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Comb honey production 39
Part I of a three-part series

Comb Honey I: Hive Management[1]

Part I of Three Parts

by JOHN A. HOGG[2]

FOREWORD

Because comb honey production know-how is somewhat obscure and fragmented in the literature, many beekeepers, interested in the new Halfcomb Cassette (fig.1) for comb honey and wishing to take up comb honey for the first time, have found the choice of a plan to be difficult. Contemporary journals and texts tend to limit coverage by featuring an exemplary plan from among a plethora, with advice often given in the form of not very useful platitudes or emphasis on difficulty.

In response to this need, a plan for producing comb honey - the Juniper Hill Plan (fig.4), to give it a name - was devised. It is a synthesis of know-how selected from the best in the art of apiculture relating to comb honey methodology.

The plan is composed of selected procedures (tactics), guided by the underlying strategies common to several recognized authorities - their strategies often being obscure due to emphasis on procedure.

Given the legendary perception that the very conditions which favor production of the best comb honey are the same that also induce swarming, it is not surprising that *those plans which most completely simulate the circumstances of an already swarmed hive, requiring radical intervention,* are recognized to be the most reliable in the production of comb honey without the loss of bees by swarming.

A further objective was to devise a plan from the "best in the art" which would complement the major labor saving achieved by the development of the Hogg Halfcomb Cassettes[3] for comb honey on the equipment side, with comparable improvement on the know-how side.

The search has left me with a sense of having rediscovered the lost art of comb honey.

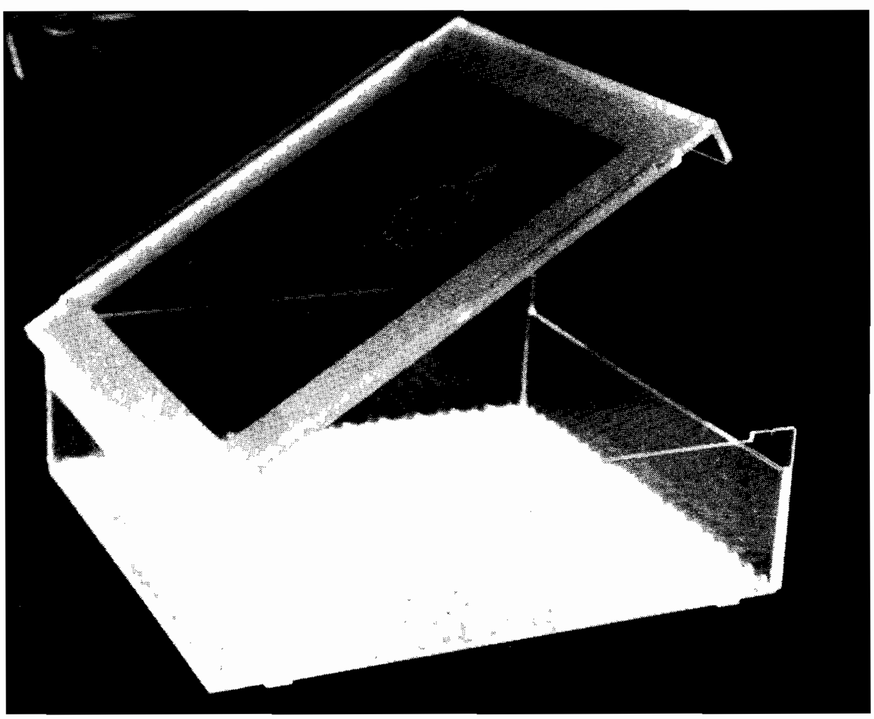

Fig. 1: The Halfcomb Cassette, A radically new comb honey section.

I. INTRODUCTION: THE STATE OF THE ART

In 1919 the United States Department of Agriculture issued a landmark publication: "The Farmer's Bulletin 1039, Commercial Comb Honey Production" authored by George S. Demuth[4].

The fundamentals underlying the art of successful comb honey production, which hold to this day, were clearly and emphatically stated by Demuth, along with a plethora of procedural options. Demuth did not endorse any particular procedure as preferential.

Curiously, although Demuth's teachings no doubt reflect the practices of many others of that time, e.g. C.C. Miller[5], they have not been widely endorsed except for the frequent quotations of a few of the principles expressed by Demuth.

E.R. Root in *ABC/XYZ of Beekeeping of Beekeeping* (1935 Edition, pg.354) noted that:

> *"The careful studies and analyses made by Demuth have resulted in the application of scientific principles to swarm control and commercial honey production, and have been instrumental in promoting commercial (comb) honey production throughout the world. Demuth had the ability to put into practical application the results of scientific research."*

Yet elsewhere in the same edition of *ABC/XYZ of Beekeeping* (1935) as well as the 1923 edition E.R.Root wrote a scholarly account of the state of contemporary comb honey methodology which does not mention Demuth's Bulletin 1039 or the important strategies described there by him.

Also the Farmer's Bulletin itself adds to the perception of difficulty in comb honey production, belying the solution that is identified within, by stating up front (editor's note) that:

"Great skill is required during the honey flow to prevent a division of the working force of the colonies by swarming and also to prevent a subordination of the storing instinct because of the crowded population of the colonies,"

while Demuth opens with the heading:

"Comb Honey Production Calls for Specialists."

