MAR 2006

Bee Culture

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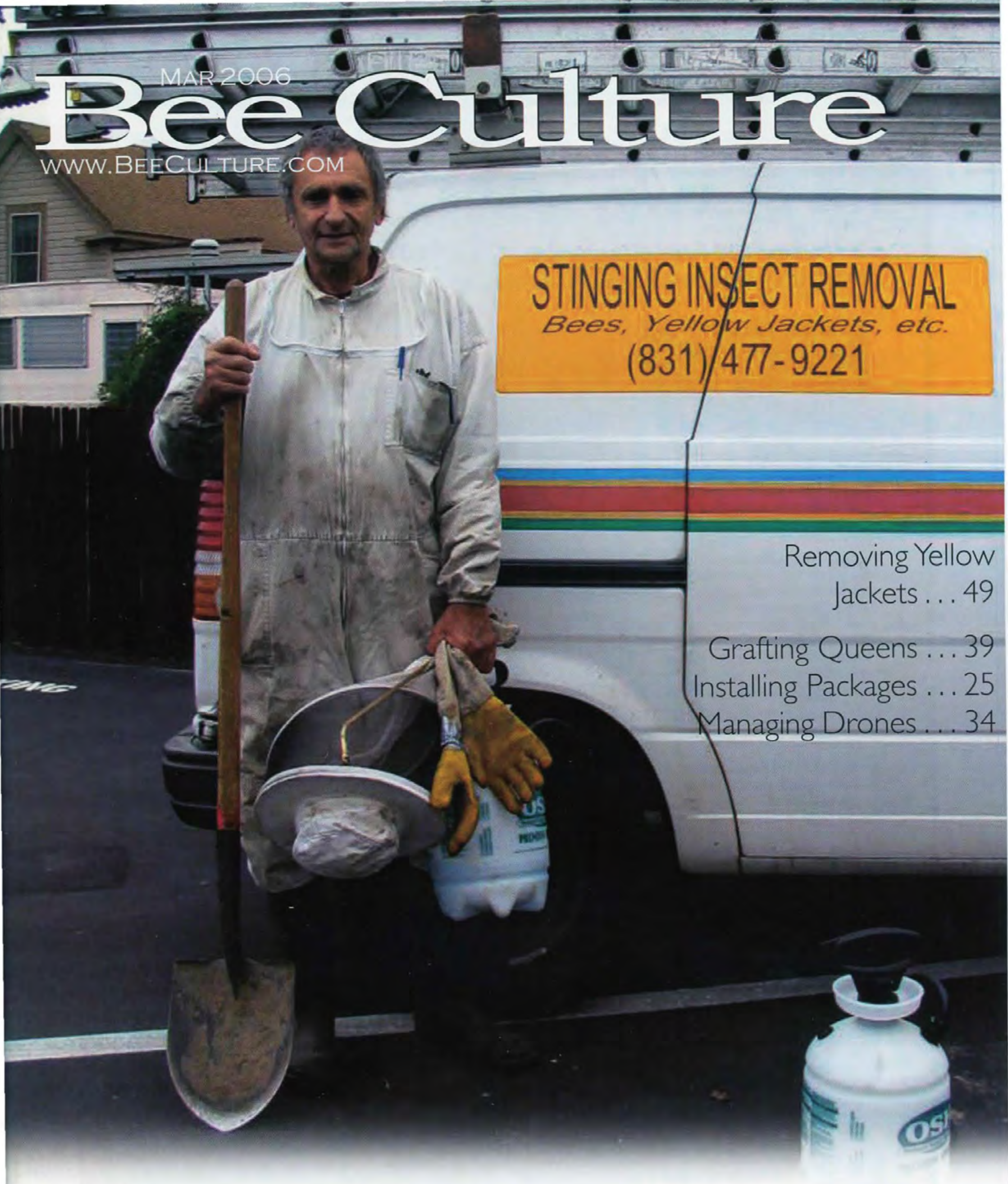

Charles Simon, with his van and some of his pest removal equipment. Find out all about Yellow Jacketology, something beekeepers are often called upon to do, on page 49.

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Subscription Information

U.S., one year, $23.50; two years, $44. Newsstand price: $4.99. All other countries, (U.S. Currency only), $15.00 per year additional for postage. Send remittance by money order, bank draft, express money order, or check or credit card. Bee Culture (ISSN 1071-3190), March 2006, Volume 134, Issue 3, is published monthly by The A.I. Root Co., 623 W. Liberty Street, Medina, OH 44256. Periodicals Postage Paid at Medina, OH and additional mailing offices.

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Advertising

For information on advertising contact Dawn Feagan at 800.289.7668, Ext. 3220

POSTMASTER: Send address changes to BEE CULTURE, The A.I. Root Co., 623 W. Liberty St., Medina, OH 44256

Opinions expressed in articles or columns in this magazine are not necessarily those of the Editor or Publisher.

Bee Culture - The Magazine of American Beekeeping *is*
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Bee Culture

THE MAGAZINE OF AMERICAN BEEKEEPING

MARCH 2006 VOLUME 134 NUMBER 3

FEATURES

DEPARTMENTS & COLUMNS

Comments
Suggestions
Criticisms
Kudos, and
anything else

Katrina Aftermath

I want to thank you and *Bee Culture* Magazine for forwarding my missed magazines to me! Because of Hurricane Katrina, our post office has not been able to deliver our magazines during the past few months. The postal system is now almost fully recovered.

What impressed me is that I did not have to contact your company to check on these missed months, but your excellent customer service took care of it. And I do look forward to reading and getting back to beekeeping. My family has three hives and they all survived the category three storm and we had just extracted our honey the weekend before the big storm hit! We were blessed in that the storm surge missed us by a few hundred yards and that our live oak trees buffered most of the wind from our home. Now I'm curious about the condition of our wild bees. Many of the trees are down and the fall food source was not plentiful.

Thanks again for your thoughtfulness.

Melanie Walrod
Pass Christian, MS

Prefers *Bee Culture*

Two years ago, I subscribed to the other bee journal for my son-in-law. He will be taking over my bees in the near future. I was 86 this year and my arthritic problems make it hard to tie my shoes, let alone take care of my bees!

At the same time I took my *Bee Culture* to the local bank and had copies made of articles which I knew would be of interest to a new beekeeper and gave them to him.

Now, it is time to renew that subscription, and when I asked him if he wanted it renewed, he said he'd rather have a subscription to *Bee Culture*. It is far more interesting and educational.

So for his next two birthdays, I have subscribed to *Bee Culture* for him.

Arnold A.
Indiana

More About Jars

In the January issue you discussed the jars which should be an improvement to those now in use. I have demonstrated this new jar at meetings. The NHB a few years back sent a circular showing three new jars, but they had foreign names (sounded Scandinavian to me). I was about to write the NHB as a follow up when your article arrived. The present honey jar/squeeze set up is poor packaging. I hope we can learn more about the new format. Feed-Bee on page 47 sounds good . . . but why get our hopes up and not give more info?

Bernie Bieder
Warwick, RI

Editor's Note: *For closures, see www.seaquistclosures.com, or www.o-i.com. Feed-Bee, we've learned comes in 50 lb. bags and is available in Canada. We're still chasing the company that just started making it.*

AHB No Joke!

There was an interesting *American Bee Journal* article describing what has happened to feral bee hunting in rural Mexico since the AHB arrived. Before the AHB arrived, traditional honey harvesting was a common diversion. Today, it's a bad and painful joke for those who have dealt with the AHB. Feral honey harvesting is no longer a leisure activity.

As a commercial beekeeper, I've worked all kinds of hot hives over three decades of beekeeping. But I've never worked any like the AHB's. They are very easily controlled with smoke most of the time. But not all of the time.

But the slightest hive disturbance, without smoke, can set them off like no other bees I've encountered. Gently removing a lid without smoke can cause an attack that is instant and vicious. They will kill any sparrow/robin sized bird that flies through the area. They will sting the black plastic molding around the windows and doors on a bee truck. They will force a normally suited/veiled/experienced beekeeper with his smoker into the safety of his truck in a few minutes. They will harass anything that moves within a 100 yards of the hive. And they will continue this activity unabated until sunset.

It is absolutely irresponsible to negate the effects this kind of bee can have to the general public's health and safety. A beekeeper can handle them in a remote location. But they spell big trouble for other people in other areas.

And it's almost inconceivable to think that the experiences of thousands of beekeepers, south of our borders, can be written off as a political/economic ploy or plot without any factual basis. Those beekeepers who have continued to keep AHBs have changed their ways or they are no longer keeping bees.

Every year, several people are killed by bees in the Southwest. And these people die from massive stinging and not allergic reactions.

Beekeepers who understand the problem can be the first line of defense for the general public. These beekeepers could be seen as protecting public safety.

Editor, 623 W. Liberty St.,
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But those who minimize, deny or negate the problem aren't doing beekeepers any favors. And I sure wouldn't want them keeping bees in a AHB area, around my neighborhood, my aged parents, my wife, my children, my cattle, pets or my friends. Anti beekeeping laws might be needed in such cases as those who don't see a problem sure couldn't help solve it. And they probably wouldn't have much concern for public safety.

And, if I as a beekeeper feel this way, imagine how the general public, who thinks they are mostly allergic and automatically associates bees with stings, would feel?

Dennis Murrell
Casper, WY

The Best Ever

Last issue was the best issue you ever put into print (January). Rearing your own queens to make splits or to replace your old queens is something all new beekeepers should know and can use. Give the writer a raise and fire everyone else.

Irving Wright
Disputanta, VA

Feeding w/PermaComb

It was with interest that I read Walt Wright's article, "Fall Feeding" in the November issue of Bee Culture. After almost three decades that PermaComb has been on the market, not only is this the first time that I have seen PermaComb mentioned in an article, there were pictures of it as well. Bravo!!

I have been using PermaComb for emergency feeding for many years (when necessary). Walt said that "dipping" the comb does not work. I beg to differ. Here is what I suggest:

First, fill up several five gal buckets with 1:1 sugar syrup. DON'T use 1/2 to 1 as the article suggests. I say this because given that:

- there may be many cells from which the bees don't immediately feed;
- the cells are open (not capped);
- the Winter air is (usually) pretty dry;

the water will evaporate out of the syrup in short order, leaving only sugar.

If one uses 1/2 to 1 syrup, there will be much less sugar for them to use (after evaporation) than if using 1:1 concentrate. I have often found that 2:1 syrup is too thick for them to readily utilize in any manner during cold Winter temperatures.

Add Honey-B-Healthy to the syrup. The Honey-B-Healthy adversely affects Varroa and accelerates consumption.

