularly halictines but also *Andrena, Panurgus, Hylaeus* and *Epeolus.*

Nesting biology

Its biology has been studied in Italy by Grandi (in Hamm & Richards 1930), who found it nesting in hard soil. There were up to 24 cells per nest at depths of 7–12 cm, with 4–12 prey per cell. As in other *Cerceris* species, the prey often appeared to be only lightly paralysed.

Map compiled by: M E Archer and S P M Roberts.
Authors of profile: G R Else and J P Field.



Map 44 *Philanthus triangulum* (Fabricius, 1775)

[Sphecidae: Philanthinae]

Distribution in Britain and Ireland

Less than 20 years ago, this magnificent wasp, commonly known as the 'bee-wolf' or 'bee-killer' was considered to be one of the great aculeate rarities in Britain. Records for the last few years indicate that currently the species is locally common to abundant in a steadily increasing number of sites in southern England, with a single record for north Wales (Else 1993a, 1995a,b,e).

Status (in Britain only)

This species was regarded as Vulnerable (RDB2) in Shirt (1987) and Falk (1991). In view of the recent expansion of its range, this status should be revised.

Habitat

Generally, sand dunes and lowland heaths. However, nesting aggregations have recently been found in a park in Ipswich, Suffolk, and on the Battersea Bridge roundabout, Greater London.

Flight period

From early July to mid-September. In England there appears to be a single brood, but in central Europe a second generation is known (Lomholdt 1975).

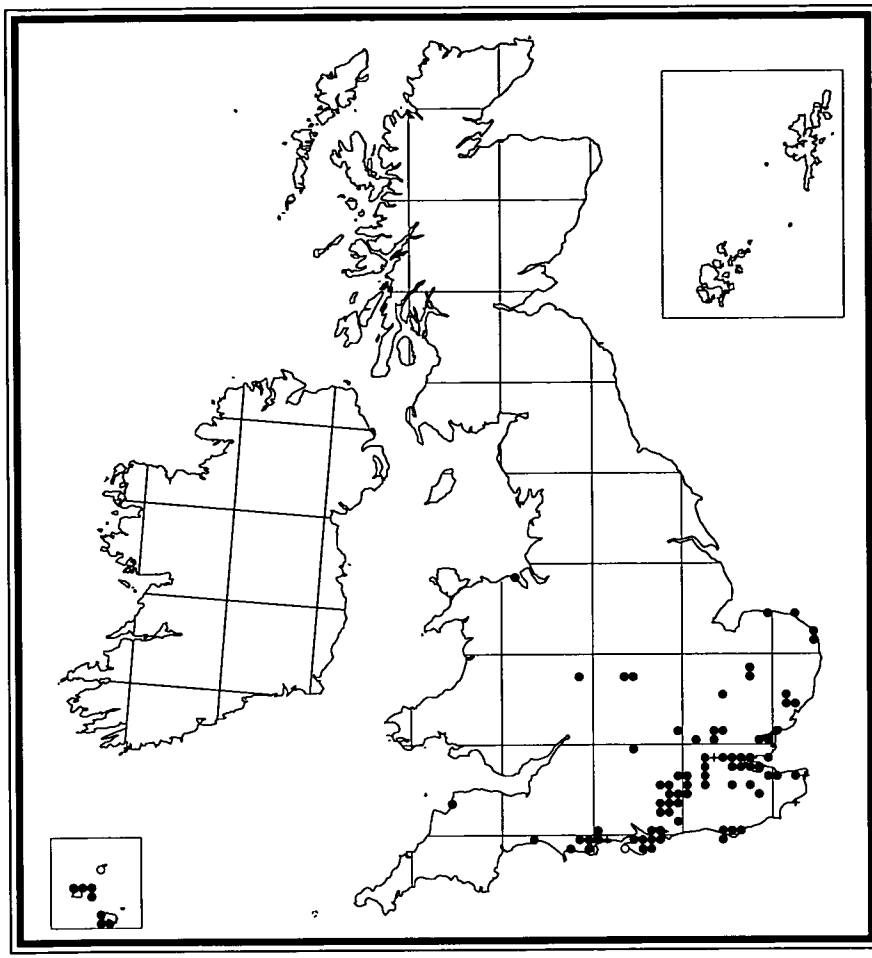
Prey collected

The major prey species throughout the world range of this wasp is the worker honey bee (*Apis mellifera*), and in some regions the wasp may greatly reduce the local populations (El-Borollosy, Wafa & El-Hefny 1972). There are, however, reports of other bees being utilised: for example in Britain, *Andrena flavipes* and *Lasioglossum zonulum* (Smith 1851a), and a *Nomada* sp. (C O'Toole, pers. comm.).

Nesting biology

This wasp nests in both level sandy exposures and in vertical soil faces. Some nesting aggregations may number as many as 15 000 burrows (Else 1995a,b). The main nest burrow may be up to 1 m in length, with 3–34 short lateral burrows at the end, each terminating in a cell (Lomholdt 1975). The prey is paralysed by being stung through the articular membranes immediately behind the front legs (Rathmayer 1962). Returning females, clutching the prey with their legs, often hover above the nest burrow before slowly descending to it.

Nesting biology and behaviour are described by Curtis (1829), Olberg (1953, 1959), El-Borollosy *et al.* (1972), Lomholdt (1975), Simon Thomas (1966), Simon



Thomas and Simon Thomas (1972), Simon Thomas and Veenendaal (1978), Tinbergen (1932, 1958, 1969, 1974) and Vergne (1935). Olberg's (1959) publication is particularly good for descriptions and illustrations of nest construction and provisioning.

Flowers visited

Nectar sources include bramble, sea-holly, heather, thrift, pale toadflax, common ragwort, hemp-agrimony and creeping thistle.

Map compiled by: M E Archer and S P M Roberts.
Author of profile: G R Else.

Map 45 *Colletes cunicularius* (Linnaeus, 1761)

[Apidae: Colletinae]

The largest of the eight British species in the genus, with a population that differs slightly from the Continental race in both morphological and ecological respects. As a result, it has been recognised as a distinct subspecies, *C. cunicularius celticus*, by O'Toole (1974). More recently, major differences between the Continental and British populations have been found in the chemistry of the Dufour's gland secretions (Albans *et al.* 1980; Duffield *et al.* in Bell & Carde 1984), raising the possibility that the British populations may be specifically distinct.

Distribution in Britain and Ireland

The species has an unusual distribution, being confined to a number of extensive coastal sand dune systems in north-west England and north-west and south Wales. It is often locally abundant; for example, at Kenfig dunes, West Glamorgan, there have been nesting aggregations of up to 18 000 nests (C O'Toole, pers. obs.).

Status (in Britain only)

Listed as Rare (RDB3) in Shirt (1987) and Falk (1991).

Habitat

Large, mature coastal sand dunes, wherever creeping willow grows.

Flight period

This is the only British *Colletes* to fly in the spring (early April to the end of May, rarely mid-June), rather than in the summer or autumn.

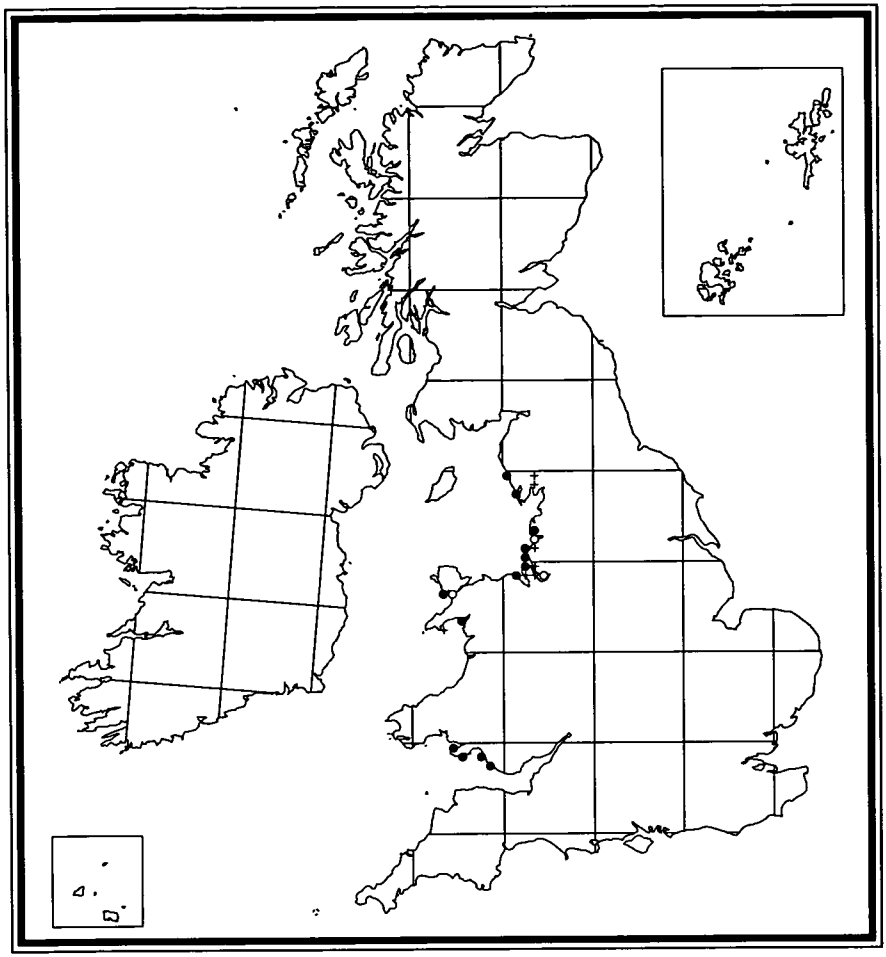
Pollen collected

The females forage for pollen exclusively on creeping willow. When 40-50% of the male catkins are dehiscing pollen, the bees can be expected to make a mass appearance within two to three days if there is continuous fine weather.

