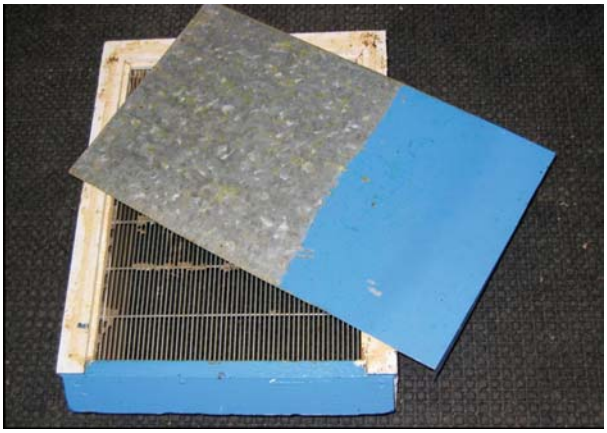
Cloake Board Method of Queen Rearing and Banking

Rearing your own queens is one of the more interesting and rewarding aspects of beekeeping. It provides a means to maintain young, vigorous queens in colonies and is the foundation of good colony management. This also enables a degree of selection for desirable colony characteristics.

There are numerous methods of queen rearing, though each follows the same basic concept. This requires: to encourage, enhance and sustain conditions that contribute to the natural stimulus to swarm, with an element of control. During the spring build up season, conditions naturally favor colony reproduction. Later in the season, queen rearing can be more of a challenge. The queen rearing system described here is one I have routinely used and adapted to serve various purposes. It is versatile and applicable to both small and large scale production.

When seasonal conditions and management needs change, simple manipulations allow colonies to be used for other purposes, with minimal labor. These can be moved into honey production, pollination or used to make mating nuclei and colony increases. The original concept of the system is the "Cloake Board Method". Beekeepers worldwide have utilized and featured this in various publications and web sites. In 1979, I first wrote about this in ABJ. Over time I have come to appreciate its flexibility and enduring value. Today, this system continues to be featured in the specialized beekeeping classes I offer at Ohio State University. Numerous requests to have this in print, with updated modifications for banking methods, is the reason for this article.

The Cloake Board Method must be credited to its originator, New Zealander Harry Cloake. Internationally recognized, Cloake was an active leader in the industry and an innovative beekeeper. In the 1950s, he helped his father operate a small beekeeping business. By the 1970s, he had built this into one of the largest beekeeping operations in New Zealand, with the help of his two sons, Mervyn and Russell. Today, Mervyn continues the business. I was fortunate to meet Cloake at the 1977 Apimondia Congress in Adelaide, Australia, and eagerly accepted an invitation to visit his apiary in Timaru, on the South Island of New Zealand. As a new, young beekeeper from the other side of the world, this was an exciting and memorable adventure. His queen rearing system impressed me.



The beauty of the Cloake Board Method of queen rearing is that it addresses the needs of the bees as well as the beekeeper. To rear high quality queen cells, the natural stimulus of the bees is encouraged. For the beekeeper, it is efficient in the use of bees, labor and equipment. The Cloake Board Method takes advantage of both a queen-less and queen-

right system. Queen cells started in a queen-less state tend to have a higher rate of acceptance, and those reared in a queen-right state tend to produce higher quality cells. Hence, the popularity of the starter and finisher methods used. Another key component of rearing premium queen cells is a minimal amount of disturbance. Moving developing larvae between starters and finishers interrupts the critical and intensive larval feeding stage. The Cloake method eliminates the need for this practice.

Experiments have shown that a developing queen larva receives 1600 feeding visits from nurse bees, compared to the 143 feeding visits received by a worker larva. The high rate of consumption and nutritious royal jelly diet of queen larvae stimulate rapid growth and development.

Queens have the shortest larval development time of honey bee castes, about four and a half days for European races. Proper nutrition is critical and will determine if the caste of a fertilized egg will become a queen or worker. The age of larva chosen to be reared as a queen is also critical. Larvae should be grafted within 24 hours of egg hatch. Larval age affects the quality and quantity of royal jelly received. Initially the diet is high is sugars, stimulating a high rate of feeding. As the larva grow, the diet changes and increases in protein content. The queen larval diet affects queen performance, influencing; queen weight, the number of ovarioles, and the size and volume of the spermatheca. The queen develops 50 different morphological characteristics, necessary to support her role as egg layer and mother of a populous colony.