While the syrup is still hot from the mixing, dip the frame in the bucket. As we well know, hot syrup flows more easily than cold. Using a long- handled bristle-brush (available anywhere), "pat" down each side and each end of each comb that you want to fill with syrup. The "patting" action causes the bristles to release the trapped air in the individual cells and allows the syrup to enter. The process is very fast and I believe easier (and possibly less messy) than Walt's method. It is just as effective if not more so in getting as many of the cells filled with syrup as possible.

I do NOT recommend doing this with all wax comb. The process will ruin it.

Using PermaComb for emergency feeding is one of its many virtues. I invite everyone to peruse PermaComb's other advantages at **www.bee-l.com/bulletinboard/seets/permacomb.htm.**

John Seets
PermaComb Systems
Employed Engineer and Backyard Beekeeper

Mite Tolerant Bees

Is it possible for a very small beekeeper to produce mite tolerant honey bees? I believe all bees have some built in genetic tolerance to mites. If we are lucky enough to have both and breed our bees in our own locality long enough then we should over time develop a strain of bees that will exist totally without medicine.

In the early 1990s, I like many other beekeepers began to lose all my bees every Winter. Each Spring I would buy two or three packages. Then in Spring of 1997 one hive was still alive. Through Summer 1997 I split hive one and got a swarm which I requeened from hive one. Spring 1998 all three hives alive, this with no medication. Boy-oboy was I proud. Could it be I was just lucky or did I have something different. I decided that only time would tell.

In 2003 I figured what if I have bees living without medical treatment but don't make honey. Got some supers ready and eight hives made 638 pounds of honey and wax.

Spring 2004 I lost nine of 12. Checking my records all three survivors could be traced to the 1997 survivor hive.

I know that inbreeding may be a problem. In 2005 we had eight of 10 survive Winter. In Summer 2004 we had been able to increase the three to 10. My buddy in September extracted 786 pounds of honey and wax. So the Fall of 2005 we have 14 hives going into Winter with plenty of honey on every one of them. Most of them have young queens except the old girls who headed the hives that produced the most honey. We hope to raise a few daughters in 2006.

The hives all have screened bottom boards with a tray we can check for mite fall, but we don't do much checking on mite fall since most we get in 24 hours is 15 to 20. We regularly check drone brood. The most we got on 50 drones was 19.

So I repeat is it possible for a small beekeeper to breed a strain of bees tolerant or immune to the mites?

Right now as I write this it doesn't make a lot of difference to me. At 83 years young I know I have very limited time to have my bees. I've had them since 1947. I only hope others will try what seems to be working here and just maybe in future years our mite problem will be just a bad memory.

Willard Phipps
South Bend, IN

INNER COVER

We begin a new column this month, for those of you who garden (over 84% of you garden, according to our surveys), and those of you who like to eat good food (that's a full 100% of us...and I didn't need a survey for that!), and like to cook with honey. The column covers growing tips for garden plants that need or are improved by honey bee pollination and then we added a section on using the produce from those plants in recipes using honey. Sometimes, we'll have crops that don't really need bees (think tomatoes, or beets), but use them in honey recipes, or, vice versa, discuss growing crops that absolutely need bees (cukes, or peppers), but not necessarily use honey in the recipe. In either case bees and honey are central to what you wind up eating. If you like gardening and cooking, take a look at our newest culinary and horticultural addition – The Honey Garden – produced jointly by Connie Krochmal and Ann Harman. Enjoy!

•

If you read this column last month and weren't absolutely horrified at the part on Funny Honey, I strongly urge you to go back and read it again. A friend points out that the next step for us is that soon the grocery store honey shelf will look like the maple syrup shelf. Take a look, the next time you are at the store, at the shelf that handles those brown syrups that pretend to be maple syrup. Aunt Jemima™ here we come!

More findings from the Honey Board study are enlightening...and scary:

+ 20% of the respondents *like* the idea of a blended product, especially the "Sugar Free" blend.

+ 16% agree that a product with as much, or more, corn syrup is *better for you* than real honey.

+ Over 30% believe there is some *ingredient other than honey* in U.S. Grade A Clover Pure Honey.

+ 17% indicate that a form of syrup (e.g. corn syrup) is an ingredient of honey.

+ *29%, yes, 29%* indicate that *sugar* is an ingredient of honey.

+ 75% agree that 100% Pure Honey is made by bees, and has no additional ingredients, but *11%, really, 11%, actually disagree!*

We have, as an industry, long shouted from our hive tops that our claim to fame is that we are a "Pure, Natural" product. It is blatantly obvious that that message has not taken hold with everybody. Somewhere between 10 – 30% of the buying public will look at a shelf with honey, honey blends and artificial honey and choose...the one with the fanciest label, the prettiest color, or the lowest price. Pure and Natural, it seems, don't mean squat.

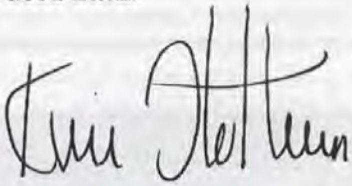
Thus, it appears that we need to step up that message of "Pure and Natural". We need to shout louder from our hive tops, scream more at public gatherings (fairs and the like), and make some level of government pay attention to what's going on. If we don't, 10 – 30% of honey sales are headed down Aunt Jemima™ Lane. If I was selling honey for a living, I might start getting worried. Very worried.

That is, unless, this Funny Honey business can be contained. What do you think?

•

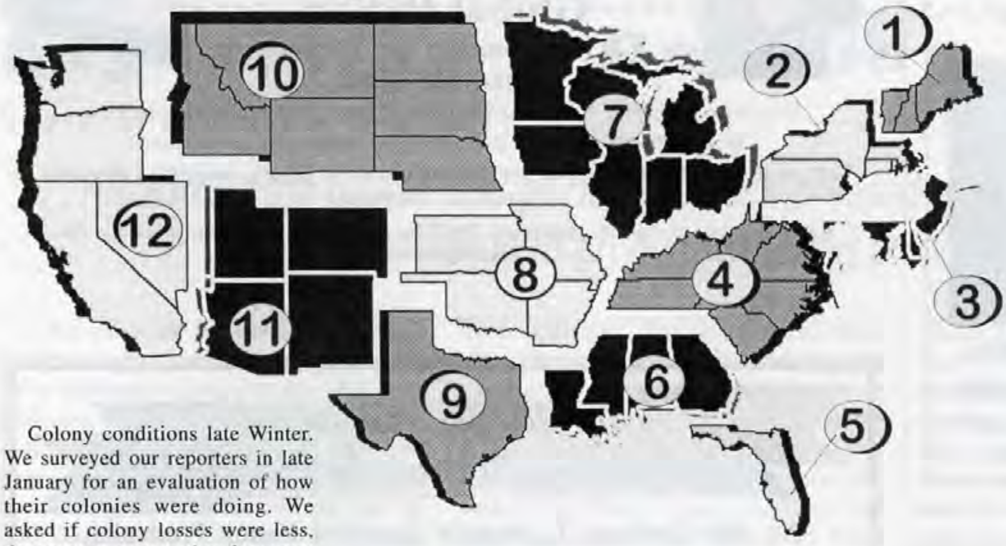
For most of us, this is the month things start to happen. Bee Schools galore get beginners out of the chute at full speed, rarin' to go. Queen and package producers are shifting into fifth gear to get as many ready as fast as they can (but don't skimp on those queens, OK?), and the rest of us are building on what's left from last year, thanking the survivors, and filling the empties.

This is, again, the year we said would be better, so do it better this year. Be on time, or better, ahead of schedule with swarm control, pest controls if you use them, and your honey production management plans. Once again we have new energy, new skills, new tools, and new knowledge. But don't forget the fundamentals...keep your smoker lit and your hive tool sharp. Good Luck!



What's New . . . And More Funny Honey

MARCH – REGIONAL HONEY PRICE REPORT



Colony conditions late Winter. We surveyed our reporters in late January for an evaluation of how their colonies were doing. We asked if colony losses were less, the same or greater than last year; what percent loss they actually experienced, how they were going to make up those losses, and, for comparison, what was the going prices of a five-frame nuc this year.

Overall, 24% of our reporters claimed Winter losses were higher than normal, 52% were about average and 24% were lower. The overall average Winter loss, across all regions, up till late January, was 20%. The range, however ran from a low of 7% to a high of 43%.

20% were not going to make up any, or only a small part of there loses. 45% were going to get back to where they were before Winter, and 29% are planning to expand past where they were last Fall. That is encouraging.

Replacing or expanding how? 64% make their own splits, 32% will buy packages, and 4% plan on buying out other operations.

And the prices of a five-frame nuc – $64, when averaged across regions. That ranges from $49 to $83.

Region 1
7% loss so far, average to less than normal. Five frames for $71.

Region 2
11% loss, which is average to less than average. Five frames for $75.

Region 3
10% loss to average to a bit high. $77 for five frames.

Region 4
16% loss is about average. $57 for a five-frame nuc.

Region 5
43% loss is way higher than average. $83 buys that nuc.

Region 6
19% loss is a little above average. $55 is all for a nuc.

Region 7
28% is a bit higher than average, and only $66 for a nuc.

Region 8
Only 8% loss so far, which is below average. $55 gets a nuc.

Region 9
Only 14% loss is right on average, and only $49 gets you a five frame.

Region 10
Barely 7% loss is way below average, but it's early. $60 gets a nuc.

Region 11
24% loss is average to a bit less, and $54 gets a nuc.

Region 12
A full 28% loss is what is about average, and $67 gets a nuc.

