

# Egg-laying Worker Bees

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An egg-laying worker bee is a female bee that lays haploid male eggs usually in a hopeless queenless situation. It is a rare phenomenon but when it does occur it can cause a serious problem.

## Differences between the queen and worker bee

There are two female castes in the honeybee colony: the queen and the worker bee. Although both hatch from a fertilized egg, the two females differ in their structure, appearance and behaviour. The difference is brought about by the variation in feeding and type of cell in which each caste is raised.

Queens are raised in special large cells, which hang vertically and are about the size and shape of a peanut shell, which allows them to grow their ovaries in longer abdomens. Worker bees develop in small hexagonal cells that have a diameter of about 5.3 mm (1/5 in) and are 10-12 mm (5/8 in) deep.

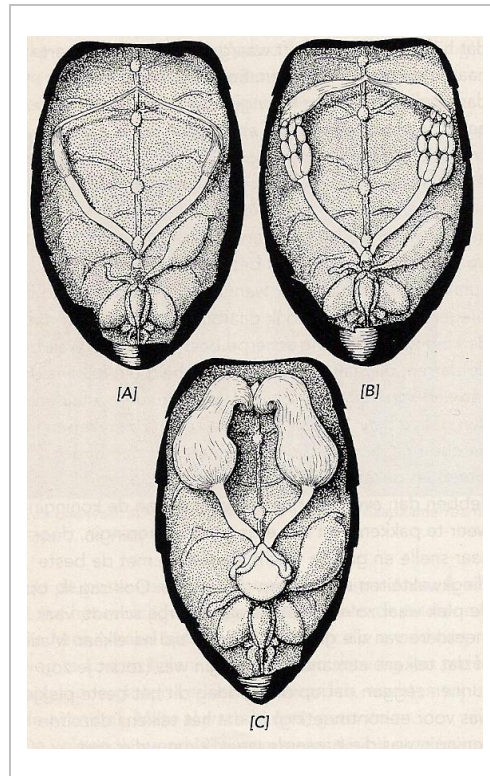
Worker larvae are fed royal jelly for their first three days, after which they are fed with a mixture of honey and pollen until the cell is sealed. Queen larvae are fed for the whole of their larval period on royal jelly. The diet of pure royal jelly transfers the queen into a remarkable insect with an extended longevity and exceptional reproductive capability. The queen bee lives longer than the worker bee: up to five years for the queen, and five to six weeks for the worker bee in the foraging season. A good honeybee queen continually emits pheromones (bee odours) that tell the bees they have a queen and all is well in the hive. The presence of the queen and both her pheromones and brood, control and calm the bees and suppress the worker bees from laying eggs.

The queen bee takes a mating flight, allowing her to fertilize eggs. Her main task is to lay eggs from which the bees develop. The queen is the only female with completely developed reproductive organs. Reproduction can take place only by her and she may lay from 1200 to 1500 eggs in a single day under favourable conditions in the most active part of the season. The queen can determine whether to lay a fertilized or unfertilised egg. Fertilized eggs become female bees (workers or a new queen). Unfertilized eggs become drones.

The queen bee's reproductive organs consists of two enlarged ovaries, each ovary is made up of about 160-180 tubular ovarioles, which contain the gene cells in which the eggs develop.

A worker bee is a female with undeveloped reproduction organs. She lacks the full reproductive ability of the queen bee and therefore does not engage in reproductive activities and performs the work of maintaining

the colony. The ovary of the worker bee is reduced and possesses on the average 4 to 12 small ovarioles, which sometimes develop if the colony becomes hopelessly queenless for very long resulting in a laying worker. Since worker bees do not have the ability to mate with the drones, the eggs they lay will not be fertilized, as they have no male sperm to fertilize the eggs and so will develop only into drones (male bees). They are incapable of laying eggs to become female workers or queen bees.