The Cloake Board Mechanics

The Cloake Board Method uses one specialized piece of equipment. This is a division board that consists of an outer wooden frame, which fits between hive bodies and provides a second upper entrance. The inner edges of the frame are grooved to permit a slide to be easily slipped in and out. A queen excluder, either attached to or placed below the Cloake board, restricts the laying queen to the bottom brood chamber. A queenless state is created with the slide placed in the division board, simulating a swarm box in the top. Removal of the slide, with the excluder in place, returns the colony to a queen-right state, simulating a finisher. Going between these two states requires little effort and minimizes disturbance during the larval feeding stage. The need to move the graft from a starter colony to a finisher colony is eliminated, yet the benefits of these two systems are maintained. To provide the crowded hive conditions desired in the upper cell building chamber, the hive entrances are manipulated. In preparation for the graft, the colony is turned (or pivoted to prevent lifting) so the main, bottom entrance now faces the opposite direction.

Exiting from the reversed bottom, returning bees reorient to use the new top entrance created by the division board. This boosts the bee population in the top chamber. A high population ratio of young nurse bees, 5 to 15 days old high quality queens. As the bees age these glands atrophy. The quality of cells will diminish if this age group is not maintained, regardless of colony strength. To attract nurse bees up through the excluder into the top box, young open brood is brought up from the queen-right lower box. Empty frames are replaced to provide space for the queen to lay. After 6 to 12 hours, the slide is placed in the division board to create a queenless state. At this time the frames of young larvae are moved to another the colony, so as not to compete with the feeding of queen cells.

In the top box, leave an empty center space to place the frame of grafted queen cells. Nurse bees will cluster here. Feed the colony syrup and pollen, and allow the bee to settle. Place a frame of foundation next to the feeder. This will stimulate wax production and provide storage of excess syrup to minimize the webbing of cells.

The next day, graft the queen cells and place these in the empty center space. A day later, after the queen cells have been accepted, the slide is removed. This converts the cell builder into a queenright finisher, without disturbing the feeding of the developing cells. Regardless of weather conditions, this is easy and convenient to do.

The number of queen cells grafted should be based upon the strength of the cell builder and time of year. During the swarm season, conditions are optimal and a large number of high quality queen cells can be reared. Generally, 45 to 60 cells per graft is reasonable. Later in the season or when conditions are less optimal, graft half or less of this number. A new graft of queen cells can be started every 4 or 5 days. Queen cells are capped in about four and a half days. No longer in need of feeding, these can be moved and held in a nursery colony. Eleven days after the graft, the cells are ready to emerge and are placed in mating nuclei or individual colonies. This system was designed to rear a large number of queen cells efficiently in a short period of time, without weakening colonies for honey production. Cloake routinely reared 4,000 queen cells in six weeks. He then removed the divider boards and moved these strong colonies onto a honey flow.

Optional Use Of Support Colonies

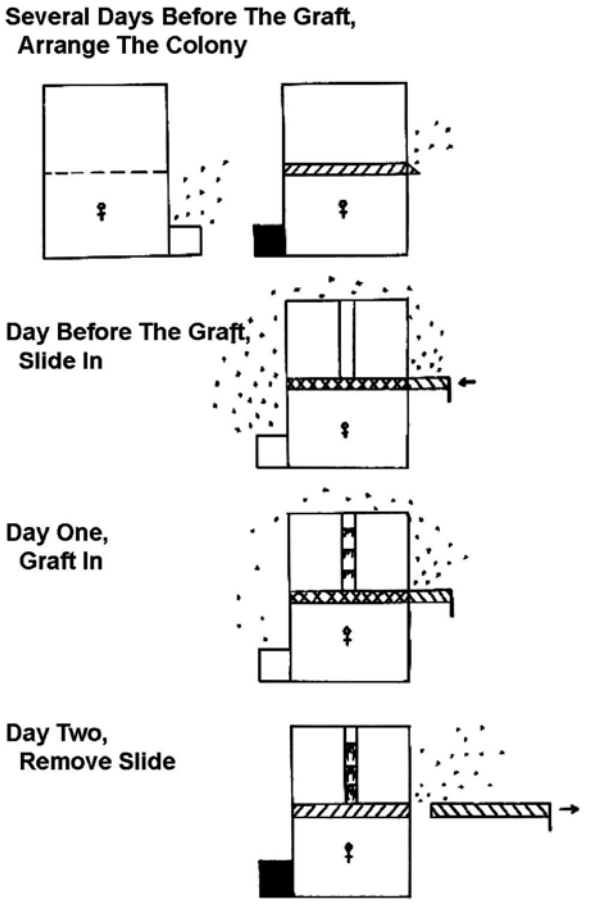
To maintain the cell builders over the season, support colonies can be used to occasionally boost the nurse bee population, rather than manipulate the colony entrances. Using this method, brood is still rotated in the manner described. To provide the cell builder with an abundance of young nurse bees, frames of emerging brood and/or bees are taken from the brood nest of strong field colonies. The addition of sealed brood given to cell builders assures an adequate supply of nurse bees for successive grafts of queen cells. The need for additional bees is dependent upon the season, conditions and production requirements. This just offers another management option. For commercial queen production, I prefer this modification of the system to ensure the quality of queen cells as the season progresses.

