WHY QUEEN EXCLUDERS LIMIT HONEY PRODUCTION

And it has absolutely nothing to do with the space between the wires.

Walt Wright

In an earlier article, the design deficiencies of the queen excluder were presented in general terms. That article stopped short of saying that those design problems were responsible for decreased honey production. However, the statement was made that the QE *does* decrease honey production - with no further discussion of why. You knew, in advance, that eventually there was more to say on the subject.

The real reason for reduced production has to do with excluder effects on colony population. More specifically, the excluder encourages brood nest reduction that limits the population. For this discussion, try to see the excluder for what it is – a screen separating the brood chamber(s) from space needing filling. Unlike the folding screen used by models to change cloths behind, the visual barrier is unintentional, but it does reduce the colony's perception of the space above.

The colony decisions governing priorities, motivation, and focus on activities are made in the brood nest. That seems unlikely to those of us who consider the brood nest workers to be comprised of mostly junior bees. But senior bees travel through the brood nest and typically the brood nest is located near the entry. Is that to keep in touch with field conditions? You do not have to believe any of the above to take advantage of the following discussion.

Figure 1 breaks the Spring season into the four major over-wintered colony development periods. The periods are centered at reproductive swarm cut off timing for your area. Although most beekeepers are aware that colonies lose interest in swarming at some point in the Spring season, there is only a fuzzy notion of when that is on their calendar. Observation of colony activities puts that timing at a strong three weeks *prior* to the "main flow" appearance of new wax, and early in the period of swarm issue for your area. The details of observations leading to that conclusion were provided here in the April '03, issue. Note that, to my knowledge, no academic organization or individual has considered those observations worthy of validation, or disproving.

The weeks of the timeline are "long" weeks. I see some of the periods as associated with worker brood cycles. When cell turn-around time is added to the 21-day (three weeks) development time of workers, a brood cycle is a couple days more. Several lines on the chart are three divisions long. Those periods are not absolute for all colonies, but are representative of most. Genetic variation, colony over-wintered strength, available flying weather, and field forage availability all introduce some scatter outside those norms.

One thing that all colonies in a given out-yard agree on is when to invoke repro cut off. Different races and mongrel crossbreeds read the seasonal timing with remarkable consistency. Repro cut off may be a week early this year, and a week late next year, but all colonies in a given location agree on the timing within a few days. It is not known what cues the colonies use for this judgment, but the consistency of timing, in any given season, suggests that the cues should be identifiable in future studies.

It has come to my attention in recent months that all walks of life are not necessarily oriented to absorbing data from charts and graphs. What is obvious to this engineer may be gobbledegook to someone else. And beekeepers come from all walks of life. To help you interpret the information on Figure 1, I will try to walk you through the information a step at a time. **It is important that you understand that repro cut off is the change in colony motivation from producing a reproductive swarm to protection of survival of the existing colony.** When season advancement progresses beyond a point where a reproductive swarm has a good chance at establishment in a new location, the colony abruptly changes focus. That new focus is oriented to gearing up to store wintering rations. Reproduction ambition is cancelled for

Tip Of The Month

The queen excluder can be removed for the main flow. At new wax of the main flow, brood nest reduction of third and more year colonies has been in process for at least three weeks. Second year colonies may have just started. Colonies that entertained swarm ambition have been reducing brood volume even longer. If you have not deprived them of rearing a comfortable number of drones in the basic brood chamber, there will be no brood in the supers.

that season, in favor of existing colony survival. Line 1 of the chart, "Colony Objective", shows the objective change at repro cut off.