	Reporting Regions												Summary		History	
	1	2	3	4	5	6	7	8	9	10	11	12			Last	Last
Extracted honey sold bulk to Packers or Processors													**Range**	**Avg.**	**Month**	**Yr.**
Wholesale Bulk																
55 gal. Light	0.90	0.95	0.90	1.10	0.70	0.88	0.99	0.87	0.90	0.85	1.00	1.10	0.70-1.10	0.93	1.05	1.08
55 gal. Amber	1.03	0.95	1.03	1.15	0.70	0.70	0.79	1.03	1.03	1.03	1.02	1.03	0.70-1.15	0.96	0.90	0.89
60# Light (retail)	107.50	112.00	100.97	99.60	82.00	117.50	91.60	97.90	113.33	120.00	60.00	90.00	60.00-120.00	99.37	104.63	105.49
60# Amber (retail)	107.50	112.50	99.77	98.40	90.00	102.50	86.63	90.00	115.00	99.77	115.00	99.77	86.63-115.00	101.40	100.41	103.41
Wholesale - Case Lots																
1/2# 24's	41.28	45.89	44.08	38.70	44.08	32.50	40.35	44.08	44.08	47.88	40.15	50.25	32.50-50.25	42.78	41.29	37.90
1# 24's	59.71	66.85	66.65	57.00	61.68	56.00	60.58	66.00	59.75	69.84	90.50	72.40	56.00-90.50	65.58	63.03	59.06
2# 12's	61.08	58.29	56.89	52.53	58.20	48.00	55.96	51.60	45.20	52.92	50.00	59.75	45.20-61.08	54.20	56.06	52.81
12 oz. Plas. 24's	58.92	57.72	55.85	49.35	46.00	54.00	49.14	45.00	46.96	47.28	61.50	55.20	45.00-61.50	52.24	54.86	51.26
5# 6's	60.70	65.63	65.48	57.00	65.48	63.50	60.45	65.48	55.80	61.86	45.00	62.00	45.00-65.63	60.70	59.46	57.86
Quarts 12's	84.43	110.18	84.43	76.67	72.00	71.50	84.38	72.90	84.00	90.25	83.40	96.00	71.50-110.18	84.18	85.12	83.31
Pints 12's	49.48	54.98	49.48	53.00	34.00	42.75	49.54	40.14	54.00	50.10	39.50	54.00	34.00-54.98	47.58	52.45	49.04
Retail Honey Prices																
1/2#	2.50	2.52	2.30	2.68	1.89	2.99	2.56	2.30	1.99	2.44	1.79	3.10	1.79-3.10	2.42	2.35	2.45
12 oz. Plastic	3.13	3.00	3.25	3.09	2.99	3.37	2.91	2.98	3.22	3.10	3.35	3.36	2.91-3.37	3.15	3.22	3.23
1 lb. Glass	3.65	3.80	4.11	4.23	3.53	3.87	3.55	3.76	3.82	4.06	3.90	4.48	3.53-4.48	3.90	3.80	3.85
2 lb. Glass	7.25	6.33	6.10	5.93	6.54	6.99	6.10	5.77	6.20	6.08	6.30	6.22	5.77-7.25	6.32	6.53	6.24
Pint	5.00	6.92	5.98	5.70	4.97	5.83	5.47	4.86	5.50	7.75	5.62	6.10	4.86-7.75	5.81	5.75	5.72
Quart	9.00	10.37	11.17	8.15	7.92	8.83	8.63	9.50	9.00	14.75	7.58	10.75	7.58-14.75	9.64	9.35	8.85
5 lb. Glass	13.63	11.86	12.61	13.49	15.00	13.25	13.43	12.61	14.36	13.98	11.47	14.99	11.47-15.00	13.39	13.45	12.93
1# Cream	4.88	4.94	5.32	4.51	3.79	3.80	4.94	5.07	5.00	5.13	4.91	4.50	3.79-5.32	4.73	4.80	4.53
1# Comb	5.35	4.86	6.62	5.28	6.62	4.50	6.00	6.62	6.62	5.75	6.21	6.00	4.50-6.62	5.87	6.00	5.23
Ross Round	4.95	3.93	4.95	5.73	4.95	3.25	4.67	4.95	4.95	2.51	5.50	4.95	2.51-5.73	4.61	4.77	4.41
Wax (Light)	2.69	2.97	1.60	1.71	1.40	2.03	2.24	2.48	2.61	2.16	1.41	2.50	1.40-2.97	2.15	2.09	2.22
Wax (Dark)	2.06	2.74	1.40	1.75	1.20	1.93	2.51	2.44	3.75	4.44	1.70	2.20	1.20-4.44	2.34	1.79	1.97
Poll. Fee/Col.	50.00	66.33	38.00	35.00	40.00	45.00	46.14	60.00	82.50	69.52	22.00	42.00	22.00-82.50	49.71	55.67	46.27

RESEARCH REVIEWED

Explaining • Defining • Using

Steve Sheppard

". . . reinforces the notion that all bees are not created equal, when it comes to their value to an overwintering colony."

As we look forward to the end of Winter here in the northern U.S., it is interesting to ponder the fact that the majority of the honey bees that are in our apiaries at the moment were born last Fall. In contrast, the bees that will emerge in the Spring and Summer will have comparatively short lives of only four to five weeks. One of the noteworthy features of the long-lived "Winter" worker honey bees is that they have a high level of a glycolipo-protein known as vitellogenin. Such workers appear better able to withstand the nutritional rigors of Winter, where they may have access to honey but to very little protein for several months.

In their recent paper in the journal *Insectes Sociaux,* Amdam and colleagues suggest that the ability of honey bee colonies to produce a seasonal batch of workers with high vitellogenin concentrations and longer lives may be an adaptation to survival in temperate climates (Amdam et al, 1005). The authors point out that tropical African honey bees lack the same "bimodal longevity distribution..." expressed by honey bee subspecies originating from Europe. To investigate this idea, the authors took advantage of the fact that worker honey bees with typical "Winter" physiology can be produced (even in the summer) by rearing them in colonies where the brood has been removed. They set up duplicated experiments in Norway and South Africa and obtained variously aged workers from two colonies with brood and two colonies without brood at each location. In Norway the honey bees were hybrids between two European subspecies, *Apis mellifera carnica* and *A. m. mellifera*, and in South Africa the honey bees belonged to the subspecies *A. m. scutellata*. The experiments were run to collect aged workers during the Summer at each location; June-July in Norway and February-March in South Africa. A similar experiment was set up in Ribeirao Preto, Brazil and bees were collected from colonies of African(ized) honey bees maintained with and without brood. The honey bee samples from all locations were then analyzed for their vitellogenin levels.

The results showed that the "genotype" (European *vs.* African) of the bees had a significant effect on the vitellogenin levels regardless of the presence or absence of brood. Thus, starting about five days after adult emergence, European worker bees had significantly higher vitellogenin levels than did the African worker bees, in the absence or presence of brood. In the presence of brood, the vitellogenin levels peaked around day 12 and then declined in both African and European subspecies. However, in the absence of brood, European honey bee workers continued to increase vitellogenin levels until day 15 post-emergence, in accordance with previous studies of winter bees. In contrast, African worker bees that emerged in broodless colonies reached their maximum vitellogenin level at day 12 post-emergence, which was "about one fourth the level of the European bees." The analyses of honey bees reared in South Africa and Brazil yielded similar results. In the Discussion, the authors cautioned that the experimental design did not allow them to directly compare the different genotypes at the same location, something that may have been a confounding factor. However, based on other research reports and the similarity of results obtained from the African and Brazilian experiments, the authors concluded that "divergent vitellogenin dynamics" occur between tropical and temperate honey bee subspecies. The authors noted that vitellogenin levels in European honey bees are higher than are strictly necessary for the production of brood food. Thus, the physiological ability to achieve a higher level of vitellogenin could have been an important mechanism underlying the evolution of the "long-lived European Winter bee".

> "Bees that are emerging in the late Summer and the Fall need to be well-fed during larval growth."

While the study of Amdam and colleagues was directed toward a specific aspect of honey bee physiology that differs between honey bees of temperate and tropical origin, there are broader implications worthy of beekeeper musing. First, their work reinforces the notion that all bees are not created equal when it comes to their value to an overwintering colony. The development of a fine crop of vitellogenin-rich Winter bees in the Fall in each colony would seem to be a worthwhile priority for beekeepers, especially those overwintering bees in the northern states. What does that mean? Given that honey bees have to build a good store of vitellogenin within their blood to experience the desired boost in longevity, bees that are emerging in the late Summer and the Fall need to be well-fed during larval growth. Thus, in areas where there is a significant pollen dearth late in the season or in cases where pollen stores are otherwise low, supplemental feeding of protein to bees with pollen substitute or supplement would seem in order. Likewise, high mite levels at this time of year would be amplified by the eventual premature loss of these needed "Winter bees." Another point, perhaps most interesting to beekeepers in parts of the southern U.S., will be the eventual outcome of the process of Africanization relative to reported differences in the production of "Winter bees." Perhaps the production of low levels of vitellogenin could represent a physiological barrier to the northward spread of Africanized honey bees in the U.S. Alternatively, hybridization of AHB with existing U.S. honey bees of European origin may circumvent this barrier. Some insight into this question might be provided if an interested researcher were to examine the physiological range of vitellogenin production in U.S. honey bee populations, especially those from the northernmost areas currently occupied by AHB. BC

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Amdam, G.V., K. Norberg, S.W. Omholt, P. Kryger, A.P. Lourenco, M.M.G. Bitondi and Z.L.P. Simoes. 2005. *Higher vitellogenin concentrations in honey bee workers may be an adaptation to life in temperate climates.* Insectes Sociaux. 52: 316-319.

Malcolm T. Sanford

Queen Problems Again Or Maybe, It's Still

"Are the problems new? Are the problems worse than usual? Is there a verifiable special problem?"

Each Spring there seems to be concerns about queen quality. I remember it was a focus of the American Beekeeping Federation's meeting back in 1998 at Colorado Springs, CO. I reported on the results in my *Apis* newsletter in February of that year http://apis.ifas.ufl.edu/apis98/apfeb98.htm#4:

"There seemed to be a lot more problems with queens in apiaries in 1997, particularly on the east coast. Dr. Eric Mussen, extension beekeeping specialist in apiculture at the University of California, Davis, attempted to define the 'problem.' He asked three questions:

1. Are the problems new?
2. Are the problems worse than usual?
3. Is there a verifiable special problem?

"The answers to these, according to Dr. Mussen, appear to be no. There are historical records of high queen losses; a 50 percent turnover in California commercial bees is common. Dr. Mussen also quoted as high as 55 percent loss in two months, reported by Washington State bee inspector Jim Bach. After gathering some facts on the reported losses, Dr. Mussen said he found little evidence of new problems. Most of the complaints centered around traditional causes associated with requeening and retaining replacement queens, including handling during processing and shipping, and subsequent introducing into recipient colonies.

"In a brainstorming session, participants at the symposium were able to develop a long list of possible problems that could have resulted in the reported observations. Generally they related to climate, malnutrition, unhealthy environments, and diseases and pests. Specific ones concerning queen acceptance and retention were those that caused stress during production, including queen handling, lack of drones and banking.

"Although there may have been repetition of well-known caveats concerning queen production and subsequent introduction, there were "nuggets" of information that came forth during the sessions. Dr. Marla Spivak (University of Minnesota) quoted the late Dr. C.L. Farrar, "Poorly reared queens of productive stock will be inferior to well reared queens of less productive stock." She also said that nosema control was most important in mating nuclei. One reason is that sperm will migrate faster into the queen's spermatheca the less stress there is on a nucleus. This means that there should be no nosema, tracheal or *Varroa* mites, a tall order in these times. Finally, Dr. Spivak concluded that drone production must be emphasized more, especially now that *Varroa* mites prefer males and the lack of feral colonies appears to be narrowing the potential genetic base. She closed with an exhortation to producers to always rear more drones that you think necessary.

