Random Thoughts

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Fine-tuning The Drone Season and The Production of Increase Nuclei

Since I released *Increase Essentials* in 2006, many beekeepers have adapted the production of increase nucleus as an integral part of their beekeeping operation. This is not a surprise to me, but is quite reassuring, in large part because many larger beekeeping operations have used nucleus increase for years as a key part of their seasonal growth before the nectar flow. These beekeepers may incorporate a trip to California for almond pollination, and thus benefit from a strong flow from that crop to build up their colonies so they are ready to be split or used to produce increase colonies once their hives have returned to their home apiaries.

These operations generally limit the production of new colonies to the Spring period, making nucs in March or April as they benefit from the increasing warmth of their southern locations. Drone populations are generally large, especially after their visit to the almonds, and the queen cells they use successfully turn into queens that are mated well, with large numbers of well-fed drones.

This does not necessarily happen for the non-migratory northern beekeeper. Often with fewer colonies, they are typically the progressive and experimental apiarists who seek to make nucs in the Spring with the intention of growing the colonies into full production colonies in time for the nectar flow, or continuously reduce brood and bee populations (often by making additional nuclei), as the season progresses, so they may overwinter the nuclei.

Many of the beekeepers of this size operation that I have visited this Spring purchased queens from California or Hawaii to install during the first cycle of nucs, often made up just as soon as they can build the colonies to a suitable size to split. Others wait for weather conditions to improve to the point when they can produce their own queens and get successful mating in their northern apiaries. Many start with purchased queens and then shift to home-reared, survivor or genetically improved stock for their queen supplies. They may continue making nucs throughout the season.

After attempting to make nucs myself throughout the season, I am fine-tuning the process. Northern beekeepers often feel that they have abundant drones throughout the season, but my observation is that that there often huge gaps in the availability of drones in their colonies, and more important, in the colonies of their neighbors, that will result in successful mating with their queens.

Because we rely upon increasing temperatures, both daytime and nighttime, to generate the rapid growth of the brood nest in the Spring, cold and blustery weather as experienced in 2013 throughout much of the United States held colonies back and forced the beekeeper to provide sugar fondant feeding and protein patties well into the Spring. Both were necessary to produce colonies of a size and strength that would have developed naturally with warmer weather and earlier pollen and nectar sources. Fortunately colonies headed with top-quality queens were able to respond to feeding and produce an abundance of brood and drones.

In April beekeepers started to phone me for Michigan-raised queen cells or virgins. It was pretty interesting, because few of them could state that they had any drones in production in the cold spring weather that would mate with these queens. True, some exceptionally strong colonies were making a few drones, but not solid brood frames needed to time the graft.

Once again I reminded them that they must have drones in the purple-eyed stage (about the fifth day of pupation) to generate the drones that will be sexually mature when the queens they graft that same day will be out flying, seeking 13 to 20 sexual partners. It would have been difficult to produce queens in the weather that included long cold periods with snow and lack of forage during early Spring, but these cold-weather queens would not have found many drones from overwintered colonies. Ironically, the best source of drones in Michigan in April of 2013 was from package bees shipped in from southern states and California. It is not a formula for good mating.

This door for drone production opened in late April, but last year it closed in early August. Our attempts at mating queens were foiled by a rapid reduction of drone production during July and the rejection

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of drones during August. Ironically, many colonies produced a second season of drones during the late August early September flow from goldenrod and aster, but by then I feel it is too late to get queens mated in nuclei that will be strong enough in terms of young bees and stored honey to survive the Winter as nuclei.

Nuclei that we attempted to mate in August either produced drone layers or failed to produce any queen at all. Recently my Spring inspections revealed colonies filled with frames of mixed drone and worker brood, as supercedure queens mated in August that were running out of semen. Ironically, the criticism many northern beekeepers have made of early spring queens from the south – that of being poorly mated – stared us in the face in the north with our own queens! We need to get queen replacement done while there is a nectar flow underway. If you are in an area where the last nectar ends in June, you have a long, hot Summer dearth during which colonies must be protected from robbing (from both other colonies and social wasps) as well as fed if their stores are too rapidly consumed.

All this being said, I suspect that the best time for me to make increase nucleus production starts when the drones appear in late April and ends sometime in July. This is a frightenly short time for a beekeeper to generate these colonies, and, as always, requires careful care and management to make sure the queens are well mated and the colonies strong enough for Winter.

Feeding is a partial answer, but this adds to the cost and time of keeping bees. Better is to get all drone production and increase nucleus complete during May through early July and call it quits for making increase. Manage strong queens with a balance of bees and brood to be added to weaker colonies and ensure all are able to survive long periods of Winter confinement.

