

BOMBUS LAPIDARIUS (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



BOMBUS TERRESTRIS (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



BOMBUS PASCUORUM (M) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



BOMBUS HYPNORUM (M) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



BOMBUS PRATORUM (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



BOMBUS HORTORUM (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



BOMBUS VESTALIS (M) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



OSMIA AURULENTA (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



OSMIA RUFA (M) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



APIS MELLIFERA (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



ANDRENA HAEMORRHOA (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



ANDRENA CARANTONICA (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



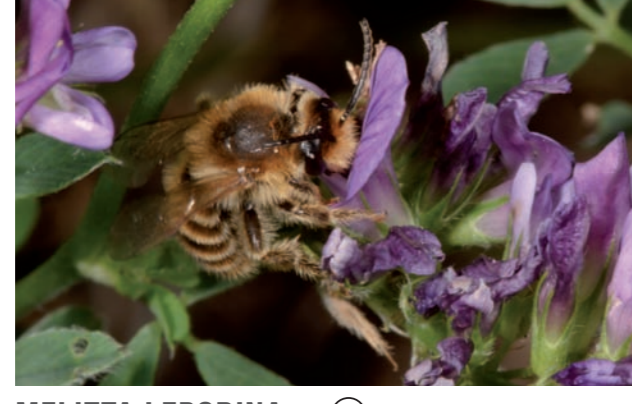
ANDRENA CINERARIA (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



ANDRENA FULVA (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



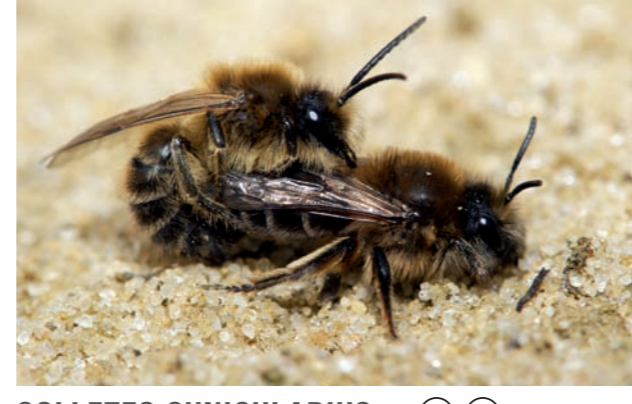
ANDRENA FLAVIPES (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



MELITTA LEPORINA (M) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



COLLETES HEDERARUM (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



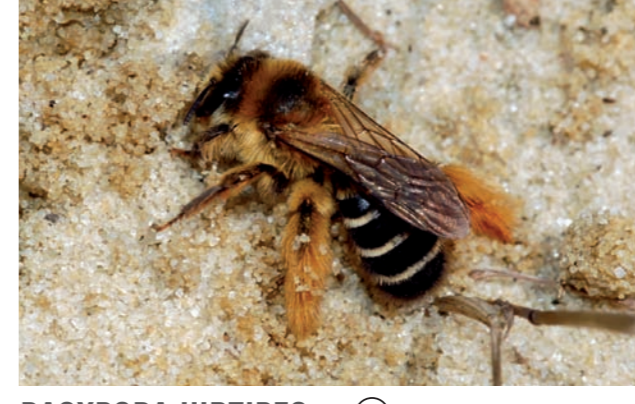
COLLETES CUNICULARIUS (M) (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



MACROPIS EUROPAEA (M) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



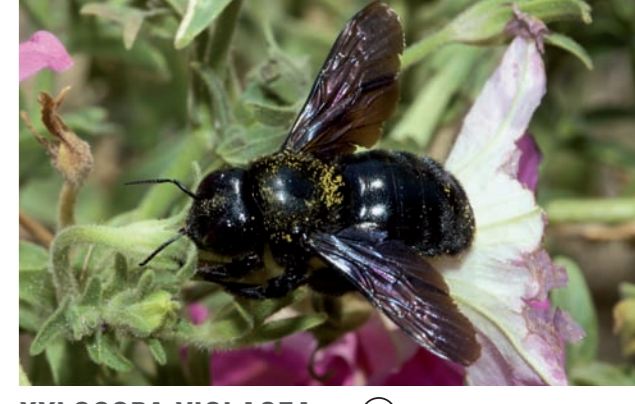
LASIOGLOSSUM XANTHOPUS (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



DASYPODA HIRTIPES (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



ANTHOPHORA BIMACULATA (M) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]



XYLOCOPA VIOLACEA (F) [Icons: Woodland, Flower rich, Cavity, Mining, Cuckoo, Small, Medium, Large, Seasonal icon]

THE OPERATION POLLINATOR GUIDE TO THE BEES OF GREAT BRITAIN AND IRELAND



Instigated by Syngenta and based on research and practical experience on over a decade of investment in R&D, Operation Pollinator trains Course Managers across Great Britain and Ireland to establish pollen and nectar-rich habitats.