"A comment from Dr. Roger Hoopingarner, now retired from Michigan State University, got some attention. Many of the symptoms of the problems being described, he said, were reminiscent of those found by investigators looking at the effects of sublethal doses of fluvalinate on colonies. Dr. Jeff Pettis at the USDA Beltsville Bee Laboratory said that a problem with current-day queen production is that producers are constantly asked to get the product out earlier. This can result in shortcuts and stress. Acceleration of expectations may also bleed over into the bee yard, according to Danny Weaver of Navasota, TX, who asked users not to 'over manage' colonies by pushing them too hard. This was supplemented by Pat Heitkam of Orland, CA, who said more observations, more management and more movement could equal more perceived problems.

"Another thread of conversation had to do with innovations in queen production. There is little information about what effects there might be from using plastic cups and cages (different sizes) or battery boxes. In particular, queen cages were described as smaller and, therefore, not able to hold the quantity of candy more traditional ones could. Finally, there was the great unknown called the U.S. Postal Service (USPS), which also is continually changing its guidelines and procedures, sometimes without informing either producer or customer. A presentation by USPS officials at the convention indicated that as much as a 200 percent increase in charges might be applied to shipments in the coming season.

"Most participants agreed that there is a lack of basic information on a great many of the issues associated with modern queen rearing, shipping and introduction technique. Thus, as Dr. Mussen concluded, although the problems do not appear to be new, certainly many of the methods employed by queen producer and user alike are. Meanwhile scientific research in many of these areas languishes as funds are directed to more pressing issues such as mite control."

Now comes word from England that at least one beekeeper, Roger Patterson, is so concerned, especially about the poor quality of queens in terms of mating and laying eggs, that he writes about it extensively in the UK's prestigious journal, *The Beekeepers Quarterly* (No. 82, Autumn 2005). This was also summarized in the October-December issue of *The Speedy Bee*, the southeastern U.S. newspaper. Finally, his writings can be found on a web site www.bbka.org.uk/news/news/bbka/research-into-poor-queens.shtml.

I was particularly struck by his introduction. It emphasizes a historical slant that cannot be ignored when discussing contemporary problems. I find this all the time when talking to beekeepers who have taken up beekeeping after the introduction of mites who relate their experiences to those who were managing colonies before these phenomena raised their heads. The experiences often confirm the oft-used remark in statistics that it's difficult to compare apples and oranges.

Mr. Patterson begins: "I started keeping bees in 1963 and at one time had 130 colonies, and have always raised my own queens on a regular basis. For a number of reasons I had a spell where I had no bees myself for about 15 years until restarting in 2002, but retained interest in my local Association, and continued to attend meetings. At one stage I could expect a success rate of getting queens mated from a sealed cell well in excess of 90%, but since returning to active beekeeping that success rate has dropped alarmingly, in my own experience to 50% or less.

"I believe the problem is very serious and poses a threat to beekeeping in this country, but of course it must first be recognized, which is not easy when so many dismiss it as being caused by the weather, or birds taking the queens on the wing, which are the traditional reasons for queens not getting mated or quickly failing. Firstly the weather has got far more bee friendly over my time in beekeeping, and results should be better, not worse, and secondly, I don't believe that birds are taking 4-5 times as many queens as they used to. If that was the case they would be taking workers as well and colonies would be much weaker.

"My initial warnings did not set off the alarm bells in the places I would have expected them to. There seemed little evidence that others had noticed the same problems I had, and when I spoke to beekeepers there was initially denial, then when I explained the symptoms I had a different response. In my locality many people are noticing problems in getting queens mated and laying properly, but only after I have alerted them. I have had correspondence from all over the country from beekeepers who have had problems. I have also had contact with beekeepers who keep records who haven't experienced problems. These are just as important." A summary of the problems identified includes:

1. Queens emerge with deformed or stubby wings.
2. Queens cells have dead and decomposing larvae.
3. Queens emerge but never lay.
4. Queens mate and produce many drones and they are retained much later in the season.
5. Queens produce patchy brood.
6. Queens lay eggs off center and often times two eggs to a cell.
7. Queens are routinely superseded, even in small colonies.
8. Queens disappear
9. Queens quickly become drone layers.
10. Queens cease laying.
11. Queens develop upside down in cells.

Mr. Patterson then asks whether the reader as a beekeeper has seen these kind of problems. If so, he suggests the following:

A. I see no problems in using queen cells that are built in a colony where the queen is laying a high proportion of drones in worker cells, but you must make sure that there are no drones in the cells. This goes against the normal theories, but if there is a problem with the semen from one of the drones the queen mated with, it doesn't mean this is the case with all of them.

B. Put queen cells in cages so that they can be seen when they emerge, and the ones with deformed wings can be discarded.

C. When raising queens aim for at least double the number you need.

D. Try to keep basic records as you may have vital information that will help in any research. It could also help you sort out a problem.

E. Alert others to the problems and ask your local Association to make members aware of them. Make sure your officials follow the suggestions set out under "Advice and suggestions for local Associations" below.

F. Check the BBKA website regularly, and make sure you have the latest version of these notes.

G. Take photos of any of the above problems and send them to me preferably by e-mail **r.patterson@pattersonpressings.co.uk**. If you are unable to do it yourself then please ask someone who can. Ideally I would like photographs of deformed queens, brood, and queen cells complete with the contents. Please also include the area of the country.

H. If possible avoid buying colonies before the Winter, otherwise they may be queenless or have a failed queen in the Spring.

I. I see artificial insemination playing a significant role. This could help produce a limited number of good laying queens. It could be useful in the research stages to help eliminate the possibility of such things as inbreeding.

He says that some non-*Varroa* related possibilities have made management techniques more difficult, but if he is correct that *Varroa* might be one of the causes, three things need addressing.

· Reducing chemical residues
· Reducing *Varroa* levels
· Reducing the population of parasitized drones.

Finally, he concludes: "I think that short term we ought to be developing ways of reducing the possible causes, rather than wait for those causes to disappear."

This takes us full circle. As mentioned earlier, research on queen evaluation is almost nonexistent as scarce funding is going to more pressing problems (mite and now beetle control). In addition, the use of new technologies in producing, shipping and storing queens has introduced a host of other variables into an already complex system.

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My profound apologies to Jim Fischer. I extensively quoted him in my last article on the state of bee science. He wrote saying that either I or the editor should have given him time to look at my scribbling before it became hard copy. He forgave me my trespasses when I sent him the following: "You are right! I should have given you a 'heads up.' I apologize for not doing so and the article is poorer for this mental lapse. I pledge to you this will not happen again." He brings up a good point. However, because of deadlines and other factors, I am not always able to contact folks I quote. I trust others will not be reticent to take me to task as he did, if they find good reason. I, like most authors, prefer to view my efforts as more dialogue than monologue. **BC**

Dr. Sanford is a former Extension Specialist in apiculture at the University of Florida.

MEASURING BROOD DIGITALLY

An easy way to measure and record brood production in your colony.

Jennie A. Knopp[1], Abdolreza M. Saffari[2], Peter G. Kevan[2], Jeff Boone

INTRODUCTION

In apicultural research and honey bee management, it can be important to measure the reproductive output of the colony (i.e. worker production). Fast Spring build-up is desirable for honey production and pollination, and stress on colonies is often manifest by reductions in brood production. The usual way of measuring comb use has been by a threaded grid reference frame (1 in x 1 in squares delineated by thread) and counting the squares with capped brood, with uncapped brood, drone cells, honey and pollen. Brood production can be measured most efficiently and quickly through estimates of areas of capped brood in the hive. Even so, the grid and counting method is time consuming and results only in estimations.

Digital photography and computer-aided analyses of the images captured eases the task of calculating brood area (capped-brood) for management and research. This method can be equally well applied to measuring areas of capped honey, pollen and drone brood by simple adaptation of the methods described below.

METHODS

Digital Camera

Any digital camera may be used and the important issue to keep in mind is consistency. The consistency of lighting in the photographs increases the consistency of the analysis. The same lighting in each photograph can be achieved by always using the camera's flash, regardless of lighting conditions. It is a good idea to take photos from a consistent distance, to ensure that the brightness of the flash is the same for every image. We designed and built a camera and frame stand that lends itself well to the task of capturing hive frame images (Figure 1). Images can be stored in any format (.TIFF, .JPEG, etc.), however it is suggested that the same format be used throughout the analysis so all the images can be measured consistently.

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Building the Camera Stand and Frame Mounting Apparatus

The objective of making the stand is to allow the frame to be photographed and measured to remain in line with the camera, held steady, and at a constant distance from the camera while the camera is securely mounted and oriented square with the frame. The actual dimensions of the components may be varied depending on the camera to be used. Portability and convenience should also be considered. The stand should secure the camera in a position that allows the hive frame to fill the whole area of the photo. We provide more details on building the stand at www.uoguelph.ca/~inesp.

Procedures for Image Capture and Analysis

Step 1: Mount the camera firmly onto the stand so that it is oriented towards the frame holder. Place the frame to be measured into the frame holder and assure that the holder is at right angles (normal) to the camera and its lens. Allow for a border (5 cm or 2 in) around the frame within the photo to ensure the comb is fully within the picture. A removeable black backdrop (sheet of plastic) that fits into a slot behind frame allows any holes in the comb to appear uniform in colour for ease of analysis in later steps (see below *Steps 2 and 3*).

Focus the camera and take the picture. Rotate the frame holder so that the other side of the frame can be photographed, move the black backdrop to the back of the frame and take the picture. Remove that frame, replace it in the hive, and continue to the next frame. Figure 2 presents an uncropped picture as would be stored in the memory of the camera to be returned to the computer for manipulation and analysis.

Step 2: Copy the images from the digital camera onto the computer's hard drive and open the images in Adobe Photoshop®. Any version of Adobe Photoshop® will work. We have used Adobe Photoshop 6.0®.

Crop the image so that only the comb or area of interest (inside the wooden end, top, and bottom bars, without any wood showing) is left in the image. Cropping can be done even if the image is slightly askew in the picture. The location of the *cropping tool* and the cropped image are shown Figure 3. With the *cropping tool,* click in the top left corner of the image, hold down the left mouse button and drag to the bottom right of the image. Release the mouse button and press enter. The resulting cropped image can be enlarged with the top-right-corner icon (little square with a black bar across the bottom).

