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Natural beekeeping 5 Queens

by Les Crowder, edited by Heather Harrell

Now we will roam into the fun and mysterious world of breeding bees. Honeybees are only slightly "domesticated". The domestication of animals is a long process that requires generations of dedication to select and propagate the "best" of a group. By selecting the male and female that we allow to mate we can have some influence over the color, size, temperament, body conformation or productivity, etc… of the animal we are breeding. One of the difficulties of breeding honeybees is controlling the males that our queens mate with. Queens mate in the air, miles away from the hive they were born in. A new or virgin queen mates with10 to 17 drones and mixes the semen in her spermatheca.

The drones congregate from all the hives for miles in all directions in designated areas (Drone Congregation Areas, DCAs, kind of like singles bars) where the breeding frenzy is intense. This keeps us from having much control over selection of the males our queen mates with. They could be from any hive within 10 miles, feral, wild or from another beekeeper's hives. So when you select your best queen to raise daughters from, remember that she mated with many drones of unknown lineage. This makes it hard to predict much about the traits of the children. This is where we may have to rely on the queen's judgment when she is in the DCA.

Note: In an isolated area where there were no honeybees for 10 or more miles in any direction, it is possible to set up a closed breeding operation. One would place drone mother colonies and queen mother colonies in the area. Many lines of bees are needed, because bees are adversely affected by inbreeding. Such a place is hard to find and would probably be an area that could not support bees with out significant feeding of honey or sugar syrup and pollen. Artificial insemination of queen honeybees is another way to control mating but it does not produce queens with a sufficient sperm count in their spermatheca, requires expensive equipment, and does not meet my definition of natural. These sorts of operations are beyond the scope of this book.

I raise a few hundred queens a year with my topbar hives and have developed a system that requires very little specialized equipment. I feel that letting my queens mate without attempting to control the drones allows the force of nature to have its influence in the breeding of bees in my area. The feral hives that exist in our area are not given any mitecides or antibiotics. They have adapted to the local conditions and have no beekeeper to report to. In my mind this makes them good bees with natural disease and mite resistance. And perhaps nature would like to show me the value of some trait that I don't now understand that I might have selected out of my bees.

The main factor I have control over is the selection of the mother of the queens I want to raise. The queens I raise daughter queens from are (1) gentle, (2) disease and mite resistant, and (3) produce a good surplus of honey. The color of the bees is not a factor for me. Honey production takes into account a lot of other factors such as propensity to swarm, egg laying pattern of the queen, etc. Many beekeepers would put honey production first but I insist on working with gentle bees, and do not use antibiotics or mitecides. Any hive with larva that are dying before they hatch, whether due to American or European foul brood, sack brood, chalk brood, or some unknown condition are not used as queen mother hives. I won't propagate any hive that requires chemical inputs.

When we first think of raising queens we don't necessarily think of raising drones. If there are not enough drones around, a queen will end up with insufficient sperm in her spermatheca. She will not be fertile and will only be able to lay drone eggs. The hive will soon die. Topbar beekeeping allows bees to raise as many drones as they would like. The bees build combs with drone size cells when they want to raise drones. It is possible that most of the drones in my neighborhood come from my own beehives or from feral colonies, as the nearby commercial Langstroth hives only provide bees with worker size cells to raise larvae in. This is another benefit to raising bees in topbar hives.

The simplest way to raise a queen is something we have already discussed. Rather than drawing the bees back into the hive to prevent swarming, we can take comb away and crowd them to induce swarming. Then we can make a divide before the swarm cells hatch and put the queen into a new hive with bees, brood, and honey and now we have the queen mother in her new hive and a daughter in the original hive. We have caused the bees to raise a queen. But only one. If we see that there are swarm cells on more then one comb we could divide the hive into three or possibly four hives and raise two or three daughter queens. We could also choose to kill a failing queen in a poor hive and brush the bees off a comb with a queen cell from the hive we've induced swarm cells in, and put the comb with the queen cell into the failing hive. The queen cell would hatch in the hive and the daughter of the good queen would become the new and prosperous queen of the poor hive. The same procedure may be used for queenless divides.

