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Forgotten Pollinators: the "other" bees

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In media shows, advertising and children's literature, bees generally get a very favourable press: they work hard together to provide us with honey – and in the process they pollinate our crops and wild flowers. Occasionally they might sting, but that's usually just our carelessness. Almost always, 'bees' means 'honeybees', and even these are usually portrayed as furry, cuddly black-and-yellow striped bumblebees that live in hives!

Male Hairy-footed Flower Bee

What is usually ignored is that in the UK alone there are some 270 species of wild bees, including 27 bumblebees, and just one species of honeybee. So, what are the 'other bees'? Keen gardeners might have been annoyed to find their prize roses with numerous neat, symmetrical holes cut out of the leaves. If they are also nature-lovers, they would have been reconciled to the damage when discovering the culprits are a species of wild bee – a 'leafcutter'. In fact, there are seven species of leafcutter bee established in Britain, and three of them are quite commonly found in gardens. Another well-known bee is the aptly named 'Hairy-footed Flower Bee' *Anthophora plumipes*. This species nests in crevices in old walls, and makes its appearance in early spring. The males emerge first, and establish regular patrols, awaiting the arrival of the females. When fresh, the males have a dense ginger-brown coat, and could easily be confused with the Common Carder Bumblebee *Bombus pascuorum* (though they are much smaller than the queens of that species, flying at the same time). The females are black-coated, with bright orange hairs on their hind legs, also looking very bumblebee-like. They have a black-and-white nest-parasite named the 'Mourning' Bee *Melecta albifrons* which is usually to be seen where the flower bees occur.

Another species that has become very familiar is the Ivy Bee *Colletes hederae*. It was first distinguished as a species by the great German bee expert, Paul Westrich and a colleague, as recently as 1993. It was first recorded in Britain in 2001, and has since spread astonishingly quickly across the UK up to Scotland. It has golden brown hair on the thorax, and the abdomen is black with bands of pale fawn flattened hairs across the segments. The bee nests in huge aggregations, sometimes in lawns, or other open areas with friable soil and sparse vegetation. There is a churchyard in Woodbridge, Suffolk, almost entirely covered with Ivy Bee nests. In most places where it occurs, it can be found on the flowers of almost any stand of Ivy from late August on into the Autumn.

The miners

These three species share with almost all the wild bees apart from the honeybee and the bumblebees a key feature of their life-cycle: they are 'solitary'. This is a bit puzzling, as they often nest in very dense aggregations – sometimes as many as thousands, all nesting within a few centimetres of one another. There is some evidence these species are attracted to sites where other bees are nesting, but they are still solitary in the sense that each female constructs its own nest, and provides food for its larvae, without any cooperation with other bees.

That is, unlike the social bees and wasps, there is no non-reproductive worker caste, enslaved into foraging and working for a dominant queen. In many species, the females make their nests by burrowing into the ground. At certain points in the burrow (or branches from the main tunnel) the wall is compressed to form a cell.



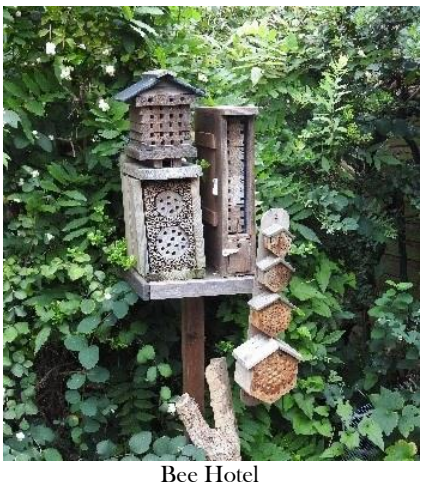
Female Ivy Bee. Holes in rose leaves made by a leafcutter bee. Leafcutter Bee carrying a leaf section.

This is usually (but not always) lined with a waterproof protective secretion. The female then stocks it with a 'loaf' of mixed pollen and nectar and lays an egg. Once the cell is completed, the female goes on to repeat the process. Meanwhile, the egg hatches and the resulting larva feeds on the store she has provided for it, going through several moults until it reaches the final larval stage (called a 'prepupa'). This is the most common stage for spending the winter, with pupation and subsequent emergence of the adult occurring during the following spring or summer. However, there are many variations on this theme: some species have two broods in a year, while some individuals of a few species may have a two-year cycle. A few species which fly very early in the year spend the winter in their cells as adults. I, with a local group of naturalists dug up some brood cells of the Early Colletes *Colletes cunicularius* (a spring-flying relative of the Ivy Bee) in winter, and the bees inside buzzed at us angrily. We kept them in cool conditions and they emerged at the appropriate time.

