

Queen Rearing/Introduction Outline by Dewey M. Caron

A. SMALL SCALE QUEEN REARING - A METHOD FOR BEEKEEPERS WHO WISH TO REAR A FEW QUEENS – EMERGENCY CELL

- (1) Shortly after the main honey flow starts, elevate one or two combs containing eggs or very young worker larvae with the adhering bees to a hive body above one or two honey supers (use a queen excluder if you desire). These frames should be coming from a colony of selected (preferred) stock. Also put one or two combs containing honey and pollen with the raised brood and then fill up the hive body with empty combs. NOTE: Frames already containing queen cells in swarming or supersedure colonies can be raised to hasten the process.
- (2) Then place a ventilated dividing board or double screen between the honey supers and the hive body containing the raised brood so that the bees in the colony and honey supers below cannot enter the upper chamber. NOTE: An attractive alternative is to use a Cloake Board – a modified queen excluder with a thin metal or wooden board that can be slid on top of the excluder to cut communication between the lower and top unit. It lacks one side board to provide an entrance into the top boxes (see below)
- (4) Provide an entrance for bees in the top box (Note that Cloake board does this). Entrance might be provided by using one inch (2.5 cm) wide [and at least 3/8ths inch (1cm) high] wedges cut from the ventilated dividing board or drill an auger hole [about one inch (2.5 cm) diameter] in the hive body or insert wooden wedges beneath the hive body and top covers. Position entrance facing to the back of the hive opposite the regular entrance or to augment population in top box, change position of lower box 180 degrees at the time when the top entrance is provided.
- (5) Nine days later examine the box of raised brood carefully; queen cells should be present. Some recommend destroying all of these cells except two, one capped and one uncapped. The first young queen that emerges will destroy the cell of the other one. Some prefer to leave all queen cells and let the bees do the selection.
- (6) A virgin queen will emerge from the emergency cells raised on the elevated brood frame and in a week or two take her mating flight. In about three weeks of emergence she should be laying eggs in the top super. She can then be used to replace the old queen in the lower portion of the hive. NOTE: After finding and killing the queen below, you can remove the queen excluder. Alternatives include using the new queen colony to requeen another colony or set it aside as a nuc to expand into a new colony (if season is long enough to permit) or as a nuc to overwinter.

B. QUEENS REARED FROM ONE STRAIN ONLY - RECOMMENDED TO ENSURE PRODUCTIVE AND GENTLE BEES. - MILLER/ALLEY/CASE METHOD

- (1) Select the colony containing the queen of the best possible stock you wish to propagate. Breed always from the best queens - those that show the least tendency to swarm, yet are good honey producers. Remember no colony is better than its queen.

- (2) As soon as the main honey flow starts, remove a comb without brood from one side of the brood chamber and move the remaining combs to provide space at the center of the brood area. Place a frame fitted with a full sheet of foundation or foundation cut to form several downward V's in this space. [Three to four pieces of foundation 1-1/4 inch (3 cm) wide and coming to a point about midway from the bottom bar works very well]. (MILLER METHOD). Foundation should be medium brood or thin surplus type because it will need to be cut later. Alternative (ALLEY METHOD) is to place new sheet of medium brood/thin surplus foundation in middle of brood area.
- (3) When this comb is drawn by the bees and as soon as one or two hundred eggs are laid in it, remove the comb, brush the bees from it and trim away the lower edge of the V shaped comb to leave fertilized eggs or young larvae at bottom of trim. You will likely be trimming drone cells so be sure to trim this comb to worker cells, eliminating all the drone cells.
- (4) Place the trimmed frame in a colony from which the queen and all open brood have recently been removed. The objective is to have the bees use the last row of egg or young larva filled cells to create emergency queen cells. Not removing the queen or leaving open brood may result in failure or very few cells being developed into queens.
- (5) Ten days later ripe (mature, capped) queen cells can be carefully cut from the comb and distributed to nuclei or colonies that need requeening, or they may be placed in hive bodies above supers containing brood as described in part A. First make sure, however, that the bee colonies receiving the queen cells have not started queen cells of their own; if they have, destroy the cells they have started before introducing the capped queen cells. The objective is to insure the new queen comes from the selected stock.