These methods depend on the availability of the bees to raise queen cells wherever they see fit on their brood combs. If there happens to be more than one queen cell on a comb we could possibly cut the queen cells carefully out of the comb and put one queen cell in each divide. This method is messy because the cells around the queen cell are usually tough cocoon reinforced brood combs, often filled with brood, that your knife will have to cut a bloody path through. In response to this problem, it occurred to somebody to invent queen cell cups like the bees scatter throughout the brood combs and to use a delicate little tool to lift a larva from a worker cell and put it into an empty queen cell cup. Sometimes the bees would raise the larva into a queen. The next questions to be answered were; under what conditions could one get the bees to raise many queens in easily detachable queen cell

cups? How many queens could be raised in a hive? From the many experiments to answer those questions came the art of grafting.

In beekeeping grafting refers to lifting larvae out of the cells they were in and putting them into queen cell cups. By experimenting with this practice, beekeepers have learned how to create the conditions that help bees raise queens. The biology of raising a queen has to be understood. When bees feel ready to swarm, the conditions are just right to raise quite a few queens. There are lots of bees in the hive. They are bringing in pollen and nectar. The queen is running out of room to lay eggs and there are fewer and fewer larvae to feed. But there are thousands of well-nourished nurse bees capable of producing great quantities of rich royal jelly. Under these conditions, the bees will begin to raise swarm cells.

Another factor that triggers bees to raise queens is queenlessness. The queen is constantly exuding a pheromone called queen substance that lets the bees know that she is alive and well. If she weakens or dies, the lack of queen substance lets the bees know that they'd better raise a new queen. They need to know quickly because they need to select female candidates in worker cells that are still young enough to be raised into queens. If a female larva is fed royal jelly in great quantities she will develop into a queen. If she is fed royal jelly for two to three days and then honey and pollen, she will develop into a worker bee. If the bees begin feeding a female larva honey and pollen to raise a worker and then suddenly decide to feed it royal jelly to attempt to make it develop into a queen, it will become an intercaste, something in between a worker and a queen, and will not likely mate or become a viable queen. So the hive has to begin raising a female larva into a queen before the larva is two days old or the hive will die.

So how do we create the conditions which induce the bees to make say about thirty or so queens in queen cell cups that we can easily detach and put into hives with no queens? After much reading and experimenting with bees in topbar hives, here is what I have come up with. First I hang two thin boards, one under the other, from a topbar. (See drawing.) They have to hang down far enough to allow room for a fully formed queen cell to form on the bar above. If the queencell could reach down and touch the bar below, or the floor of the hive, the queencell would attach and tear when you tried to detach it to put it into another hive. These topbars are what I use for the bees to raise queens on.

Queen cell cups are small bowl shaped structures that bees occasionally build into their combs. When they want to swarm, they clean them and the queen lays an egg that they will feed royal jelly and make into a queen. These natural queencell cups can be recreated by cutting one off of a comb and filing a wooden dowel until it fits snugly into the natural cup. Then the tip of the dowel is dipped into some vegetable oil once and then into hot liquid beeswax about 5 times. The oil will make the beeswax cup slip easily off the dowel and the remaining wax queencell cup imitates the natural one you found in the hive. I use plastic queen cell cups that are commercially available. I have used the same cups over and over for more than ten years.

I stick 12 queencell cups to the underside of the top bar, 10 under the middle board, and 8 under the lower board. Then I designate two hives to become part of the queen raising process for this graft. One hive will be the queen mother colony that I will lift a few larvae out of to have the other colony, the queencell builder colony, raise into queens. The queen mother colony is one of my favorite hives evaluated with the above mentioned criteria. I try to use a different queen mother colony each graft to keep from getting too many queens from the same line, to avoid inbreeding.

To hang the queen cells, I find a hive that has at least 10 to 15 combs full of bees that I designate as a queen cell builder hive. I lay an empty hive next to it. I open it up and

carefully look for the queen and brood. As I go through the combs I put them into the empty hive so I know which combs I have looked over. By putting them in the empty hive I make sure the queen is not running along the bottom of the hive and hiding in the combs I just looked through. If the queen is a good queen and there are plenty of bees I might make a divide out of the hive and put the queen in a new hive some where else in the bee yard. If she is laying spotty brood or if the hive has any brood disease or mites I may just kill the queen.