Brood cells of Early Colletes Bee

The cavity nesters

The ground-nesting bees belong to four families of solitary bee, but species belonging to two families usually nest above ground in cavities of various kinds. These might be cavities in old walls, steep quarry sides or cliffs, as in the Hairy-footed Flower Bee, or in hollow plant stems, as in some of the leafcutters and their relatives (family Megachilidae). These are the species that have benefitted greatly from the provision of garden 'Bee Hotels'. In fact, these need not be 5-star accommodation. Many people experiment with blocks of wood with holes of various widths bored into them, or bind together lengths of garden cane in a modified bird-table. These should be placed in a sunny part of the garden, with the openings roughly south-facing. There are also commercially supplied nest boxes of various designs, some of them with concealed transparent sides that make it possible to watch the bees' activity as they make and stock their nests.

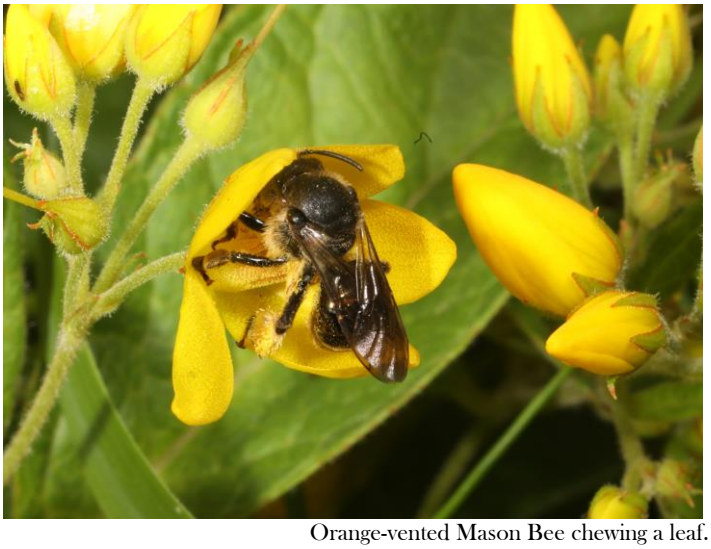
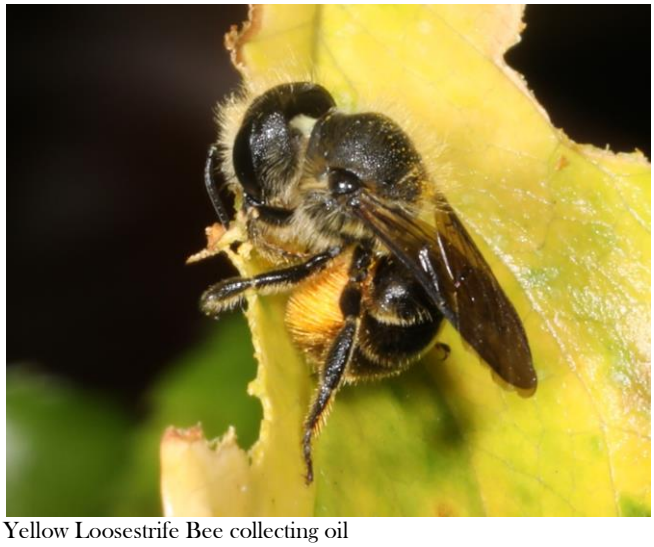


Bee Hotel

These features in a garden offer endless hours of fascination for those with time to watch. In spring, the most likely occupants of the hotel are females of the well-known Red Mason Bee *Osmia bicornis*. These begin by collecting mud in their mandibles, and using it to line their first brood cell. Then they bring back a load of pollen, carried in a brush of long hairs under the abdomen. They first turn round and scrape the pollen into the cell, and later regurgitate some nectar to mix with it. When the stock of food is complete, they lay a single egg and close the cell with more mud (which they manipulate with two 'horns' on the head). This forms the rear wall of the next cell, and the process is continued until the cavity is almost filled. A 'vestibule' is left empty near the nest entrance, and the completed nest is sealed with a thick wad of mud. The next species on the wing is likely to be another mason bee. The Orange-vented Mason Bee *Osmia leaiana* is the most frequent in our garden, and instead of mud it uses a form of mastic made from chewed-up fragments of leaves to construct its cell walls and to plug the nest entrance when it is complete.

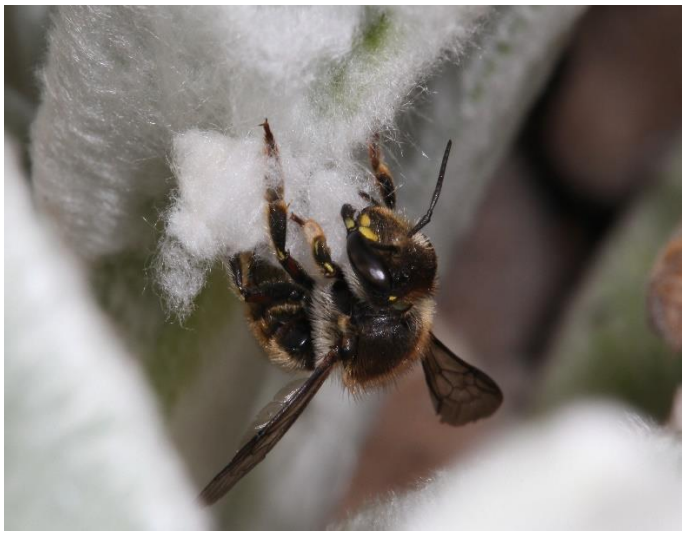
Another species that readily uses bee hotels was once quite a rarity, but has become increasingly widespread in Britain. This is the Large-headed Resin Bee *Heriades truncorum*. The males usually appear in late May, but the females are actively constructing their nests through June and July and even continue to late August. Like the mason bees, they carry