A. GEORGE S. DEMUTH: THE "STRATEGY" DEFINED

The essence of Mr. Demuth's overall analysis of hive management in comb honey production, the nature of the difficulties, and the underlying remedial strategy are herewith repeated in abstract form via the following series of quotes:

1. The use of two full depth brood chambers to maximize population buildup prior to the honey flow are recommended:

"It is therefore highly important (1) that each colony be in a normal condition at a period six or eight weeks previous to the honey-flow, and (2) that brood-rearing be at its maximum for the entire period of six or eight weeks during which the brood is reared to produce workers that will be available for the honey-flow."

2. Reduction to one hive body for brood at the outset of the honey flow is recommended.

"Brood-rearing, which is of primary importance during the preceding period, becomes of secondary consideration at about the beginning of the honey-flow, ... At this time, therefore, there is a radical change in the purpose of the manipulations. Instead of continuing the expansion of the brood-chamber, the policy of the beekeeper should now be rather a concentration of the worker and brood . . . . The brood-chamber of colonies occupying more than one hive body should at this time be reduced to one."

The conditions which favor the production of the best comb honey are the same as those that induce swarming.

"This massing of the workers in strong colonies, so essential to the production of a fancy grade of comb-honey, renders necessary extremely careful and skillful management, since the efforts of the beekeeper may still be nullified in either of two ways: (1) The bees, by swarming may divide their forces into two or more parts, or (2) being defeated in their effort to swarm or from lack of convenient storage space, etc., they may do very poor work even during a good honey-flow . . . . the entire working force of each colony must be kept undivided and the means employed in doing so must be such that the storing instinct remains dominant throughout any given honey-flow."

3. Demuth then defined the key strategy for coping with the unwanted swarm - the simulation of an already swarmed hive.

"It is necessary, therefore, for best results, that the operation to prevent a division of the working force of the colony be in harmony with the instincts of the bees. The conditions created by the beekeeper for this purpose, therefore, may well be expected to simulate to some extent the conditions present in natural swarming. There are two well recognized sets of conditions under which colonies preparing to swarm may be expected to be satisfied without dividing their forces and without a further attempt to swarm during a considerable period, usually during the remainder of the honey-flow. They are (1) conditions similar to those present in a swarm that has been hived . . . . and (2) conditions similar to those present in the parent colony after a young queen is established as the new mother of the colony."

4. The specific recommendation for "keeping the forces together and satisfied during a good honey flow - the most difficult problem with which the producer of comb honey must deal" is embodied in the following statement:

"All successful remedial measures for swarming whether applied after the colony has acquired the 'swarming fever' or applied to all colonies alike previous to the swarming season, have one factor in common - a temporary disturbance in the continuity of the emergence of young bees . . . . If each colony is requeened with a young queen at the beginning of the honey-flow, after having been queenless for 10 or 15 days, there will probably be very little if any swarming during an ordinary season."

This statement specifically identifies the most important single strategy, the magic bullet underlying those plans which enable the production of the best comb honey.

5. Demuth did not endorse any particular procedure for carrying out the above - but he did identify the chief reason for reluctance to make use of the "method":

"This method is not in general use among beekeepers largely because of the difficulty in so timing the operation that there will be no loss."

Thus, a major objection yet to be explained and resolved is that of timing.

B. CARL AND GENE KILLION: THE "STRATEGY" VALIDATED

In another landmark publication, *Honey in the Comb* by Carl Killion in 1951, updated by his son and partner Gene Killion in 1981[6], the reliability of the strategy of "simulating the already swarmed hive" is unequivocally validated. Decades of successful commercial and award winning comb honey production by the Killions in up to 1,000 colonies constitutes a "field trial" of unprecedented scope.

The Killion system had its roots in the teachings of Dr. C.C.Miller[5] and George S. Demuth. According to John A. Root[7] "These two men were recognized in their day as the best authorities on the production of comb honey." Mr. Charles Kruse of Paris, Illinois, following their lead, made valuable contributions, especially in the super used. Further improvements were made in partnership with Carl Killion[6,8] (also of Paris) and later fine-tuned by the latter in partnership with Gene Killion[6].

Honey in the Comb describes a full season approach to hive management. But that part of the system which deals with swarm control, so critical at the beginning of the honey flow and the swarm season, embodies the Demuth strategy in full, albeit by a uniquely bold procedure demonstrating uncommon brinkmanship. The bees with queen are crowded into one of two brood chambers for a few days at the outset of the honey flow, intentionally forcing swarm preparations if not already under way. *Clipped queens serve as a safety net to prevent the loss of bees in a swarm either before or after the split.* The queen is removed four days later. On the 10th day a ripe cell (or laying queen) is introduced. Now the loss of the bees later in a "mating" swarm (or of an introduced queen) rests solely on the assurance that no cell such as an emergency button cell had been overlooked in a systematic cell search plan.