Procedures

Prepare Colonies In Advance

The first step in queen rearing is advance planning, beginning with good over-wintering preparations. Colonies must be strong, healthy, well fed and free of miticide chemical treatments and residues. The buildup of colony strength and proper nutrition are essential. Maintain young queens in these colonies to increase production and prevent swarming. Colonies can be combined, fed and re-queened, if necessary. Early in the season, queen rearing is initiated when drones begin to emerge.

Several Days Before the Graft



Arrange the colony several days before the graft is planned. Confine the queen to the bottom super, below an excluder. Place the Cloake divison board, without the slide, between the two hive bodies. Bring up several frames of young open brood from the bottom box to attract nurse bee up. The top super should contain frames of nectar, brood, pollen, foundation and a feeder. Place a pollen frame in the center, next to where the graft will be. Arrange the bottom super to contain honey, some sealed and/or emerging brood and empty comb for the queen to lay. Be sure the queen is present, and has not been moved up with the brood. It is helpful to mark the queen for fast identification. Pivot the colony 180 degrees, so the bottom entrance is reversed. Close this back entrance, forcing bees to use the new upper entrance. Feed the colony syrup and pollen in the top box. Allow the bees to settle.

Day Before the Graft

A day before the graft, place the slide in the division board frame. Open the back, lower entrance to encourage bees to fly out and return in the top, boosting the population of the upper cell builder unit. At this time, remove the young brood in the top chamber. These frames can be rotated into a nursery colony. Allow the cell builder colony to settle, the nurse bees hypopharyngeal glands will become engorged, and ready to concentrate on feeding the queen larvae. Cell builders should be very populous, often forming a bee beard on the upper entrance.

Day One: The Graft

Allow the colony to settle for 12 to 24 hours. Graft queen cells. Open the colony with the least amount of disturbance, no smoke, and place the graft in the empty, center space. Allow the frame of queen cells to "float" down among the festooning nurse bees filling this space.

Day Two

A day after the cells have been accepted, remove the slide to create a queen-right cell builder. Close the rear entrance. By the time eggs have been laid by the queen and hatch in the bottom box, the developing queen cells in the top will be nearly capped. Nurse bees will remain in the top to feed and attend the queen cells.

Day Four & Five

When the developing queen cells are capped, about four and a half days after the graft, these can be moved to a nursery incubator colony to mature. Simply, place these above a queen excluder surrounded by young brood. Routinely check brood in the cell builders for rogue queen cells each time these are worked. Rotate the brood in preparation for the next graft, repeating this process. A new batch of cells can be grafted every 4 to 5 days.

Day Ten or Eleven

Pull the mature, capped queen cells before emergence, day 10 or 11 after the graft. Handle the cells gently, avoid shaking as this may injure queens. While cutting cells from the grafting bars and transporting these to colonies, keep them warm. A few degrees change in temperature can speed or slow emergence. Cells ready to emerge, held against a light, can be seen moving. Held to the ear, these can be heard chewing their way out.

Transitional Queen Rearing

The Cloake Board can be used in various ways to efficiently address production needs, seasonal conditions and beekeeper management considerations. I refer to "transitional queen rearing", as a simple system that allows easy transition from a short-term, queenless method into a long-term, self-supporting queenright method. A single swarm box is established and this is built into a queen-right cell builder. Transitional queen rearing has value in situations where there is a need to set up cell builders quickly, without reducing colony numbers. Established colonies are used to provide; young bees, capped and emerging brood, freshly collected pollen and nectar.

During the spring buildup season, the impact of taking some material from several colonies is minimal, provided colonies are healthy and strong. This can also serve as swarm control.

Queenless cell builders are initially set up as a single box. Shake 6 to 8 pounds of young nurse bees from the broodnest of several colonies. These bees are shaken into a single box containing: a feeder of syrup, a couple frames of open nectar, a frame of foundation, pollen, sealed and emerging brood and a pollen patty. Set up the cell builders at dusk to minimize flight activity and drifting. Allow the bees to settle overnight and graft the queen cells into this the next morning. Queenless units can be established with or without brood. The addition of sealed and emerging brood, 2 to 4 frames, provides a second wave of young nurse bees to rear another batch of queen cells. Several grafts can be reared in succession, if the nurse bees are maintained. As nurse bees age and become less effective in feeding and rearing queen cells, this unit is given a laying queen. Above this box, place the Cloake board, with the slide inserted and an empty box.