To find out more about Operation Pollinator and any of the topics discussed here, please go to: www.operationpollinator.com/golf

Different types of pollen transportation



Bees and their role as pollinators

Many insects transfer pollen between the reproductive parts of flowers of the same species – a process known as pollination. Most insects, however, only visit flowers for nectar. Bees, solitary bees in particular, are usually far more efficient at pollination than other insects and there are a number of reasons why. Female bees visit flowers for nectar to be used as energy for both adult and larvae, and for pollen, which provides protein, mostly for larval food. Bees also have branched hairs on the body, to which the pollen grains attach through electrostatic forces. This, combined with the extra time spent collecting, and thus transferring, pollen makes them very efficient at pollination.

Different bee species visit flowers for different reasons

Adult honeybees outnumber larvae many times over. Therefore, workers spend much of their time foraging for nectar to meet adult energy requirements, rather than collecting pollen to feed larvae. With 'solitary' bees, it is completely the opposite. A female looks after her brood on her own. This brood can number over 20 larvae during her adult life. This means she spends much more time collecting pollen for her larvae than an individual worker honeybee.

Different bee species transport pollen in different ways

Honeybees and social bumblebees collect pollen on a shiny hairless patch on their hind leg surrounded by strong hairs, called the pollen basket or corbiculum. To make the dry pollen stick to the hairless patch, they mix the pollen with nectar, which stops the wet pollen being rubbed from the pollen basket onto the next flower.

Most 'solitary' bees collect dry pollen on specialised areas of hairs on the hind leg or beneath the abdomen, called the scopa. The dry pollen stays attached to the bee in transit, but is easily brushed off when it visits other flowers.

Solitary bees are the best pollinators

It is widely assumed that honeybees are the only viable pollinators. They can be transported in large numbers and are therefore currently used for commercial pollination. Scientific research suggests, however, that solitary bees can be more efficient at pollination than honeybees.

- Wild bees are an essential part of the natural ecosystem for the pollination of food crops and wild plants, and to maintain biodiversity
- There are over 250 species of bees in Great Britain and Ireland, only one of these is the Honeybee *Apis mellifera*
- Many bee species have seriously declined in Great Britain and Ireland and some species are on the verge of extinction
- Golf courses provide outstanding potential to create essential nesting habitat and food resources for a wide range of native bees and other pollinating insects

The different types of bees

There are currently 28 genera contained within over 250 species of bees in Great Britain and Ireland. Only one species is the Honeybee *Apis mellifera*, 26 species are bumblebees – from the well known genus *Bombus* – and the remainder are often described as 'Solitary bees'.

Solitary bees can be broadly divided into two main groups: mining bees and cavity nesters. A few can be social. Some construct their own nests from materials such as mud, resin and pebbles, attaching them to various structures.

1. Honeybees

This is the only bee species in Europe that makes honey, and is the only species which is used for commercial honey production and pollination. Most colonies are managed by man, but honeybees may also exist as a wild species over much of Europe.

2. Bumblebees

Bumblebees are social bees and are related to honeybees. Both use a similar method for collecting pollen. Bumblebees make nests on the ground or in cavities above or below the ground, often in vole or mouse nests.

3. Mining bees

Mining bees excavate nests individually or in loose colonies, in various soil types on the ground, in banks or cliffs. *Andrena* is the largest genus with over 60 species, *Lasiglossum* has over 30 species; many are important crop pollinators.

