

Beekeeping or apiculture:

Honey bee: Classification:

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Hymenoptera
Family: Apidae
Subfamily: Apinae

Species

Subgenus *Micrapis*:

- *Apis andreniformis*
- *Apis florea*

Subgenus *Megapis*:

- *Apis dorsata*

Subgenus *Apis*:

- *Apis cerana*
- *Apis koschevnikovi*
- *Apis mellifera*
- *Apis nigrocincta*

Micrapis

Apis florea and *Apis andreniformis* are small honey bees of southern and southeastern Asia. They make very small, exposed nests in trees and shrubs. Their stings are often incapable of penetrating human skin, so the hive and swarms can be handled with minimal protection. *A. florea* is more widely distributed.

Megapis

There is one recognized species in subgenus *Megapis*. It usually builds single or a few exposed combs on high tree limbs, on cliffs, and sometimes on buildings. They can be very fierce. Periodically robbed of their honey by human "honey hunters", colonies are easily capable of stinging a human being to death when provoked.

Apis dorsata on comb

- *Apis dorsata*, the giant honey bee, is native and widespread across most of South and Southeast Asia.
- *Apis dorsata binghami*, the Indonesian honey bee, is classified as the Indonesian subspecies of the giant honey bee or a distinct species; in the latter case, *A. d. breviligula* and/or other lineages would probably also have to be considered species.^[5]
- *Apis dorsata laboriosa*, the Himalayan honey bee, was initially described as a distinct species. Later, it was included in *A. dorsata* as a subspecies^[1] based on the biological species concept, though authors applying a genetic species concept have suggested it should be considered a species.^[4] Essentially restricted to the Himalayas, it differs little from the giant honey bee in appearance, but has extensive behavioral adaptations which enable it to nest in the open at high altitudes despite low ambient temperatures. It is the largest living honey bee.

Beekeeping (or **apiculture**, from Latin apis, bee) is the maintenance of honey bee colonies, commonly in hives, by humans. A beekeeper (or apiarist) keeps bees in order to collect honey and other products of the hive including beeswax, propolis, pollen, and royal jelly), to pollinate crops, or to produce bees for sale to other beekeepers. A location where bees are kept is called an apiary or "bee yard".

Wild honey harvesting

Collecting honey from wild bee colonies is one of the most ancient human activities and is still practiced by aboriginal societies in parts of Africa, Asia, Australia, and South America. Some of the earliest evidence of gathering honey from wild colonies is from rock paintings, dating to around 13,000 BCE. Gathering honey from wild bee colonies is usually done by subduing the bees with smoke and breaking open the tree or rocks where the colony is located, often resulting in the physical destruction of the nest location.

Castes

A colony of bees consists of three castes of bee:

- a Queen bee, which is normally the only breeding female in the colony;
- a large number of female worker bees, typically 30,000–50,000 in number;
- a number of male drones, ranging from thousands in a strong hive in spring to very few during dearth or cold season.

The queen is the only sexually mature female in the hive and all of the female worker bees and male drones are her offspring. The queen may live for up to three years or more and may be capable of laying half a million eggs or more in her lifetime. At the peak of the breeding season, late spring to summer, a good queen may be capable of laying 3,000 eggs in one day, more than her own body weight. This would be exceptional however; a prolific queen might peak at 2,000 eggs a day, but a more average queen might lay just 1,500 eggs per day. The queen is raised from a normal worker egg, but is fed a larger amount of royal jelly than a normal worker bee, resulting in a radically different growth and metamorphosis. The queen influences the colony by the production and dissemination of a variety of pheromones or "queen substances". One of these chemicals suppresses the development of ovaries in all the female worker bees in the hive and prevents them from laying eggs.

Life cycle

Eggs and larvae

As in a few other types of eusocial bees, a colony generally contains one queen bee, a fertile female; seasonally up to a few thousand drone bees or fertile males;^[9] and a large seasonally variable population of sterile female worker bees. Details vary among the different species of honey bees, but common features include:

1. Eggs are laid singly in a cell in a wax honeycomb, produced and shaped by the worker bees. Using her spermatheca, the queen actually can choose to fertilize the egg she is laying, usually depending on what cell she is laying in. Drones develop from unfertilised eggs and are haploid, while females (queens and worker bees) develop from fertilised eggs and are diploid. Larvae are initially fed with royal jelly produced by worker bees, later switching to honey and pollen. The exception is a larva fed solely on royal jelly, which will develop into a queen bee. The larva undergoes several moltings before spinning a cocoon within the cell, and pupating.
2. Young worker bees clean the hive and feed the larvae. When their royal jelly producing glands begin to atrophy, they begin building comb cells. They progress to other within-colony tasks as they become older, such as receiving nectar and pollen from foragers, and guarding the hive. Later still, a worker takes her first orientation flights and finally leaves the hive and typically spends the remainder of her life as a forager.

3. Worker bees cooperate to find food and use a pattern of "dancing" (known as *the bee dance or waggle dance*) to communicate information regarding resources with each other; this dance varies from species to species, but all living species of *Apis* exhibit some form of the behavior. If the resources are very close to the hive, they may also exhibit a less specific dance commonly known as the "Round Dance".
4. Honey bees also perform tremble dances which recruit receiver bees to collect nectar from returning foragers.
5. Virgin queens go on mating flights away from their home colony, and mate with multiple drones before returning. The drones die in the act of mating.
6. Colonies are established not by solitary queens, as in most bees, but by groups known as "swarms", which consist of a mated queen and a large contingent of worker bees. This group moves *en masse* to a nest site that has been scouted by worker bees beforehand. Once they arrive, they immediately construct a new wax comb and begin to raise new worker brood. This type of nest founding is not seen in any other living bee genus, though there are several groups of Vespid wasps which also found new nests via swarming (sometimes including multiple queens). Also, stingless bees will start new nests with large numbers of worker bees, but the nest is constructed before a queen is escorted to the site, and this worker force is not a true "swarm".