Brood nest volume and growth or reduction in size reflects that change in motivation. A colony motivated by swarm ambition increases its brood nest size to acquire the population needed to support a division by a reproductive swarm. Brood nest expansion continues to the maximum safe volume. The safe volume is determined by the amount of honey reserve that must be maintained to offset hard times in field forage or flying weather. Having reached maximum *safe* brood volume and potentially maximum *safe* population, they start swarm preparation. The first activity of swarm preparation is to *reduce* brood volume to a level that can be maintained by the parent colony left behind. When the colony is reduced in population by swarm

We will come back to the concepts above, as appropriate, as we discuss application of the queen excluder for the development phases of Figure 1. Line 3 of the chart, "Colony Operation", reflects colony activities for the four phases of operations. Starting at the left side of the chart, phase A is the early build-up. This period begins in mid-winter and stretches through early field forage availability. While that is only two brood cycles at my location, at northerly locations, it can be four months or more. Regardless of the calendar length of this period, it is the time that the colony, strong enough, builds brood volume to the max limit – stopping short of the safety reserve of honey. Assuming that an excluder is installed at the top of the wintering honey, it would have no more effect than the hive cover.

There is dramatic change in effect in phase B, the

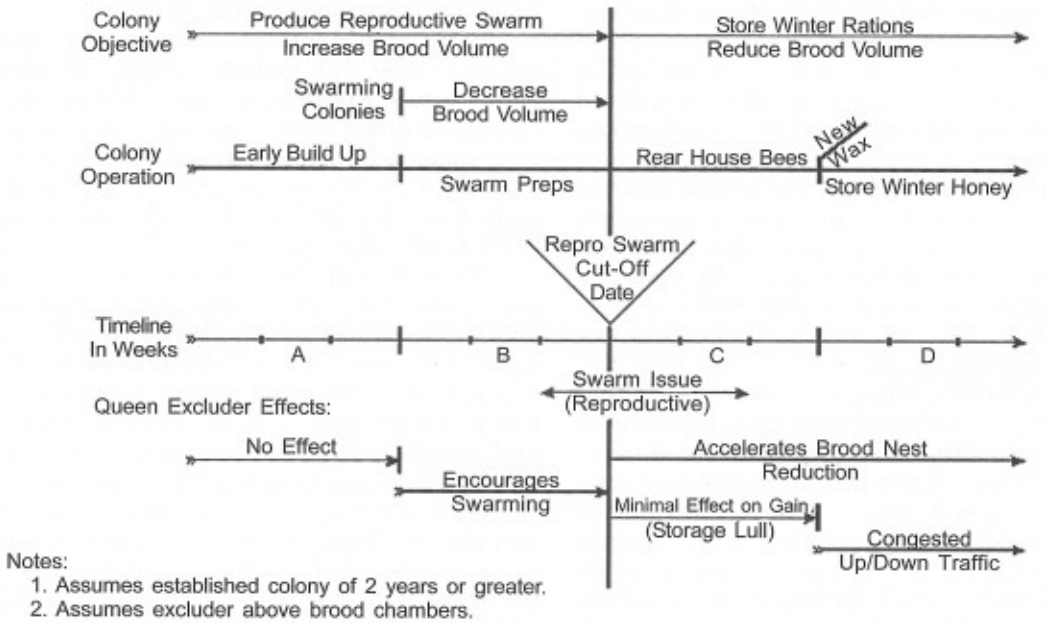

Figure 1. Effects of Queen Excluder for Colony Spring Development Phases (chart by Roy A. Kesmodel)

departure, the parent colony needs a reduced brood volume. This brood nest reduction is a prerequisite for swarm commit, but is seen in the literature as nectar "congestion." Line 2 of the chart, "Swarming Colonies", shows the timing of brood nest reduction associated with swarm preps.

The brood nest reduction described above is relevant to over-wintered colonies strong enough to entertain swarm ambition and may start six to seven weeks prior to the "main flow." All colonies, excepting those struggling for survival and *second year colonies*, get serious about brood nest reduction at repro cut off. They must reduce brood to limit consumption of the stores being collected on the main flow. Excessive brood and nurse bees would be a burden on stores being collected. Nectar processors, wax makers, and foragers support the objectives of that season period. An over-run of new bees generated during the main flow would be counter-productive to the season objectives.

swarm prep period. The colony wants to reduce the brood volume from the top with nectar. In the natural scheme of colony operations, reducing the brood volume from the top is important. This puts the honey overhead of the brood nest to grow into the following Winter. Not relevant to this discussion, but that's why hive body reversal is successful in swarm prevention. When the box with brood to the top is raised, the colony has to start over on brood nest reduction, giving a two to three week reprieve on swarm commit. Swarm prevention by hive body reversal does not reduce population crowding, but puts the nectar below the brood. That's a no-no for wintering.