The conditions of a swarmed hive without the loss of bees is achieved after an approximately 14 day brood break early in the honey flow. (See fig.2)

Further work in the supers is now jump-

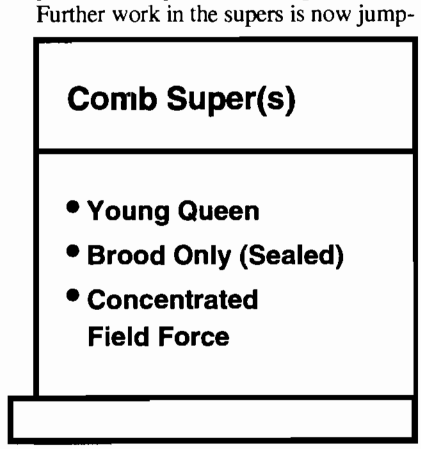

Fig.2: The renewed Killion hive, a model to be emulated.

started by what may be termed an "artificial flow".

"During this queenless period, the field bees have been placing some fresh nectar in the super above and in any open cells in the brood nest vacated by young emerging bees. This hive body will become jammed with fresh honey when the cell or queen is given . . . . As soon as the queen starts laying, most of the nectar in the brood nest will be removed and carried up into the supers. In the desire of the bees to give the young queen plenty of room to lay, work in the supers practically explodes, quickly giving the beekeeper well-filled supers of comb honey . . . . It is from this on that the finest comb honey is produced and it is impossible to crowd the bees enough to make them swarm ("Honey in the Comb" pg.102).

Perhaps it would be possible to emulate the Killion model (fig.2) by other means requiring less discipline and dependence on knowledge of "bee biology and behavior."

C. BROTHER ADAM: THE "STRATEGY" ENDORSED

A strong testimonial to the reliability of the Demuth-stated strategy for swarm control comes from Br. Adam in his book[9] entitled "Beekeeping at Buckfast Abbey", pg. 46-47:

"There are, admittedly, an endless number of swarm prevention measures; none can be relied on with any certainty, apart from the one involving the removal of the queen for a period of 10-14 days . . . We applied this method to all colonies, irrespective of whether swarm preparations were in progress or not, on or about 21th of June. Ten days later all the queen cells were removed and a few days after, a young fertile queen introduced. By the use of this method the weekly examinations were avoided. Furthermore, a substantial increase in the crop from the clover was thus secured, for as soon as unsealed brood was again present, 14-18 days, colonies so treated worked with an energy and determination normally manifested only by newly-hived swarms . . . . This method of swarm control excludes any uncertainty. There is no question: will it or will it not work?"

Here, Brother Adam testifies to the assurance that the storing instinct will remain dominant with swarming under complete control, as called for by Demuth and demonstrated by the Killions. But Brother Adam goes much further:

"The many other advantages are likewise equally certain . . . . The break in brood-rearing has a prophylactic influence on colony health. It also brings about a reduction in colony strength subsequent to the main honey flow at a time when an excess of strength can be a positive drawback; that is, in areas without a late honey flow. Colonies thus treated will go into winter in a rejuvenated condition and, as experience has demonstrated, will forge ahead in the spring build-up with a vigour missing in colonies not so managed."

The "prophylactic influence on colony health" observed by Br. Adam is poignant in the currently endemic mite and associated disease syndrome disaster.

Now Brother Adam puts his finger on the problem of "losses" due to the difficulty of "timing", mentioned by Demuth, as the reason for lack of general acceptance and use of the "brood break" method - including at Buckfast Abbey where there is a late honeyflow:

"Unfortunately, as we soon found to our loss, on Dartmoor one cannot hope to obtain a worthwhile crop (heather honey) except from colonies at their peak of strength. Here again the break in brood rearing at a time when the bees should have been raised for gathering the crop in the latter part of August proved responsible for the loss of the necessary colony strength."

One can conclude that in about 6-7 weeks (or before) that the advantages of the Demuth-stated strategy have expired for the reason noted (a forager hiatus during a honeyflow) and that soon thereafter so would the immunity from swarming. Therefore, any new synthesis should be designed to cope with this inbuilt timetable.

D. G. W. DEMAREE: FOREFATHER OF THE SWARM SIMULATED HIVE

The rudimentary version of the now classic Demaree plan for swarm control

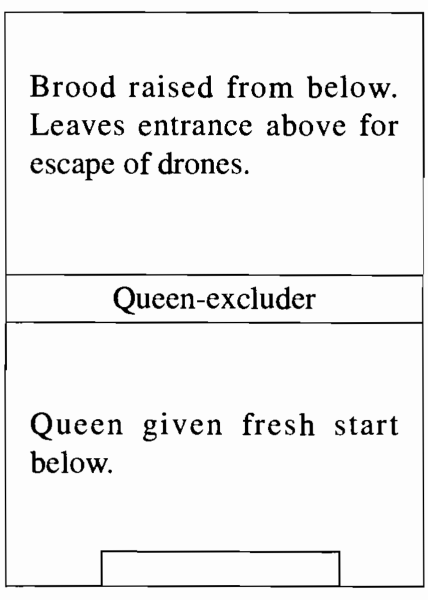

Fig. 3: Demaree's plan in 1894 for swarm prevention: All brood raised.

(see fig.3) was published in 1894, followed by a series of modifications (*ABC/XYZ Beekeeping* 1935 edition, pgs.216-219). To "Demaree", in its simplest form, is to separate the queen from her brood by a queen excluder. Thus, some of the conditions of an already swarmed hive are imposed; the queen is confined below with a new start (the swarm), and the queenless brood is above (the swarmed hive) both sharing the same bees. Some explain that the Demaree is effective because congestion in the brood nest is relieved with regard to young bees while providing room for the queen to lay. However, there has been no <u>overall</u> break in the continuity of brood rearing.