Nesting biology

The nest comprises a slightly inclined tunnel, some 45–55 cm deep, with cells built at the ends of side branches. These branches are concentrated in the deepest quarter of the nest, so that the vertical distance between the shallowest and deepest cells is only 4–8 cm. The mass emergence of males (from the upper cells) occurs in the afternoon of the day before mass emergence of females.

Like all species of *Colletes, C. cunicularius* lines its brood cells with a transparent cellophane-like membrane. This is waterproof, resistant to fungal attack and presumably maintains the correct level of humidity during larval development. The



source of the membrane is a liquid secretion of the Dufour's gland in the abdomen. The female bee uses her short, bilobed tongue as a kind of paint brush to spread the oily secretion over the internal surface of her cell. It dries to form a clear membrane.

Flowers visited

In addition to creeping willow, both sexes have been observed in South Glamorgan by R Paxton (pers. comm.) visiting dandelion flowers, presumably only for nectar.

Map compiled by: G R Else and S P M Roberts.
Authors of profile: G R Else, J P Field and C O'Toole.

Map 46 *Colletes floralis* Eversmann, 1852

[Apidae: Colletinae]

Distribution in Britain and Ireland

This species was originally found for the first time in the British Isles in south-west Scotland in July 1899 (Saunders 1899), the record being published under the name *Colletes montanus*). However, it is most widely distributed in the Western Isles and especially in Ireland. Indeed, it is the only bee that is more widespread in that country than in Britain.

On mainland Scotland this mining bee has been recorded from Dumfries and Galloway (Torrs Warren) and Strathclyde (Irvine Moor, near Ayr). It is probably now extinct at Irvine Moor, as the probable site where it was first found has been destroyed (R Angus, pers. comm.). However, it is more widely distributed on the islands off the west coast: Colonsay and Tiree (Strathclyde), and Barra, South Uist and Benbecula (Western Isles). Published, but unconfirmed, records of *Colletes daviesanus* from Pabbay north to Lewis (Western Isles), and from Coll, Tiree and Rhum (Heslop Harrison 1952) almost certainly refer to *C. floralis*. In England, the bee was collected at Sandscale Haws, Cumbria, by M E Archer on 18 July 1994.

The species is very widely distributed on the coast of Ireland, with records from Dublin, Wicklow, Wexford, Waterford, Cork, Kerry, Clare, Galway, Mayo, Sligo and Donegal. The bee has also been found on the islands of Cape Clear (Cork) and Great Saltee (Wexford). In addition, it is known from some inland sites in Wexford, Kilkenny, Galway and Cavan.

Status (in Britain only)

Not listed in the British *Red Data Book* (Shirt 1987), but Falk (1991) has proposed that it should be included in future editions as Rare (pRDB3).

Habitat

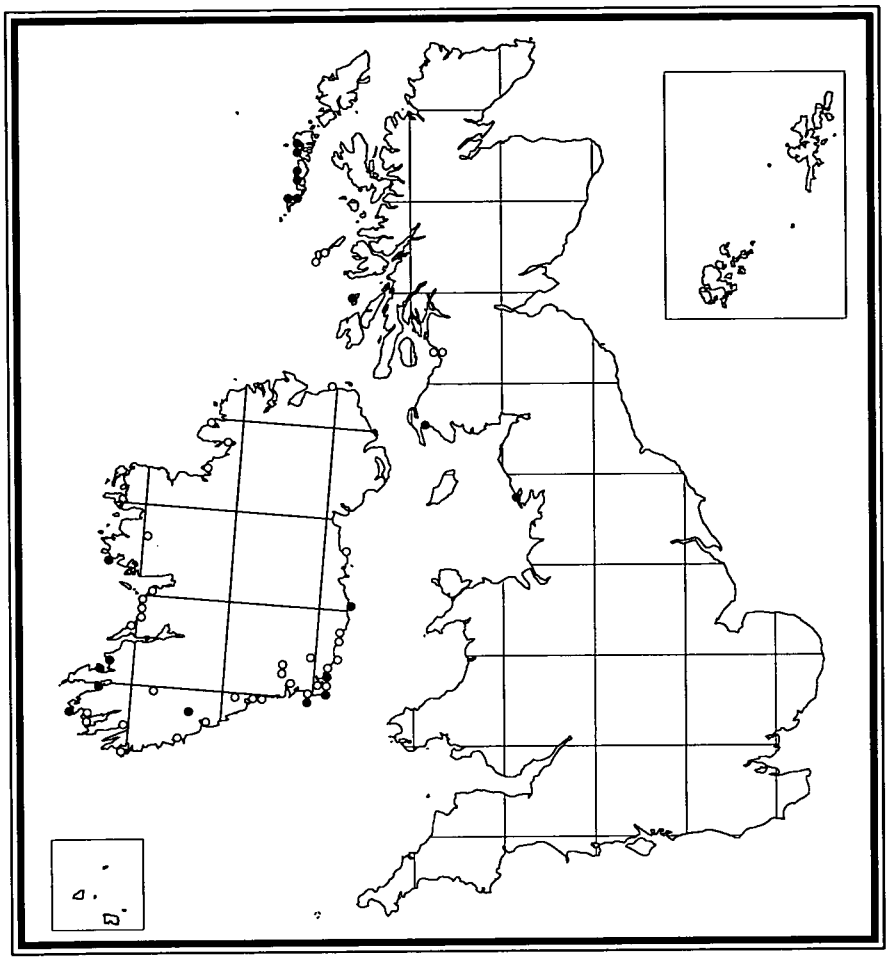
Mainly coastal sand dunes and, in the Western Isles, the machair (a maritime grassland typical of the Hebrides, comprising a rich flowering sward established on wind-blown shell sand). In Ireland, the species has been found nesting in sandy clays along cliffs, in marram dunes and in the interstices of the masonry of a bridge (Stelfox 1927, 1933).

Flight period

Single-brooded; mid-June to early August.

Pollen collected

Not known, but possibly a polylectic species.



Nesting biology

A typical mining bee, excavating its nesting burrows in expanses of bare or very sparsely vegetated, firm sand. The burrows often occur in aggregations and, on South Uist, were flush with the surrounding soil, there being no tumuli around the burrow entrances (pers. obs.).

Flowers visited

White clover, bird's-foot-trefoil, bramble, cinquefoil, biting stonecrop, sea-holly, water-dropwort, wild angelica, hogweed, wild carrot, heath, thyme, sheep's-bit and cat's-ear.

Map compiled by: G R Else and S P M Roberts.
Author of profile: G R Else.

Map 47 **Colletes halophilus** Verhoeff, P.M.F., 1943

[Apidae: Colletinae]

Originally described as a subspecies of the widely distributed *C. succinctus*.

Distribution in Britain and Ireland

This bee is particularly common in East Anglia and by the Thames estuary, but it occurs more sporadically along the southern coast of England. Records for the Channel Islands were misidentifications for *Colletes hederae* (Schmidt & Westrich).

Status (in Britain only)

Listed in Falk (1991) as Nationally Notable (Na).

Habitat

Associated almost exclusively with coastal habitats. Found on both dunes and the firmer soil behind beaches.

Flight period

Mid-August to mid-October, and occasionally into early November.

Pollen collected

Nest cells are mainly provisioned with sea aster pollen (C O'Toole, pers. comm.).