NOTE: ALLEY METHOD- uses same preparations. In this method, strips of worker foundation that have eggs are cut and oriented vertical (by pressing the foundation onto bottom bar of medium depth frames) and removing 2 of every three eggs. This frame is put into queenless colony without brood (step (4) above). The bees will be able to utilize the remaining eggs to produce queen cells.

The HOPKINS or CASE method is essentially the same except the entire frame (or a portion of it) is removed and then laid on its side in a queenless colony. Two rows of worker cells are destroyed leaving one, beginning at the top of the frame running across the comb and two of every three cells in remaining row are destroyed leaving every third one intact. This is more awkward since you need a larger space. Both methods should yield a series of individual queen cells with a half inch or more of space between them.

C. THE GRAFTING METHOD - THE MOST PRODUCTIVE METHOD OF OBTAINING QUALITY QUEENS FROM SELECTED STOCK.

- (1) Select the colony containing the queen of the desired stock. Find a frame that has young larvae of 24 hours or less in age. NOT: Confining the queen to a frame with a cage of hardware cloth 3-4 days prior to grafting is recommended to insure a good supply of young larvae from which to graft.

- (2) Prepare a colony to receive the grafted queen cells. This is usually termed a **starter colony**. Starter colonies may be either a queenless colony or a queenless portion of a standard colony or a queenless box of young bees. The three alternatives are:

- (A) Remove the queen (dequeen) and all open brood from a moderate to strong colony. Leave an empty frame space in the middle of the hive, preferably in the upper box and not at the bottom near the entrance. In a few hours the colony is ready for the grafted queen cells. Alternately, dequeen a colony without removing the brood and feed dilute sugar water for three days. Then remove all queen cells started from the brood left behind and the colony is ready to receive grafted queen cells.
- (B) Duplicate conditions as in part (A) in a portion of a colony. Accomplish this by placing older brood and the queen (leaving some egg laying room) on frames below an excluder. Raise two frames of young brood above the queen excluder leaving a space for the grafted cells between the frames. The greater the separation of brood areas, the better the results. Supers between the two brood areas (even with a second queen excluder above the supers) helps improve success. This modification results in room for fewer grafted queen cells but the starter colony is not as difficult to prepare. NOTE: The Cloake Board is a variation that allows you to temporarily halt flow of bees from the lower queenright brood area when you are ready to start queen cells in the upper queenless brood area (see below).
- (C) Prepare a "swarm box". This is a small sized box into which two frames of fresh nectar with abundant pollen are placed. Next a large population of young nurse-age bees are added by brushing bees from several brood frames of a strong colony into the box. The box is closed so there is no foraging by the bees. It should be placed in an area where it won't overheat or suffer heat stress potentially reducing the number of started queen cells.

NOTE: A Cloake Board is a handy "extra" piece of equipment to assist with starting new queen cells. A Cloake board (named for a New Zealand beekeeper who developed it) is a modified wooden queen excluder without front slat (so there is an entrance into boxes above the excluder). It contains a slot which allows a "temporary" 2nd floor (usually a thin metal sheet) to be easily slid in place to temporarily create two colonies. Prior to rearing queens, the colony is a normal functioning unit with the queen confined by the queen excluder to the lowest portion. To easily convert into a starter colony, the temporary floor (Cloake) board is slid into place (some advocate rotating the lower box 180 degrees at this point so entrance is now at the back but this requires a lot of effort and may be considered unnecessary) creating a queenless unit on top. When left for 24 hours, the bees in portion above will realize they are queenless and will now readily start (accept) grafted queen cells or a frame of open brood for emergency queen cell elaboration. After 24 hours, the temporary floor is removed and the upper chamber becomes a finishing colony. Google Cloake Board and or consult the 2005 Amer Bee Jour article on use of the Cloake Board Method (by Sue Cobey an advocate for this queen rearing method) for additional details on Cloake Board use.