Pollination

Main articles: Pollination management and List of crop plants pollinated by bees

Species of *Apis* are generalist floral visitors, and will pollinate a large variety of plants, but by no means *all* plants. Of all the honey bee species, only *Apis mellifera* has been used extensively for commercial pollination of crops and other plants. The value of these pollination services is commonly measured in the billions of dollars.

Honey

Honey is the complex substance made when the nectar and sweet deposits from plants and trees are gathered, modified and stored in the honeycomb by honey bees as a food source for the colony. All living species of *Apis* have had their honey gathered by indigenous peoples for consumption, though for commercial purposes only *Apis mellifera* and *Apis cerana* have been exploited to any degree. Honey is sometimes also gathered by humans from the nests of various stingless bees.

Beeswax

Worker bees of a certain age will secrete beeswax from a series of glands on their abdomens. They use the wax to form the walls and caps of the comb. As with honey, beeswax is gathered for various purposes.

A forager collecting pollen

Pollen

Bees collect pollen in the pollen basket and carry it back to the hive. In the hive, pollen is used as a protein source necessary during brood-rearing. In certain environments, excess pollen can be collected from the hives of *A. mellifera* and *A. cerana*. It is often eaten as a health supplement.

Mating of queens

The queen emerges from her cell after 15 days of development and she remains in the hive for 3–7 days before venturing out on a mating flight. Mating flight is otherwise known as 'nuptial flight'. Her first orientation flight may only last a few seconds, just enough to mark the position of the hive. Subsequent mating flights may last from 5 minutes to 30 minutes, and she may mate with a number of male drones on each flight. Over several matings, possibly a dozen or more, the queen will receive and store enough sperm from a succession of drones to fertilize hundreds of thousands of eggs. If she does not manage to leave the hive to mate — possibly due to bad weather or being trapped within part of the hive — she will remain infertile and become a 'drone layer', incapable of producing female worker bees.

Worker bees will sometimes kill a non-performing queen, and produce another. Without a properly performing queen, the hive is doomed.

Mating takes place at some distance from the hive and often several hundred feet up in the air; it is thought that this separates the strongest drones from the weaker ones - ensuring that only the fastest and strongest drones get to pass on their genes.

Female worker bees

Almost all the bees in a hive are female worker bees. At the height of summer when activity in the hive is frantic and work goes on non-stop, the life of a worker bee may be as short as 6 weeks; in late autumn, when no brood is being raised and no nectar is being harvested, a young bee may live for 16 weeks, right through the winter. During its life a worker bee performs different work functions in the hive which are largely dictated by the age of the bee.

Period	Work activity
Days 1-3	Cleaning cells and incubation
Day 3-6	Feeding older larvae
Day 6-10	Feeding younger larvae
Day 8-16	Receiving honey and pollen from field bees
Day 12-18	Wax making and cell building
Day 14 onwards	Entrance guards; nectar and pollen foraging

Male bees (drones)

Drones are the largest bees in the hive (except for the queen), at almost twice the size of a worker bee. They do not work, do not forage for pollen or nectar and are only produced in order to mate with new queens and fertilize them on their mating flights. A bee colony will generally start to raise drones a few weeks before building queen cells in order to supersede a failing queen or in preparation for swarming. When queen raising for the season is over, the bees in colder climates will drive the drones out of the hive to die, biting and tearing at their legs and wings.

Differing stages of development

Stage of development	Queen	Worker	Drone
Egg	3 days	3 days	3 days
Larva	8 days	10 days	13 days
Pupa	4 days	8 days	8 days
Total	15 days	21 days	24 days

Structure of a bee colony

A domesticated bee colony is normally housed in a rectangular hive body, within which eight to ten parallel frames house the vertical plates of honeycomb which contain the eggs, larvae, pupae and food for the colony. If one were to cut a vertical cross-section through the hive from side to side, the brood nest would appear as a roughly ovoid ball spanning 5-8 frames of comb. The two outside combs at each side of the hive tend to be exclusively used for long-term storage of honey and pollen.

Within the central brood nest, a single frame of comb will typically have a central disk of eggs, larvae and sealed brood cells which may extend almost to the edges of the frame. Immediately above the brood patch an arch of pollen-filled cells extends from side to side, and above that again a broader arch of honey-filled cells extends to the frame tops. The pollen is protein-rich food for developing larvae, while honey is also food but largely energy rich rather than protein rich. The nurse bees which care for the developing brood secrete a special food called 'royal jelly' after feeding themselves on honey and pollen. The amount of royal jelly which is fed to a larva determines whether it will develop into a worker bee or a queen.

Apart from the honey stored within the central brood frames, the bees store surplus honey in combs above the brood nest. In modern hives the beekeeper places separate boxes, called 'supers', above the brood box, in which a series of shallower combs is provided for storage of honey. This enables the beekeeper to remove some of the supers in the late summer, and to extract the surplus honey harvest, without damaging the colony of bees and its brood nest below. If all the honey is 'stolen', including the amount of honey needed to survive winter, the beekeeper must replace these stores by feeding the bees sugar or corn syrup in autumn.