Step 3: The image must be edited to remove superfluous components (*i.e.* non-brood; holes, honey, pollen, and bees) and the colors in the image must be standardized to make all of the capped cells appear solid white and all of the uncapped cells solid black. The aim of the following manipulation is to provide two numbers: the number of pixels (the tiny dots that make up the image) that represent capped brood (A), and the number of pixels that are enclosed by the entire image (B). With this information the amount of capped brood as a percentage (C) of the entire frame ($C = A/B \times 100\%$), or as the area, D (cm^2, in^2) ($D = C \times$ area of frame within the top, end, and bottom bars).

To eliminate any unwanted parts of the image (bees, honeycomb, pollen cells, etc.) go to the tool bar and into the *Paint Bucket Tool* (this tool looks like a paint bucket in the tool bar). With the cursor, click within the areas that need removing. This process may require numerous clicks to select all unwanted areas and will result in converting the unwanted areas into black pixels. There are a number of simple steps that must be taken to leave only capped brood for consideration versus the total area of the comb on the frame.

To standardize the colors in the image, the next step is to make the image black and white. Go to *Image > Adjust > Threshold* function in the top menu of Photoshop® (shown in Figure 4). The *Threshold* function leaves the image with only black and white pixels, and no grey tones. The holes in the frame will remain black due to the use of the black backdrop while taking the photo. The proper *Threshold* setting must be determined by the user and should be adjusted to show the highest amount of white comb outlines surrounding the black uncapped cells, without compromising the size of any black cells themselves. We find that threshold settings between 50 and 80 serve well, but user practice is required to get the best results for each set of personal equipment. For example, too much emphasis on contrast can result in counts that include the areas of rims of vacant cells. An example of the desired image is shown with the *Image* menu item indicated by the arrow. Once the threshold setting has been determined, it should remain consistent in future analyses and should not need to be reset.

Step 4: Select the *magic wand tool* (shown by the bottom black arrow in Figure 5) and click inside one of the black cells that are fully enclosed with white comb. This results in a *marching ants selection line* around a single black uncapped cell. The *marching ants* indicate that all pixel information within the confined area has been selected. With the *marching ants selection* still selected, type the number *"135"* into the *Tolerance window* at the top of the Photoshop® screen (just below the *Select menu item*). This value of "135" is independent of previous threshold adjustment value and works well for this application. Once this setting has been entered, it does not have to be adjusted again. Next, go to the *Select > Similar* function in the top menu (shown by the top black arrow in Figure 5). The result of using this function is that all the black pixels, representing all uncapped cells, are now selected within the marching ants.

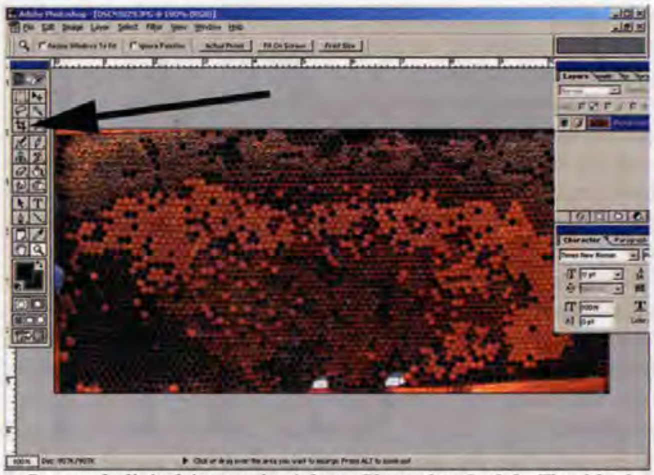
Step 5: Now that all of the pixels which represent the capped cells are isolated, the number of pixels selected can be calculated. Figure 6 presents the elements needed to complete the area measurements. Go to *Image > Histogram* in the top menu. This activates a pop-up window, with the word *Luminosity* in the pull-down menu at the top of the window and a variety of numbers across the bottom. The number we are interested in is the bottom left number beside the word *Pixels*. In this particular example, the number was *197299 pixels*. This number represents the number of pixels selected inside of the *marching ants*, and therefore the number of pixels that the uncapped brood area covers. Record this number.

Close this *Histogram* window. Press *Control + D* to deselect the marching ants and go again to *Image > Histogram*. This time, the number of *Pixels* displayed represents all the pixels in the image (equivalent to the total area of the frame). In this example, the number was *254935 pixels*. Record this number.

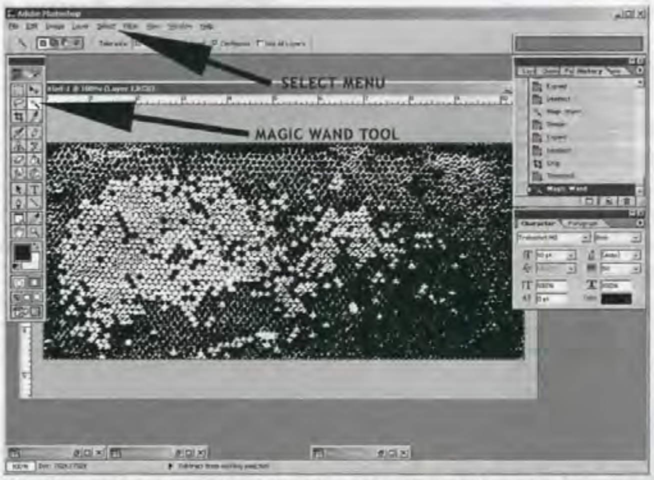
Step 6: Depending on the number of frames to be analyzed, one can either use a calculator or set up a Microsoft Excel® file to do the calculations. Take the number of black pixels calculated (from within the

Stand for holding the digital camera and hive frame, placed on top of a super.

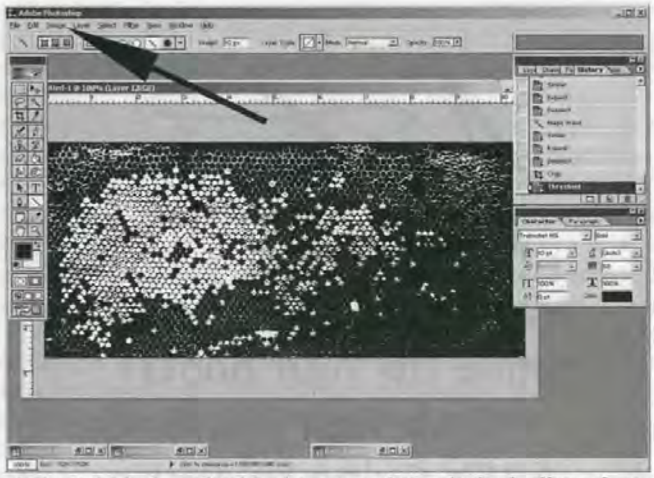
Frame image captured by the digital camera. This image demonstrates excellent lighting conditions, and good squaring of the hive frame within the digital image.



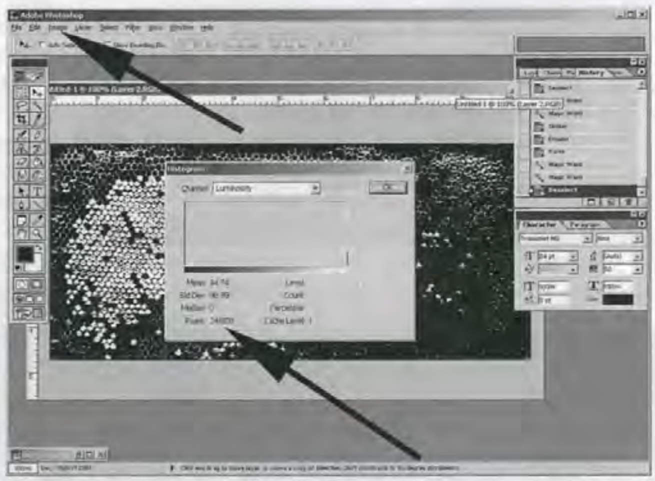
Cropped digital image in Adope Photoshop® 6.0. The black arrow shows the cropping tool on the main tool bar, as viewed on the computer screen.



Black areas contained within the marching ants selection area. *(The marching ants do not show up in this image as they are too small.) The black arrows indicate the location of the* Image menu *(top arrow) and the* magic wand tool *(bottom arrow).*



Adjusted black and white image and the desired effect of standardizing the cell colors by using the Threshold *command and values. The outline of the cells and capped brood should appear white, while the empty or uncapped brood and unanalyzed areas of the hive frame should appear black.*



Computer screen with the black and white image in the background and the Histogram window *open. In the* Histogram window, *the pixel count to be recorded is shown (bottom black arrow). The top black arrow shows the location of the drop down menu.*

marching ants selection) and divide that number by the total number of pixels in the photo. For this example *197299 pixels / 254935 pixels* gives a value of 77.4% uncapped cells in this frame, which in turn gives us a value of 22.6% capped cells in this frame.

DISCUSSION

The stand is quite simple in design, but the dimensions need to be tailored to the kind of camera to be used. The stand is easily portable to the bee yard, accepts the frames easily, allows the frame to be rotated for both sides to be photographed, holds the camera steady, and is generally sturdy for field use and transport.

This method of using digital photos and computer analysis of the photos to determine brood area does not take long to learn, and once practiced several times can result in the analysis of the area of a frame cover of capped brood cells versus uncapped cells in a matter of minutes per frame. The main inconvenience is the present necessity of transposing by hand the sets of two numbers of pixels to a spread sheet for analyses of large experiments. We have test driven the method using over 600 frames from experiments on honey bee nutrition and have found the method to be effective and efficient.

Comparisons have not yet been completed between the results obtained by estimations of capped brood areas using threaded grids and measurements by digital photography. Taking pictures using the stand requires less manipulation and time that the frames are out of the hives. In turn, this results in much less disruption to the hive. Moreover, if the colony being studied is rather defensive, the semi-automated recording for the frames by digital photography allows for less distraction and fewer mistakes in the apiary. Although some of the image processing with the computer requires some user judgment (subjectivity), these are minimal and consistency of analysis on the part of the user heightens as experience is acquired. This method is accurate and precise, and is more efficient and less invasive to the hive estimates from threaded grids. BC

ACKNOWLEDGEMENTS

We thank the Ontario Beekeepers' Association for partial support from a grant from the National Research Council of Canada (IRAP) for the development of the technology we describe.

Enviroquest Ltd., Cambridge, Ontario developed the stand and provided it to the project for testing and use. Computer facilities used are part of the amenities available in the Anthecology laboratory at the University of Guelph.