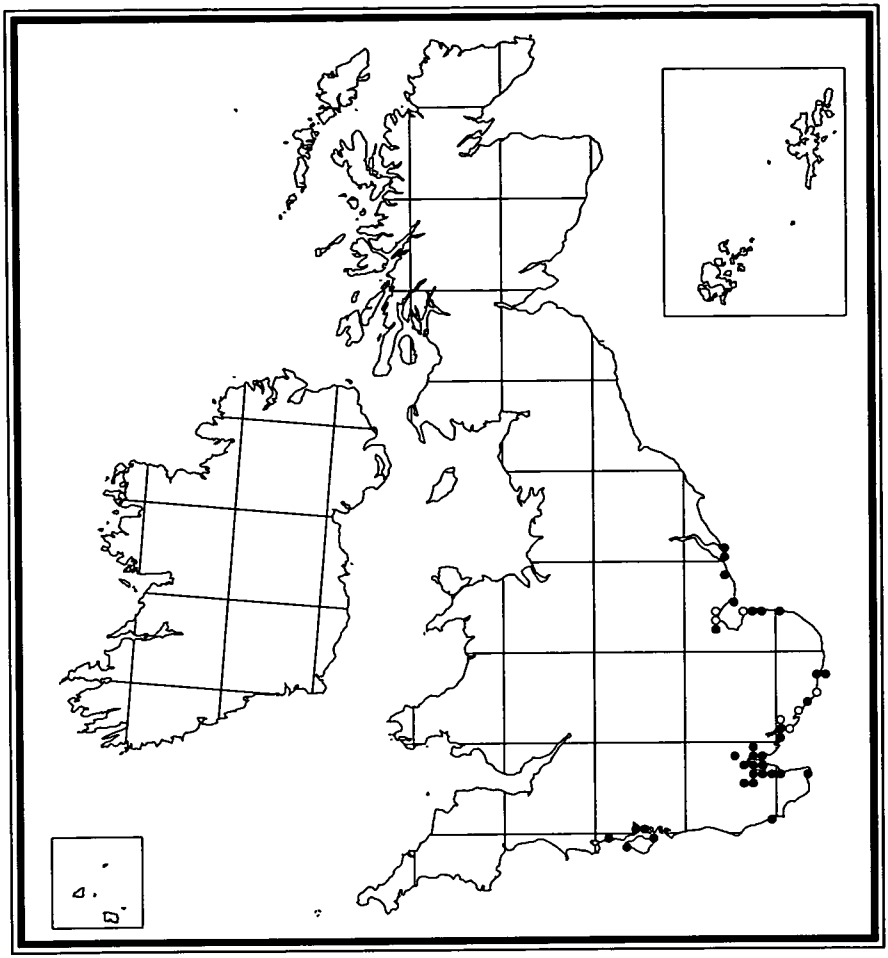
Nesting biology

Nesting aggregations, which are sometimes very large, occur in bare soil (eg surfaces exposed by land slippage), in artificial mounds of soil, and even in the sides of rabbit burrows.

Nesting sites may be subject to occasional inundation by the sea. A nesting aggregation at Scolt Head Island, Norfolk, was reached by the highest spring tides, and the bees were observed trying to reach their burrows, which were submerged in about 7 cm of water (Field & Foster 1988). On the Norfolk coast, bees have been seen emerging from waterlogged mud (D B Baker, pers. comm.).

The nest architecture is similar to that of *C. succinctus* and has been illustrated by O'Toole and Raw (1991): a cluster of five to six cells radiates from the end of a short, curved burrow.

Males may occasionally be found roosting in groups of up to a dozen on grass stems (P Kirby, pers. comm.).



Flowers visited

Females visit a wide range of plants for nectar. However, weld is an important nectar source on the east coast of the Wash (C O'Toole, pers. comm.).

Parasites

C O'Toole (pers. comm.) has reared the parasitic fly *Miltogramma punctatum* (Sarcophagidae) from puparia excavated from nests at Swanscombe Marshes, north Kent. Here, Guichard (1974) observed large numbers of *M. punctatum* and the cleptoparasitic bee *Epeolus variegatus* flying about the burrow entrances of *C. halophilus*.

Map compiled by: G R Else and S P M Roberts.
Authors of profile: G R Else and J P Field.

Map 48 *Colletes marginatus* Smith, F., 1846

[Apidae: Colletinae]

Distribution in Britain and Ireland

The accompanying map is considered to be a clear representation of this species' entire distribution in Britain. It is apparently absent from Ireland. *C. marginatus* is a very local bee, although it is sometimes numerous where found. There is little evidence of any major decline, though in Dorset it was formerly found at Studland but was last recorded from there in 1938 (S P M Roberts, pers. comm.). A 1905 record from Swanage is shown on the map, though this specimen too is likely to have been collected nearby at Studland.

Status (in Britain only)

A Nationally Notable species (Na) (Falk 1991).

Habitat

In Britain this is predominantly a bee of coastal dunes, though it is also quite widespread on grass heaths in the Brecklands of East Anglia. Elsewhere, it may be found on light, sandy soils.

Flight period

Single-brooded; late June to mid-August.

Pollen collected

On Hayling Island, Hampshire, females have been observed collecting bramble pollen on several occasions (pers. obs.).

Nesting biology

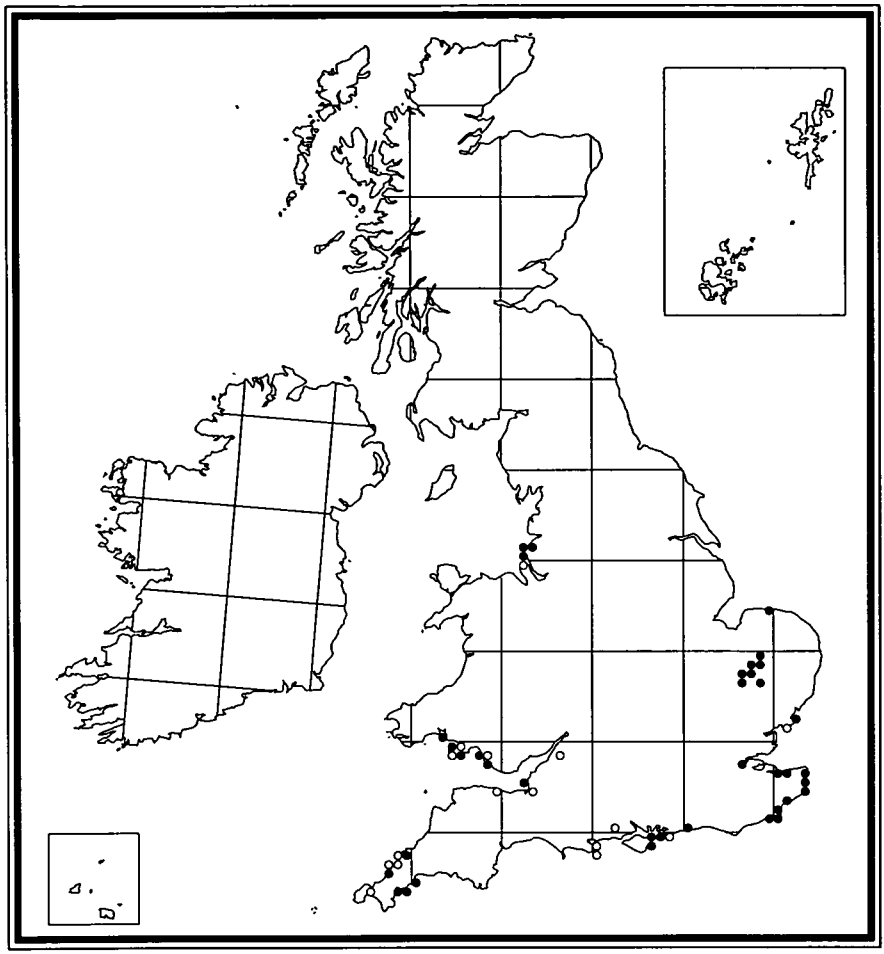
Nests of this bee are constructed in burrows excavated in the soil and are not often encountered. They have been reported as occurring in aggregations, though in Hampshire I have found a single burrow entrance in firm, sparsely vegetated sand. The depth of the burrow and the arrangement of the cells within it are not known.

Flowers visited

Mignonette, white clover, sea-holly, parsley water-dropwort, cowbane, fennel, angelica, wild parsnip, hogweed, wild carrot, sea spurge, heather, thrift, dodder, sheep's-bit, ragwort and creeping thistle. It is not known if these are pollen sources.

Parasites

A small race of *Epeolus cruciger* is considered to be a cleptoparasite of *C. marginatus* (Richards 1937).



Map compiled by: G R Else and S P M Roberts.
Author of profile: G R Else.

Map 49 *Hylaeus pectoralis* Förster, 1871

[Apidae: Colletinae]

There are very few British aculeates which are largely confined to wetland habitats. One of these is *Hylaeus pectoralis*, a bee which for many years was almost entirely associated with the fens of East Anglia, especially Wicken Fen, Cambridgeshire.

Distribution in Britain and Ireland

Since the early 1970s this bee has been found from West Sussex to east Devon, the Isle of Wight, Surrey, Essex, Suffolk, Norfolk, Cambridgeshire and Northamptonshire. Most recent records are from the coast of southern England, though it is probably as common (but overlooked) in inland sites in East Anglia, as in former times (see Else 1995d).

Status (in Britain only)

Not listed in the British *Red Data Book* (Shirt 1987) or Falk (1991). It has a restricted distribution and may be nationally scarce.

Habitat

Owing to its special nesting requirements, this little bee is associated with stands of the common reed, both in brackish and fresh water where it prefers the drier margins of the reeds.