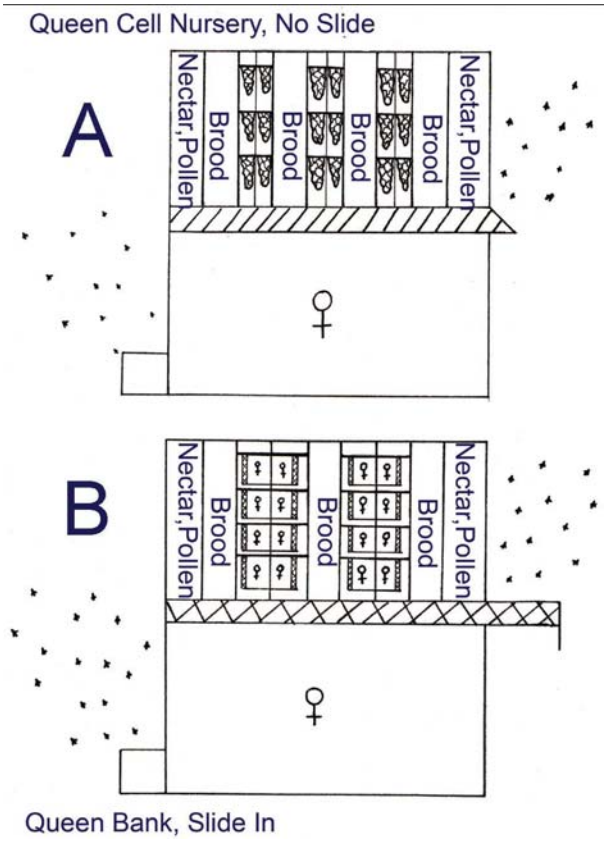
Build a second queenless cell builder using material from support colonies. A queen-right cell builder system is established and can now be worked as described. To efficiently use cell builders, a graft can be given every 4 to 5 days. Capped queen cells, no longer in need of feeding, can be matured in an incubator nursery colony.

Use of Cloake board for Banking Purposes

"Banking" refers to incubator or nursery colonies used to hold and maintain caged queens or maturing queen cells. The practice of banking allows efficient use of cell builders and flexibility in scheduling the requeening of colonies. Banks are also used to hold virgin queens and drones for instrumental insemination.

Successful queen banking systems are generally queenless, though should contain brood. Support colonies are required to provide a continuous supply of young nurse bees and brood. Queens held in banks without brood tend to have higher injury and mortality levels. The presence of brood, especially developing larvae that require feeding, attracts nurse bees to care for the caged queens. Open brood will also inhibit the development of laying workers, which can occur in broodless banks.

A similar management scheme, as used for queen rearing, should be applied to banking. The Cloake board, described last month, can also be used to establish flexible and self-sufficient banking systems. Banks are often used for temporary storage. Use of the Cloake board allows colonies to be quickly converted into banks or placed back into production, as needed.



Incubating Queen Cells

To use cell builders efficiently, capped queen cells are moved to an incubator colony to mature. A cell builder can support a new graft of queen cells every 4 days. As soon as the developing queen cells are capped, these are moved and another graft of cells started. Needing only warmth to mature, capped cells are held in nursery colonies until they are ready for introduction into mating nuclei. Removing capped queen cells helps maintain a high acceptance level in the cell builder. When an older graft is already present in the cell builder, acceptance of a second, younger graft is often reduced. Maintaining the high feeding demand of open queen cells also helps to keep the brood food glands of nurse bees in production.

Several hundred capped queen cells can be held in an incubator colony, if this is kept strong. Colony strength, weather conditions and seasonal considerations will determine the number of cells that can be incubated. Early in the season, developing cells should be

protected against cold nights. Provide wind blocks and reduce the top entrance to maintain heat. A heater can be placed beneath the colony if necessary.

Capped, maturing queen cells can simply be held in a queenright colony above an excluder. The slide insert is not necessary, as free movement of workers through the excluder is desirable in this situation. Use of the Cloake board eliminates the confinement of drones by providing an upper entrance for bee traffic. However, if located near a large mating yard, the risk of a virgin moving into the bank is possible.

To provide warmth and attention from nurse bees, brood should be placed next to the queen cells. Rotate frames of brood up into the top nursery box and empty comb down to provide space for the queen to lay. If young open brood is moved up, routinely check these frames for development of rogue queen cells. Be sure to remove the frame of queen cells before they are due to emerge. An emerged virgin queen can destroy many cells.