Reproductive organs of a normal worker [A],  
A laying worker [B] and a virgin queen [C].  
From: Anatomy and dissection of honeybee, H.A. Dade.  
Publisher: IBRA  
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## Development of laying worker bees

In a honeybee colony, under normal conditions female worker bees' ovaries are inactive as their development is prevented by pheromones emitted from the queen and her brood. However, when a colony loses its queen and there are no fertile eggs or worker larvae of an appropriate age to raise a new queen from, one or more worker bees will partially activate their ovaries and commence to lay eggs as a result of the absence of queen and brood pheromones. The process of developing a laying worker usually takes weeks (3-4 weeks) after the loss of the queen, and by the time all the brood has emerged.

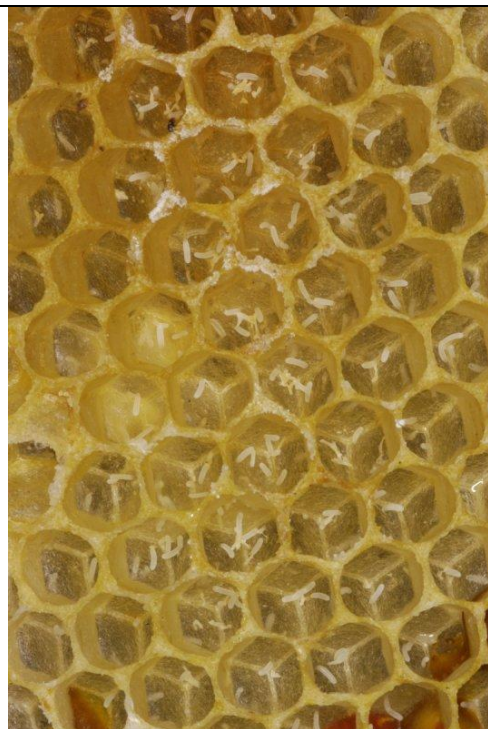
The eggs will be laid in worker cells with several in the same cell and produce eventually undersized drones. Drones produced from laying workers are sexually viable.

The laying workers take the place of the proper queen, they emit a pheromone, which mimics that of the queen scent and inhibits the other workers to lay eggs.

## Signs of egg laying workers in the hive

The following signs inside the hive could be indicative of laying workers problem:

- There is no queen
- Multiple eggs in the cell
- Eggs are laid on sides of the cells or off centre because, unlike the queen, their bodies are not long enough to reach the bottom of the cell
- Disappearance of the worker brood
- Only drone brood present in worker cells with domed capping
- Scattered or spotty brood pattern. Laying workers tend to lay their eggs haphazardly in a cell here and there with many empty cells in the brood area. The comb will have a similar appearance to European foulbrood (EFB)
- Multiple eggs on pollen mass



Multiple laying worker eggs within cells. Notice eggs are in the side of the cell instead of the base.

Photo by: Bill Mondjack



A frame of laying workers, brood showing drone brood in worker cells with the domed capping.

Photo source: Berniesbeebuzz.com

## Effect of laying workers on the colony

The existence of laying workers leads to the destruction of the colony. A colony with laying workers perceives itself as queenright and will not readily accept the introduction of a new queen or a queen cell, nor it will attempt to raise a queen from young larvae given to it from another colony.

As stated before, laying worker bees lay only unfertilised eggs, which give rise to drones. Drones do not do any work in the hive, they do not forage for nectar or pollen and can only consume the food stores. The primary purpose of drones is to fertilize new queens. A bee colony in which only drones are produced is doomed unless the beekeeper interferes. This is because there is no new worker brood; no new worker bees emerge to replace the older bees as they die off.

## What to do with laying workers

To deal with the laying workers the beekeeper must first confirm that there are laying workers or if a drone laying queen in the hive. This is easily recognised by examining the brood combs and looking closely at the brood pattern of the eggs. While laying workers and drone laying queens both produce drones in worker cells, a drone laying queen will lay one egg in each cell – multiple eggs laid haphazardly confirms laying workers.

It is difficult or impossible to distinguish laying workers and remove them from a hive, since they do not differ in size and appearance from other female workers. Also, introducing a new queen bee to a colony of laying workers is almost impossible, as the bees think they have a queen. However, there are a number of possible methods to eliminate laying worker bees and to prepare the colony to accept a new queen.