- (3) Modify a standard frame to take 2-3 bars with queen cups. Alternately, a shallow or half-depth (western super) frame can also be used in a standard hive body with queen cups placed on the bottom bar of the frame. Queen cups can be purchased or made by dipping a rounded wooden stick of proper dimension in beeswax. Cups should be placed in wooden holders to facilitate handling. Up to 20 cups can be placed on a single bar.
- (4) Remove the frame of very young larvae from the colony you have selected as breeding stock. Gently brush the bees from the comb and move it to a sheltered location with good light. This is best done inside a shelter with artificial fluorescent light and some magnification in a comfortable protected setting.
- (5) The next step is to graft. **Grafting** is the transfer of worker larvae from worker cells into queen cups. Grafting is a delicate operation. It is important to select larvae of the right age. Grafts (transferred worker larvae) are placed into plastic or beeswax cell cups, previously placed in a suitable bar that will be held upside down in the starter colony. Use a grafting needle or wooden stick or quill sharpened to a slightly flexible point for transfer. Best results are obtained if some royal jelly can also be transferred with each larva. NOTE: Some prefer to graft into primed cells. To prime a cell, dilute previously collected royal jelly and place small droplet in bottom of the cell cup so the larva removed from the worker cell floats off onto the jelly pool. Any liquid will serve as a substitute if royal jelly is not available. Some even double graft whereby cell cups from successful first day grafts are reused to add a new larval graft the second day (first larva is removed before placement of second graft onto royal jelly).
- (6) Grafting is a difficult and delicate transfer of a larva. It needs to be done quickly and in a temperature of not less than 70°F (21° C). Take care not to injure or chill the larvae or let them dry out. Avoid jarring the newly grafted larva and be careful when inverting them to hang vertical in the starter colony lest they fall out. Priming queen cups with diluted royal jelly or a small drop of water or double grafting will often improve overall acceptance rate.
- (7) As soon as possible after grafting, place the bar containing the grafted cell cup into a modified standard frame or affix to bottom bar of a shallow frame. The cells are inverted and position so they open downward. They should be placed without delay into the center of the starter colony prepared by any of the methods described above. The starter colony can be given 20-50 grafted cells depending upon need and size of the colony. Hopefully 50%-80% or more of these grafted cells will be accepted and the transferred (grafted) worker larvae fed royal jelly so they begin to be developed into queens. Failures will be evident as empty cups after 24 hours.
- (8) A **finishing colony** should be prepared once grafted cells are transferred to the starting colony. For a finishing colony, select a strong colony and confine the queen to the lowest box beneath a queen excluder. Raise all capped brood frames with adhering bees to a hive body above the queen excluder with honey supers, filling out this body with frames of honey and pollen but leaving a space in the center for the transfer of queen cells. Finishing colonies may hold 100 or more developing queens, alternating the grafted cells between brood frames.
- (9) Twenty-four to thirty-six hours after grafting, queen cells that contain larvae may be transferred to the finishing colony. Another 20-50 of freshly grafted queen cups

may be given to the starting colony. A "swarm-box" is usually effective only twice before it must be replenished with young bees. For continued use of starter boxes above queenright colonies, it is helpful to add additional brood to insure favorable conditions for subsequent bars of grafts NOTE: If you wish to raise queens just one time a starting colony can also serve as the finishing unit. If you need to raise a larger number of queens or your starting number is insufficient, you can establish another starter colony from a different colony. It is not advisable to mix newly grafted cells with already started queen cells in a single colony.

- (10) If the larvae chosen for grafting were of the right age (less than two days old), the new queens will be ready to emerge on the 11th or 12th day after the cells were grafted. Two days before the queens are due to hatch (the 10th day), the **capped queen cells** should be transferred to mating nuclei or to colonies that are to be requeened . Failure to transfer ripe queen cells can be disastrous as one adult queen will quickly cause all remaining cells to be destroyed. Likewise, failure to ensure that starting and finishing colonies are queenless, at least in the portion receiving the grafted queen cells, will lead to destruction of cells and total failure.
- (11) The final step is to make a **mating nuc** for each ripe queen cell (see next section). One ripe queen cell is carefully transferred to each nuc so the queen may mate with drones after emergence from her cell. If all the cells are left in the finishing colony, it will serve as a mating hive but only a single virgin queen will survive and be ready to leave for mating. It will be a week or so before the virgin queen mates and another few days for her to begin to lay eggs so mating nucs need be strong enough to support the new queen for about a 3-week time period. They are often kept small (baby nucs) to more easily facilitate finding the mated queen.

