

Queen Management Notes

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Understanding the balance and organization a Queen brings to her colony is a requirement of good beekeeping. The Queen determines nearly all the characteristics of behavior, health and ultimately the ongoing success of the colony. The significance of this cannot be over emphasized because no amount of management skill or expertise can keep a colony healthy and productive without a good Queen. Every beekeeper should practice the skills essential to handling the Queen and evaluating her performance. The following information provides a list of suggestions, and outlines activities, to help increase the skill and experience necessary to keep your colonies Queen right and productive.

Rule number 1 – Confirm the presence & evaluate your Queen each time you inspect the colony. Look for:

- Eggs, larvae, and capped brood. Eggs indicate a Queen was in the colony within 3 days. All three stages of brood indicate a balanced expanding population. You do not need to see the Queen if eggs are present.

Warning:

- *New Queens will sometimes lay multiple eggs in the same cell, and will lay the occasional drone egg in the worker brood (popped up capping). Watch to see that this stops as the Queen settles down to a normal laying pattern.*
 - *Full sections of drone capping on a frame are an indication that the Queen did not mate properly and lacks semen to fertilize worker eggs. She must be replaced. It is impossible for the colony to raise a new replacement without a fertilized egg. Drone capping are found along outside edges of a brood frame not in the center unless cells are larger drone size cells.*
 - *Solid drone patterns and multiple eggs in the same cell are also signs of laying workers. Find your queen to confirm this is not a laying worker problem. If you have laying workers it will not be possible to introduce a new queen until you remove the laying workers.*
- Larvae are white, plump, and glistening in appearance. This indicates healthy brood. Discolored, dried up larvae indicate a brood disease & should be identified and treated.
 - Brood pattern on the frames should be full looking (few open cells) and containing brood of similar age. For example all eggs, larvae of the same size, and capped brood. This is an indication of a good Queen.

- The number of frames that contain brood are an important measure of the quality of the Queen. – This can be difficult to assess as it changes with the seasonal development of a colony. Typically populations decline from September to February (less brood), and begin to increase in February and peak in June. Populations tend to stay level during mid-summer. The number of workers available to provide heat for incubation, the weather & temperature, and available honey and pollen also influence the amount of brood found at any given time of year. Large populations with plenty of stored honey and pollen, dry weather and daily temperatures ranging from 50 to 70s are ideal for supporting large brood nests. I like to see 1-2 frames of brood coming out of winter, 5 -6 frames by April and 8 or more in May. This is a colony that will produce honey in June.
- In May & June look for signs of swarming. When a colony has sent out a swarm there is a period of time that no eggs are laid and an interruption in brood rearing takes place. This is due to a new virgin Queens's emergence and then 4-5 days before she mates and a few more days before she lays eggs. Look for open Queen Cells indicating a Queen has hatched. Also note the lack of your marked Queen.

2. Finding Queens – before any manipulation can take place you must know if you have a Queen and where she is in the hive. This is also the most difficult activity for beginning as well as experienced beekeepers. It requires practice and a good deal of patience to become competent at Queen spotting.

Purchase marked (painted spot) Queens, and learn to mark your Queens. I will wait until a Queen has been accepted by a package or colony. Once I know she is performing well I will mark her. There are several useful tools (queen catcher and queen marking tube) specifically designed to aid in catching and holding queens to be marked. They minimize harming the Queen. Although each year has a designated color, I prefer white or bright colors for marking that improve the visibility of a queen on the comb. Most commercial queen producers use white for best visibility.

- Another advantage of marking Queens is to know you have your original Queen. This is important during swarm season when you need to know if you have a new or virgin Queen. A lack of eggs & brood can indicate a failed Queen, or that you have a new Queen not yet laying eggs.
- I use different colors to track breeding stock, and the age of my Queens.

Squat or kneel to the side of the colony you will be inspecting. Keep the sun to your back. Be comfortable and don't hurry. Use as little smoke as possible and do not wear gloves. Smoke disrupts bees (starts them running) and alarm pheromones, from stings, can stay on gloves for months.

- **Queens spend most of their time in the brood nest.** Always start your search with the center 2 or 3 frames. Find the frame with eggs and the Queen is likely to be nearby.

- ***Queens will move away from the sun.*** As you inspect a frame keep the sun to your back shading the frame. Also look at the next frame still in the box before removing it.
- ***Check for virgin Queens in the morning.*** Mating flights are normally in afternoon.
 - Virgins are smaller and more difficult to see.
 - They are more active on the comb.
- If you do not find the Queen, after checking all the frames, check on the bottom board and walls of the hive bodies.
- Still no Queen? Close the hive and try again later.