If she is a good queen but there are not at least 14 combs of bees I may put her in a queen cage (see caging queens below) and either put her in a hive I need to re-queen or in a divide, or I could sell her to another beekeeper. She cannot be in the hive while they are supposed to be raising queens for me. Then I need to find a home in other hives for all the brood, as I don't want much brood in the hive either. I brush the bees off the brood combs back into the queen cell builder hive and put one or two brood combs into neighboring hives. In order to raise queens, I want a hive with an empty space for them to build a comb in front, followed by a comb full of honey and pollen, then the queencell holding topbar, then one comb of brood from the queen mother colony with eggs and just a bit of young larvae in hatching capped brood if such a comb is available. This brood comb is followed by another pollen and honey comb, and then the combs of honey that have no brood on them. This creates a crowded hive with a lot of nutritious pollen and honey surrounding a little brood next to empty queencell cups, excess nurse bees, and no queen. The bees will want, and be able to raise many queens with all the royal jelly they have. The brood will attract them and since it is next to the empty queencell cups they will clean and warm them in hopes that some eggs could be laid in them. This process is what I call setting up the graft.

I try to set up the graft in the late afternoon. The ideal time to graft (transfer larvae into the cups) is 12 hours later and I like to do the graft in the morning before it gets too hot and when the humidity is high.

The next morning I take a wet towel, a hand pump spray bottle, veil and smoker down to the colonies and get ready to graft. I don't tie my veil, just hang it over my head, and then select a willow twig to use as a grafting tool. I pull a twig off a willow tree and strip the bark off the twig. (There are tools available in beekeeping catalogues for this and I have heard of people filing a thin wire until it was the right shape to be used as a grafting tool.) I want a soft thin end that I can reach down into the worker cells and gently slip under a little larva.

Next I get the brood comb and the queencell topbar out of the queencell builder colony and brush most of the bees off. I lay them down on the wet towel on a metal or wood tray. In my dry climate the larvae can dry out and die quickly when out of the hive and the wet towel is there to keep the brood and queencell cups humid. I occasionally mist the comb and cups with water from the hand pump spray bottle. I take my veil off to see well. If you need eye glasses to read you will need them to graft because the larvae you are lifting are small and hard to see. If the bees have already started queencells on the brood comb I will gently lift out the smallest looking larvae and put one into each queen cell cup. Large larvae might be older than I want, they could turn into intercastes, and I usually lift them out and toss them aside and then lift some of the royal jelly that was under them and smear it into some of the queencell cups. Then I gently lift the smallest larvae I can see out of the brood comb and deposit them into the queencell cups. I find that if I slip the twig end under the back of the larvae and lift straight up so as to not touch the sides of the cell and knock the larva off the twig it is easy to touch her down in the queencell cup and slip the twig out from under her, leaving her in the cup. With practice you can get pretty fast. I

try to get the cups filled quickly and put back into the cell builder hive quickly. The brood comb now goes back to the queen mother colony it came from.

If all goes well I find I can get most of the larvae to be raised into queens. A few will be rejected by the bees for whatever reason. Some will seem to turn out small. I cull the small ones. These future queens were probably four to five days old (from when the egg was laid) and should not hatch until 11 or 12 days from the day of the graft. But the first one to hatch will kill all the other queens in their cells leaving me with one instead of thirty. I usually try to put the capped queen cells into hives without queens one week after I've grafted just to keep my scheduling smooth and to avoid accidentally waiting until it is too late. When moving and lifting capped queencells you must be gentle. There is a stage in their development when the pupae are nearly formed into adults but their exoskeleton is very soft. If they get banged around they will get deformed wings and legs.

Now where do we put the queen cells? I set up "mating nucleus" hives made of a topbar hive divided in half with a partition and two entrances on each end. I like these even though they are larger than most commercial mating nucs because the bees can over winter in them and I don't have to start new nucs each spring and break them down each fall. I also use these double hives to pollinate orchards with if they have 5 -7 combs of bees and brood. The double hives hold about 14 combs in each half. I need as many hives with out queens as I have queencells to put in them. I count the queen cells in the cellbuilder hive and then make queenless divides or cage queens until I have a home for each cell. Then I gently detach the queencells from the bars and press them lightly into the receiving hive combs right above brood. They will hatch and eat for a few days, go out and mate and then begin laying eggs. Once the eggs are laid I can see how well the new queen lays and get ready to sell her or use her in my own beeyard wherever I might want a queen. Then I start the whole process over again so I can replace the queens I take out of the mating nucs with capped queencells.