their loads of pollen in hair brushes (known as 'scopae') under their abdomen, but they use tree resin to make the compartments dividing their cells, and also to insert a 'plug' across the nest entrance – this can be as much as 5mm thick. As if that were not enough protection, they then collect tiny pieces of grit or stone and press them into the resin plug. The females of this species seem to be especially aggressive, and conflicts frequently break out between neighbours, often as a result of one attempting to usurp the other from her nest.

Orange-vented Mason Bee chewing a leaf. Yellow Loosestrife Bee collecting oil

Also, from mid-summer the leafcutters are active, cutting their neat, symmetrical sections of leaf to line their nests and then plugging the entrance with numerous layers of disc-shaped sections. Several of the leafcutters will use the artificial cavities of the bee hotel, and it is fascinating to watch them cutting the leaves and then carrying them back to the nest caged between their legs. Another remarkable member of the family is the Wool Carder Bee *Anthidium manicatum.* The females line their nests with plant hairs that they clip off with their scissor-like mandibles. A patch of Lamb's Ear *Stachys bizantina* in the garden is a good way to attract them. The males patrol territories around the plants, diving onto females as they arrive to forage for nectar or pollen. Meanwhile, females that have mated and are searching for nesting material shear hairs from the lower leaves, unnoticed by the males.




Wool Carder Bee and Mourning Bee

The nesting behaviour of solitary bees is almost unendingly various, with three species that make their nests in the spiral cavities within snail shells, and another which nests in the cavity of a gall made by a fly that lays its eggs in flower-stems of Common Reed *Phragmites australis.* Another lines its nests with plant oils which it collects from the flowers of an uncommon wetland plant, Yellow Loosestrife *Lysimachia vulgaris.*

Prepupae of Reed Yellow-face Bee

Solitary bees and flowers

If we shift focus to another aspect of their behaviour – their relationship with flowers – the fascination continues. Most bees will suck nectar from a wide range of flowers, but pollen is another requirement for the nutrition of the larvae. It is high in protein and other nutrients, and is expensive for the plant to produce. The plants have evolved a huge variety of ways of attracting insect pollinators to do the necessary work of transferring pollen from one plant to another, whilst limiting the amount of pollen they 'waste'. Of course, this pollen that is wasted, from the point of view of the plant, is the indispensable food supply for the offspring of the bees. So, at least for those plants that rely on cross pollination, there exists a sort of competitive mutual dependency. This has produced a great variety of different adaptations on the part of both the bees and their plant 'hosts'. These include, of course, the huge variety of flower colours, scents and structures.

While some bee species are able to collect pollen from many flower species, others are very choosy – and some are very choosy indeed. Some bees will collect pollen just from one, or a small range of flowers, for example, from one genus of plants only. One example is the Bryony Bee *Andrena florea*, which collects pollen only from plants of White Bryony *Bryonia dioca* in Britain, or from this and a close relative in its wider European range. As bryony has male and female flowers on separate plants, pollination depends on insect visitors to the male flowers being 'persuaded' to go on to the female ones for nectar. How is this done?

Another example is the Yellow Loosestrife Bee *Macropis europaea.* This species seems to be completely dependent on the oil from the loosestrife flowers (or a close relative), and other insects do not seem to visit the flowers, so the plant may be dependent on the bee for pollination. But although the plant is widespread, it is also often very localised. So how do the bees find it?

These and many other puzzles abound in the realm of the solitary bees. It is often stated – and correctly so – that a majority of our wild flowers, and many of the crop plants we use for food are pollinated by solitary bees. There is evidence that they do better than honeybees in this respect – and also that honeybees can be a threat to the diversity of our wild solitary bees. So, their ecological function is indispensable, but for me, at least, it is the wonderful diversity of their modes of life, and the many unanswered questions about them, that inspire my appreciation of them.

What next?

The Bees, Wasps and Ants Recording Society (BWARS) is the national society for people interested in bees and their relatives. It has workshops to help beginners with identification, and issues two newsletters a year.

The authoritative, two-volume *The Bees of the British Isles* by Mike Edwards & George Else (2018) is the standard work, while the *Field Guide to the Bees of Great Britain and Ireland* (2015) by Steven Falk (illustrations by Richard Lewington) is an excellent, comprehensive guide (and is complemented by Falk's web feature). Books that focus less on identification, more on behaviour and ecology, include my *Solitary Bees*, in the Naturalists' Handbooks series (2017); *The Solitary Bees*, by Danforth, Minckley and Neff (2019); and *Solitary Bees* by Nick Owen and myself, in the New Naturalist series, forthcoming in May 2023.

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All photos: T. Benton.