Big colonies – try placing Queen Excluders between each box. After 5 to 7 days check the boxes for eggs. The Queen will be in the box with eggs. If you do not see her place the box on top of the hive (leave excluder under this box) and check again later.

Warnings:

No Queen, but eggs (more than one per cell) could indicate laying workers.

In 5% of colonies there may be two or more Queens.

3. Queen Introduction – The beekeeper must learn to properly introduce Queens to colonies. Every year valuable Queens are lost as a result of unsuccessful introductions. This is most often caused by beekeeper error. When Queens are properly introduced the rate of failure, by experienced beekeepers, is 1 in 50. You cannot keep bees without being able to introduce Queens. Introduction of queens to new packages is a different process than re-queening large established colonies.

Many beekeepers replace Queens annually or every other season. This is one way to keep young vigorous Queens that lay large numbers of eggs and have less of a tendency to swarm. I do not replace Queens that are performing well as they often become part of my breeding stock. I also do not replace Queen on any fixed schedule. They are replaced when they are failing, or do not meet other predetermined criteria.

“There is no best time to requeen a colony of bees. The time to requeen a colony of bees is when the queen is failing, regardless of the time of year or season.” (G.H. Bud Cale 1958).

1. Find and remove the old Queen.

- This is the most common mistake beekeepers make. If you try to introduce a new Queen with the old Queen present (or laying workers) they are likely to be killed by the workers. You should only introduce a new Queen to a Queenless colony.

2. Cut out all Queen Cells.

- Look for newly opened Queen Cells that indicate the presence of a virgin Queen.
- Remember workers can still raise a replacement Queen six days after old Queen is removed. Three days from last egg, three days as larvae.
- If your colony has been excellent you may want to leave well developed cells and let the bees replace the queen. Continue good stock.

This is often misinterpreted by beekeepers. When a swarm has left it can take a week or more before a virgin queen has mated and begins laying eggs. You may not see signs of eggs and assume you have no queen present, but she has not mated, or started laying. Look for signs that the colony has swarmed; no eggs or young larvae with capped brood, too many drones for the number of workers (workers have left with swarm), empty queen cells with ragged edges (new cells have smooth edges).

3. **Introduce Queen over a period of time.** Bees need time to forget the old Queen & pickup a new Queen's presence (Queen substance). The following three methods work best for me.

- **Queen Cage / candy release** – Hang cage between frames in brood nest. Remove cork on candy end and allow bees to eat through candy to release Queen. Usually takes 1 to 3 days. Usually this is successful with new packages, less with established colonies. It helps to feed syrup 24 hours ahead of introduction and remove any attendant workers in the cage. Failure rate is 8-10%.
- **Push in Cage** – (Mraz / Rea 1941) Queen is confined in a cage pushed into a section of comb containing open cells and emerging brood. Cage is removed after the queen begins laying eggs (4-7 days) if bees are not tightly clustered or biting on cage. Do not remove the cage unless bees are behaving gently toward queen (up to two weeks). This has a high degree of success. Failure rate less than 2%.
- **Nuclei Introduction method** – Queen is first introduced to a small Nuc containing young workers. Old Queen and all Queens Cells are removed from the colony before introducing Nuc frames with new Queen. I prefer this method and it is, in my opinion, the safest method of introduction. You are introducing a queen that is a proven layer and established in a small colony. Failure rate less than 2%.

Warning: *Before releasing a Queen by any method watch the worker bees carefully. If they appear to be trying to bite, sting or are tightly clinging to the cage do not release the Queen. This is a sign that a Queen or laying worker is still present in the population. Check your hive again and remove old Queen or laying workers, then try to reintroduce the caged Queen. Remember to allow 2 to 3 days before releasing the Queen.*

After a Queen has been released check back for eggs in seven days. It can take up to 14 - 16 days before a Queen starts laying so don't assume she is poorly mated after one week. Continue to check her every three days until you find eggs.

Queen Rearing Timeline

This is the schedule of events I use when raising Queens. It provides a useful timeline for estimating the number of days in a Queens development, mating and start of egg laying. From start to first eggs it takes about one month. This gives you an idea of the sequence of events and length of time each event needs for completion.

<u>Day</u>	<u>Event</u>
- 16	Begin stimulative feeding of drone, breeder, and finishing colonies.
- 15	Queen lays drone eggs (unfertilized).
- 12	Drone eggs begin to hatch. Day 3.
- 6	Drone larva capped. Day 10.
- 1	Place empty frame in breeder colony.
0	Confine breeder queen on frame in afternoon. Queen lays fertilized eggs.
1	Remove queen from frame.
3	Eggs hatch / Work finishing colony / Put cells in for cleaning.
4	Shake swarm box / Graft queen cups, place in swarm box late afternoon.
5	Transfer cells to finishing colony (after 24 hours).
8	Queen cells sealed, drones emerge.
13	Make up nuclei colonies or dequeen colonies for virgins.
14	Remove queen cells from finishing colony.
15-16	Virgin queens emerge.
21	Mating flights begin. Weather can delay this & if not mated within a week or ten days can result in a poorly mated Queen.
28	Queen begins laying eggs.