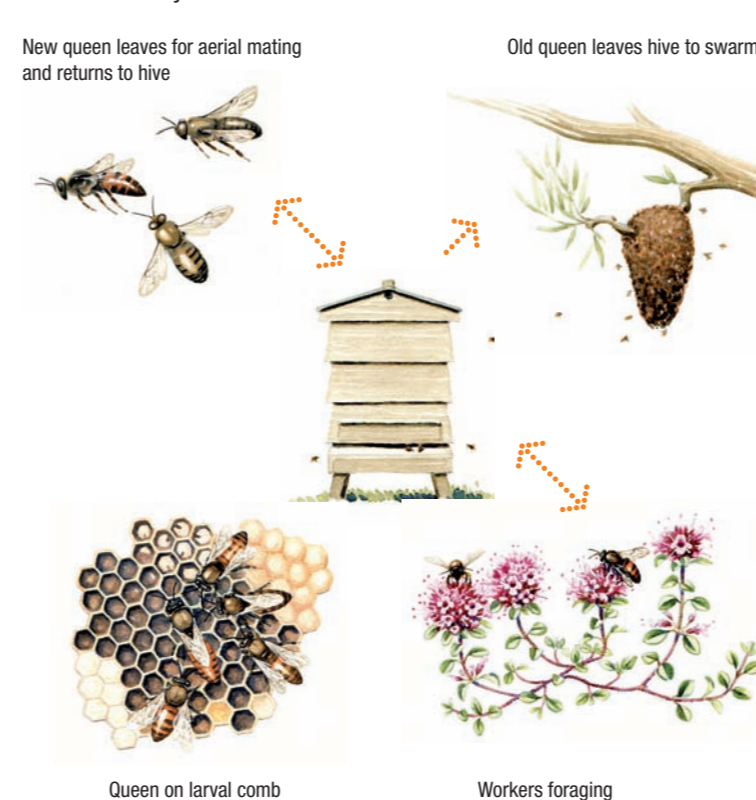
4. Cavity-nesting bees

These bees nest in various cavities, including snail shells, or excavate nests in dead wood, soft rocks, masonry or soil. The largest family is *Megachilidae*, which includes mason and leafcutter bees. They all use mud, petals or leaves (chewed or cut pieces), or resin in nest construction. A few species are used commercially for pollination.

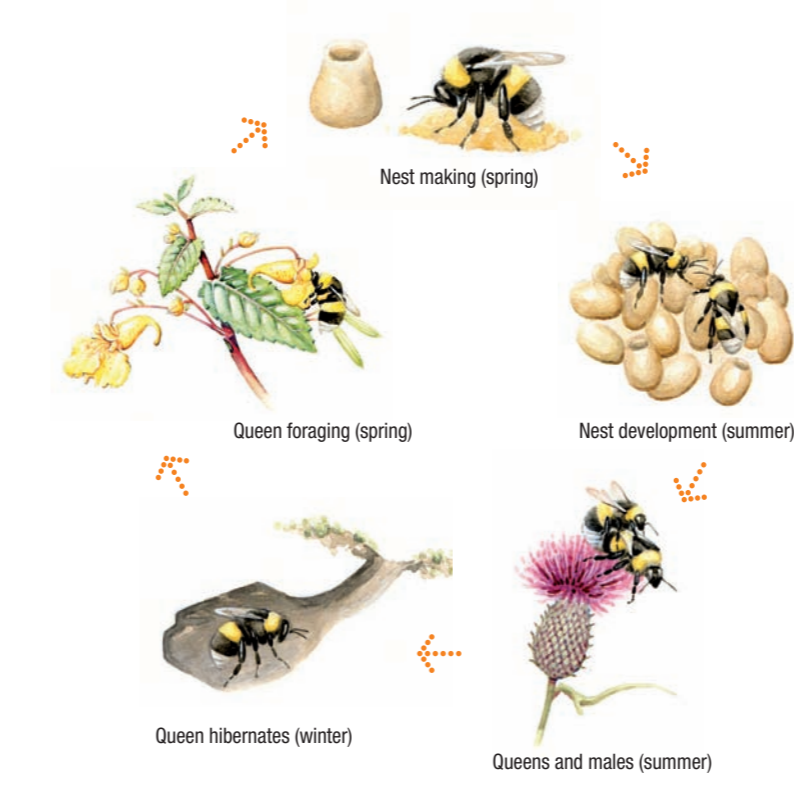
5. Cuckoo bees

Over 20% of solitary bees in Great Britain and Ireland are cuckoo bees. There are also cuckoo bumblebees. As their name suggests, these take over the nests of other bees. They do not collect pollen but can pollinate flowers when foraging for nectar.

Honeybee life cycle



Bumblebee life cycle



Solitary bee life cycle