Whether influenced by Demaree or not, Demuth lists the use of an excluder to partition a double brood chamber hive (without brood redistribution) as one of several options to conduct a brood break in the queenless part. (Farmer's Bulletin 1039, pg. 31)

Widely used with modifications, the Demaree plan per se is however not recommended for comb honey.

Its reliability is limited to relatively short term swarm control, often requiring repetition - probably because there has been no overall "brood break". Reliability in a hive already preparing to swarm is controversial.

The strategy defined by Demuth and the teachings and/or testimony of the other authorities discussed here constitute a consensus, and a sound basis to guide the development of a new synthesis.

II. THE JUNIPER HILL PLAN

The Juniper Hill Plan as outlined in fig. 4 embodies the consensus "Strategy of Renewal" (the simulation of an already swarmed hive) within the framework of a new procedural synthesis - hopefully in a manner that will bring the best from the art into the purview of most beekeepers. Multiple objectives have been condensed into a minimum of steps.

The brood break, Stage 1, is initiated on day 0, ten (10) days before the expected honey flow, whether for comb production on the early flow and beyond, or for a later main flow.

A prerequisite is that the colony to be renewed must be healthy and queenright with a minimum of 11-12 frames of brood in all stages in two hive bodies such as seen in fig. 5.

A. STAGE 1, FIG. 4: THE DEMAREE BROOD BREAK

The concept of the Demaree, the separation of the queen from her brood by an excluder (fig.3), was elected to start this plan, not only because of the convenient brood break inherent in the upper queenless hive body, but because the Demaree plan serves several other important purposes in itself:

•Swarm immunity for the 10 day

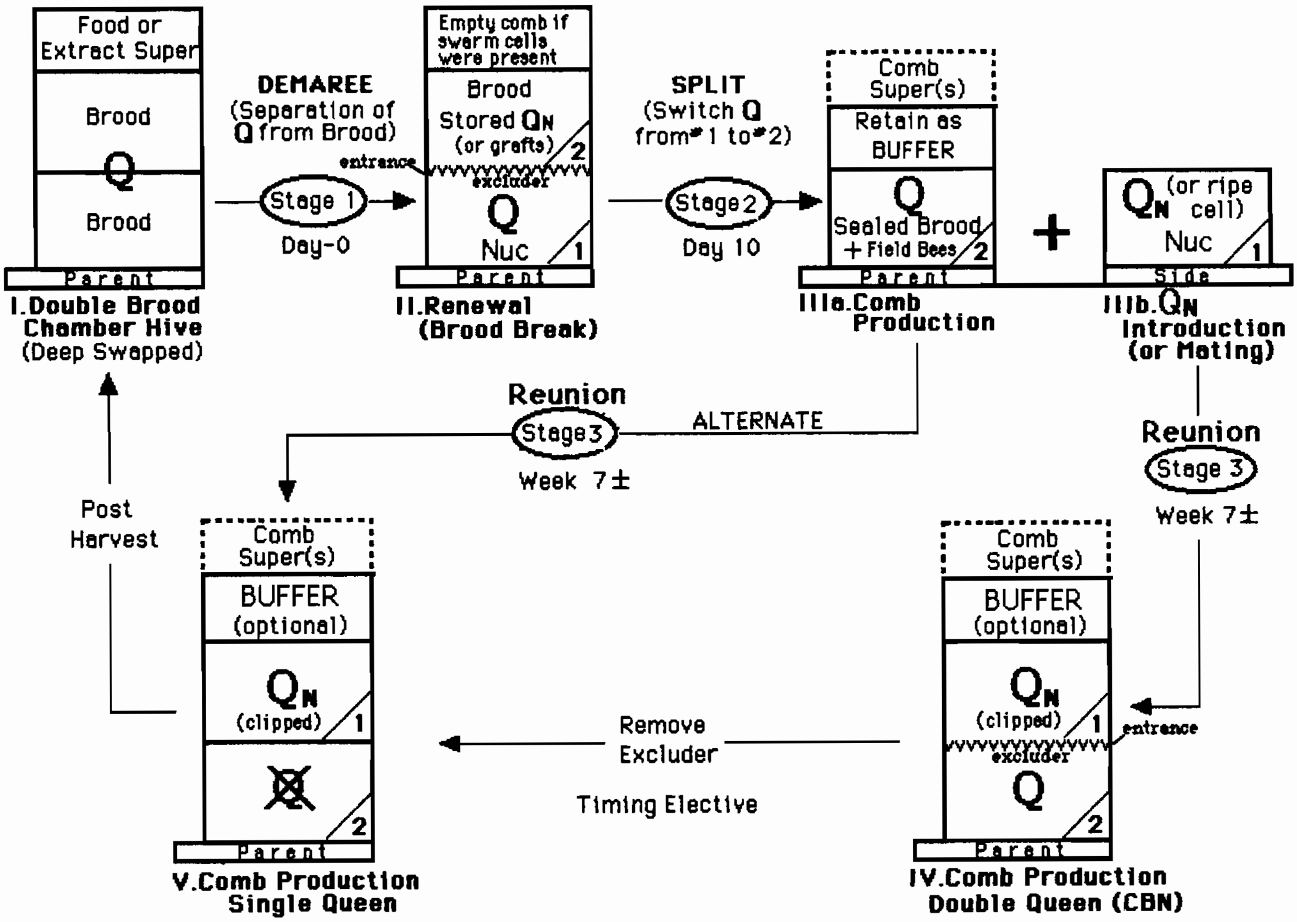

Fig. 4: The Juniper Hill Plan is a composite of compatible classical procedures in sequence for year around management adaptable to different regional nectar flow patterns.

