

# Bumblebees - What We Should Know About Them

By Khalil Hamdan  
Apeldoorn  
The Netherlands

Scientific name: *Bombus*, a Latin word meaning a buzzing or booming sound.

Family: Apidae

Order: Hymenoptera (stinging insects)

## Biology and Behaviour

Bumblebees are social insects, live in organized colonies in nests typically built in a small hole in the ground or under a clump of grass. They are robust, hairy, black with yellow bands and make a buzzing sound while flying. There are about 250 different species of bumblebee in the world. They are most common in temperate climates, and fly from March to October. Bumblebees are vegetarian and get their food from flowers. They would die of starvation without flowers. They collect pollen and nectar in spring and summer and store relatively small quantities of honey. Bumblebees require pollen as a protein source for feeding their larvae, and nectar as a sugar (carbohydrate) source - a fuel for the adults' flight. Since the honey they store in their nests is of small quantities compared to honey bees, they are not domesticated as honey producers. Their use is limited to pollination of agricultural crops in large greenhouses. Bumblebees live in habitats where there are flowering plants, and can be found in farmland, grassland, woodland edges, roadside verges, garden, heartland, long grass and highland.

The three castes of bumblebees are the queen, female workers and males. The length of The queen is 20-25 mm (0.7-1 inch), worker 18-25 mm (0.6-0.9 inch) and the male 14 -16 mm (0.6 inch). In the adult worker the abdomen is rounded and divided into six segments, the tip of the abdomen pointed with a sting. In the male the abdomen is more narrow and elongate and has seven segments - the tip of the abdomen is blunt. The feelers or antennae of a female are shorter than those of the males. Each antenna is divided into 12 segments, whereas the male's antennae are somewhat longer and each has 13 segments. The gender of a bumblebee can be distinguished by counting the number of segments on its back or the number of segments of the antenna. The time of year should also be considered - males become common in late summer and autumn.

The queen and the worker have a sting, while the male is stingless. The queen and the worker are capable of stinging if they are disturbed or provoked. Unlike honeybees, they do not die after stinging. Bumblebees are non-aggressive although, will sting in defence of their nest or if harmed. Unlike the honeybee queen, the bumblebee queen sets about the task of building her own nest, foraging, and incubating brood cells. She is not as prolific as the honeybee queen. Nests may have up to 300 workers depending on species. A bumblebee queen lives one year from autumn to autumn. A worker lives about 8 -12 weeks.

Bumblebees have an annual life cycle; each year new colonies are founded in spring by a queen, which mated in the late summer of the previous year after her winter hibernation.

On a warm day the queens emerge and search for a suitable nest site. The nest is usually built from moss and leaves in a hole in the ground and often the nest entrance is covered with grass. The queen builds first a rudimentary nest consisting of a few small wax cells known as "round honey pots" in which she stores honey and pollen, which she herself collects from flowers during early spring.

The bumblebee queen lays two types of egg, fertilized eggs with chromosomes from the queen and a male she mated with the previous year, and unfertilized eggs, which contain chromosomes from the queen alone. Before she lays the egg she decides whether to use sperm from the spermatheca to fertilize it or not. The fertilized eggs develop into workers (females) and queens, and the unfertilized eggs develop into males. Bumblebees pass through four stages during their life span. The four stages are – egg – larva – pupa and adult.



