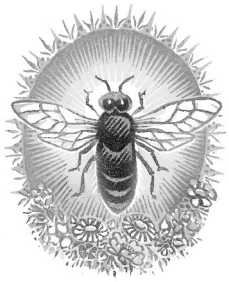

Trusting the Bees: Thoughts on a Stronger Stock or How to Raise Queens with Just a Few Hives

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As a natural beekeeper—by which I really mean keeping honeybees without subjecting them to treatments or medications—I am struck by how inadequate my options are. I've lost colonies over the winter that died surrounded by a hundred pounds of stored honey. I've pored over the clusters' remains and vainly looked for the *Varroa* mites so often blamed for a colony's demise. I've studied the apparently disease-free comb of colonies that were overflowing with bees the prior October—and found myself asking, have I been wrong in choosing this path? If I'd elected to feed my bees Fumagillin and dosed them with acid fumes, would they still be alive? I don't know, but I doubt it. Experts now agree, adding foreign substances to a hive complicates the issue and undoubtedly adds problems. Whatever is killing our bees is a mystery evading the brightest minds. In the absence of answers, what's a beekeeper to do?

Well, what does Mother Nature do? She allows survivors to reproduce. Without knowing precisely what is causing this plague, we have an answer: those not succumbing carry the seed of an antidote—and I don't mean bees from some isolated place, but those that manage to live where others have fallen. I think it imperative to raise at least one daughter from every queen mother that survives the winter, because their genes hold the potential for a

stronger strain of bee. Only when we saturate our area with the drones and daughters of locally adapted/selected stock can nature work her magic. How do we get there from here?

Before the 1880s, when a man named Doolittle pioneered the way our queens have been bred ever since, beekeepers collected swarms. It was how nature maintained diversity, in times before a queen could travel hundreds and thousands of miles by plane, ordered overnight. Now we have factory queen assembly done by humans. If you buy 300 queens from a particular source (who would buy from 300 different queen breeders?), chances are good they'll be sisters with the same mother. Then, imagine all the drones those sisters will produce in your colonies—and you can recognize the genetic "bottlenecks" we've been perpetuating for 130 years!

This inbreeding weakens the immune response. And at the same time, globalization adds one "whammy" after another to a species that hasn't had time to adjust to the threats and isn't even being given the opportunity to begin. So what would I change about beekeeping as it is—and how can individual beekeepers help? I'd recommend alternate means of raising and using queens.

Why? "Modern" queen rearing is unnecessarily complicated and includes the assumption that *any* worker larva 12 hours old or younger is suitable for making a queen. With grafting, a larva is selected (by a human), shoveled out of its cell with a grafting tool, and placed into an artificial queen cell. With skill (and luck), this is accomplished without desiccation or damage. 40 larvae at a time are selected to grow 40 queens—as if each has the same potential. This will cause queens—*but are they the best queens?* Is there something in *that* egg or about *that* larva—something the bees know that we don't—that would make for a better queen?

I think it important to know that workers can preferentially cannibalize the eggs of some of their sisters, based on how closely related they are. *What? Sisters' eggs?* Most people might not realize that hives can have some laying workers, even though the hive isn't queenless. Studies have shown that some workers routinely lay eggs that would, of course, become drones. But these eggs rarely reach adulthood because they are eaten by workers. What's important about that? If a colony consists of 15 "sub-families" (where all workers share one of 15 fathers who mated with their mother), they are able to discern before the egg even hatches if that egg is laid by a full sister or one with which they only share the genes of their mother. Amazing! With that degree of perception, isn't it possible the bees have chemical and sensory abilities to select potential queens—and we mess up by deciding for them?

Is there a simple and more natural method to enlarge the survivor gene pool? Yes.

The Method

The ingredients Mother Nature uses are the same found in the conditions of swarming: 1) plentiful nurse bees, 2) plentiful pollen and nectar, 3) plentiful eggs and larvae of the proper age, and 4) plentiful drones of sexual maturity. Any beekeeper who keeps these points in mind can stimulate a nucleus colony to produce a quality queen.

These conditions can be met at other times of the year, but I prefer to make queenless splits during build-up to the spring flow. In our area of southern Appalachia, honeybees begin swarm preparations in April. Three things indicate a colony is preparing to swarm: the population of drones swells quickly, the number of frames containing worker brood exceeds the equivalent of nine deep frames, and workers create a "honey ceiling". This last can be seen on frames where workers begin back-filling—cells recently containing capped brood get refilled with nectar instead of another egg. If the intention is to keep the colony's

strength for the coming honey harvest, it is good to retard swarming by removing frames of brood and opening the honey ceiling.