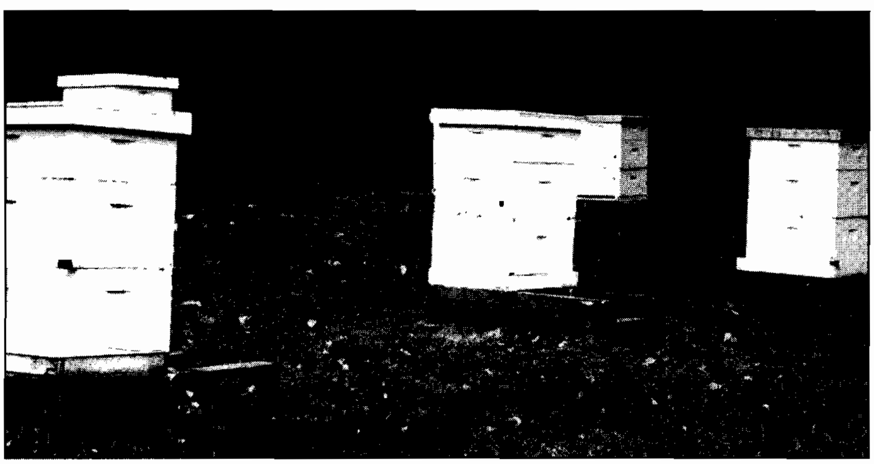

Fig. 5: "Deep-swapped" hives on two hive stands prior to renewal.

period.

•Uninterrupted egg laying in the queenright hive body.

•Conditions which induce the construction of high quality supersedure cells in the queenless hive body, which is of great value if the second queen is to be raised in-hive. (See more on supersedure cells in Discussion.)

Further, three important tasks can also be accomplished while setting up the Demaree:

•Swarm cells, if any, can be eliminated as each frame is handled while redistributing the brood for the Demaree.

•The queen is automatically isolated from the brood in the lower hive body, thus avoiding a queen search.

•The first step is taken to produce (or introduce) a second queen.

PROCEDURE (DEMAREE):

The following steps are suggested as one way to conduct Stage 1 logistically.

1. Assess the hive status quo. Presumably the above noted prerequisite for the condition of the hive may be known or obvious to an experienced beekeeper or determined by a quick check inside - or observed early in the process of redistributing brood for the Demaree (fig. 4), in which case back off for another time if not ready.

2. After tilting the top hive body for a quick check of queen cells on the frame bottoms (10-second check), set it down to the side on the hive cover. Place an empty hive body on a spare bottom between the two hive bodies.

3. Now exposed, and arranged conveniently, transfer 8 or 9 of the broodless frames (bees and all) from the brood chambers into the empty hive body, working from the four outside locations inward until brood is encountered. If the queen should happen to be on such frames, she will be where we want her - i.e. in the #1 hive body to-be.

4. Select one (or two) frames of brood with bees (either hive body) and transfer into the center of the #1 hive body to-be to establish a NUC (again without regard for the queen).

5. Shake all bees from the remaining

frames of one of the two original hive bodies into the top of #1 hive body-to-be, also without regard to the queen. Install the queen excluder, notched for a drone escape, and place that hive body with now beeless frames on top (#2).

6. Frames in the remaining hive body are now transferred into the new #2 hive body after the bees from each frame have been shaken into the front entrance below; at the same time each frame is easily checked for cells.

The queen should end up below with the NUC - just where we want her and without a search.

7. Finally take first steps for providing the second queen (Q_N) in the top queenless hive body (#2) full of brood before closing the hive after the Demaree. The two choices for the second queen to be introduced 10 days later at Stage 2, are:

A young laying queen: To buy a young mated queen is the simplest way to go if grafting is a problem. Such a queen should now be stored in a corked candy cage at the center of deep #2 to help suppress the construction of supersedure cells there and to assure recovery under good care during the 10 days. The narrow JZ/BZ queen cages are excellent because they can be inserted between frame top bars.

Or, A ripe queen cell:

a) By grafting larvae into several sturdy wax cell cups (Dadant) pressed into the comb next to frame top bars in deep #2, using larvae from the same frame or chosen stock (see fig. 6). The bees will accept such cells even when they may not start new cells (see discussion re"Supersedure cells"). Acceptance of grafts should be checked after a day and repeated if needed, or wait one day for grafting for better acceptance..

b) Or by using swarm cells: If swarm cells were present, the advanced cells are mashed and the cell starts (egg or day old larvae) may be left in #2 in lieu of grafting.

Cell status, acceptance and quality can be monitored easily as desired because this is conducted in the accessible top hive body.

