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Double Queening the Consolidated Brood Nest Hive

Methods for Double Queening the Consolidated Brood Nest Hive[1]

Part II — Conclusion

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GIVEN the background of queen introduction fundamentals for reference, as developed and interpreted in the preceding section, the task of planning and discussing double queening techniques becomes much easier. These principles and explanations remain relevant, and must be understood in order to cope with the special circumstances of double queening.

In the original report[1] on the CBN double queen hive it was suggested that it may be possible to adapt the Demaree plan of swarm control (separating the queen by an excluder below her brood in a double brood chamber hive) so that the bees would start supersedure cells in the upper queenless portion, as they always do; and then, in some way, to induce them to allow a second mated queen to develop directly in the CBN arrangement.

These induced supersedure cells are normally destroyed at about seven days, when most of the brood above is sealed and new open brood appears below. At that time the nurse bees, responsible for starting and maintaining queen cells in the first place, move from above to below.

If at 4-5 day intervals open brood is brought up from below to attract nurse bees — as in commercial queen rearing — virgin queens will be allowed to hatch. However, it is still a matter of three weeks before the virgin is mated and fully functional, with brood in all stages. In none of the few attempts to double queen in this way did the virgin survive that period. But the experiment did demonstrate the precarious status of the virgin, since balling was observed as a result of inspection prior to expected mating.

By analogy to the Queen Matching Principle No. 6 it was reasoned that when the two gynes in CBN double queening are not of equal status, the gyne of lesser status is at risk at the hands of bees circulating through the excluder from the brood area of the higher status gyne. This status differential in some way precipitates acts of aggression toward the virgin, possibly in response to gyne stress, by those bees conditioned for higher queen expectation.

As it has turned out, this rationale was supported by the results of this study. The only successful strategies for directly establishing the double queen CBN hive were those that were based either on (a) simulation of equivalent status quo in the two chambers, with respect to both queen and brood status, or (b) tactics for deferral of the confrontation of a lesser status second queen by workers coming from the higher status brood area until the CBN status quo is uniform.

Since gyne (or queen) status has emerged as the important factor in devising methods for CBN double queening, some definition should be given to the term. A convenient way to do this is shown by the chart in figure 3. Gyne status is rank ordered 1 to 10 through the several recognizable stages of physiological development and aging, according to potential or actual function at each stage.

As will be seen, all three of the following general methods developed for double queening are based on strategies of equating the status quo with respect to queen related functions within the two cooperating chambers of the CBN hive.

FIRST GENERAL METHOD: **Simultaneous direct introduction of two queens (or gynes).** *Two gynes (or queens) of equal status may be introduced by conventional methods directly and simultaneously into the CBN hive, one into each of the two chambers, provided that they are of equal status, and that the brood is divided equally between the two chambers.*

Two gynes (or queens) of equal status are introduced simultaneously by the method of choice directly into the respective chambers of a CBN hive which has just been assembled, all in one operation. Assembly of the CBN hive, with brood equally divided between the chambers, can be from an overwintered double chamber hive by rearrangement (after dequeening) — or the equivalent made up of frames of bees and brood from any source.

For gynes, the apiarist may choose two full-lay queens (preferably by the comb method), two newly mated queens (usually by the cage method, see fig. 4) or two ripe queen cells. Of these choices, the author has not yet tried two ripe queen cells, but with the separate entrances (front and back) the virgins should be successfully mated without more than the usual risks associated with mating. The possibility of a swarm issuing with a mating flight is not ruled out.

If one prefers to use mail order queens, with the aim also of annual requeening, the cost of two queens for each hive would be prohibitive. But that is unnecessary. The two-year-old queens from two hives are of equal status and may be matched into one

of the hives; and the two mail order queens being of equal status, may be introduced into the other. When the time comes to reverse double queen status to a single queen, by removing the excluder, the two top brood chambers with queens are united as are the two bottom hive bodies. The chamber with the youngest queen goes to the top in each case, and no paper is needed. The young queens above survive in each hive.

Another technique is to follow the attempted Demaree supersedure procedure, mentioned above, to the ripe queen cell stage. Then remove the old queen (or store her in the same hive) and at the same time distribute the ripe queen cells and brood into both chambers separated by the excluder. As noted before, this particular pairing of gynes has not been tried.