TAX TIPS

Sylvia A. **Ezenwa, J.D.**

Hobby, or Business?

Yes, it's that time again: time to file an individual federal income tax return with the Internal Revenue Service (I.R.S.) for tax year 2005. And as the April 15th filing deadline fast approaches, many a backyard beekeeper will be asking the following questions: *(1) Is my beekeeping income taxable? (2) Are my beekeeping expenses and losses deductible?* The answers depend, in large part, on whether you determine your beekeeping operation to be a sideline business or a hobby. This article shows you how to make that determination, and explains the tax consequences for both hobby and sideline beekeepers.

Is it a business or hobby?

Unlike a commercial beekeeper, who runs a beekeeping operation as a full-time, *for-profit* business, a backyard beekeeper might keep bees part-time, extracting honey and beeswax in a basement or garage to use at home or sell at a local farmers' market or roadside stand – all while carrying on another trade, business, or occupation as a main source of income. But does such a part-time beekeeping operation constitute a sideline business or a hobby? And what is the distinction between the two?

Well, a sideliner, like a commercial beekeeper, keeps bees as a business, for profit, albeit to supplement another source of income. Meanwhile, a hobbyist keeps bees, not as a business, and *not-for-profit*, but only for recreation and to satisfy a personal interest. The tax consequences for a sideliner versus a hobbyist differ considerably, so you need to determine which category your beekeeping operation falls into. Start by asking yourself the following questions:

(1) Do you carry on your beekeeping operation in a businesslike manner?
(2) Does the time and effort you put into your operation indicate that you intend to make it profitable?
(3) Do you depend on your beekeeping income (e.g., from the sale of honey, beeswax, and other bee by-products, and pollination rental fees) for your livelihood?
(4) Are your beekeeping losses due to circumstances beyond your control (or are they normal in the start-up phase of a beekeeping business)?
(5) Have you changed your method of operation in an attempt to improve profitability?
(6) Do you have the knowledge needed to carry on your operation as a successful business?
(7) Have you been successful in making a profit in beekeeping in the past?
(8) Has your beekeeping operation made a profit in some years?
(9) Can you expect to make a future profit from the appreciation in value of the assets (e.g., land, buildings, equipment, vehicles) used in your operation?

Of course, no one question is determinative, but the more that you answer in the affirmative, the more likely it is that your beekeeping operation is a *for-profit* business rather than a *not-for-profit* hobby. For more information on Not-for-Profit Activities, see I.R.S. Publication 535 (2004), *Business Expenses*, available at http://www.irs.gov/.

Tax consequences for a hobbyist

As a hobbyist, you must report all income generated from your beekeeping operation ("hobby income") on your individual income tax return, generally, on Line 21 (Other Income) of Form 1040. [Remember, since your operation is not a business, your beekeeping income should not be reported on Form 1040, Schedule C, *Profit or Loss from Business*; or Form 1040, Schedule C-EZ, *Net Profit from Business*.]

Unfortunately, the expenses you incur in carrying on your beekeeping operation ("hobby expenses") can only be deducted up to the amount of your hobby income and the total deduction cannot be more than 2% of your adjusted gross income. Meanwhile, the losses you incur in carrying on your beekeeping operation ("hobby losses") cannot be deducted, which means that they cannot be used to offset income earned from another (non-beekeeping) source.

For instance, suppose a high school teacher, who earns a yearly salary of $40,000, begins keeping bees as a hobby in 2005. Over the course of the year, he spends $800 on beekeeping tools and supplies, and sells $500 worth of honey at a local farmers' market. On his 2005 individual federal income tax return, he should report the entire $500 as hobby income on Line 21 of Form 1040. However, of the $800 of hobby expenses, he can only deduct up to $500 (which is equal to the amount of hobby income), provided that the total deduction is less than 2% of his adjusted gross income. His $300 of hobby losses (i.e., $800 minus $500) cannot be deducted and cannot be used to offset his non-beekeeping earnings of $40,000. Hobby expenses are miscellaneous itemized deductions subject to a 2% of adjusted gross income limit, and can only be taken if you itemize deductions on Form 1040, Schedule A, *Itemized Deductions*.

For more information on hobby income, expenses, and losses, see I.R.S. Publication 525 (2005), *Taxable and Nontaxable Income*; Publication 529 (2005), *Miscellaneous Deductions*; and Publication 535 (2004), *Business Expenses*, available at http://www.irs.gov/.

Tax consequences for a sideliner

As a sideliner, it is crucial that you keep track of all of your business expenses, because business expenses (i.e., the costs of carrying on your beekeeping business) can be deducted if: (1) your business is operated to make a profit; and (2) the expenses are ordinary and necessary. An ordinary expense would be one that is common and accepted in the beekeeping industry. A necessary expense does not have to be indispensable to your beekeeping operation, but only helpful and appropriate. To better understand what, how much, and when you can deduct business expenses, see I.R.S. Publication 535 (2004), *Business Expenses*, available at http://www.irs.gov/.

Normal business expenses incurred in a beekeeping operation might include:

(1) Cost of land, buildings, beekeeping equipment, flatbed trucks, forklifts, and other business assets, including the cost of rentals, repairs, and improvements
(2) Cost of package bees and queens
(3) Cost of business use of utilities, including electricity, gas, and water
(4) Cost of business use of telephone and Internet service
(5) Cost of business use of an automobile or home
(6) Cost of business insurance premiums
(7) Cost of small beekeeping tools and supplies
(8) Cost of travel to beekeeping conventions and seminars
(9) Cost of beekeeping books, periodicals, and instructional videos and CD-Roms

Not all business expenses can be deducted, some must be capitalized (i.e., "capital expenses"). Capital expenses are considered part of your investment in your beekeeping operation, and consist of: (1) business start-up costs; (2) business assets; and (3) improvements. You generally cannot deduct the entire amount of a capital expense in a single year, but you may be able to recover the amount you spent over a number of years using depreciation, amortization, or depletion. For business start-up costs, you can deduct up to $5,000 incurred after October 22, 2004, and the remaining amount can be amortized over 180 months. For business assets and improvements, which have a useful life substantially beyond tax year 2005, you may be able to recover their costs through annual depreciation deductions over a number of years. For more information, see Chapters 9 (*Amortization*) and 10 (*Depletion*) of I.R.S. Publication 535 (2004), *Business Expenses*; and Publication 946 (2004), *How to Depreciate Property*, available at http://www.irs.gov/.

Similarly, you generally cannot deduct personal, living, or family expenses. However, if you incur expenses for things like your automobile, home, utilities, or telephone and Internet service, which are used partly for business and partly for personal purposes, you can deduct the percentage of the cost that is used for business. For more information on how to divide personal from business expenses, see I.R.S. Publication 535 (2004), *Business Expenses*; Publication 463 (2005), *Travel, Entertainment, Gift, and Car Expenses*; and Publication 587 (2005), *Business Use of Your Home*, available at http://www.irs.gov/.

Finally, let us assume you are not an employee of another beekeeper, but a sole proprietor and sideliner with no employees of your own. You should report any net earnings (i.e., income minus expenses) of $400 or more from beekeeping on Form 1040, Schedule C, *Profit or Loss from Business*; or Form 1040, Schedule C-EZ, *Net Profit from Business*. Since no federal taxes have been withheld from those earnings, you must also pay self-employment tax using Form 1040, Schedule SE, *Self-Employment Tax*. This is how you will pay into the Social Security and Medicare trust funds. And, if you did not do so in 2005, you should begin making quarterly estimated tax payments in 2006 using Form 1040-ES, *Estimated Tax for Individuals*. Making estimated tax payments this year will lessen your tax bill on April 15th of next year, and may help you avoid a penalty for underpayment of estimated tax. For more information, see I.R.S. Publication 533 (2004), *Self-employment Tax*; and Publication 334 (2005), *Tax Guide for Small Business*, available at http://www.irs.gov/. See also http://www.irs.gov/faqs/faq12.html for answers to frequently asked small business and self-employment tax questions.

Conclusion

The determination of whether your beekeeping operation is a sideline business or a hobby will affect the way you prepare your 2005 individual federal income tax return, and there are a lot of resources available to help you make that determination. You can visit the I.R.S. Web site at http://www.irs.gov/ for applicable forms, instructions, and publications; or speak with an I.R.S. representative by phone or at your local I.R.S. Taxpayer Assistance Center (phone numbers and center locations are available on the Web site). You can also consult with a tax attorney or certified public accountant in your area for more specific advice. *But whatever you do, do not neglect to file.* And please do not let your fear or apprehension of the filing process deter you from your pursuit of beekeeping – whether for profit or recreation. BC

BIOGRAPHY: Sylvia A. Ezenwa is a lawyer, author, and freelance writer based in Superior, Colorado. She is licensed to practice law in the State of Texas.

DISCLAIMER: The information in this article is not intended to constitute legal advice. Please consult an attorney regarding your specific situation.

GULLETTE PACKAGE

If it's warm where you are this works great!

Steve **Genta**

A little over 15 years ago, I took a beekeeping course from a man named James Gullette who owns a little hardware store, and had a true love of bees and beekeeping. During his life, he had been a honey producer and a pollinator. He distributed bees and bee supplies from his store and advice on beekeeping from the cases of nails that we used for chairs. His vast experience gave him the expertise needed to help everyone, from the beginner to the long time beekeeper. He taught a beekeeping course every year for at least 15 years. During this time he was experimenting with an easier way to install a package of bees. Many new beekeepers would "lose their nerve" when pouring bees out of the package. Bees would be flying and sometimes there would be stings to contend with. Dead bees are poured into the new hive making more work for the newly established colony. So after trying a few different methods, James hit upon this procedure I am about to describe. I have added a few minor changes to his method, but it is basically the same. I want to dedicate this article to his memory and hope that many more beekeepers can be helped by his wisdom.

SO HERE WE GO...

The materials you will need are:

1) 1 complete hive with frames; at least one frame must be foundation.
2) 1 hive tool
3) 1 package of bees
4) Mist bottle of 1:1 sugar syrup
5) 1 small nail
6) 1 large rubber band
7) 1 entrance feeder (remember, it has to be warm to do this – night temps should **not go below 65°F**

LET'S GET STARTED...

Your package of honey bees arrives. Place the package in a cool dark place, such as a basement. Leave them until late in the afternoon.

If you have not already done so, orient your hive, typically facing South or Southeast. Remove the top cover and the inner cover. Remove half of the frames (five of the 10) and set them aside. Place the large rubber band around the center of the frame of foundation. Place your filled entrance feeder on the hive and reduce the remaining opening down to about ¾ of an inch. Stuff a small amount of grass in the ¾ inch opening.

