Playing It Safe

Walter Wright

In the evolution of the species, honey bees have become masters of hedging their bets, or betting on both sides to minimize their losses. In this article I'd like to explore some generalities and provide some insight on the specifics in the reproductive process or the swarm impulse, where they hedge their bets.

One of the bee's most constant and formidable adversaries is the weather. They have devised means to survive harsh winters and hot summers in close quarters and much has been written about Winter clustering and hive cooling. But have you observed how they hedge their bets on "iffy" conditions? They are constantly aware of weather conditions. It doesn't matter whether it's flight temperature or the possibility of rain, when conditions are marginal, they only commit a small portion of the work force to foraging. If conditions change suddenly for the worse, they can sustain the loss. If no foragers went to the field in marginal conditions, there would be no gain for that period, so they hedge their bet.

When the weather improves they send more foragers to the field and when conditions reach a suitable stage for foragers brood is sometimes just barely covered.

But if conditions worsen again the number of foragers in the field is reversed to maintain the low risk. Fewer foragers return to the field for another trip.

Reproduction of any species is one of the primary urges. But, unlike mammal species that mate and nurture young under what may be difficult conditions, honey bee colonies generally do not jeopardize the parent to produce an offspring (swarm). The parent colony has no child-bearing age restrictions and the drive to reproduce is not all-consuming. There is always next year. Survival of the parent colony has priority over generating a swarm. That doesn't mean that they are complacent about swarming, and have developed a behavior specifically designed for producing a swarm at the optimum time of the year.

The "experts" who look for a stimulus for swarm preparations have offered some real gems. Distribution of queen pheromone(s) and day length are two that come to mind. But I think experts are overlooking the obvious. The bees don't need a reason to start building swarm cells. The whole objective of the build-to-swarm mode is to generate that swarm.

Queen pheromone dilution lacks credibility in my opinion. In a double hive body brood configuration, swarm cells are almost always constructed in a plane at the bottom of frames of the top hive body. The queen passes through that plane regularly. Cells are opening up for egg laying in both hive bodies because of brood nest expansion during build-up.

"Honey bees seem to have a plan when it comes to swarming. Here's what I see, in Tennessee."

With respect to the influence of day length, I would point out that, very likely, the sun did not change position in the Spring of '96, but swarming was a month later then than in years past. There must have been some other reason for the swarming season being a month late.

But if these aren't the reasons for swarm preparation, what are? We must offer something more rational. To this end we ask the question: In view of the requirements for swarm establishment in a new location, what would be a better cue than increasing nectar availability? All they need are sufficient bees and evidence of suitable conditions to let them have a go at it, right?

There are two basic requirements for generating a swarm and assuring perpetuity of the parent colony. They must produce enough bees to populate two viable colonies, and there must be sufficient reserves to sustain the parent colony under adverse conditions. The swarm is on its own after it leaves, but the parent colony survival must be protected.

These requirements are accomplished in two phases. The first is all-out brood rearing, which I'll call the *pollen phase*, and the second is the replenishment of stores, which I'll call the *nectar phase*.

The most important feature of the build-to-swarm mode (spring build-up) is their emphasis on forager force. House bee duties are reduced by graduating nurse bees during this build-up period and they become foragers sooner than usual. During the pollen phase of late winter/early Spring, foraging opportunities are limited by weather. They must have pollen for brood rearing, but nectar is not essential, because stored capped honey is (should be) sufficient. Not only is it sufficient to feed the small brood volume, but

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some of it must be consumed to make room for the expansion of brood nest.

The emergence of the second brood cycle means the population is increasing, at least here in Tennessee, and Winter losses have been canceled out and the build-up is on. Each emerging brood cycle fills their vacated cells plus stores depletion cells with capped brood, then graduates to the foraging team. Ever-increasing brood volume generates the need for increasing amounts of pollen.

The bees seem to have a good "feel" for the overall volume of the cavity in which they operate, and this "feel" for overall volume, and the amount of remaining capped honey, plays a role in determining the limits of brood expansion. Generally, the smaller the cavity size, the sooner the limit is reached. If they expanded the brood nest to the point their stores became depleted, and nectar failed the parent colony could fail. They have some "formula" that dictates when enough brood nest expansion is enough. The brood *volume* does not increase much when housed in a small cavity, but the rate increases as the season progresses. The bees maintain their youthful vigor much longer in the Spring because of the limited flight in the early season. It would not surprise me to learn that bees that emerged on February first were leading the swarm on April 10.

If the bee population is sufficient to staff two viable colonies, all that remains undone is the insurance of survival of the parent colony. When nectar is available in sufficient quantity, brood nest expansion is reversed, and nectar is stored in the upper part of the brood nest. The swarm will leave with roughly half the work force. Some insurance nectar storage, to replace stores used for generation of the two colonies worth of bees seems appropriate. But what is important is that from the bees perspective, the backfilling of the upper part of the brood nest is mandatory for "swarm commit." When the nectar encroachment on brood nest volume meets their requirements for survival of the parent colony, they start building swarm cells. Whether that is the reason is irrelevant. Here, they go together. Additional nectar is between swarm commit and swarm exodus, because the departing bees take their fair share with them.

Conversely, if all these things do not fall into place, they can abort the swarm process. A number of things can cause them to fail to generate a swarm in any given year. Failure to optimize the brood nest in the Fall is probably the leading cause. Other reasons are early queen failure requiring supercedure or any problem resulting in general colony weakness. If the bees do not reach swarm-commit early in nectar availability, generally they don't swarm.

To wrap this up, the pollen-phase builds a colony to populate a swarm, and the nectar phase replaces some of the stores used to build that population. The replacement of nectar, plus the capped reserve of honey gives the decision makers of the colony confidence in parent colony survival with half the current work force, (playing it safe).

I considered submitting this article without any reference to my checkerboarding program. I intended that the earlier article (Dec. 1996) be the "what" and this to be the "why", but I concede that the distinction is obscure. So I'll add a postscript.

Checkerboarding is where some of the overhead honey is removed and replaced with empty comb. This takes advantage of one of the honey bee's weaknesses to prevent swarming. They want to store incoming nectar above and to the sides of the brood nest, and they will in the empty comb provided, readily, as long as there is continuous storage space available. If solid capped honey is overhead, they resist storing above that barrier, even when empty supers are provided above the solid honey (at least here in Tennessee). Storing nectar that exceeds feed requirements above the brood nest prevents them from backfilling the upper part of the brood nest. Failing to achieve the necessary brood nest backfilling with incoming nectar, the brood nest volume continues to increase to the level the existing queen can produce eggs. I suspect that storing nectar overhead continually adjusts their perspective ("feel") for how much brood nest expansion can be safely accomplished. Brood volume usually is limited to about 2-1/2 stories in my nine-frame system.

Next time, I'll look at supering, considering all of the above, and the fact that by March, *you* should be prepared to do exactly that. BC

Walt Wright is a retired engineer, with 9 years beekeeping experience. His engineering experience taught him to solve problems rather than treat symptoms. His ideas in beekeeping reflect that direction.