**Bumblebee extracting nectar from a flower.**  
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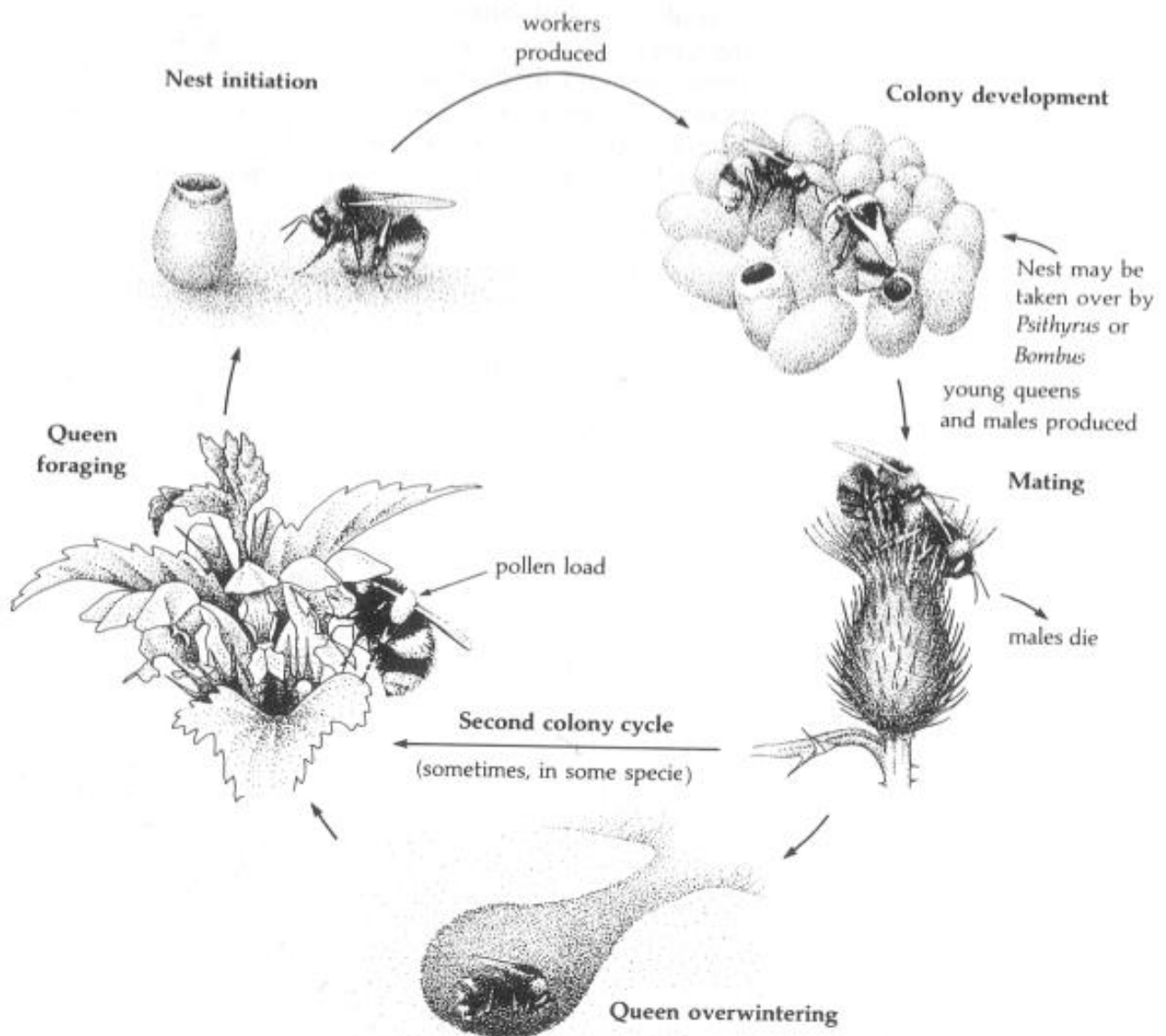


**Bumblebee nest showing the cells in which honey, pollen and offspring are stored.**  
Photo: Dan L. Perlman/EcoLibrary.org.

The queen lays eggs in batches of 5-20 on the ball of pollen in the pots, seals this with wax and incubates the eggs to keep them warm. Like a bird, the bumblebee queen uses the warmth of her body to incubate her eggs. Eggs and larvae must be kept at a temperature about 30–32 °C (86-89.6 ° F). The queen feeds on honey in a honey pot, which is positioned within her reach in the nest while she incubates the eggs. Eggs hatch into larvae after 5 days; larvae pupate after 12 days and the pupae metamorphose into the adult insect after 2 weeks. The development time from egg to adult is 30 days depending on the temperature. Approximately half the time is spent as a larva feeding, the rest of the time as a pupa in a cocoon. As soon as eggs hatch the newly hatched larvae partially consume the food in their cells, and later they are fed by the queen herself with honey and pollen through a small hole in the cell wall till they have completed their development and sealed themselves in the cell with a cocoon. The first batch or hatching of bumblebee workers are small than their sisters who will emerge later on when the colony grows larger. These daughters of the new colony stay in the nest for the first week performing nursing duties before starting to forage. When they have become foragers they take over from the mother the duties of collecting and feeding the offspring. The queen then stops working outside and devotes herself to egg laying and incubation. She will lay batch after batch.