**1. Shake out the bees:** Since laying workers reject a new queen or a queen cell, success in re-queening can be achieved by first getting rid of the laying workers as follows:

- (i) Move the hive 50–100 meters. On the original location, place a hive body with four frames of brood and bees and frame of honey - feed if required.
- (ii) Shake the bees from all the frames on the ground and brush the bees clinging to the inside of the hive off. In theory, the bees capable of flying return to the original location. The laying workers who have never left the hive are unable to fly back.
- (iii) Introduce a queen in an introduction cage. Alternatively give a queen cell, or a frame of eggs and brood to raise a queen. The bees will raise a new queen within two weeks. Another option is to unite with a queenright colony by the newspaper method. By uniting a laying workers colony with a queenright hive, the brood and queen pheromones will aid in suppressing the urge to lay.

- (iv) Scrape or freeze the frames with drone brood and give them to a strong hive to clean up, or the combs can be melted for wax.

**Note:** This operation is carried out only if the hive is strong and has a large population. If you have a weak laying worker hive, the simplest solution is to shake all the bees in front of the other hives and distribute the combs into other hives. The bees will drift to the other hives where they will accept the resident queen.

**Tips:**

- (i) Never attempt to introduce a queen to a colony with laying workers. She will be killed
- (ii) Giving a queen cell to a colony containing laying workers, usually the bees will tear it down
- (iii) Never unite a colony with laying workers to a queenright colony. The risk of so doing is that the bees from the laying workers colony will probably kill or harm the queen from the right hive. First get rid of the laying workers before uniting.
- (iv) Regular hive inspection and prompt replacement of missing queen are the solutions to the laying worker bees problem. Prevention is better than cure.

**2. Add unsealed brood:** In order to prepare a colony with laying workers to accept a new queen, the status of the egg-layers must be changed. This can be achieved by adding a frame of unsealed worker brood and adhering nurse bees every week for three weeks. They will start queen cells by then. At this point a new queen can be introduced or let the bees raise a queen. Bees making queen cells may be willing to accept a new queen. When introducing a new queen make sure that she is not released from the introducing cage for at least 3 to 4 days.

The pheromones from the workers brood inhibits the ovary development that has taken place in the laying workers and provide stimulus for the laying workers to refrain from laying eggs. This increases the chance of queen acceptance by the colony.

## Drone laying queen

A drone laying queen is a queen that lays only unfertilised eggs, due to age, poor or no mating, or having exhausted the supply of sperm in the spermatheca to fertilize the eggs. Under these circumstances the queen will lay infertile eggs and only drones will develop. Consequently the colony will dwindle and eventually die out.

A drone-laying queen will deposit the eggs in the base of the cell, as with a normal queen, one egg per cell and in good order. The eggs will be laid in worker cells, which will be capped by high domed capping. The amount can vary from a small number to 100 percent. The resulting drones will be smaller in size than the normal drones and are able to mate with virgin queens.

The symptom of a drone-laying queen is having all drone brood and deformed cells of the comb caused by nurse bees enlarging the mouth of worker cells to accommodate the large drone larvae. In normal hives a brood comb will contain up to 20 percent drone and in colonies that show signs of swarming 20 percent. It is not normal that a comb has all drone brood.

Usually when the queen becomes very old or starts failing, the bees will detect this and will then start to build one or two supersedure cells in the middle of the comb to raise a new queen to replace her. As long as fertilized eggs or female larvae are present, the bees will raise a queen within 15 days. In a drone-laying queen hive, the bees will fail to supersede the queen, as all the eggs are haploid (infertile with a half set of chromosomes) so no eggs are female.



A drone-laying queen brood pattern

Photo source: [www.dulley.com](http://www.dulley.com)

The drone laying queen problem can be rectified by removing the old or failing queen and either introducing a young queen, or by uniting the colony with another one with a good queen. It is important that the queen in this case be killed, and replaced immediately with a new queen. Another solution is to give the bees a frame of eggs if the colony is strong. They will supersede the failing queen.