

## Bees

Bees are flying insects closely related to wasps and ants. Bees are a monophyletic lineage within the superfamily Apoidea, presently classified by the unranked taxon name Anthophila. There are slightly fewer than 20,000 known species of bee, in nine recognized families, though many are undescribed and the actual number is probably higher. They are found on every continent except Antarctica, in every habitat on the planet that contains flowering dicotyledons.

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The smallest bee is the dwarf bee (*Trigona minima*), about 2.1 mm (5/64") long. The largest bee in the world is *Megachile pluto*, which can grow to a size of 39 mm (1.5"). Member of the family Halictidae, or sweat bees, are the most common type of bee in the Northern Hemisphere, though they are small and often mistaken for wasps or flies.

The best-known bee species is the Western honey bee, which, as its name suggests, produces honey, as do a few other types of bee. Human management of this species is known as beekeeping or apiculture.

Bees are the favorite meal of *Merops apiaster*, the bee-eater bird. Other common predators are kingbirds, mockingbirds, bee wolves, and dragonflies. Solitary and Communal Bees

Most other bees, including familiar species of bee such as the Eastern carpenter bee (*Xylocopa virginica*), alfalfa leafcutter bee (*Megachile rotundata*), orchard mason bee (*Osmia lignaria*) and the hornfaced bee (*Osmia cornifrons*) are solitary in the sense that every female is fertile, and typically inhabits a nest she constructs herself. There are no worker bees for these species. Solitary bees typically produce neither honey nor beeswax. They are immune from acarine and *Varroa* mites (see diseases of the honey bee), but have their own unique parasites, pests and diseases. Solitary bees are important pollinators, and pollen is gathered for provisioning the nest with food for their brood. Often it is mixed with nectar to form a paste-like consistency. Some solitary bees have very advanced types of pollen carrying structures on their bodies. A very few species of solitary bees are being increasingly cultured for commercial pollination.

Solitary bees are often oligoleges, in that they only gather pollen from one or a few species/genera of plants (unlike honey bees and bumblebees which are generalists). No known bees are nectar specialists; many oligolectic bees will visit multiple plants for nectar, but there are no bees which visit only one plant for nectar while also gathering pollen from many different sources. Specialist pollinators also include bee species that gather floral oils instead of pollen, and male orchid bees, which gather aromatic compounds from orchids (one of the only cases where male bees are effective pollinators). In a very few cases only one species of bee can effectively pollinate a plant species, and some plants are endangered at least in part because their pollinator is dying off. There is, however, a pronounced tendency for oligolectic bees to be associated with common, widespread plants which are visited by multiple pollinators (e.g., there are some 40 oligoleges associated with creosotebush in the US desert southwest, and a similar pattern is seen in sunflowers, asters, mesquite, etc.)

Solitary bees create nests in hollow reeds or twigs, holes in wood, or, most commonly, in tunnels in the ground. The female typically creates a compartment (a "cell") with an egg and some provisions for the resulting larva, then seals it off. A nest may consist of numerous cells. When the nest is in wood, usually the last (those closer to the entrance) contain eggs that will become males. The adult does not provide care for the brood once the egg is laid, and usually dies after making one or more nests. The males typically emerge first and are ready for mating when the females emerge. Providing nest boxes for solitary bees is increasingly popular for gardeners. Solitary bees are either stingless or very unlikely to sting (only in self defense, if ever).

While solitary females each make individual nests, some species are gregarious, preferring to make nests near others of the same species, giving the appearance to the casual observer that they are social. Large groups of solitary bee nests

are called aggregations, to distinguish them from colonies.

In some species, multiple females share a common nest, but each makes and provisions her own cells independently. This type of group is called "communal" and is not uncommon. The primary advantage appears to be that a nest entrance is easier to defend from predators and parasites when there are multiple females using that same entrance on a regular basis.