In the summer the colony population grows rapidly generally containing 50-300 individuals and the workers bring in abundant food. Towards the end of the summer males and new queens are produced. The males fly with the virgin queens to mate and after mating the males die. Mating takes place on the ground or on vegetation. In autumn (October) the old queen stops laying eggs and as cold weather arrives the old queen and the colony gradually die out. The newly fertilized queens leave the nest and search for a sheltered place in which to hibernate during winter without feeding. The following spring each queen will found a nest on her own and repeat the whole cycle. In the tropics where weather is warm and flowers are available throughout the year, reproduction takes place the year round. This would mean that instead of hibernating the new queens immediately start their own colonies.

### Outline life cycle of bumblebees in a temperate region



## Bumblebees as pollinating agents

Bumblebees play a vital role in pollination of plants. Being large, very hairy and so are ideal for picking up and transferring pollen. These insects can control their body temperature in cold weather by using their flight muscles to warm up themselves, which allows them to continue pollinating when it is cold. Bumblebees can fly at lower temperatures as low as 5 °C (41° F), even in the rain and on windy or cloudy days; they will fly out 5 km (3.1 miles) or more off the nest to gather nectar and pollen and forage from dawn until dusk thus longer hours than the honeybees. Bumblebees are perfect pollinators of fruit trees in the Scandinavian countries and North America, in areas where honeybee pollination is limited by low temperatures.

Many species have longer tongues than honeybee, so they are capable of pollinating flowers with long, narrow corollas for example, Red clover (*Trifolium pratense*). Bumblebees are better pollinators than honeybees in greenhouses and polytunnels, and are of great economic importance in greenhouse cultivation of such as tomato, strawberry, cucumber, courgette, melon, sweet pepper and eggplant. Unlike honeybees, bumblebees seem happy to exist inside a greenhouse. Bumblebees are also able to perform buzz pollination where they bite the anther of the flower and shake the pollen out by vibrating their flight muscles (again something which honeybees are unable to do).



**Bumblebee nests in a commercial greenhouse.**

Photo: Biobest NV

All these factors make the bumblebees invaluable pollinators. That is why they are reared commercially in a number of countries across the globe and sold at between \$70 to 200 per box. Each box or commercial hive contains a mated queen and brood. About 250,000 colonies are reared yearly and used in over 30 countries for pollinating over 25 crops. Bumblebees are beneficial to Apples, plums, cherries, avocados, kiwi fruits, and small fruits.

Tomato flowers require slight vibration for pollen grains from the stamens to fall on to the stigma of the flowers. Outdoors, this is done by wind and insects. Under greenhouse conditions, however, the flowers require buzz pollination for fruit sets.

## Buzz pollination

Bumblebees are effective pollinators of tomato plants and do this more efficiently than honeybees, manual pollination and hormone application. They have a special ability to shake loose firmly held pollen grains from plants using sonic vibration. In order to shake loose the pollen, the bumblebee holds the flower with its legs and mouthparts and buzzes or vibrates its wing muscles rapidly without moving its wings, causing the flower and anthers to vibrate and the pollen to be released on to the bumblebee's body, and on to the stigma of the flower. This resonant vibration is known as buzz pollination or sonication. Some of the pollen on the bumblebee's hairy body is transferred to nearby flowers by the bumblebee, thereby assuring a higher yield and larger quality of fruit.



**A bumblebee buzz pollinating a tomato flower.**

Photo: Andre Kessler



**A bumblebee covered in pollen.**

Photo: Jesse Hickman