Late in the afternoon, around dusk, go and get the package from the cool, dark place they have been in. Using your hive tool, gently pry off the cover from the package. You should now be able to see the feeder can and the top of the queen cage.

You should read this next step completely before performing it.

You will now be removing the queen cage from the package. Spray the bees with sugar water, bounce the package on the ground to knock the workers to the bottom of the package and away from the queen cage. Grasp the queen cage with your right hand. Take the cover that you removed from the package in your left hand, and as you remove the queen cage slide the cover over the hole from the queen cage. This will prevent bees from escaping.

Remove the metal tab from the queen cage and inspect your new queen, making sure that she is alive and well. Remove the cork from the candy end of the queen cage. Carefully push the small nail into the candy to help loosen it up a little. Be careful that you do not push the nail in too far and impale your queen.

Take the queen cage and place it on the frame that you previously put the rubber band around. Orient the cage at an angle on the bottom of the frame, with the candy end up. Place the frame in the center of the five frames currently in the hive.

Now, with the cover still in place, put the entire package into the hive in the empty space created when you removed the five frames earlier. Place the inner

Remove frame.

Open Package.

Remove queen cage.

Remove cork, poke hole in candy.

Place cage on foundation frame.

Remove frame.

Place package in box.

Remove cage cover, close up hive.

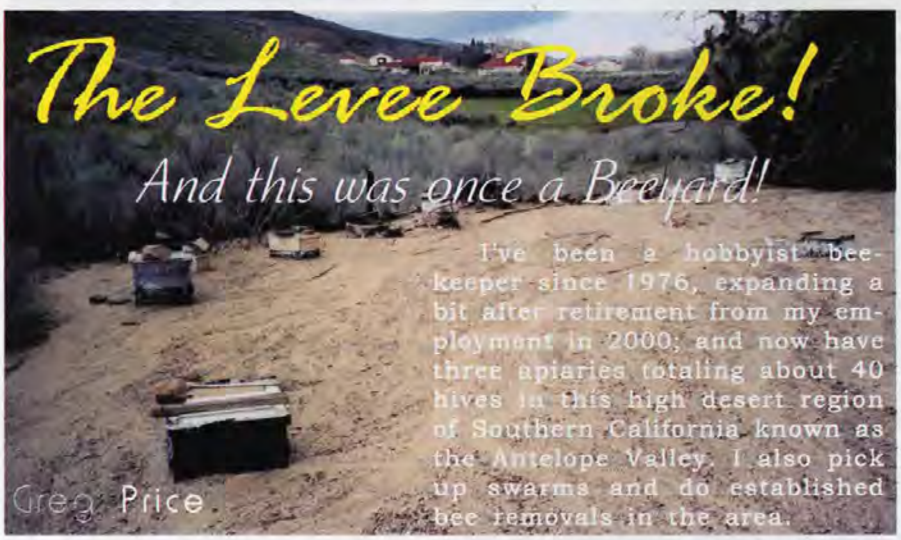
cover over the five frames and the queen. Grasp the cover of the package and remove it as you slide the inner cover over the package. Place the telescoping cover over the inner cover and you are done.

The next day, at dusk again, take the five frames with you that you removed yesterday out to the hive. Remove the telescoping cover. Gently slide the inner cover just enough to be able to remove the package. Set the package in front of the hive. Slide your frames in, one at a time until all five are back in the hive. Slide the inner cover back and replace the telescoping cover.

If bees are clinging to the package, just leave them alone and they will return to the hive on their own.

This procedure has been performed by many beekeepers without veils, gloves or any sort of protective clothing without getting stung. I have installed packages in this manner with as many as 30 people surrounding the hive with no protection on anyone and no stings. If you feel more comfortable wearing protective clothing, you should. You need to be as calm as you can be when working with bees, no matter which method you prefer to use. BC

Steve Genta is a hobby beekeeper from Greenville, South Carolina and is also the SC EAS Director.



The Levee Broke!

And this was once a Beeyard!

Greg Price

I've been a hobbyist beekeeper since 1976, expanding a bit after retirement from my employment in 2000; and now have three apiaries totaling about 40 hives in this high desert region of Southern California known as the Antelope Valley. I also pick up swarms and do established bee removals in the area.

These photos were taken at one of my beeyards where the overwintering honeymakers suddenly became "underground bees" or "mud dauber bees" as a result of a levee break. This occurred in early January 2005 at a time when much of Southern California was receiving torrential rains resulting in flooding, landslides, etc.

This apiary site is located on a ranch in the Leona Valley area which lies at the southwestern edge of the Antelope Valley or on the northern slope of the Sierra Pelona range of the San Gabrial Mountains north of Los Angeles. The ranch produces a variety of fruit: cherries, apricots, peaches, and apples. I've kept bees at the location for about 20 years. Except for the recent several drought-stricken years – producing starvation, skunk predation, yellow jackets and robbing bees – it has been a reasonably good spot for wildflower, sage and buckwheat following fruit blossom. I finished winterizing this yard in mid-November 2004 with 26 mostly quite strong three or four story colonies and a few twos, all amply stocked with stores. Also, I had stacked for Winter storage several boxes of empty comb – 27 medium 6-5/8″ supers and 15 standard deep 9-5/8″, to be exact. Everything was sitting on either two by four or four by four "rot boards" keeping them off the ground.

On the morning of January 11 a call came from the ranch: "We had a levee break, some flooding, and your bees took a hit. You might want to come over." So I gathered a few basic tools, camera, lunch and water and headed out. What greeted me was an expanse of new earthen fill covering the beeyard and a portion of the adjacent orchard and continuing downhill through some evergreen trees and the adjacent cattle pasture. Some hives were still standing but many had vanished, and hive parts lay scattered within the yard and downhill from it and against the nearby fence. The new ground surface was at about the top of the second story on most remaining hives.

First tasks: do what I could to rescue/recover any bees that may have survived, take some photos "for the record," gather and salvage whatever I might. Of the 26 hives, 13 were left standing intact pretty much on or near their original locations and 12 of them had live bee activity once the top covers were moved over a bit to provide exit/entry.

Left – a three-story (in foreground) and two four-story hives still standing as well as several hive parts seined from the flow by the fence which is a typical web-wire/barb-wire livestock combination. Also, buried against the fence out of view I found quite a number of loose frames and some top covers. The far four-story hive was still quite populous with little detectable bee loss. While digging out the stuff against the fence I found that skunks had dug under a pile of buried frames through the web-wire and had been helping themselves to the comb contents from underneath. Right – the scene downhill, below the beeyard.

The weather that day was mixed. Soon after my arrival a light rain started, later mixed with sleet and by about noon it was sleeting quite heavily. Shortly, to my amazement, the sky cleared, the temperature became pleasant for working in my shirtsleeves, and the bees began flying and were active for a good two hours or so. Again, clouds moved in bringing rain/sleet mix by the time I pulled out just after 4:00 p.m. with my load of hive components gathered from the landscape. As I continued the salvage effort into the following couple weeks most days provided several hours of bee flight conditions.

Finding a two-story hive totally buried but with significant live bee activity, I dug it out with a hand shovel, and also located and partially excavated several "remains" – mostly first story with bottom board – at their original hive locations. Much of the stuff I found was located by using a ¼" rod to probe through the fill, but the bees led me to find some hidden frames. Noting quite a bunch of them on the ground surface, I checked the "wet" spot they seemed so interested in and found it was honey in a frame lightly covered out of sight with more frames beneath.

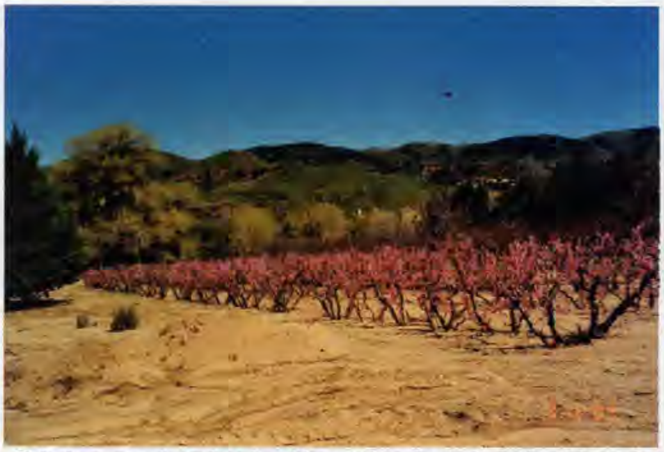
A ranch man helped me dig out some stuff using a tractor with a front end scoop but his availability was limited, having priorities elsewhere on the ranch. Also, the tractor was less than ideal in that its scoop was too wide for my between-hive spacing. I then rented a mini-excavator, or track hoe, and used it in digging out and extricating the rest of the live hives, the stored equipment, and whatever buried equipment I could find. After clearing out dirt fill from three sides of a hive I could suspend my hive cradle under the excavator's bucket, hoist out the hive intact and move it outside the hole above ground.

When hive rescue/recovery was completed and their bottom one or two mud and silt filled stories removed or replaced, three hives were still quite populous. The rest had sustained moderate to heavy losses of drowned bees, with a couple obviously queenless – one I merged with a small queenright colony from another yard and the other merged with its neighbor. One hive that had initially shown quite heavy flight activity had apparently absconded by the time I was able to dig it out. I wound up with 10 that I called survivors that might make it to Spring, barring harsh cold weather (and as it turned out we had none). I estimated the bee loss to be 85% to 90%, including "normal" Winter losses to that point. By the first Spring inspection in early March, one of the weak survivors had perished, followed by two more soon thereafter. The survival rate at my other two apiaries was much, much better.

As the Summer progressed I found that working the bees on that light colored sandy surface was not unlike working on concrete, with the sunlight and heat reflected making it not my favorite place to be on a 100+ degree day. I suspect the heat took its toll on the bees, too; with apparent absconding of some new swarms placed there probably attributable to the conditions.

As for salvaged equipment, my inventory showed about 87 to 89 percent overall of items accounted for, although some was damaged beyond use. At all but two of the original hive locations, I was able to find something, in one case only a bottom board but usually the bottom board and first story hive body. Some

A two-story hive that had been totally buried with three or four inches of fill above its top cover, ready for extrication. It had surviving bees but heavy losses to drowning in the lower part of the hive. That's a four-story hive beyond it.



This is a peach orchard, with crotches buried, during bloom in March.

loose frames were found as far as about 150 yards downhill from the beeyard. My final tally of missing items, approximately: two bottom boards, eight top covers, five nine-inch hive bodies, two six-inch supers, 78 nine-inch frames, 38 six-inch frames, and four queen excluders.