8. If the hive had been preparing to swarm, be sure to add comb storage space (extract super) on top of II. fig 4 to reinforce the swarm immunity value of the Demaree.

It is a good idea to follow the Killion practice of clipping the queens as a safety net especially before the renewal. The possibility that a swarm would issue from such a newly Demaree'd hive (see fig.7) during the short 10 day brood break is unlikely; the clipped queen is insurance.

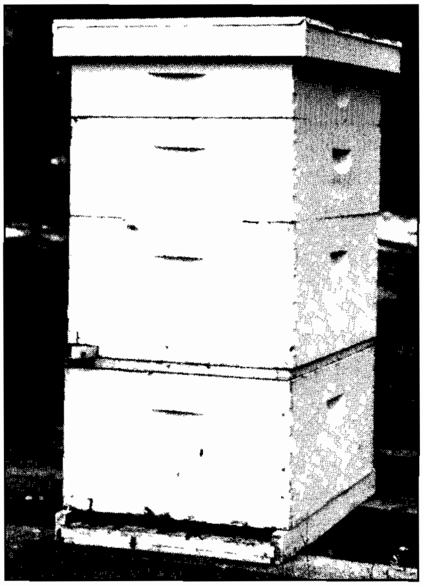

Fig. 7: A Demaree'd hive with super on top.

B. STAGE 2: FIG. 4, THE SPLIT

The split is conducted 9 to 10 days later - and no later if queen cells were chosen as the source of a second queen.

Fig. 6: Cells grafted in cups under top bar.

The task now, in the course of the split, is to transfer the hive queen (Q) back to her brood in #2 on the parent stand in exchange for the caged Q_N (or a ripe cell) - and to concentrate the bees into a single hive body on the honey producing stand. Note the reuse of the hive queen after the brood break instead of the new young queen. This is a deviation from the strategy of Demuth et al. There will be no risk in restoring the queen to her brood because she has been the prevailing queen all along; she needs no introduction.

Also, by restoring the hive queen (Q) instead of using a Q_N on the parent stand (III.a of fig.4), the length of the brood break can be precisely controlled and so can the resumption of work in comb supers as a consequence of the "artificial flow" (The Killion "explosion") stimulated by the prompt resumption of egg laying. The honey backlog is transferred upward to make room for the queen.

PROCEDURE (THE SPLIT):

The first step of the suggested procedure as follows is based on the use of double hive stands - a personal preference (see fig.5):

1. Slide the hive to the other side (of a two-hive stand), leveraged by a small bar, and set the super aside (if one).

2. Remove the caged Q_N (or ripe cell) from #2 and hold - to be relocated later in the side unit (III.b of fig. 4).

3. Set the #2 deep down onto a bottom board (front facing) on the vacated parent location (III.a), and reverse hive #1 at the side (III.b) to face rear.

4. Transfer the hive queen (Q) in III.b back to the parent stand (III.a), manually or by shaking the queen into III.a at the top - being sure to leave enough bees to care for brood. We want the main force in the honey-producing stand.

5. Return the shallow super (if one) onto III.a and add the comb super(s) on top.

6. Lastly, introduce the caged Q_N (or ripe cell) that has been on hold into the reversed "side" unit (III.b).

The ensuing 5-6 weeks is a period of comb honey production on the parent stand (III.a) and concurrent but independent brood rearing at the side (III.b). See fig.8.

This side unit (III.b), dedicated now to requeening and brood rearing, is off the critical path of honey production for this period; there is full and easy access to it for the purpose of monitoring the status of the second queen. This is the time to clip and mark the Q_N (the new hive queen for the next season) but only after the new queen is accepted (or mated) and has started to lay eggs.

During the brood break in hive body #2, the queen in #1 has had the support of the full population of bees in raising brood, now in all stages there. By conducting the split coincident with the termination of the brood break in #2, all of the brood produced in that 10-day period has now been

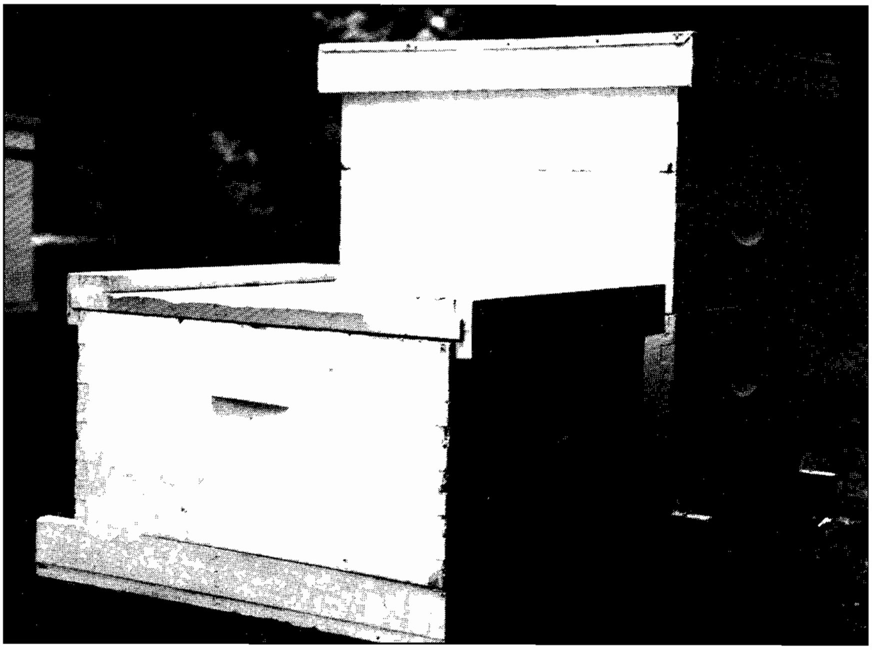

Fig. 8: A newly split hive at the beginning of a flow.