Flight period

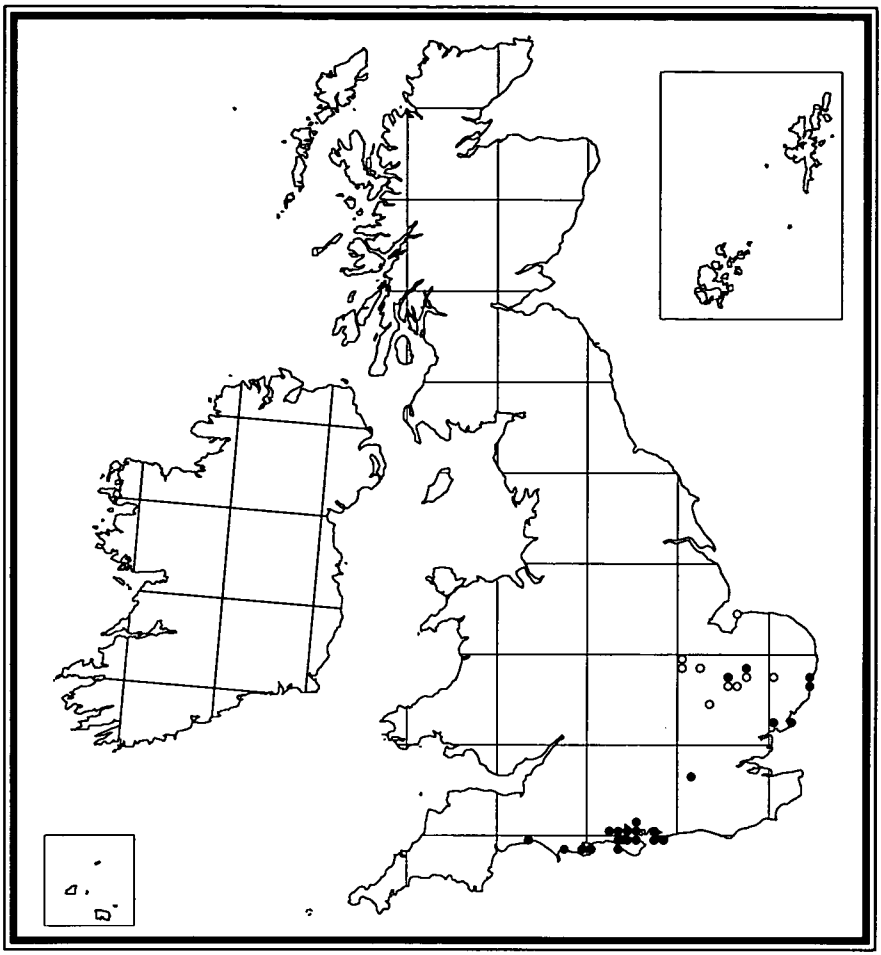
Single-brooded; June to late September.

Pollen collected

Not known for Britain, but probably polylectic, as in Germany (Westrich 1989). In contrast to most bees which carry pollen externally to their nests, female *Hylaeus* (with a single known exception) swallow the pollen they collect and store it in the crop until they reach the nest. There, along with nectar, it is regurgitated into the cell which is being provisioned.

Nesting biology

This bee has long been known to nest within the vacated galls of the chloropid fly *Lipara lucens*, which are formed on the main flower stems of the common reed, where their formation prevents flowering. These galls are spindle-shaped and most are about 10 cm in length. The cells are constructed, one above the other, within the empty gall chamber and, as in other *Hylaeus* nests, the side and end walls of each cell are formed from a secretion of the bee's enlarged salivary glands; on drying, the secretion forms a thin membrane, closely resembling cellophane. One to about eight cells are usually found in a gall, the number largely



depending on the size of the gall's chamber. A completed nest is sealed with a substantial plug of compacted, minute leaf fragments. Some nests are occasionally built in dry reed stems (Perkins 1900; J P Field, pers. comm.). The life cycle of this bee is described in some detail by Else (1995d).

Flowers visited

Bramble, angelica, hogweed, wild carrot, hawkbit and perennial sow-thistle.

Parasites

The gasteruptiid wasps *Gasteruption assectator* and *G. jaculator* have been reared from nests of this bee collected in Britain (Else 1995d).

Map compiled by: G R Else and S P M Roberts.
Author of profile: G R Else.

Map 50 *Anthidium manicatum* (Linnaeus, 1758)

[Apidae: Megachilinae]

Males of this strikingly coloured, medium-sized bee hover and dart around patches of flowering labiates (and some other flowers) and regularly pursue other insects.

Distribution in Britain and Ireland

Widely distributed throughout much of southern England and Wales, becoming scarcer in the north. Note the three Scottish records, all in Dumfries and Galloway. It is also found on the Channel Islands and on the Isles of Scilly (St Mary's). There are no records from Ireland. Recently (since about 1993) the bee has become locally common in many sites in southern England after a long period of scarcity. This species is certainly under-recorded in Britain.

Status (in Britain only)

This species is not regarded as being threatened.

Habitat

Varied, including private gardens (both in rural and urban areas), open broadleaved woodland, chalk grassland, coastal sand dunes and landslips.

Flight period

Single-brooded; from late May to early August, with a peak in June/July. In 1995 both sexes in freshly emerged condition were noted in late July; it is not known if these represented a partial second brood, or a single, staggered emergence.

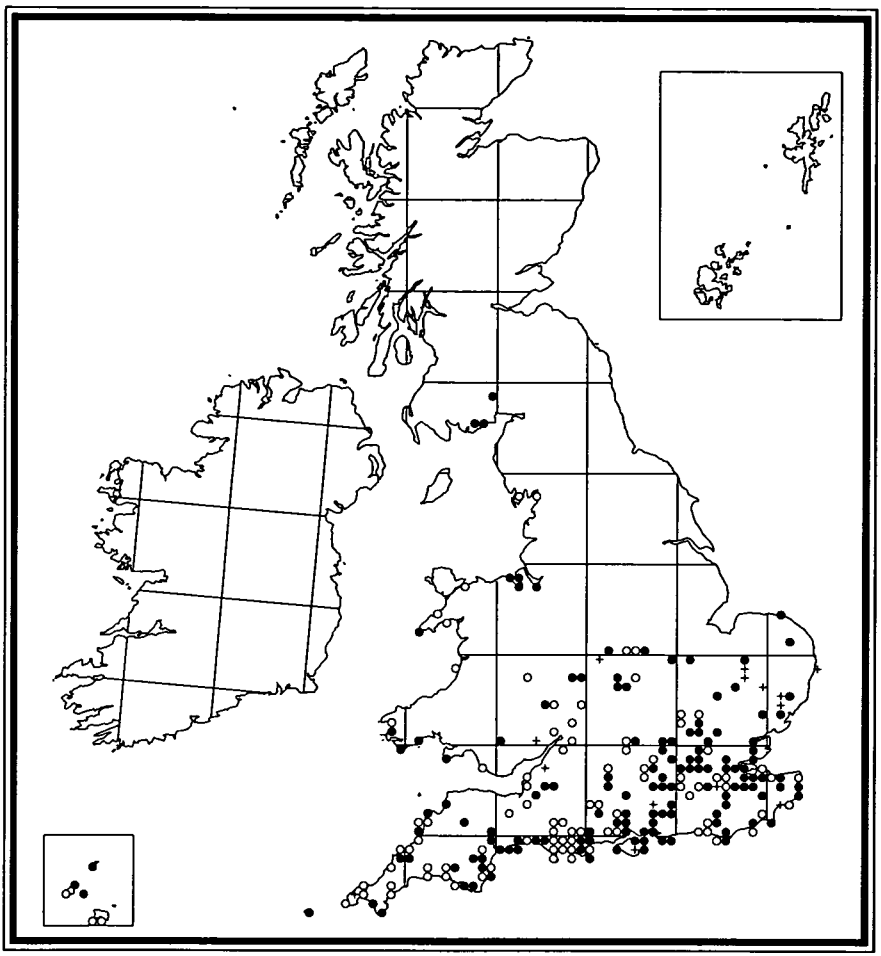
Pollen collected

Pollen sources are not known: the bees are probably polylectic (Westrich 1989).

Nesting biology

Large males vigorously defend clumps of favoured flowers and will intercept and chase away any other insect which enters such a territory. Males have even been known to kill such intruders (by crushing them between the ventral surfaces of the flexed down abdomen and the thorax). Females are allowed to visit the flowers and it is at these sites that mating takes place. Resource defence polygyny, as this behaviour is called, is discussed by Severinghaus, Kurtac and Eickwort (1981) and is summarised by Thornhill and Alcock (1983).

Females select existing cavities as nest sites, examples including insect exit burrows in dead wood, hollow stems, crevices in the mortar joints of masonry, burrows in the soil, and various man-made objects. The cell walls and closing plug of the nest are fashioned from compacted layers of long, silky hairs which are shaved off leaves by the female's multi-dentate mandibles. Favoured plants are woundwort, yarrow, great mullein, pelargonium, cotton thistle and house-leek. Hairs are brought to the nest



site in a ball and applied to the inner surface of the cavity by teasing them out with the mandibles; the gaster is then used to tamp down the hairs (A Raw, pers. comm.). The species has earned the colloquial name 'wool-carder bee' from this habit.

Flowers visited

The bees visit a wide variety of flowers.

Parasites

The bee *Stelis punctulatissima* (Map 51) is a cleptoparasite of *A. manicatum.*

Map compiled by: G R Else and S P M Roberts.
Authors of profile: G R Else and C O'Toole.

Map 51 *Stelis punctulatissima* (Kirby, 1802)

[Apidae: Megachilinae]

The four species of *Stelis* which occur in the British Isles are all rare bees, in contrast to some other cleptoparasitic bee genera which contain species which are often locally common.