As I monitor my colonies in the spring, I count the total number of frames of brood. Five frames is "critical mass", the number that indicates a colony has reached the minimal resources necessary to explode in population. Once this number is exceeded, the colony can add one or more frames of brood a week. And once they exceed nine frames, the likelihood of swarming becomes acute. So I remove frames of brood in excess of six until the first of May, when most colonies will abandon the urge to swarm. In place of the brood frames I substitute undrawn frames and I make sure the honey ceiling is broken. And the best time to make a split is in the middle of a clear, sunny day, over sixty degrees, when most of the foragers are out. The bees on those particular frames are mostly nurse bees, provided a flow is on.

In making a queenless split, it isn't necessary to have all the frames be from the same hive. For example, one frame may come from one colony, two from another, and additional ones from yet another. The frames selected are covered with nurse bees who've never been out of the hive (and they don't fight). So what makes up an ideal box? I've had good success with two frames of open brood, one frame of capped brood, and one frame of capped honey with a generous amount of pollen. Add one frame of foundation and it makes a five-frame nuc.

What do I mean by open brood? You will see frames that look nearly empty that are covered with bees. These bees are fuzzy, gentle, and too intent on their work to worry about you. You should see cells of pollen and others with watery nectar. If you can nudge the nurse bees aside you will see uncapped larvae of different ages. It takes six days for a larva to grow from a nearly invisible little "c" to a large white worm ready for capping. Let your eye track these larvae from largest to smallest, to an area that *looks* empty—and on the fringes of these

you should find eggs. You are sort of following this track: *There's one! … These are a little smaller … and those are even a little smaller … And ooh! What's that little dog hair in the bottom? I thought that was a glimmer of light!* The bees can raise a queen from this kind of a frame. If you only find the bigger larvae and don't find any of the smaller ones, that's not a frame to select because it is too old for the bees to raise a good queen cell.

Open brood frames can be hard for beginners to identify because a lot of the time (and I've thought this myself) it looks like these frames are empty. Over time I questioned, if they are empty, why are all these bees hanging out on this comb? In fact, if a frame is *really* empty, there aren't any bees on them. If you have a frame in the brood nest that looks empty *and* there are thousands of bees on the frame, there will be eggs all over that comb (that's the clue). These are the frames with the nurse bees (you won't find them on frames where the brood is already capped or on the outer frames where the foragers exchange nectar with the house bees). And also be sure that when you identify the frames you want for your nuc, find the queen from the mother hive *before* you remove them (she needs to stay home).

Why do I include two of frames of open brood? Because you need a lot of nurse bees to produce a rich royal jelly to feed the coming queen cells. These nurse bees will mature in the next two weeks and become foragers naturally. If there are not enough stores, they are forced to become foragers way too early. That's why it is important they have everything they need in-house, so they don't have to go out, go to the store for a while or travel all those dangerous roads.

I am often asked if we should be driving newly made nucs three miles away from our bee yard. Yes, if you are moving large established hives. But with these nucs, it's a non-issue because you don't want any of the foragers in the hive anyway. You want all of the bees in there to be nurse bees (that have not ever left the hive). They don't know they are in a

different place so they are not going to leave. The ones that will go are the older forager bees that will return to the parent hive you made the split from (residing in the same yard).

The one frame of capped brood you will select for the nuc ensures a continuous supply of young bees to fill the gaps while the daughter queens are developing. This is important because it will be about three weeks before a new queen is laying—and another three weeks before the first of her offspring hatch. Keep notes so you don't become confused or anxious. Fortunately, this is a season of good weather and prosperity.

Capped brood spends 11 days under that capping so if you have a frame of all capped brood, in the next 11 days all of them are going to hatch. That translates to about 4,000 hatched nurse bees. When that happens, the original nurse bees can graduate to foragers. They will be bringing in pollen and nectar about the time the new queen is born. This frame helps fill the gap during the three weeks that no new eggs are being laid. The colony's entire emphasis is on getting a new queen hatched, mated, and laying as soon as possible. It will be three weeks before those bees have any more sisters, unless the beekeeper adds additional frames.

