Larry Connor

Changing The Way We Train New Beekeepers

A look at bee biology and how it affects colony management

Worms in the bee box

It was in the early 1970s and I was a shiny new Ph.D working my first job at The Ohio State University, and assisting the Ohio State Beekeepers Association with their annual Summer meeting. The banquet was about to start when a local TV crew appeared seeking an interview. After a few minutes of rapid discussion, it was determined that one of the senior members of the association, and a beekeeper local to the area, would be ideal to speak to the reporter and to show off the insides of a hive while the banquet started. I think that decision was made because the beekeeper enjoyed talking about bees much more than sitting at a stuffy banquet.

Later that evening on the TV screen appeared the beekeeper holding a frame of brood in his hands, talking about all 'them worms' at the bottom of the cells. And that 'them worms' would be fed by the nurses and would grow up and fill the bee box. This made an impression on me. Certainly I know that any publicity about bees and beekeeping is probably a good thing, and it is fitting to put an established pillar of the Ohio beekeeping community in front of the camera for the local news. (When given the choice I would rather have a local talk to the reporter and film crew rather than doing it myself, since I am from out of town and nobody really cares about an egghead Ph.D.)

But worms? Didn't this guy understand that they are not worms, but larvae? 'Relax,' I said to myself, not many people really care what they are called. Worms refer to creeping invertebrate animals with long, slender, soft bodies and no limbs: specifically, segmented worms, roundworms and flatworms. The immature bees (and they are already bees, but not yet adults), at the bottom of the cells are called larvae, the stage of immature insects between egg and pupa.

The education gap

The amount of education a person does or does not possess is no excuse for incorrect terminology. And while this gentleman was doing his best (and enjoying every moment in the spotlight), he could have been prepared with some training somewhere along his beekeeping experience.

This still happens. Traveling from state to state and visiting with many different beekeepers I have learned that there is a tendency for the old-time beekeepers to train the new crop that comes along every year. Some of these trainers are excellent, and I give them all high marks for the volunteer work they perform. But just this Summer I heard an older beekeepers talk about grafting worms during a queen-rearing course. 'Earthworms don't turn into queen bees,' I said loud enough for them to hear. As a writer and a public speaker I labor over the selection of the proper word to use in my work, and nowadays I work hard to remain politically correct, minority sensitive and culturally aware.

Teaching teachers and mentors

Using terms like *worms in the bee box* reflect a time and place in our culture, and every country has locals with colorful but inaccurate speech. That leads to the first part of this article, coming to grips with our need for correct facts and terminology so we will have well educated beekeepers regardless of their level of their formal education. To accomplish this we need to teach the teachers, mentors, advisors and the helpers of new beekeepers so they receive the best possible education and learning experience. Right now we have a huge number of new people starting with bees, so it is important that we teach them correctly.

All colonies are on several cycles. The food cycle, the abundance of pollen and nectar, are key biological events that determine the beekeeper's management plan. Here returning pollen foragers group at the entrance of a hive. The pollen is from goldenrod.

What do we teach?

A long-term, hands-on, colony-based education is the best way I know to teach a new person beekeeping, especially if the teacher is a skilled beekeeper with balanced education in apiculture, the science of beekeeping. There are not too many shiny new Ph.D.s in apiculture float-

ing around right now, but we need to recruit them to teach the teachers, assisted by the retired entomology professionals who have a great deal to share about their knowledge of bee biology and beekeeping.

What needs to be taught are those subjects where bee biology and bee management intersect, bump heads or cause problems. My students are happy to get a calendar of management – what month to do certain management chores. And to some extent beekeeping by the calendar is an effective way to teaching basics. Unfortunately, it misses the one big theme essential to all beekeeper training: it fails to teach the student beekeeper to 'think like a bee'. We need to produce a class of new beekeepers who are able to view bee activities and anticipate the needs of the colony. In my mind, that is the essence of training beekeepers – getting them to anticipate and respond to the bee colony behavior and biology they observe – and then knowing how to provide the colony what it needs before the moment of opportunity has slipped past.

Learning to think like a bee is the challenge all beekeepers face, even if they have been keeping bees for decades, and have old dusty degrees from big universities. The bees are our ultimate teachers, and we must listen closely and watch carefully to determine what they are doing and what they may need next. And if we open a hive, pull out a frame of brood and ask the bees to 'show me your worms,' they will react a lot better than I did years ago. They just don't listen to what we say!

Here begins Bee & Beekeeper, a study of the biology and behavior of the honey bee, and how a beekeeper might best respond to what the bees are doing. There is so much to learn.

Natural Cycles

Day length

Humans divide the calendar into four seasons, and we mark the two Solstices and two Equinoxes with celebrations and even religious events. Bees have their own way to mark the calendar because they are amazingly sensitive to changes in day length. Most beekeepers are aware that colonies detect the increase in day length after the Winter Solstice, so that one colony might start rearing brood on January 4th, while another one January 8th, but they all respond to the lengthening day when the actual minutes of increase in day length is very small.

Worms? No, larvae (singular - larva). These larvae are at the bottom of the frame where we expect to find them. There are also some eggs if you look closely.