Practical Aspects of Queen Production

Emergency queen rearing is the method used by queen producers to get 5 – 50 cells.

Things that suppress Queen rearing:

- Queen pheromone (mandibular pheromone and *Arolium* or tarsal pads) inhibits workers from building cells and laying eggs.
- Brood pheromone – inhibits Queen Cell building.
- Wrong time of year / fall winter.
- Lack of food in a colony or in the field.
- Not enough young bees (royal jelly / nurse bees).

Three Laws of Queen Rearing:

- 1) No mother queen can be in the hive.
- 2) A colony must have lots of nurse bees / 200 nurse bees per queen cell.
 - Queen larvae receive 1600 feeding visits.
 - Worker larvae receive 143 feeding visits.
- 3) Ample food & pollen close to cells.
 - Diet starts as high in sugar to stimulate more feeding, gradually changes to high protein.
 - Larvae must receive stimulative feeding within first 24 hours as a larva to achieve full development as a queen. Diet has most affect on queen performance.
 - Queen's weight.

- Number of Ovarioles that develop.
- Size and volume of spermatheca.
- 50 other morphological characteristics necessary to support her role as an egg layer & mother of a colony.

Methods of Queen Rearing:

1) **De-queen the colony** / colony will raise new queen if eggs or day old larvae are present.

2) **Demaree method**

Honey Super
Capped brood
Open brood

Open brood
Honey super
Excluder
Capped / Queen

3) **Swarm Box method**

- No queen
- Lots of nurse bees
- Ample food
- Use capped brood / no open brood.

4) **Cloake Board or “Transitional Queen Rearing”** – Sue Colby. Eliminates the need to move cells between starters and finishers / creates minimal disturbance.

When slide is in – simulates a queenless swarm box on top.

- Queen cells started in queenless state have a higher rate of acceptance.

When slide is out – simulates a queen-right finisher colony.

- Queen-right state produce higher quality cells.

1) *Place (Harry – New Zealand) Cloake board between Cell builder box and lower hive. Remove slide.*

2) *Create a cell builder in a single box above (over Cloake board) queen right colony. Setup the day before the grafting Queen cells.*

- Shake 6-8 pounds of young bees from several brood nests. Bees less than 5-15 days old with well developed *Hypopharyngeal glands*.
- Include a feeder / frames of open nectar and pollen / frame of foundation.
- Include sealed & emerging brood to replenish nurse bees for multiple grafts. Also open brood will attract nurse bees from lower box.
- Leave slide out to allow nurse bees to move up through the queen excluder for 6-12 hours.
 - Place empty drawn comb in lower box for Queen to lay eggs.

3) *Graft Queen Cells and place in center of cell builder.*

- Remove slide after cells have been accepted (1 day later). This restores cell builder to a queen-right state.

- Capped cells can be moved to a nursery colony or incubator every 4-5 days. New grafts can be added as capped cells are removed.
 - Regularly check for “rogue” queen cells on other frames and remove.
- On day 10 or 11 (after graft) place queen cells into mating nucs, or colonies.

Methods of Grafting:

- 1) Emergency Queen rearing / workers select.
- 2) CC Miller method / use cut foundation to entice queen cell building.
- 3) Doolittle method / Most common and most dependable.
- 4) Jenter method / no grafting by the beekeeper.

Tips for High quality Queens:

- 1) Graft them young / less than 24 hours old.
- 2) Place grafts in large populations of nurse bees with plenty of pollen and honey.
- 3) Use diverse sources / genetic variation.
- 4) Cull poor cells.
- 5) Well mated queens / plenty of drones & good weather.
4. mating nucs
5. At least 300 workers / increases queens ability to store sperm.
- 6) Drones /select from best colonies.
6. 1 – 2 drone frames per chamber / 20% are normal in colonies during swarm season.
7. Graft after drone brood is capped.
8. Use diversity in drone population.

Drone Congestion Areas (DCA) are very stable / same each year & follow contours of land geography.

9. Use at least 6 drone sources.
10. Locate mating nucs in center of drone sources / one mile distance.
11. The number of drone colonies is the square root of the number of queens being mated.

Tips for mating queens:

12. Don't be nosy.
13. Allow newly mated queens to lay eggs for an extended period in nucs.
14. Evaluate capped brood before using in production colony.
15. Avoid banking queens for extended periods.