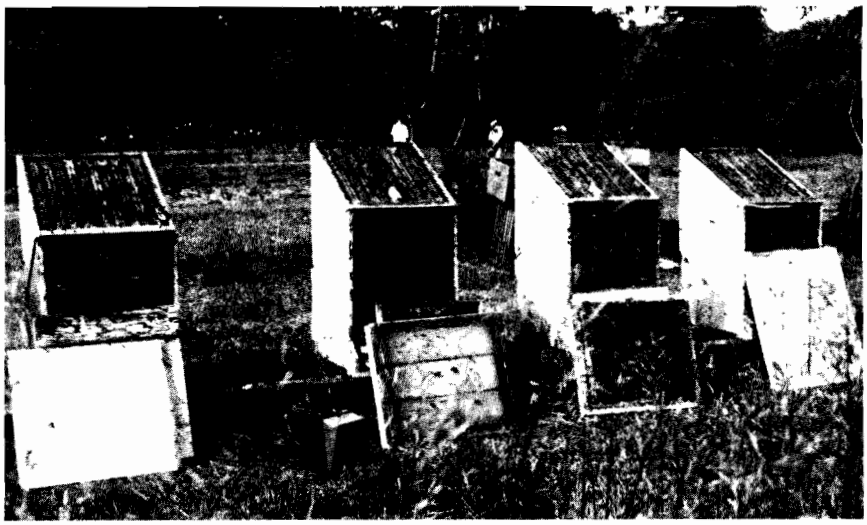

Fig. 4. A-frame hives in the CBN configurations. The brood has been equally divided and the excluders are in place. A pair of new mated queens in cages for each hive have been distributed (some visible) for insertion between the frames before closing.

SECOND GENERAL METHOD: **Uniting queenright (gyneright) colonies:** *Two populations of bees with queens of equal status may be united directly to establish a CBN hive if the bees of the upper colony have been previously trained so that they exit the CBN hive through the upper rear entrance rather than through the lower chamber.*

Exit training is accomplished by positioning the two colonies along side one another (or piggyback) so that their entrances face in opposite directions for a few days while in this position before uniting. When united, the bees from above will continue to exit and enter the upper rear entrance of the CBN hive, having already learned that exact (or approximate) location.

When there is no such familiar entrance, the upper bees of field (or guard) age circulate in force in search of one. Thus the queen below, attended largely by young bees which are outnumbered, is confronted precipituously by strange bees already alerted that something is wrong. Since mingling of colony odors has not yet had time to take place, the lower queen is at risk.

Queenright colonies to be united can be brought from any location, or preestablished in entrance-training position from a double brood chamber hive (or otherwise) at the site of the new CBN hive. In any case entrance training at the new location is required.

For instance, a double brood chamber hive can be partitioned with the queen below by inserting an inner cover or **single** screen to block bee passage. In either case the rim is notched for an upper rear entrance. A second queen can then be estab-