Distribution in Britain and Ireland

Widely distributed throughout much of southern Britain, from Kent to Cornwall, northwards to Gwynedd and Suffolk. In June 1974, the late A B Duncan collected several specimens of this species in his garden at Castlehill, near Dumfries, Dumfries and Galloway. This is the only species of *Stelis* which is known from the Channel Islands, where it has been found on Jersey (date unknown – not mapped). The distribution map suggests a species that is in decline, with comparatively few recent records.

Status (in Britain only)

A Nationally Notable species (Nb) (Falk 1991).

Habitat

To be expected wherever its host species occur in Britain.

Flight period

Single-brooded; mid-June to late August.

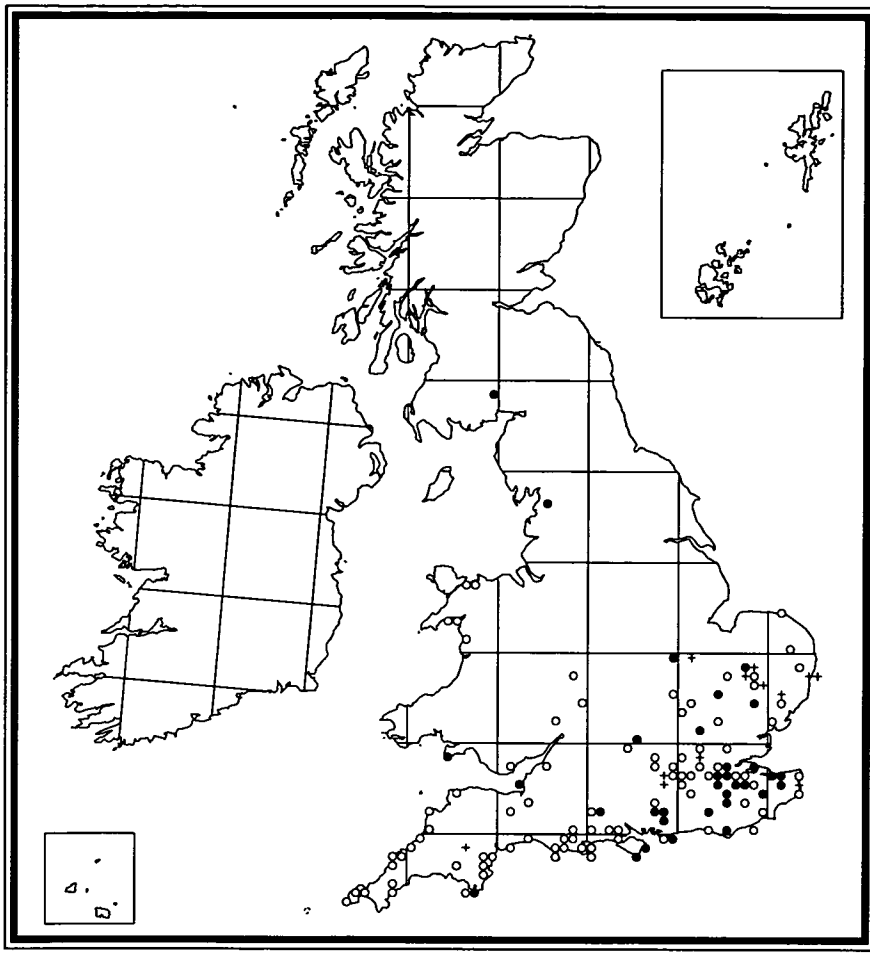
Nesting biology

In Britain, this is apparently a cleptoparasite of three species of Megachilinae. These are *Anthidium manicatum* (specimens of the *Stelis* reared from a nest of this species are in the Natural History Museum, London), *Osmia fulviventris* (Smith 1876; Saunders 1896; Perkins 1923; Hallett 1928) and *O. tunensis* (as *O. aurulenta*) (Smith 1876).

Flowers visited

Common mallow, bird's-foot-trefoil, bramble, wild marjoram, ragwort, common fleabane, yarrow, spear thistle and hawkweed.

Map compiled by: G R Else and S P M Roberts.
Author of profile: G R Else.



Map 52 *Osmia inermis* (Zetterstedt, 1838)

[Apidae: Megachilinae]

In the past, this bee was sometimes misidentified as *O. parietina* or *O. uncinata.*

Distribution in Britain and Ireland

Rare. Restricted to the central Scottish Highlands (Else & Edwards 1996).

Status (in Britain only)

Listed as Vulnerable (RDB2) in Shirt (1987) and Falk (1991).

Habitat

Habitat characteristically consists of exposed, base-rich uplands (about 260–430 m). A site for this species near Blair Atholl, Tayside, was visited several times by M Edwards and G R Else in the early 1980s. It comprised exposed sheep pasture on low, dry hillocks on a south-facing mica-schist escarpment. Vegetation was heavily grazed heather, with lichen and moss predominating amongst it. Possible forage plants utilised by the bee there included bird's-foot-trefoil, bugle and bilberry.

Flight period

Late May to the end of July. Single-brooded.

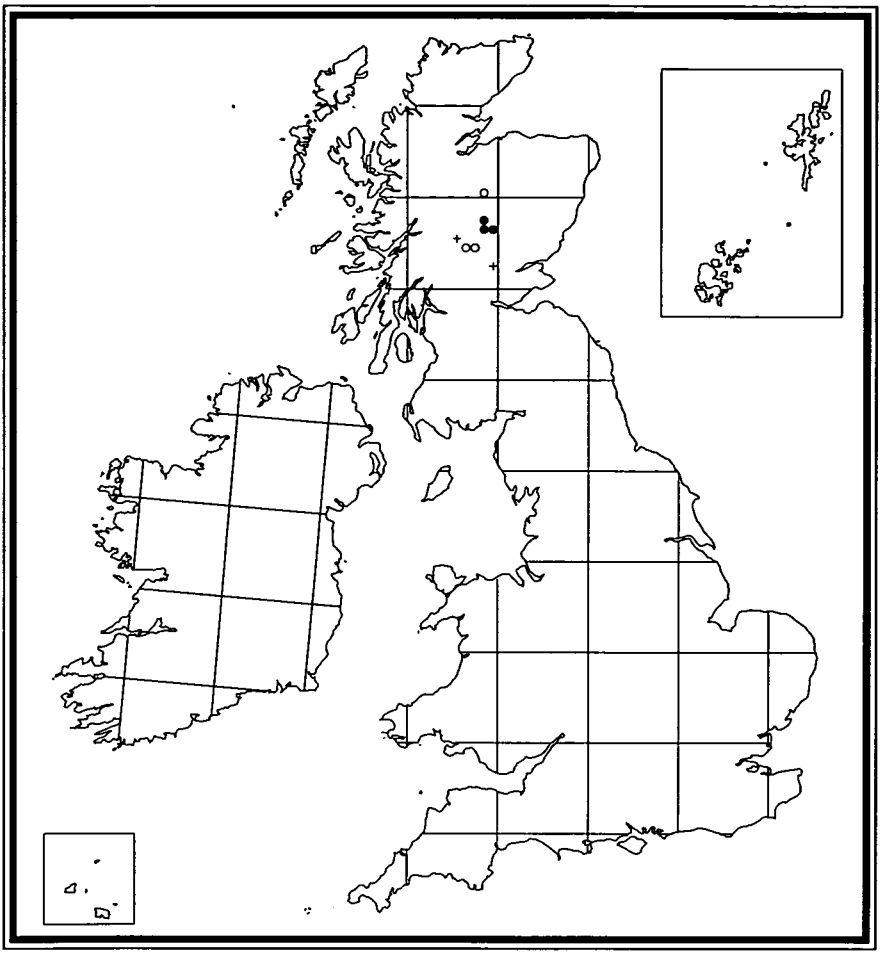
Pollen collected

The pollen load of a Scottish female *O. inermis* was found by P Westrich to consist entirely of bird's-foot-trefoil (Else & Edwards 1996).

Nesting biology

Females of this bee build clusters of oval cells from masticated leaf pulp on the undersides of rocks overlying shallow depressions. When freshly constructed the cells are probably bright green but, with time, assume a dull brown colour and then closely resemble rabbit droppings. The number of cells per rock varies from one to about 230, but large numbers either result from several females working independently of each other in a single season, or from several generations of females.

Rearings from nests collected at the Blair Atholl site mentioned above suggest that in Britain this bee has a minimum two-year life cycle, the first winter being passed as a prepupa, the second as a diapausing adult within its cocoon. Some individuals may emerge from their nests three or four years after their cells were sealed (see Smith 1851b). Such a staggered emergence could be important in northern Britain, where prolonged, inclement early summer weather could seriously hinder the activity of this bee.



Flowers visited

With the exception of the forage species reported above, there are apparently no British records. It is probably polylectic, as in Germany (Westrich 1989).

Parasites

The chrysidid wasp *Chrysura hirsuta* has been reared from Scottish nests. The larva of the parasitoid attacks the host larva after the latter has spun its tough cocoon. When fully grown the *C. hirsuta* larva spins its own cocoon within that of the host (see drawing in Morgan 1984). The chrysidid seems to have an obligate, minimum, two-year life cycle which parallels that of its host (Else & Edwards 1996).

Map compiled by: G R Else and S P M Roberts.
Author of profile: G R Else.