Mating Queens

When raising queens, it is necessary to establish individual colonies for queen cells and virgin queens during the time period they will mate. These colonies are usually small in size and are termed **mating nucs** (nuclei). These colonies are prepared by the beekeeper to receive mature (capped) queen cells. Young virgin queens hatch there, are mated and then allowed to begin egg laying before they are caged for sale or used to requeen full-sized colonies.

Mating nucs are generally established the day before the capped queen cells are placed in them. To insure quality mating, nucs should contain one or two combs containing capped brood (to insure emerging young adults) and an adult worker bee population of sufficient size transferred from a colony that can spare the bees. At least one other frame containing honey and pollen is added to the nuc so the colony never is in danger of starvation.

Depending on the beekeeper, the mating nuc may be as small as two frames or as large as five frames in size. Nuc boxes can be standard hives divided into two or three bee-tight compartments, each with a separate entrance, or they may be a small individual hive utilizing a standard frame cut in half. Various sizes and shapes can be used, each have their advocates.

As mating nuclei are made up, they should be placed in the shade and held for several hours or overnight before movement to their ultimate position, usually in a bee yard of similar mating nucs. A capped queen cell is added to the newly established nuc, carefully placed into the comb that contains the brood. Nucs have free flight but reduced entrances may be useful.

The nucs should not be disturbed unnecessarily. They can be checked 10-12 days later to determine if the young queen is mated and laying eggs. If so, she is now ready for transfer to a cage for introduction to a colony that is to be requeened. Within twelve hours, the same mating nuc may be given another capped queen cell, although sometimes their population must be bolstered and/or more capped brood added for proper virgin queen care.

The advantages of mating queens from nuclei are:

- * Should the queen not emerge from her cell or is deformed or is lost on her mating flight, the loss of the small nuc colony is not nearly as serious as it would be for a full-size colony.
- * The inspection of a small colony is less time consuming.
- * A mating nuc permits a selection of queens prior to their introduction to full-size colonies.
- * A colony will accept a laying queen more readily than it will a ripe cell or virgin queen.

Queen Introduction

In the honey bee society, a single queen is normally present in a bee colony except during or sometimes for a short period after rearing of new queens. Bees recognize their own queen and a new queen/queen cell is an intruder to a queenright colony. Beekeepers must, therefore, take certain precautions when introducing a queen reared in one colony to the bees of another colony. To requeen the colony must first be dequeened and then the new queen/queen cell introduced.

It is important to disrupt colony odor to successfully introduce a new queen and to provide adequate time for the bees to get used to a new queen. In the "newspaper" method, one unit is added to another with a sheet of newspaper in between. The bees at the top must go through the hive below to get outside, thus insuring that the bees remove the newspaper between the two units. The union is gradual and relatively little fighting occurs between the two once-separate but now more similar-smelling units. Bees will mix together well under good foraging conditions whereas they do not do so during periods with fewer resources.

Confusion techniques such as shaking of bees of two units together while heavily smoking both units are also used to combine bees. Alternately, the bees may be heavily coated with a sugar syrup or dusted with powdered sugar as they are combined. Both units appear to become disorganized while they recover from the smoke and/or clean up the mess and the bees end up mixing together freely with reduced fighting and the new queen adopted. Some advocate dipping the queen in a strong smelling chemical such as vanilla extract as part of odor disruption

Queen introduction techniques which allow bees to contact the queen with mouthparts and antennae but which prevent them from balling her are more reliable. Thus beekeepers introduce queens using a cage to hold the queen. There are several cage designs which allow the bees to release a queen by chewing through a sugar candy plug. Bees touch the queen through the cage and by the time she is released among the bees (by bees or beekeeper), the workers are more likely to accept her

For a variety of reasons, successful introduction of virgin queens is more difficult than introduction of a marked queen. It is best to requeen colonies that have been dequeened using either capped queen cells or mated adult queens. Best results are obtained by combining colonies.