Where were we?

Queen excluder effects during swarm preparation! Let's assume that you intend to take advantage of the "early flow." You add an excluder and a super of drawn comb when the colony appears to be crowded. The colony is already prepared to ignore space above their band of

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reserve honey (an un-natural circumstance in the tree hollow). Then the excluder also helps obscure the overhead space. What you have done is almost insure that the colony marches on down the path of swarm preps. You gave them space and obscured that space with a visual screen. Had you reversed and added the super of drawn comb without the excluder surplus bees would have occupied the empty comb, and they can't ignore empty comb underfoot.

Phase C, after repro cut off, is the period devoted to development of house bees to support main flow storing of Winter honey. During this period, the established colony (two years or more) generally does not add much nectar at the top. It is sometimes seen as the "dearth" before the main flow by beekeepers. Although there is typically ample nectar in the field, foraging is limited to feeding brood and colony. Since that activity is primarily in the brood chambers, an excluder has little effect during that period. Keep in mind, however, that at repro cut off virtually all *established* colonies are reducing brood volume. Those that started during swarm preps, continue. Others start at repro cut off. Second year colonies, last year's swarm, splits, or packages will often expand the brood nest until the start of main flow. Obscuring overhead space is not helping slow the process. By the start of main flow, all colonies with an excluder will have substantially reduced brood volume.

Phase D, is the open-ended "main flow." It lasts as long as surplus nectar is available in the field. But that statement is misleading. The bees didn't hire in to gather honey for you. They are motivated by survival requirements. When they have stored sufficient honey for wintering, complacency sets in, and brood nest reduction accelerates. Overhead storage of honey trails off earlier than nectar availability in the field.

Another characteristic of the colony is that they want to fill their residence cavity with stores for Winter. Empty space at the top doesn't fit their natural survival format. It doesn't happen in the tree hollow. This article is about use of the queen excluder and a discussion of top or bottom supering is outside the scope. A couple statements will avoid that subject: If the extra work of bottom supering is worth it, do that. The colony has better perception of empty space immediately above the brood nest, and wintering honey there is mandatory to survival.

Those statements are relevant to excluder use in the main flow. The excluder reduces perception of the empty space above that needs filling. That leads to continued brood nest reduction. The damage to brood nest size, population, and honey production that started in the swarm prep period continues into the main flow. In addition, the congestion created in up/down traffic slows forager turn-around time.

The wild colony in a fixed cavity size must regulate population and stores in proportion to that cavity. Population is regulated by adjustment in brood volume – a continuing process. The colony, wild or managed, has a gift for the arithmetic needed for regulating population in consonance with the space available for stores and brood. I often say (facetiously) that honey bees majored in physics, with a minor in mathematics.

In conclusion: My objections to use of a queen excluder are based on personal observations that are, in most cases, both radical and subjective. Radical in the sense that they have not been examined by the academic world, and subjective in the sense that they are unproven deductions based on observation. Subjective, loosely translated, equates to opinion.

You can prove these characteristics for yourself. Assuming you Winter in a double deep and practice hive body reversal for swarm prevention, try the following approach: Reverse during the swarm prep period, as usual, and reverse again in the range of repro cut off (three weeks prior to main flow). Notice the weight differential between the two boxes. The upper box with the nectar of brood nest reduction will normally be significantly heavier. Nectar/honey weighs more than brood of any age. At the beginning of the main flow, check the brood chambers again. You will likely find that the upper chamber is again filling with nectar, reducing the work force for later into the flow. When that upper chamber is filled and capped, the colony has survival "in the bag" and motivation to do more is relaxed.

In my area, with standard management, the bees have shut down for the season by the time sweet clover blooms. BC

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