Map 53 *Osmia pilicornis* Smith, F., 1846

[Apidae: Megachilinae]

As with other woodland insects, the fortunes of several bees have been adversely affected by modern woodland management – the abandonment of coppicing leading to stands of mature broadleaved trees or the establishment of coniferous plantations. Both these woodland types eventually shade out the understorey and its rich and varied herb communities. One bee adversely affected by such changes is *Osmia pilicornis*, though where suitable conditions exist it can still be locally common.

Distribution in Britain and Ireland

This species is largely confined to deciduous woodland in southern England, from Kent to Cornwall (though it is very rare in the south-west), northwards to Hereford and Worcester and Suffolk. In Wales, known only from Mid Glamorgan. There are no records from the Channel Islands or Ireland. It is a scarce species, but is occasionally numerous in a few sites, eg woodland near Goodwood, West Sussex.

Status (in Britain only)

Listed as Nationally Notable (Na) (Falk 1991).

Habitat

Open, broadleaved woodland, especially on chalky soils. In the spring both sexes can be found flying low over banks, paths and in coppiced clearings, the males usually appearing silvery and often difficult to follow (the colour of their body hairs rapidly fades after emergence). The species is sometimes found flying with *Osmia bicolor*.

Flight period

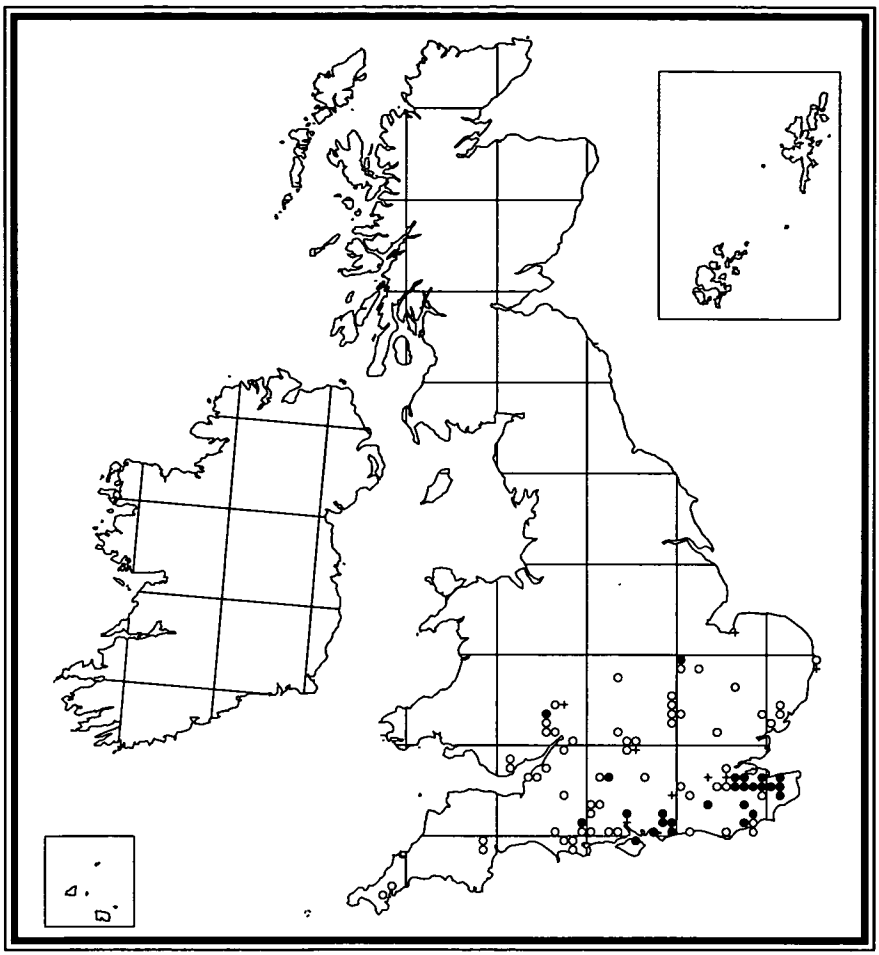
A spring species, flying as a single brood from early April to the end of June, rarely July.

Pollen collected

The scopa of a Dorset female of this species contained substantial amounts of bugle and ground-ivy pollen (S P M Roberts, pers. comm.)

Nesting biology

The nests are built in existing burrows in dead wood, including fallen branches (Chambers 1949) and stumps. It is almost certain that both sexes overwinter as adults in their cocoons.



Flowers visited

In Britain, the bee visits violets, willows, comfrey and selfheal, though it is not known if these are pollen sources. In Germany, the species is polylectic, visiting flowers in the families Boraginaceae, Fabaceae, Lamiaceae and Rosaceae (Westrich 1989). The bee is, however, most strongly associated with bugle. The unusual form of the galea (fringed with rows of strong, curved black setae) may be an adaptation for removing pollen from long, narrow flowers.

Map compiled by: G R Else and S P M Roberts.
Author of profile: G R Else.

Map 54 *Osmia uncinata* Gerstaecker, 1869

[Apidae: Megachilinae]

Several years ago, D B Baker and G R Else found that the series of Scottish *Osmia inermis* in the Natural History Museum, London, consisted of two closely related species: *O. inermis* and *O. uncinata*. The latter was a species not previously known from the British Isles.

Distribution in Britain and Ireland

Osmia uncinata, in common with *O. inermis*, is confined to central Scotland, but it seems to be more localised, with records only from Highland Region: Speyside (Kincraig to Nethy Bridge), Ardersier and Bonar Bridge (Else & Edwards 1996). It is occasionally locally numerous. Other sites worth investigating for the presence of this species are Deeside (Grampian Region) and Glen Affric (Highland Region).

Status (in Britain only)

Listed as Vulnerable (RDB2) in Shirt (1987) and Falk (1991).

Habitat

Osmia uncinata is closely associated with remnants of the ancient Caledonian Forest, specimens being encountered in woodland clearings, along paths through woodland, and on adjacent roadside verges where the main forage plant, bird's-foot-trefoil, is well established.

Flight period

Late April or May to early July. Single-brooded.

Pollen collected

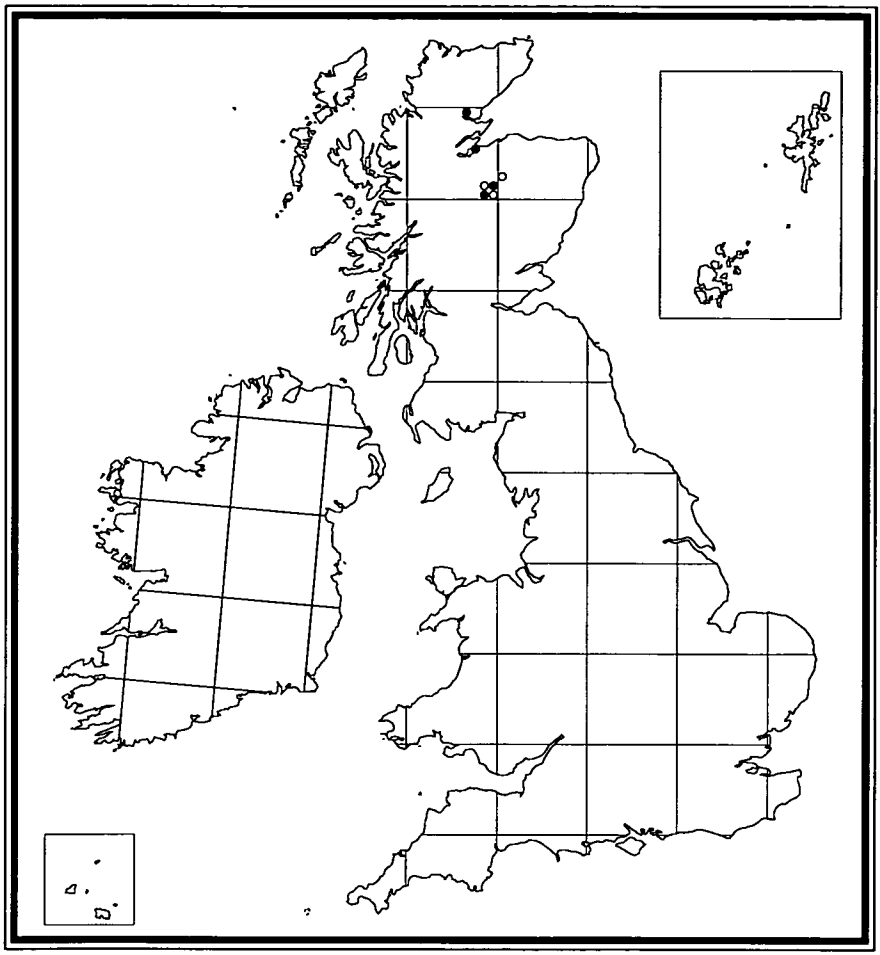
An analysis by P Westrich of pollen removed from the scopa of a Scottish female, revealed it to be almost entirely from bird's-foot-trefoil (Else & Edwards 1996).

Nesting biology

Nests of this bee have not been found in Scotland. In Germany, females of *Osmia uncinata* nest in bark on trunks and stumps of pines and sometimes in small detached pieces lying on the ground (Stoeckhert 1933). The bevelled cutting-edge of the female's mandible suggests that the cell walls are constructed with leaf mastic. More details may be found in Else and Edwards (1996).