Developing queen cells are fragile and easily injured by shaking, rough handling and temperature extremes. This is more critical in the earlier stages of development. Take care to brush bees off the queen cell frames, rather than shake these. Provide warmth, such as a hot water bottle, for transport.

Nurse bees are very attentive to capped maturing queen cells and continuously work the wax. They will tear down injured, diseased and non-viable cells. When the cells are close to emergence, the bees chew the wax cap of the cell leaving only the cocoon. This is an indication the virgins will emerge soon. For these reasons the care of queen cells in a nursery colony is preferred over the use of an electric incubator.

Banking Virgins and Mated Queens

The banking of queens can be of value in certain situations. A new batch of queens arriving during bad weather, or to be placed in distant apiaries, can be temporarily banked. Older queens from dequeened colonies can be held in waiting until the arrival and/or acceptance of new queens is assured.

Caged queens should always be banked in a state of queenlessness. Worker bees will be aggressive toward the caged queens in the presence of a laying queen, including one that is restricted or placed below an excluder. This often results in injury and high mortality of the caged queens.

To establish a self sufficient "queenless" banking system using the Cloake board, the slide insert is kept in position. A state of queenlessness is maintained in the top box. The presence of a laying queen in the bottom box, separated by the slide, provides a source of young bees and brood. Frames of eggs and young brood are rotated up, eliminating or minimizing the need for support colonies. It is essential to maintain a high population of young nurse bees around the caged queens to ensure these are well fed and receive proper care. Older bees are aggressive toward caged queens and their brood food glands are atrophied.

Nursery colonies should be fed syrup and pollen to assure food resources are plentiful. Capped honey should be removed and replaced with open nectar and foundation. A sheet of wax foundation will prevent webbing, stimulate wax builders and provide a place to store nectar. Queen cages can also be supplied with bee candy.

A key factor in the success of banking is to maintain a high population ratio of young nurse bees. Using the Cloake board, the colony can be pivoted, to either boost the population or reduce the number of older bees in the top box, depending upon need. When using this technique, be sure adequate bee strength is maintained in the top nursery chamber.

Bank Queens of Uniform Age and Race Together

Bees recognize and discriminate age, reproductive status and the degree of relatedness among themselves. Resident bees in the nursery colony will preferentially care for queens more closely related to themselves. They will also favor mated queen over virgins. Queen pheromone levels are more developed in mated queens.

For these reasons, do not bank queens of different reproductive status or of different ages in the same colony. Make a separate bank for virgins, a separate bank for newly mated queens and a separate bank for older queens. Mixing these is often fatal to one group of queens.

Queens of unrelated stocks or different racial backgrounds should not be banked together. The bees in colonies used for banking should also be of similar genetic background. For example, do not bank Carniolan queens in a colony of Italian bees. Preferential treatment occurs and will influence the quality of care provided. The aggressive behavior by resident bees can cause severe injuries and high mortality of caged queens.

Minimize the Duration of Banking

The banking of caged queens, while offering advantages and providing convenience, is a practice that should be limited to a brief period of time. Queen confinement is an unnatural situation and worker bees are often aggressive towards multiple, caged queens.

Injuries to queens can result in chewed tarsal pads, missing legs and wing parts. These injuries may reduce acceptance and cause premature supersedure. Queens with injured arolium (tarsal pads), tend to fall off the comb when removed from the colony and examined by the beekeeper. The insufficient production of queen footprint pheromone, which functions to inhibit the construction of queen cells, may contribute to supersedure.

There are many types of queen cages and some designs offer more protection in preventing injuries. Use of cages with a tight weave screen and a covered area inaccessible to worker bees may help prevent injuries, though the reduced access to worker bees restricts feeding. It is advisable to provision queen cages with bee candy.

Queens held in cages tend to lose weight and may receive an insufficient diet. Queens can survive for many months in a banking situation, though this is not advisable. Queen performance is often reduced after long-term banking, and may negatively affect fertility.

The common practice of banking queens for an instrumental insemination program has been shown to have detrimental effects. Much of the unfounded reputation for poor performance of instrumentally inseminated queens is due to this practice. Queens confined after insemination store less sperm and are subject to injury.

Banking is a practice that should not be routine, but rather used as an emergency measure. For good results banks must be maintained much like cell builders, with lots of nurse bees and ample food stores. The quality of the bank and length of confinement will determine the care given.

by SUSAN COBEY, Ohio State University mailto:cobey.1@osu.edu.
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