"Then it happened that night that the angel of the Lord went out and struck 185,000 in the camp of the Assyrians; and when men rose early in the morning, behold, all of them were dead."

— 2 Kings 19:35 (NASB 1995)

Beekeeper spring is finally here, at least for us in Piedmont North Carolina. Our colonies are on a rapid upward trajectory and will reach full strength soon. This means that we must continue to keep a close eye on honey stores. While holding out promise, March is also known for a mid-month relative dearth that can result in starvation for the unwary (see February 2014's "Beware the Ides of March"). Keep in mind that well-provisioned honey bee colonies don't starve at the beginning of winter, but rather at the end. At my house, the risk isn't fully over until tulip poplars bloom. But sunny skies and full honey supers are on the way!

March is also when I receive lots of e-mails from beekeepers saying they've found dead larvae and pupae at the hive entrance. What happened? Did they die of disease or perhaps parasites? Should they call their State Apiary Inspector?

I normally hesitate to give armchair diagnoses about bee mortality because there are a million things that can go wrong for our little furry friends. But in these cases, after I check the prior night's weather report to confirm my suspicion, I'm pretty confident in sharing a "most likely scenario": chilled brood.

Chilled brood is the name of the malady that occurs when brood dies from being chilled. The name isn't very creative but it is completely descriptive. The condition tends to upset beekeepers but looking at it holistically, it can be viewed as a sign that a colony is doing very well… in fact a bit too well. Beekeepers can also take comfort in the knowledge that not only is the problem self-correcting, but it will cease to be an issue once our nighttime low temperatures rise a bit and/or the population of worker bees continues to increase.

Dead brood on the front porch is not uncommon in early spring. Drone brood is especially vulnerable because it is typically found on the outer edges of the nest. Photo courtesy of Mark Gruener.

How does this happen? Three things are at play here. First, responding to the inrush of nectar and pollen that is going on right now, the brood nest is expanding rapidly. The queen is laying like crazy and nurse bees are eagerly feeding larvae. However, the population of adult bees is growing fairly slowly in comparison. We first have to raise all that brood through the egg, larval and pupal stages (21 days total for worker bees) before we get new adults. The number of new worker bees per day will depend on how many eggs the queen laid 21 days previously. (See November 2015's "Bee Math".)

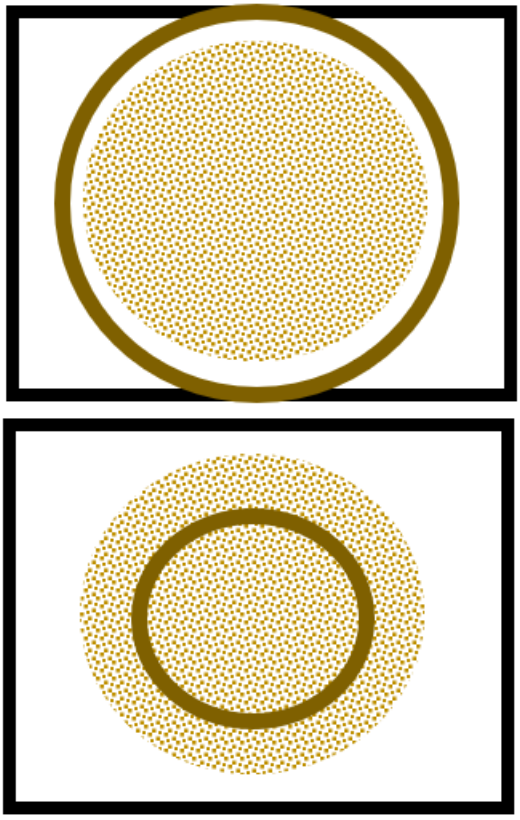
Second, as alluded to, the ratio of workers to brood is decreasing. This is important for a very simple reason: brood must be maintained at about 95^{o} F to develop properly, and it is the worker bees that heat the brood nest. In the warmer months, "heater bees" are responsible for this function (see December 2019's "Honey Bee Colonies as a Superorganism"). In winter, temperature control is also maintained via clustering and subsequent heating of the cluster. Cool temperatures (e.g., 45^{o} F range) result in loose, fairly large clusters; colder temperatures (e.g., 20s and 30s) induce tighter, smaller clusters. It is critically important to remember that honey bees do not attempt to heat the hive box – their sole concern is heating the cluster.

The third factor is that nighttime temperatures in our area can fluctuate significantly from day to day. As I write this on February 21st, the coming week's weather forecast calls for daily high temperatures from 65° F down to 43° F, and more importantly, nighttime lows from 49° F to 29° F.

If nighttime temperatures were low but constant, we wouldn't see dead brood at the front entrance. The cluster would cover the brood "real estate" and nurture it as needed; anything outside the cluster wouldn't survive the egg stage. The brood-rearing capability and the environment would be somewhat in equilibrium. Where we see conflict is when the nighttime lows have been relatively warm for a while and then they plummet. A loose cluster has allowed for a larger area to be used for brood, but now due to a cold snap the cluster must contract beyond the outer limits of the brood nest, exposing the outermost brood to the ambient temperature. The next morning, housekeeper bees clean out the brood killed by chilling and the beekeeper finds their corpses at the hive entrance or on the ground.

What's to be done about this? In my opinion, for hobbyists, this is just an interesting occurrence where the colony's expansion plans are being put in check by the environment, a purely natural circumstance that doesn't require action on our part. Seeing chilled brood typically means that the colony is doing extremely well, so much so that it has gotten a bit "too big for its britches" and nature has given it a tweak. Possible preventions, such as insulating the hive, can, in our area, create more problems with moisture buildup etc. than the issue we are trying to address. The risk of chilled brood will disappear on its own not only as the nighttime temperatures increase but also as the ratio of workers to brood increases.

We can of course greatly increase our chances of having chilled brood, if that's what someone's goal is. One way is to make splits very early in the season, leaving them with few workers to cover the brood. Another is to "checkerboard" the brood frames by placing empty comb between frames of brood,



In the top illustration, given the ambient temperature and the colony population, the bees have no problem covering the brood nest within the bounds of the winter cluster (represented by the dark brown circle). But if the temperature drops sharply, the cluster must contract in order to maintain the same internal temperature, exposing the edges to cold air. The result is chilled brood.

significantly increasing the number of worker bees required to cover the space and keep the brood warm. Either of these techniques have their place in the bee yard but we must consider the weather forecast and plan accordingly! As with many beekeeping chores, "the right tool for the right job" often depends not only on the season of year but the daily weather as well. Is the weather forecast part of your beekeeper toolkit?

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