The frame of capped honey with a generous amount of pollen is sufficient to ensure the nurse bees don't rush into becoming foragers. The population is small and its needs modest. The bees are not going to consume that frame in less than two weeks and by then, there will be new foragers and new stuff coming in. Resist the urge to put in more stores than they can defend. An unguarded frame can lead to small hive beetle infestation.

A frame of foundation gives the little colony enough room to expand and gives something for the 10 to 14-day-old wax makers to do. They do a good job drawing proper worker brood comb because they are not foraging and they have no need of drone comb. This

colony is establishing itself, not trying to swarm, so there is no incentive to raise males at this time—they don't want to feed a bunch of guys that don't bring anything in.

OK. The nuc is made up. Now what?

Immediately the nurse bees will sense they are queenless. They will evaluate the hatched larvae and eggs and begin building out from certain worker cells. In many cases they will wait for an egg to hatch rather than use an existing larva. They will continue to gorge on pollen and nectar, converting those substances into royal jelly to feed their future sovereign. They will place such a copious amount of jelly in the cells that the larvae are literally floated from the bottom of the cell and out and down into the peanut-shaped vertical cell under construction. Generally, a colony of this size will produce from three to six queen cells. This compares favorably with commercial queen breeding operations where a colony approximately six times greater is expected to produce forty queen cells. I let the colony work out which of the hatched queens they prefer.

There are some dependable numbers a beekeeper should keep in mind: an egg takes three days to hatch, a queen larva will be capped on the fifth day after hatching, the queen will complete her development and hatch eight days after the cell is capped, the virgin will take three days to develop her ovaries before she attempts mating flights, and it will be two days after mating (at the earliest) before she begins to lay. In a few cases (for unknown reasons), it may take as long as two-and-a-half weeks before she begins to lay. If the beekeeper cannot find the virgin and becomes anxious by a long delay in seeing eggs, he or she may add a frame of eggs. If there is no virgin present, the nuc will draw another queen cell.

If a beekeeper has the time and curiosity, he or she may want to check the colony's status on day five (after the make-up). Be very careful in allowing space between frames when you

remove them for inspection, because some queen cells can stick out from the sides of the comb. People who aren't used to finding queen cells don't realize they can jut out; the cells can be in different places and if you pull frames up without enough space, this can destroy a queen cell that is on the side of a comb. A good technique is to take the frame of foundation out of your nuc (the one not drawn, because there hasn't been time yet for the bees to draw it out). Pull that out and give yourself a working space. Then, as you inspect the rest of the frames, pull each subsequent frame apart gently before lifting up, otherwise an adjoining frame can brush up against the queen cell, damaging or killing her.

What you should see inside the nuc is several cells close to capping. Turn them upside down and see the larvae floating in a sea of jelly. If you find a cell already capped, it would mean the bees used a larva older than one day—and might indicate they were not offered the appropriately young choices. In my experience this has never happened.

So within a month you should have a growing colony headed by a daughter queen you raised! These colonies take few resources from the mother colonies and start at a time of year when conditions are most favorable for their success. They are not intended to produce honey in the first year, but to provide a "safety net" against loss or to be over-wintered. Should an established colony lose their queen, the beekeeper will have one at hand. These nucs are also a means of reducing the likelihood of the mother colony's swarming—of keeping the bees which otherwise would be lost. The new colony can be kept in the nuc box by removing some brood (over time) and replacing it with empty frames. Or they can be allowed to expand into full-sized equipment. But in either case, the goal is to get these colonies through winter, alive. In the meantime they will eventually produce drones that will strengthen the population in your area. There are many variations in the above method—just keep the four requirements in mind and you should be successful.

In my opinion, if we really want a stronger bee, we are going to have to stop making choices that favor artificial props (anything from the use of natural formic acid, feeding too much sugar, or adding Fumagillin, regardless of whether or not it is refined from a naturally occurring fungus). It's not a question ultimately of how natural our choices are, though that is important too. If our strategy is simply to keep the bees alive *at any cost with any props*, then we are not gaining ground. We are basically just keeping the status quo—and perhaps losing ground. But if we allow selection to occur and vigorously breed from those survivors, we should be able to saturate the area with strong bees and actually help them. I think it is better to have resistant stock without all the props.

It will help if everyone gets on board. This strategy won't work in a sea of indecision or lack of resolve. If together we can support honeybees to do what they do well, then I believe honeybees will support us in our quest for a brighter, cleaner future.

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Photo courtesy of Valeria Watson-Doost (valeriawatsondoost.com).