reserved intact to be returned 5-6 weeks later as adult bees - considerably reinforced by uninterrupted brood rearing during the 5-6 weeks. This more than offsets the forager hiatus that would have otherwise occurred in 5-6 weeks, thus providing "the necessary colony strength" at that time, the lack of which was responsible for Br. Adam's losses on Dartmoor (see I.c).

STAGE 3: FIG. 4, THE REUNION

The queenright pair of split units are reunited after about 5-6 weeks to form a two-queen hive on the parent stand (IV. of fig. 4). This double queen hive is the consolidated brood nest[10] (CBN) double queen hive for comb honey production previously described by the author[10]. The object here is to again concentrate the field forces into one powerful honey-producing unit (IV.) which includes the now adult bees which had been reserved as brood in III.b to offset the expected foraging hiatus called to attention by Brother Adam[9] and inferred by Demuth[4].

Stage 3 would of course be bypassed if Stages 1 & 2 had been conducted for comb honey production on a late main flow.

PROCEDURE (REUNION):

1. Set supers on III.a aside; presumably there will be comb supers from an earlier flow and the main flow is imminent or under way.
2. Install a queen excluder with a notched rim, top side, as an exit for drones and rear-facing as a temporary exit for the bees above after the reunion.
3. Hive body #1 goes onto the notched excluder retaining the same compass orientation that the bees learned before the reunion (i.e. do not rotate the hive body 180°). The reason for this is that the bees on top still seek their exit as expected and become alarmed if closed off, sending them down so that the queen there is at risk. (The use of the newspaper method for uniting is good insurance.) An alternative idea for the upper entrance, built into the hive body, is shown in fig. 9.

Note: If such a reunion were to be conducted prematurely, i.e. before there is brood in all stages and a good population of bees, it is the upper queen that is at risk.

4. Return supers and add new supers as needed. (Paper II. in this series will discuss "Super Management".)

Swarm control now shifts from the benefits of the brood break to control by managing surplus nectar storage space and reliance on the presence of two queens, both known to reduce the incidence of swarming. (See fig. 10)

The Alternative Stage 3, single queen (V. of fig. 4), is followed when Stages 1 and 2 have been initiated late to produce honey on the main flow; or it may be used as the method of choice following an early Stage 1 and 2 simply by reuniting; in either case, the upper queen (Q_N) is likely to survive. The two options may prove to be equally productive, the queens possibly overlapping for some time in equally powerful colonies.

III. DISCUSSION and ADDENDUM

Several important subjects either not included in the Juniper Hill Plan or needing further explanation, are as follows:

A. TIMING: ADAPTATION TO DIFFERENT REGIONS

Given the time intervals (fig. 4) for each stage of the plan and the knowledge of expected honeyflow (dates and duration) in any given location, the plan can be readily timed to exploit that honeyflow profile.

At locations with only one significant honeyflow suitable for comb honey, or where the beekeeper chooses to target only one such flow, the key is to initiate the brood break 10 days before the flow starts (day 0) and produce comb honey only for the duration of that flow - which fits nicely with the production of extracted honey before and after (bypassing the double queen Stage 3 i.e. following alternate Stage 3).

Otherwise, for full season comb honey production, day 0 is set at about 6 to 7 weeks before the expected main flow or (the first half of May in this region if the hive meets the prerequisites then); comb honey is then produced in both Stage 2 and Stage 3.

B. ALTERNATIVE QUEEN LOCATION

In Stage 2, the exchange of hive queen and ripe cell (or caged Q_N) could be eliminated. There would be less work.

This option would be more fully in compliance with the Demuth-stated strategy for extended swarm immunity, yet it seems not to be needed here - given the

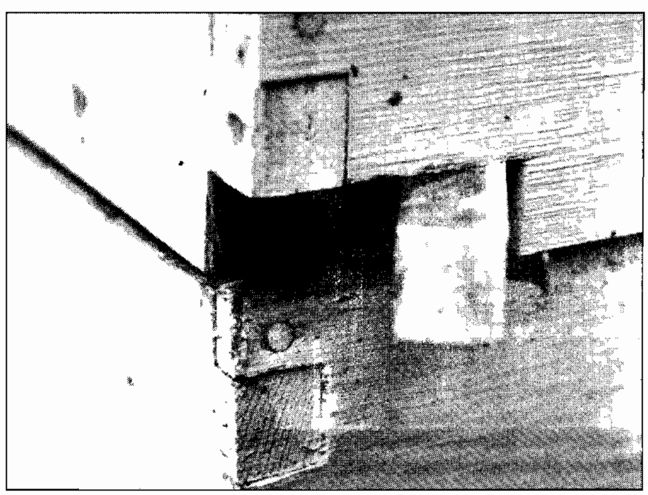

Fig. 9: A closeable upper hive body entrance.