Swarms and The Ecosystem

Bees and plants communicate in several ways. The most obvious way is during the pollination process; during which bees collect pollen from flowers and perform acts of pollination so the plant's reproductive mechanism moves on to pollen germination and the fertilization process. Once this occurs, many flowers reduce or terminate their attractiveness to bees and other pollinators by stopping nectar production and terminating growth and production of new flowers. This can be seen in plants like cucumbers, melons and squash – as flowers are pollinated there is a slowing of growth on the vine and reduction of new flower formation. This ensures the full development of the fruit that have been pollinated will be well supported by the plant. Should there be a failure in pollination the vines will continue to grow and continue to produce new flowers. Without pollination the grower will have lush vine growth and few fruit.

When weather or a shortage of pollinators reduces successful flower visits in sweet clover, the plants will continue to grow and hold the flowers for days and even weeks to provide reward to pollinators. But once the flowers are visited by bees and the ovary of the flower is fertilized, additional growth of the plant slows. In areas with large numbers of pollinating insects the sweet clover flowers will be set quickly; mowing and grazing, when developing seed is removed, will often result in regrowth of the plant and the development of new flowers, especially if Summer rains renew the plant's vigor.

Bees are electrostatic pollen magnets; attracting the fine, dry pollen to their bodies to ensure their body is covered with the agent of fertilization the other flowers may need. As bees visit new flowers, more pollen is attracted to their bodies but some may be deposited onto the receptive stigmas of the flowers, where the fertilization process occurs. The bee grooms her body to remove pollen from her body by using the front legs. A small structure on the middle of the front leg is the antenna cleaner, which the bee uses to remove pollen from her highly sensitive antennae.

When bees visit flowers they leave odors from their bodies on the flower that trigger a pass response by additional foragers. Some of these odors come from the worker bee's tarsal pads, which produce a footprint substance that other foragers detect and move to a new flower. This increases pollination efficiency, giving the flower time to secrete more nectar and perhaps dehisce more pollen. This is typically seen in plants that have a longer bloom period. But in flowers that are open for only a few hours, like the above-mentioned cucumbers and squash, there are few chemical odors hat deflect pollinators. We see bees hovering over flowers and hesitating before landing on the structure. They are apparently monitoring chemical signals from the flower and the previous flower visitor before they waste the time to probe for nectar when the flower has just been visited.

These bee and flower interactions lead me to ask the question: *Do swarms have similar feedback mechanisms with the ecosystem in which they are produced?* Do they monitor chemical signals produced by flowers and foliage to determine when to swarm?

There is a clear pattern of maternal favoritism by swarms in an isolated area. Since feral colonies are respread in the ecosystem, found in suitable nesting cavities and near favorably water supplies, especially in areas where moisture is in short supply.

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After swarms enter a new area, its bees work to forage area flowers and collect pollen and nectar. This may increase the population of flowers that benefit by honey bee visits in terms of greater seed production, fruit yield and fertilization success. The presence of a new swarm in a new territory has a positive effect on their ecosystem by fully supporting flowering plans pollination requirements. Successful swarms quite often swarm their second season, and may produce multiple swarms. The parentage of success of these swarms surviving to reach their first anniversary is less than 20 percent, based upon work by Seeley and others.

But the founding swarm has improved the ecosystem where it exists and this should mean that more bees could be supported in their region (all things being equal). So if the founding colony produces a swarm and it does NOT reach its first anniversary, it does not mean that the colony has failed to support future growth of the bee population in the ecosystem. Why? Because that nest or cavity contains beeswax comb that required an enormous amount of bee energy to produce and build. Should the founding colony survive for several years, and continue to generate swarms nearly every year during this time period, subsequent swarms will benefit by discovering the nest of 'older sister swarms' that died. Scout bees are attracted to beeswax comb, and the younger sister swarms will often 'vote' to move into a previously constructed nest rather than start anew. That comb may represent the equivalent of 20 to 40 pounds of honey the older sister hive collected and digested to produce beeswax; this is honey that the younger sister hive will be able to use for growth and winter food storage.

We have a very poor understanding of this tremendous change that occurred in the Americas as *Apis mellifera* spread across the two continents hundreds of years ago when Spanish and Puritan settlers introduced colonies. Relationships with honey-bee friendly plant species favored both bee colony and plant populations of these selected plants. Other insect pollinators faced new competition from these aggressive foragers and may have experienced a suppression of population levels as their share of the food supply diminished.

But of course, the addition of Western cultural practices, related to farming and ecosystem alteration, had an even greater effect on pollinating species, many of which are undoubtedly facing extinction. BC