Flowers visited

In Speyside, both sexes have been observed visiting bird's-foot-trefoil, broom and



bilberry (Else & Edwards 1996). In Germany, the bee is reported to be polylectic (Westrich 1989).

Parasites

The chrysidid wasp *Chrysura hirsuta* may be a parasitoid of this bee as the wasp has been found in woodland sites where *O. uncinata* also occurs (*C. hirsuta* is a known parasitoid of *O. inermis*, but this bee is not found in woodland).

Map compiled by: G R Else and S P M Roberts.
Author of profile: G R Else.

Map 55 *Osmia xanthomelana* (Kirby, 1802)

[Apidae: Megachilinae]

Of the 24 species of endangered bees listed in the British *Red Data Book* (Shirt 1987), four have only been recorded in recent years from a single site. One of these is *Osmia xanthomelana*, the largest and perhaps the most attractive of the ten species of British *Osmia*.

Distribution in Britain and Ireland

The map illustrates the former widespread distribution of this species in Britain, from the south coast northwards to Tyneside. It has been recorded from about 28 widely scattered localities (Else 1994b). Throughout this century there has been a contraction of this range southwards, so that currently the species is on the verge of extinction. The mapped data for the Isle of Wight represent the known nesting location and a single specimen from the south side of Sandown Bay. The population there in most years is estimated to consist of a few tens of individuals, though daily totals of individuals seen are considerably less (Else 1994b). Some apparently ideal sites in north Wales for the species were investigated in 1994 and 1995 by C Clee, but unfortunately without success. The cause of this considerable decline is unknown but may possibly be a combination of loss of suitable habitat and climatic changes. The bee is also rare elsewhere in Europe.

Status (in Britain only)

Listed as Endangered (RDB1) in Shirt (1987) and Falk (1991).

Habitat

In its remaining British site the bee frequents a short section of sandstone and chalk cliffs, and an adjacent landslip. Most specimens have been observed at the base of these, though some females were also seen visiting horseshoe vetch at the top of the cliff (pers. obs.). Freshwater seepages from the cliff are necessary as a source for nest-building materials.

Flight period

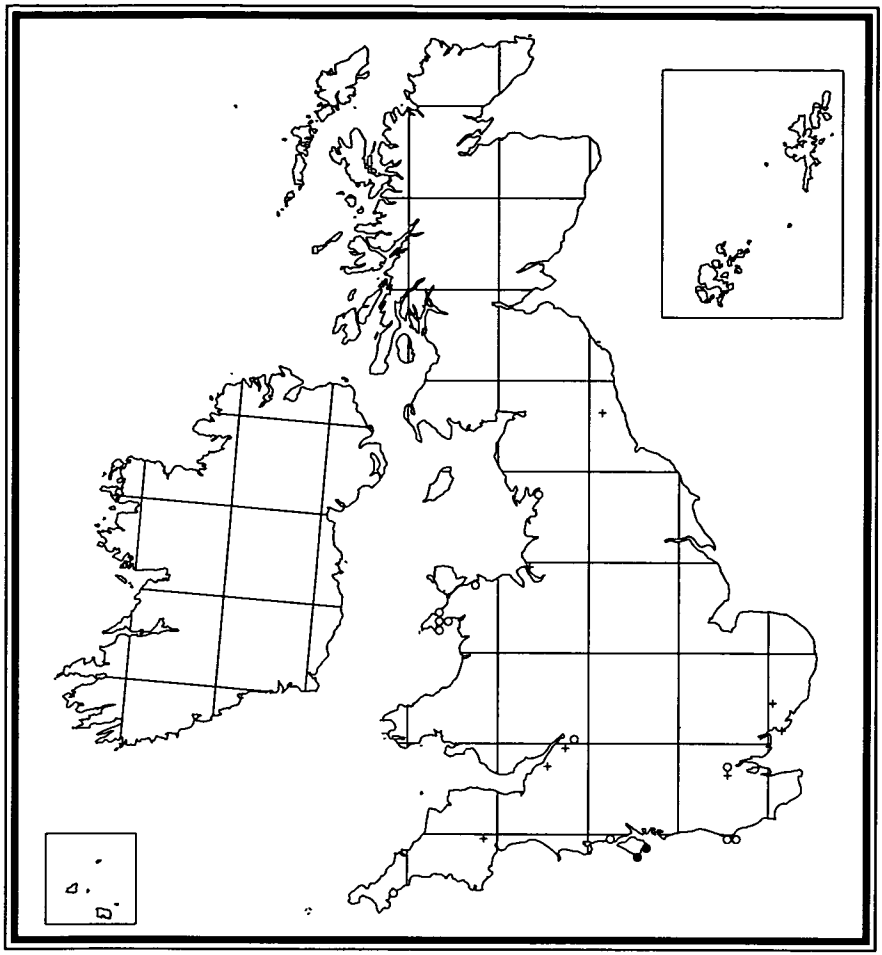
Single-brooded; May to mid-June (exceptionally, March, April and mid-July).

Pollen collected

Females are probably oligolectic on bird's-foot-trefoil and horseshoe vetch.

Nesting biology

A nest generally consists of five or six pitcher-shaped cells, either standing as a cluster, with their bases inserted into the soil (Waterhouse 1844, as *Osmia atricapilla*), or arranged within a burrow (Mortimer 1905). The cells are built with mud mixed with grit or small stones; each is sealed with a flat lid of the same materials.



Flowers visited

On the Isle of Wight, the bee has been observed visiting only bird's-foot-trefoil and horseshoe vetch flowers. There is also a record of the species visiting ground-ivy flowers from near Bristol (Smith 1876).

Parasites

Sapyga species are known cleptoparasites of *Osmia* species, and in north Wales Mortimer (1905) observed many females of *S. quinquepunctata* inspecting open cells of *O. xanthomelana.*

Map compiled by: G R Else and S P M Roberts.
Author of profile: G R Else.

Map 56 *Ceratina cyanea* (Kirby, 1802)

[Apidae: Anthophorinae]

This is the only example in Britain of a small 'carpenter bee', so-called because of its nesting habits – the female excavating its nest burrow in dead, pithy stems.

Distribution in Britain and Ireland

Ceratina cyanea was considered to be a great rarity in Britain until 1972, when it was found in abundance on a downland site in east Hampshire. Subsequently it proved to be widely distributed and locally common in south-east England (especially in the Weald: see distribution map of this area in Else 1995c).

Status (in Britain only)

Listed as Rare (RDB3) in Shirt (1987) and Falk (1991). Recent records suggest that this species may be regarded as scarce.

Habitat

South-facing chalk escarpments, heathland, disused sand quarries and open rides in deciduous woodland.

Flight period

Single-brooded; May to late August, but adults can be found in every month of the year. Females can live about a year; there is evidence to suggest that some individuals of this sex may live for about 18 months (Else 1995c).

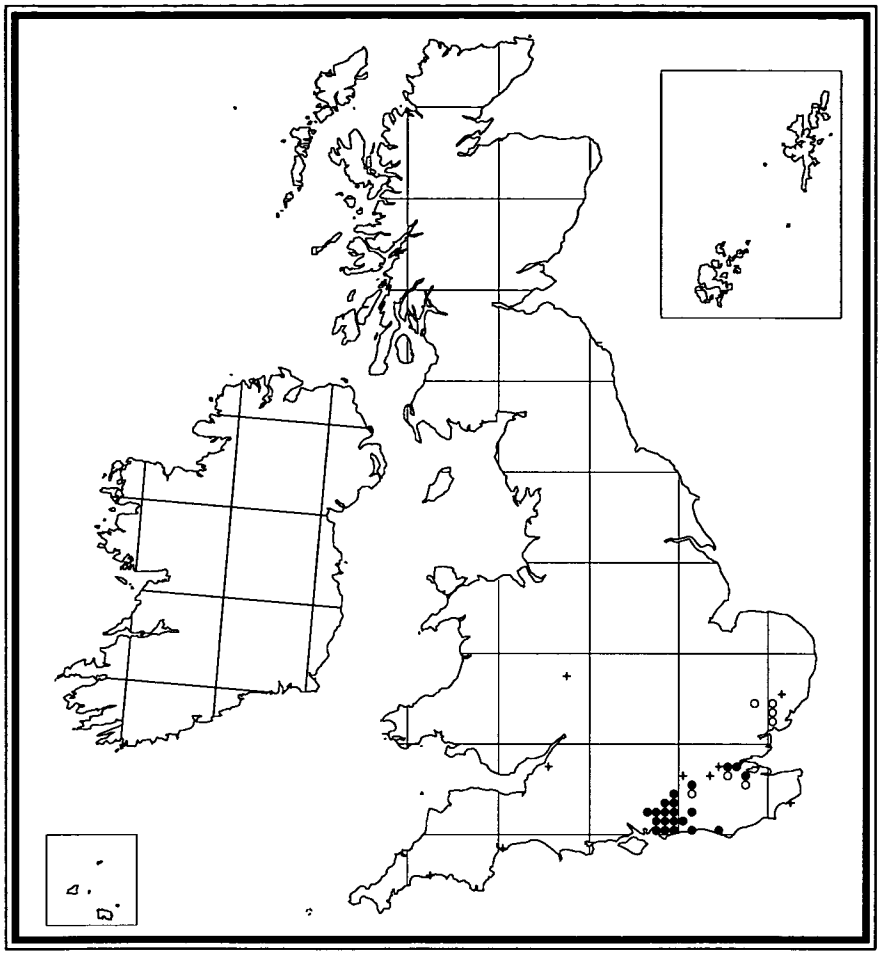
Pollen collected

Polylectic. Pollen from the following species were identified by G Clarke (in Else 1995c) from provisioned nests collected in Hampshire: yellow-rattle, cinquefoil, buttercup, cornflower, fairy flax, bird's-foot-trefoil and unidentified Asteraceae.