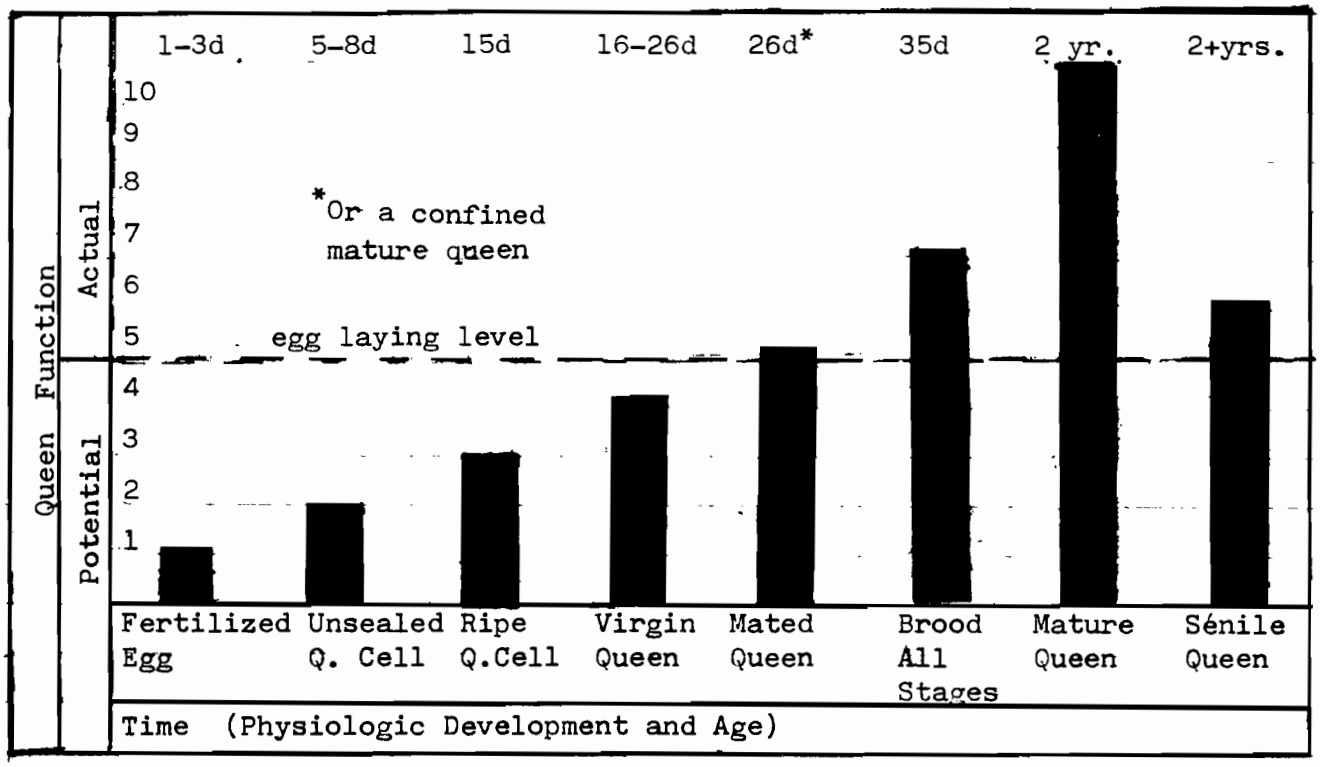

Figure 3: Gyne Status Chart

lished in the upper chamber by any of the conventional methods. The chambers should not be united (by replacing the barrier with a queen excluder) until there is brood in all stages. The use of a newspaper to unite is probably wise. In this case the method chosen for queening should not be too long a process, or swarm preparation from crowding could be induced below. Being obliged to relieve such crowding by inserting a super below defeats the purpose of this simplistic two queen system.

As noted earlier, it should be possible theoretically to unite any two fully queenright colonies, without entrance training, if all the frames with brood and bees were to be intermixed according to Simmins observations. By alternating all of the frames from the two populations throughout the CBN arrangement, assuring that one queen is in each side of the excluder, the bees and combs are thoroughly scrambled so that a common colony odor is immediately established.

THIRD GENERAL METHOD: **Sequential direct introduction of a second queen:** *A second queen may be introduced into the upper chamber of a CBN hive with a queenright lower chamber, if the upper chamber can be kept semi-autonomous, as to the circulation of bees from below, until the new queen achieves status comparable to the pre-existing queen.*

The key to the sequential method is the concept of temporary semi-autonomy in the upper chamber of the CBN by means which reduce, but do not block, upward traffic through the excluder. To do this, all of the unsealed brood is left below with the old queen. In the same operation, a second queen is introduced into the upper chamber which contains all of the sealed brood.

Young bees will be emerging from this sealed brood for nearly two weeks in the upper chamber, while no young bees will be emerging below until then. Presumably, these young bees, as they emerge, continuously migrate downward to the open brood to serve as nurse bees.

Since there is no open brood above, no migration of nurse bees from below to the upper chamber occurs for a few days. Such older nurse bees, conditioned for the status quo existing below, would likely react aggressively toward the lesser queen. Within the two-week period, however, the new queen will have established brood in all stages resulting in a uniform status quo throughout the CBN hive. Then, upward migration of nurse bees is not a problem.

Further, throughout the two week period, nearly all traffic by foraging field bees is through the lower front entrance, away from the upper chamber. Returning field bees which do move to the upper chamber are likely to be full of nectar, in which condition defense behavior participation is pre-empted.

Another favorable circumstance is that the new queen is introduced to a population rich in young emerging bees. Also, by moving only sealed brood above and away from the queen, no supersedure cells are started to complicate the introduction.

The gyne to be introduced by this method should not be a queen cell or a virgin because the total time required for mating and developing brood in all stages exceeds the period of semi-autonomy. The risk outweighs the benefit.