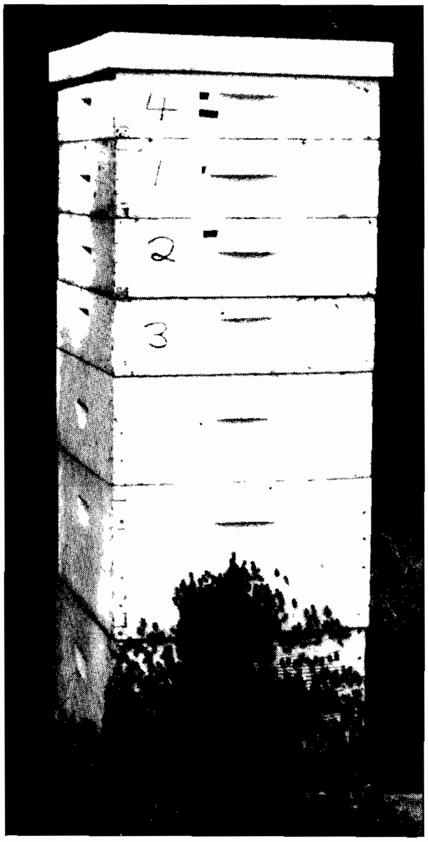

Fig.10: A strong double queen (CBN) hive well into the honeyflow (metal excluder).

limited duration of Stage 2 before reunion (5-6 weeks). Further, the ease of managing Q_N production in-hive here on the honey producing stand (III.a) would be less convenient, and the brood break period subjected to the possibility of prolonged extension by delayed matings or even the disaster of a failed mating or introduction here on the critical path of honey production.

C. SUPERSEDURE CELLS AND THE DEMAREE

Whether or not supersedure cells are started spontaneously and continued in a Demaree'd hive is a tenuous matter[9] somewhat dependent on the honeyflow, colony strength and distance of the isolated brood from the queen etc. There are never many cells and they are of good quality. Whereas the bees may not start a supersedure cell spontaneously within the period that brood is young enough (approximately one week), they will accept a grafted cell cup. Cells are accepted better on the second day after the Demaree in Stage 1. Regrafting may be required then.

A queenright brood break (such as in the Demaree here) is better than a queenless brood break (such as killing the queen outright) because only a few manageable "supersedure" cells of high quality are formed compared to large numbers of easily over-looked "emergency" cells.

Previous attempts by the author to establish the second queen (Q_N) via a ripe cell (protected) directly into a queenright Demaree'd hive such as #2 of II. to produce a two-queen hive (such as IV. fig.4, the consolidated brood nest) have always failed, simply because the virgin was not accepted. If this result could be shown to be a reliable expectation, the fate of unwanted spontaneous supersedure cells in this plan could be left to the bees - even when cells were grafted, since the grafted cells would be harvested on schedule.

Then it would be possible to extend the brood break period in Stage 1 to the upper limit of the preferred range (10-14 days), allowing a leeway of about 4 days with no concern for the safety of a new introduction of any kind into a gyneless brood chamber.

Another option, which the foregoing would make possible, is that of raising multiple cells grafted into one Demaree'd hive to be used in several others which had been Demaree'd up to 4 days before. The acceptance percentage in multiple grafting for this purpose is improved if the #2 deep of II. fig.3 is further distanced by placing the extract super under it next to the excluder.

D. COLONY HEALTH AND MITE CONTROL

The "prophylactic influence on colony health" due to a brood break, mentioned by Br. Adam (I.c), now embraces the varroa mite as well. Further to this, we can now also medicate the brood rearing side unit of the split (III.b) with impunity, quite apart from the honey-producing stand, for the full period of 5-6 weeks before reuniting - using Apistan strips, essential oil patties or the like.

E. CONTROLLED NATURAL MATING

We can also conduct controlled natural matings[11] in the side unit of the split (III.b) if desired without deviation from the plan.

This is conducted by confining the virgin in III.b during the daytime drone flight period as well as the drones in the selected drone-donor hives of the same apiary by queen excluder guards at the entrances of both, and then removing the guards each evening for mating after other drones normally cease flying. The virgin and sequestered drones are anxious to fly then.

By such a scheme anyone could conduct a private breeding project more effectively on a limited basis for selected characteristics.

CONCLUSION

The Juniper Hill Plan in its simplest form (i.e. buying instead of rearing a second queen in-hive) can be conducted in a remarkably efficient and labor friendly manner essentially free of the complications of swarming.

Queen or queen cell searches are either avoided or conducted coincident with or secondary to other manipulations, especially the Demaree.

Hive manipulations to carry out the multiple objectives of the Plan are conducted over a period of 7-8 weeks and condensed into three stages: Lifting, aside from supers, can be reduced to two hive body sets downs and two lifts up; all 20 brood frames are handled at least once for sorting and transfer, and bees shaken from half of them; while requeening and/or double queening is accomplished in the process with minimal effort and in a manner as nearly fail-safe as is possible. The overall time invested is significantly reduced.

Hopefully, this analysis of the "State of the Art" and its application here will contribute to a better understanding of and participation in comb honey production.

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