Nesting biology

Females excavate nesting burrows in dead, dry, broken herbaceous stems in which the pith has been exposed. Most nests have been found in bramble stems, with a few in rose. The majority of nests seem to be in stems lying on or close to open ground: detached stems are regularly utilised. The cells are separated from one another by vertical partitions composed of compacted, fine wood-dust.

From late summer onwards, adults of both sexes seek out hollow stems in which to pass the winter. Such hibernacula are similar to nest burrows but lack partitions. The bees enter the burrows head first and remain within, often in small aggregations, until the following spring. In a woodland site in east Hampshire many bees were found in the winter in stems of hemp-agrimony, but on nearby chalk grassland they were mainly in bramble stems (pers. obs.). The life history of this species in Britain is described by Else (1995c).



Flowers visited

Bulbous buttercup, bramble, tormentil, burnet rose, viper's-bugloss, heath and germander speedwells, thyme, wild basil, selfheal, harebell and rough hawkbit.

Parasites

In a Hampshire nest which had been opened, an ichneumonid larva (possibly *Aritranis signatorius*) was observed devouring a larva of *C. cyanea* (Else 1995c).

Map compiled by: G R Else and S P M Roberts.
Author of profile: G R Else.

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GAZETTEER

This list shows where places named in the text are situated according to the Watsonian Vice-counties system. These areas have fixed boundaries and are not subject to the changes that occur in modern counties.

Place name	*V-c No.*	*Vice-county*
Abernethy Forest	96	E Inverness
Ardersier	96	E Inverness
Ayr	75	Ayrshire
Barra	110	Outer Hebrides
Benbecula	110	Outer Hebrides
Blair Atholl	89	E Perthshire
Bonar Bridge	107	E Sutherland
Borrowdale	70	Cumberland
Bosherston	45	Pembrokeshire
Botley	11	S Hampshire
Bournemouth	11	S Hampshire
Bovey Valley	3	S Devon
Brockenhurst	11	S Hampshire
Canterbury	15	E Kent
Castlehill	73	Kirkcudbrightshire
Chobham	17	Surrey
Coll	103	Mid Ebudes
Colonsay	102	S Ebudes
Cranes Moor	11	S Hampshire
Deal	15	E Kent
Deeside	92	S Aberdeenshire
Dorking	17	Surrey
Easter Ross	106	E Ross
Edinburgh	83	Midlothian
Emery Down	11	S Hampshire
Forest of Dean	34	W Gloucestershire
Friston Forest	14	E Sussex
Furzebrook	9	Dorset
Glen Affric	96	E Inverness
Goodwood	13	W Sussex
Gower	41	Glamorgan
Holiday Hill	11	S Hampshire
Holmwood	17	Surrey
Holt Heath	9	Dorset
Ipswich	25	E Suffolk

Irvine Moor	75	Ayrshire
Kenfig Dunes	41	Glamorgan
Kingsdown	15	E Kent
Lewis	110	Outer Hebrides
Loch Morlich	96	E Inverness
Loch Rannoch	88	Mid Perthshire
Lustleigh Cleave	3	S Devon
Morden Heath	9	Dorset
Morwenstow	2	E Cornwall
Odiham Common	12	N Hampshire
Oxenbourne Down	11	S Hampshire
Pabbay	110	Outer Hebrides
Pamber Forest	12	N Hampshire
Parley	9	Dorset
Petersfield	11	S Hampshire
Poole	9	Dorset
Purbeck	9	Dorset
Ringwood	11	S Hampshire
Robertsbridge	14	E Sussex
Rhum	104	N Ebudes
Sandscale Haws	69	Westmorland
Sandwich	15	E Kent
Scolt Head Island	28	W Norfolk
Sidmouth	3	S Devon
South Uist	110	Outer Hebrides
Southaven	9	Dorset
Studland	9	Dorset
Sunningdale	17	Surrey
Swanscombe Marshes	16	W Kent
Tadnoll Heath	9	Dorset
Talbot Heath	11	S Hampshire
Tiree	103	Mid Ebudes
Torrs Warren	74	Wigtownshire
Tyddyn Bach	48	Merionethshire
Upnor	16	W Kent
Wicken Fen	29	Cambridgeshire
Wisley	17	Surrey
Woking	17	Surrey
Wotton	17	Surrey
Wrexham	50	Denbighshire

LIST OF PLANT NAMES

The names of plants have been standardised on the *New flora of the British Isles* (Stace 1995).

Note that in this list, vernacular names starting with a lower case letter indicate an unspecified species, or more than one species. The old collective term 'umbellifers' is often still used for members of the family now known as the Apiaceae.

Angelica, wild	*Angelica sylvestris*
angelica	*Angelica* species
Ash	*Fraxinus excelsior*
Aster, sea	*Aster tripolium*
Basil, wild	*Clinopodium vulgare*
Bilberry	*Vaccinium myrtillus*
Bird's-foot-trefoil, common	*Lotus corniculatus*
bramble	*Rubus fruticosus* agg.
Broom	*Cytisus scoparius*
Bugle	*Ajuga reptans*
Buttercup, bulbous	*Ranunculus bulbosus*
buttercup	*Ranunculus* species
Carrot, wild	*Daucus carota*
cat's-ear	*Hypochaeris* species
cinquefoil	*Potentilla* species
Clover, white	*Trifolium repens*
clover	*Trifolium* species
comfrey	*Symphytum* species
Cornflower	*Centaurea cyanus*
Cotoneaster, wall	*Cotoneaster horizontalis*
Cowbane	*Cicuta virosa*
Currant, black	*Ribes nigrum*
dandelion	*Taraxacum* species
dodder	*Cuscuta* species
Elder	*Sambucus nigra*
Fennel	*Foeniculum vulgare*
figwort	*Scrophularia* species
Flax, fairy	*Linum catharticum*
Fleabane, common	*Pulicaria dysenterica*
geranium	*Pelargonium* species
Ground-ivy	*Glechoma hederacea*
Harebell	*Campanula rotundifolia*
Hawkbit, rough	*Leontodon hispidus*
hawkbit	*Leontodon* species

hawkweed	*Hieracium* species
heath	*Erica* species
Heather	*Calluna vulgaris*
Heather, bell	*Erica cinerea*
Hemp-agrimony	*Eupatorium cannabinum*
Hogweed	*Heracleum sphondylium*
house-leek	*Sempervivum* species
Ivy	*Hedera helix*
Lilac	*Syringa vulgaris*
Mallow, common	*Malva sylvestris*
marigold	*Calendula* species
Marjoram, wild	*Origanum vulgare*
Melilot, white	*Melilotus albus*
mignonette	*Reseda* species
Moor-grass, purple	*Molinia caerulea*
Mullein, great	*Verbascum thapsus*
oak	*Quercus* species
Parsnip, wild	*Pastinaca sativa*
Ragwort, common	*Senecio jacobaea*
ragwort	*Senecio* species
Reed, common	*Phragmites australis*
rhododendron	*Rhododendron* species
Rose, burnet	*Rosa pimpinellifolia*
rose	*Rosa* species
Samphire, rock	*Crithmum maritimum*
Sea-holly	*Eryngium maritimum*
selfheal	*Prunella* species
Sheep's-bit	*Jasione montana*
Sneezewort	*Achillea ptarmica*
Sow-thistle, perennial	*Sonchus arvensis*
Speedwell, germander	*Veronica chamaedrys*
Speedwell, heath	*Veronica officinalis*
speedwell	*Veronica* species
Spurge, sea	*Euphorbia paralias*
spurge	*Euphorbia* species
Stonecrop, biting	*Sedum acre*
Sycamore	*Acer pseudoplatanus*
Thistle, cotton	*Onopordum acanthium*
Thistle, creeping	*Cirsium arvense*
Thistle, spear	*Cirsium vulgare*
thistle	Numerous genera
Thrift	*Armeria maritima*
Thrift, jersey	*Armeria arenaria*

thyme	*Thymus* species
Toadflax, pale	*Linaria repens*
Tormentil	*Potentilla erecta*
Vetch, horseshoe	*Hippocrepis comosa*
violet	*Viola* species
Viper's-bugloss	*Echium vulgare*
Water-dropwort, hemlock	*Oenanthe crocata*
Water-dropwort, parsley	*Oenanthe lachenalii*
water-dropwort	*Oenanthe* species
Weld	*Reseda luteola*
Willow, creeping	*Salix repens*
Willow, goat	*Salix caprea*
willow	*Salix* species
woundwort	*Stachys* species
Yarrow	*Achillea millefolium*
Yellow-rattle	*Rhinanthus* species

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