The comb method of introduction, in accord with principle No. 7, is especially recommended in sequential double queening. The comb method as applied here closely resembles the method of uniting two matched colonies (first general method). But in

the comb (or nuc) method entrance training is not needed because the population of bees accompanying the queen is relatively small and not a threat to the queen below.

DISCUSSION

Following the initial publication[1] of the Double Queen Consolidated brood nest concept, a few reports were received confirming that queens will coexist opposite an excluder. The plans mentioned either differed in some way from the rigorous CBN definition, or the reports were verbal with insufficient detail for evaluation. One responder called to attention a publication describing a two-queen system,[21] which I have not seen.

The purpose of further experiments in double queening the CBN hive was to find direct means of introducing two queens safely and simply. The original published method[1] was a two-step process; the second step of which followed the second general method (uniting).

The principle deterrents to the general use of most two queen systems appears to be the complex logistics, labor intensity and the excessive heights. The latter imposes a manipulative barrier to many, as well as a wind instability problem. Some systems are really two double brood chamber hives stacked on top of one another, supered variously on top, or between brood chambers and on top.

The foregoing assessment on the use of most two-queen systems is frequently reiterated by those reporting their experience with them.[22] However, there is unanimous testimonial for the following advantages in the use of two queen systems;[23] increased honey production; reduction of swarming; and the bonus of annual requeening.

The consolidated brood nest two-queen system is believed to be a significant improvement with respect to the aforementioned deterrents; and it retains the advantages. But there are additional advantages. First, management of the CBN hive is very similar to single queen-double brood chamber management with annual requeening. No extra parts are required to set it up, and there are no parts to be placed elsewhere when terminated.

The second important new dimension of the double queen CBN hive system is the potential of optimizing comb honey production. The classical systems of single queen hive management for comb honey generally advocate intensive swarm control measures coupled with crowding the bees by reducing a two-story hive into one, while requeening with a new young queen. The extra brood chamber must be gainfully used elsewhere and returned later. Careful attention to timing and the arrangement of supers is called for. This is the Killion plan,[24] the most advanced and highly sophisticated comb honey system of all.

There are other satisfactory ways to produce comb honey. Even the use of the double brood chamber hive[25] has gained some popularity. But this usually calls for favorable conditions to be successful.

The CBN hive, with two new young queens, is the double brood chamber analog of the crowded, single queen, single brood chamber Killion plan. But it is not as labor intensive, since swarm control depends on the presence of the two queens. There is no need to find use for one of the brood chambers elsewhere.

The author intends to evaluate comb honey performance in the CBN double queen hive system this next season. The new molded plastic half-comb[26] cassettes will be used, instead of the standard square or round sections. These modular cassette-like sections are designed to be packed directly into a standard 4¾" deep super. By virtue of the unique half-comb design, several other deterrents to comb honey production are removed. The tedious effort and time required for the assembly of sections is avoided since they are pre-assembled in molding. There are no section holders to purchase or clean, since the cassettes are self-supporting when in combination in the super; and there are no separators to purchase or clean since in combination the base of one cassettee serves as a separator to the neighboring cassette.

Over four seasons I have found as many hives in which one of the queens has disappeared in an unexplained manner. The majority of the double queen hives have lost no queens until terminated by intervention. Whereas I would not rule out other explanations for these few queen losses, I doubt if most apiarists realize how often they are themselves responsible for queen loss while working the bees. The queen is crushed or, more likely, drops or crawls into the grass and is lost.

Also, a differential status quo could arise in an established CBN hive when one queen ceases to lay eggs for one reason or another, such as a honey dearth, sooner than the other. That queen becomes the lesser status queen, and could be at risk at the hands of the bees coming from the other chamber with a full complement of brood in all stages.

In the same period there have been at least two swarms that I know of; large swarms. Swarming is reduced but is not contraindicated. For instance, if one of the queens fails significantly, the status quo in that chamber becomes such that supersedure cells are induced. This is because the failing queen's contribution of queen substance is markedly reduced. Such cells are known to lead often to swarming instead of supersedure, the swarm being led by a virgin in single queen hives. Alternatively, the consequence of failure of one of the queens in a populous colony could be a true swarming event, given the overall lesser production and distribution of queen substance if one or both queens fail.

The preferred time for setting up the double queen consolidated double brood nest hive in this region is early to mid May so as to take advantage of the fruit and dandelion flow. This allows time to develop peak population before the main flows in late June through early August.