At the Spring Equinox bees are rapidly building their colonies, but the equal day length of that moment seems to trigger stronger growth. And the Fall Equinox does the reverse, it marks the strong slow down of brood rearing, even in areas where food is abundant. Simple behaviors typical of the Spring, such as aggressive drone production, becomes increasingly more difficult once Fall has arrived. Drones are produced, but only under optimal food conditions.

Very few beekeepers have tried to manipulate the length of the bee's day because it is so difficult, with one big exception. Beekeepers in Canada and other northern locations have developed methods of wintering colonies in chambers where the temperature is regulated by heaters and air conditioners, and the carbon dioxide level is kept low with air baffles to bring in fresh air. This is different from the 'cellaring' common to beekeepers 100-150 years ago, when bees were brought into the cellar of a house and kept there, doors opened on warm Winter days and closed on cold nights so the bees could be kept calm and consume a minimum of food reserves. Now, in the potato regions in the West, old potato storage facilities are being used to Winter bees. In fact, some beekeepers put the bees into storage at the start of Winter only to move the bees out and into California for almond pollination, and then return the colonies to the storage facilities for the rest of the Winter, removing them a second time in April.

When there is no daylight in a wintering facility the bees do not start rearing brood. If they do not rear brood they are not consuming as much honey or generating as much heat, carbon dioxide or water vapor. When removed from the storage in April, the bees and queen respond to the rapidly increasing day length and prepare a large brood nest. The challenge here is with the age of the worker bees that are doing the brood rearing. They must be healthy 'fat bees' with good food reserves in their bodies. They must be from colonies that are either resistant to *Varroa* mites or have had mite treatment that does not shorten the length of these bees lives. If the bees that are kept in confinement are old or damaged they will not make the distance, the time from the last natural food of the Fall to the first food of the Spring. The must be free of *Nosema*.

The natural food cycle

Nature provides bee colonies with food early in the Spring. We will discuss early pollen and nectar sources some other time, but on a warm Winter day it is not uncommon to find bees at the bird feeder, or at the sawdust pile, searching from some-

thing sweet and nutritious. The bees are at the end of their long Winter's rest, and are eager to start the food gathering cycle as the weather and the flowers provide.

It is hard to separate weather from food sources, since the weather – more specifically the accumulation of heat units – is responsible for the growth of early Spring plants and the nectar and or pollen they supply to the bees. Some farm magazines and gardening websites track these stats for different areas of a state, so you can see where the plants are developing. In a state like Michigan, where Lake Effect rains and snows begin with the first cool weather of the Fall, there is a buffering temperature effect from the amount and late timing of the snowy weather. At the edge of the Lake, for just a few miles inland, the area is never quite as cold as it gets in the center of the state, and many plants will survive along the lake that would be Winter killed inland. The State's major fruit and vegetable industry relies on this thermal effect. For the bee colonies in these areas, their development is also slowed, and ironically, the bees needed for pollination may need to be wintered inland where they will benefit from earlier forage than if left along the perimeter of the western shore.

There are two more common effects from geography. Of course, the further North you are located, the later you expect plants to grow and produce food for bees. But there is also a mountain effect, most often demonstrated in places like North Carolina, where there are three regions, coastal, piedmont and mountains. Some beekeepers will move their bees so they can collect nectar or pollinate the same plant species by moving the bees up the mountain as the season progresses. Even in areas where you don't think of being terribly mountainous, there can be a week of difference due to elevation.

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The queen cycle

Every bee colony has another cycle that the beekeeper must keep in mind, one that is not calendar dependant – that is the queen's cycle, which may determine the swarming pattern for a colony. Queens come in different ages, first date of egg production, and, more importantly, different life expectancies. They are also subject to the strength or weakness of the colony, the presence of *Nosema*, *Varroa* mites, miticides and environmental pollutants.

Queens are part of a democratic hive, where every bee votes, including the queen. The queen was selected by the worker bees to head the colony, but she is not in charge; colony decisions are made by majority agreement. The bees collectively determine when it is appropriate to produce swarms cells, and when it is necessary to replace the current queen with a new one. There is good evidence that the trigger for cell production is a reduction in the level of pheromone production *as measured by each bee*. So when the colony is large and populous, the amount of queen pheromone is diluted, and swarm cells are produced. Or when the queen is failing and her pheromone production drops (apparently to about half her potential level) then the bees produce queen cells that we call supercedure cells.

Part of the queen pheromone's effects on the worker bees works as a controlling suppressant on the production of cells, so when the pheromone is diluted, then the inhibition is reduced and the cells are produced, either swarming or supercedure. There are frequent reports of swarm cells located on the edge of the frame resulting in colony supercedure. Also, the reverse occurs, where the supercedure cells result in swarming. From that we conclude that the location of the cell is not as important as the colony's overall state as influenced by population and incoming food supplies.

We must learn to think like a bee. BC

Hear Dr. Connor, Dave Mendes and Randy Oliver discuss the issue of queen self-sufficiency and related topics at the Southern New England Beekeepers Assembly in Hamden, CT on November 21. Register on line using PayPal at www.wicwas.com. Connor's new book, Queen Rearing Essentials, is now being reviewed and is scheduled for release in early 2010. Wicwas Press, 1620 Miller Road, Kalamazoo MI 49001, ljconnor@aol.com; www.wicwas.com.