The preferred time for terminating two queen status (by removing the excluder) is just before or at the end of the main flow, which is early August in this region. Sometimes both queens remain together for some time. Time is also needed for the colony to organize around one queen in a manner favorable for wintering. Abrupt removal of one queen earlier from such populous colonies when both queens are laying heavily can actually precipitate swarming, for the same reason mentioned just above. Abrupt removal of one queen when egg laying has tapered off should not be a problem.

The principles associated with the three general methods described for double queening the CBN hive (supported by the general principles for introducing double queens) should be useful to beekeepers in choosing methods according to their circumstances, or to devise their own. My preference is for the first general method (simultaneous direct introduction of matched queens). The second general method (uniting) is safe, but more steps are involved; development of the second queen above a notched single screen is preferred. The third general method (direct sequential) involves the greatest risk, except when the second queen to be introduced is in full-lay and is introduced *via* the comb method. Only then does the third method become a preferred method.

REFERENCES

1) **J. A. Hogg, 1981.** "The Consolidated Double Queen Brood Nest and Queen Behavior **American Bee Journal,** Vol. 121 (1): 36-42.

2) **T. S. K. and M. J. Johansen, 1971.** "Queen Introduction" **American Bee Journal,** 8 parts, March through October.

3) **L. E. Snelgrove (1940).** "The Introduction of Queen Bees" London: Purnell and Sons.

4) **The ABC and XYZ of Bee Culture, 1975.** The A. I. Root Co.: Section on Introducing: pg. 446-455.

5) **E. L. Sechrist, 1944.** "Honey Getting" **American Bee Journal,** Hamilton, Ill.

6) **Charles D. Michener, 1974.** "The Social Behavior of Bees, A Comparative Study" The Belknap Press of Harvard University, Cambridge, Mass.

7) **E. O. Wilson, 1974.** "The Insect Societies" The Belknap Press of Harvard University, Cambridge, Mass.

8) **N. E. Gary, 1975.** "The Hive and the Honey Bee" published by Dadant and Sons, Hamilton, Ill. Chapter VII, "Activities and Behavior of Honey Bees."

9) Refernce 6, Chapter 18.

10) **R. P. S. Yadava and M. V. Smith, 1971.** "Aggressive Behavior of Apis Mellifera L. Workers Towards Introduced Queens" I. Behavioral Mechanisms Involved in the Release of Worker Aggression. **Behavior** 39:212-236.

11) **C. G. Butler, 1969.** "Some Pheromones Controlling Honeybee Behavior" Proceedings of the Sixth Congress of the Internation Union for the Study of Social Insects, Bern. pg. 19-32.

12) **E. O. Wilson,** Reference 7, page 32.

13) **D. F. Peer, 1977.** Canadian Beekeeping, "Requeening with Queen Cells" 6(8):89.

14) **American Bee Journal.** Reference 2, October 1971, pg. 387.

15) Reference 4, pg. 447.

16) **R. Darchen and J. Lensky. 1963.** "Quelques Problémes Soulevés par la Creátion de Sociétés Polygynes d'abeilles." Insectes Sociaux. 10:337-357.

17) Reference 6, Chapter 12.

18) **C. R. Ribbands, H. Kalmus and H. L. Nixon, 1952.** "New Evidence of Communication in the Honeybee Colony." **Nature,** London, 170:438-440.

19) Reference 7: Chapter 14.

20) **Simmins, 1885. American Bee Journal.** 21:472-473.

21) **Ron Brown O.B.E., B.Sc., F.R.G.S., 1980.** "A Simple Two Queen System." 20 Parkhurst R. Torquay, Devon, United Kingdom.

22) For a recent concise account to two queen systems see — S. Taber, 1982. "Two-Queen Honey Production" **American Bee Journal,** Vol. 122(5):348-349.

23) **Farrar, 1953.** "Two-Queen Colony Management" **American Bee Journal,** (93): 108-110, 117.
Also, 1958. "Two-Queen Colony Management for Production of Honey" U.S. Dept. Agr. Res. Serv. ARS-33-48 (Review).

24) **Eugene E. Killion, 1981.** "Honey In The Comb" published by Dadant and Sons, Hamilton, Ill.

25) Reference 4, page 172.

26) **J. A. Hogg, 1980.** "A New Comb Honey Concept" **American Bee Journal,** Vol. 120(5): 357-362.