Do you know how heavy a nine-inch box pretty full of honey and tightly impacted with sand and gravel between frames is? Or, a nine-inch hive body with attached bottom board empty of frames but filled with sand, gravel and rock? I hope you never have to find out!

Then came the cleanup of the salvaged stuff in my backyard at home – not my favorite task! Many of the boxes were impacted with sand and gravel, sticks and other debris filling every open space, including honeycomb cells, and making frame removal very difficult. By inverting a box, top down, on the edges of two by four blocks I could usually dislodge the frames by pushing them down with my foot, sometimes requiring almost my total weight. Then work and lift the hive body from around the frames. When that was nigh impossible, I'd set the box on end and wash out the dirt with a jet stream of water from a garden hose directed between and around frames. Once the frames were out of the hive body, I'd separate them one by one, wash the surface crud away and, using spray from the hose nozzle, flush the comb of sand, silt, debris, pollen, brood, dead bees, and what-have-you by spraying directly into the cells, cleaning it hopefully to the point of being acceptable to new bees. Then "extract" water from the comb by shaking and stack upside down to drain.

Was I tempted to just dump the whole lot? You bet! But then I'd think about how long it took the bees to build all that honeycomb, and the honey consumption required; as well as the beekeepers time required for frames, foundation and box assembly. So I kept on washing. Meanwhile, I did take the opportunity to do some comb culling that otherwise wouldn't have been done. Combs containing a significant amount of honey were marked and put on live hives for keeping, to be used as feed for new bees to be acquired. BC

Greg Price has finished cleaning up this mess, and is now on higher ground.

Since early March the archangel has been in bloom, and the bees are still its eager visitors. Bees may remember archangel or "dead nettle" from England. There the flowers were often white, not reddish blue, as they are here. Here, archangel is *Lamium purpureum*, and the bees love it.

Archangel, sometimes called "bees' nettle," is a "weed," of course, just as the honey bee that will soon work it is a "bug." We have a way, we humans, of putting things in their place. Interestingly enough, honey bees and most weeds came to the U.S. about the same time by the same means: those early colonists. However, bees came on a work permit, valued for precious honey and wax. Weeds, on the other hand, were stowaways – in the mud on settler's boots, in the shaggy hair of beasts, in fodder and dung and ballast. And here they are, reunited around my pine tree in the lush mass of archangel and speedwell that I'm too bad a gardener to shift.

I'm a bad gardener, all right. Avid, but bad. I'd as soon grow weeds as anything, and they're really easy to grow. The bees don't care what kind of gardener I am, and are as happy with my uninvited violets as with my neat clumps of purchased pansies. Pansies are glorified weeds, anyway. Old Aristotle thought that violets were the only plants bees visited. He was smart, that old Greek and probably intuited that the landing patterns on the violet petals were guides for bees.

I once thought about keeping bees, but bad gardeners make bad beekeepers. Three thoughts dissuaded me:

(1) How on earth could I think I could "keep" and manipulate such critters. I'm the one with the opposable thumb and the big brain, but I've read enough to know they'd run rings round me. Like my mentor told me about first graders in my teaching practice: "Don't try to teach 'em, kid. They're quicker and smarter. Just observe 'em."

(2) "Who keeps who?" According to Michael Pollan (who theorizes in *The Botany of Desire* that it's not we who exploit Nature, but vice-versa – and how can bee lovers not trust a guy with a name like "Pollan"?), that bee buzzing around while I plant my beans and transplant my raspberries, is supervising *me*, inventorying the potential supply of blossom nectar a month or two or hence. Bees oblige us by letting us keep them, and however much we applaud *their* industry, they seem largely unconscious of *ours*. (I suspect the bees know perfectly well who's being exploited. Otherwise we might see organizer-bees outside the hives waving placards: "Down with exploitation of the workers! A fair day's pay for a fair day's work.")

(3) I'm an excitable type, and I don't think bees like excitable types. I'm likely to throw my arms up in delight when I see my thyme and lambs' ears and St. John's wort alive with bees. You don't see them at first; then everything's moving – the mints and the wort, with bees hovering and darting and zipping around the slowpoke butterflies and less driven insects, and sucking away and socking away pollen in their buskins. For me, it's an ecstatic moment. But bees respond well neither to ecstasy nor hysteria. Infuriating people who leap to their feet and start frantically fanning and waving at "bugs" ought not to be allowed outside at all. For a start, they're doing exactly the wrong thing: bees notice when you move, not when you sit still. All too often an inoffensive bee commits suicide over some jittery halfwit not worthy of the sacrifice.

While we're on the subject of stings, there's some argument that jumpiness around bees is a throwback to a time when bees could be counted on to deliver a far more agonizing pang than our milder species do. (My employer who grew roses in England died of a bee-sting. She was always telling me about her allergy and that one day a bee would do her in. And one day one did! The bee died, too, so I guess it was a pact.) The old herbalist-medicine men from Pliny and Dioscorides to Gerard ranked bee-stings with the poisonous woundings of serpents and scorpions needing a pretty strong antidote: a 12-penny weight of rue seed, they prescribed, "drunk in wine [as] a counterpoyson against . . .Wolf's bane . . . Mushroom or Tode stooles, the biting of Serpents, stinging of Scorpions, spiders and bees, hornets, and wasps." A fearsome company indeed. Nowadays, just settle for the wine. It'll help you grin and bear it.

My archangel has the folk-name "bees' nettle." I don't think it's called that because bees like it or there'd be hundreds of plants named after bees. (There are probably more plants named after adders than bees.) "Bees' nettle" may be saying, "I look like a nettle but I

don't sting; however, the bee foraging in me might." "Bees' nest", a name for Queen Anne's lace, evokes that little black spot in the center of the blossom that looks for all the world like a bee sting. "Bee-balm" may be named for its supposed efficacy – and that of all the mints, which bees so love – at relieving bee-stings. "Lay it (balm) to the stinging of wasps and bees," says Gerard, "with good successe." This is an example of that wondrous old doctrine, "Like cures like," the parent of modern homeopathy. People run their fingers through mint plants – thyme, rosemary, balm, oregano, sage – to release their fragrance, and they accidentally get stung. (I know. I do it all the time.) So leaves from the plant where the offending insect lurked, says the herbalist, cure your pain. Anoint yourself with their oils, and the bees won't sting you at all.

There's another reason why I decided to remain a bad gardener and not risk being a bad bee keeper. My longtime buddy, Oak, the most meticulous man I know, volunteered to care for a friend's bees for six months while his pal was on sabbatical. He was schooled particularly in the importance of identifying rival queen cells to prevent swarming. Those bees waited till the day before Oak's chum returned and swarmed just in time to create the worst possible impression. It was years before Oak tried bee-keeping himself and, before he knew it, he had a swarm on his hands. Clinging for dear life to the branches of a spiky locust tree with one hand, a sawn-off limb with a ball of bees on the end of it in the other, much thought about the meaning of life went through his mind. It's no use my telling him that the ancients stopped bees swarming by painting the hives with hyssop. Some bees just don't want to be kept.

I'll just watch. After all, the archangel is still in bloom and the bees have nothing against weeds. BC

Old Friends

Cindy **Bee**

Maybe it was a silly thing to do, but I lit my smoker today – just to remind myself. It's a ritual of preparing to visit old friends. It's cold here today, an odd thing here in Georgia. I want to put my ear to the hive body and tap softly to hear the familiar hum from within. But I won't disturb them today. Still, I miss seeing them in their busy steady stream of comings and goings from their hives like sunshine rays across an open field. I miss the lessons they teach: their hard work, their communications, their supreme need for each other.

But now is not quite the time for honey bees. So I content myself with lighting the smoker, to feel its warmth in my hands, to light and smell its familiar offerings. The thick pine needle smoke emerges from what used to be my father's smoker. The whitish puffs hang in the still and frosty air as if contained by a hair net. It has always reminded me of my great-grandmother's thick gray hair as she continually poked it back under the hair net keeping it "fixed" and off the back of her neck in the hot Summer air.

I would go with her, reluctantly, "visiting." She'd approach the home of her dear friend, a neighbor we grew up calling, "Aunt Jane." There would be the customary double knock, and she'd let herself in. Her heavy, black, slightly heeled shoes resounded across the old, dark, wooden planked floor.

"Yoo hoo! Anybody ta home?"

In no time the ice would be tinkling in glasses of sweet tea while they traded the latest gossip. Outside, I was forgotten, relinquished to lop the heads off the clover blossoms, which wisely flourished beneath the clothes line. A fly swatter was always a good sword and could be found in its typical place beside the porch swing upon which rested the piece-work quilting.

Now, in my beeyard, I am reminded of years gone by as I light my smoker – not for the calming of bees, but just as a reminder that soon, soon there will be a time to visit old friends. And I'll let myself in via the top cover to hear the faint buzz of gossip while tiny legs kick off the darkened runway of the bottom board to explore the opportunistic heads of clover. (Far more productive than a fly swatter in the hands of a bored child).

I know I should be repainting supers and repairing frames, wiring in foundation and building new bottom boards – all the things I now have time to do. But today I longed for just a little more. And so I lit my smoker in sweet anticipation of that day when the weather breaks and a long ago voice calls to me as I to my bees. "Yoo hoo! Anybody ta home?"

A Few (More) Comments On Honey Bee Swarm Biology and Management

And still, we don't know enough

James E. Tew

Over and again

Oh, no! Not swarming – not again. How many times have you read articles or listened to presentations on the subject of swarming? How many times have I explored this topic? What else could there possibly be to understand about swarming? Well, bluntly stated, a lot. We are still in the lower levels of grade school in our education and understanding of swarming. *(In fact, we are still in the lower levels of grade school in our understanding of bee biology in general.)* In this piece, I make no claim to give you information that will promote you to the next grade level, but I would like to review the seasonal subject of honey bee swarming, but with an honest acknowledgement that swarming is complex far beyond our present comprehension.

An overview of the usual swarm episode

The typical event

The general story is that a colony – probably headed by a queen that is more than one year old – comes out of Winter with a good population (What would you estimate – about 15,000 – 30,000 bees?). Swarming genetics is important, too. The brood nest becomes increasingly crowded. At some mysterious point, drone brood production is started by nurse bees and about 400-600 drones are reared. At the next mysterious point, nurse bees either build or modify queen cups into which the queen will – again mysteriously, deposit eggs. The swarming stage is set.

The swarm composition

At the next point – normally just about the time the virgin queens begin to emerge, the bees will "decide" who is to leave and who is to stay. While we still don't know how bees get selected for the various categories, we do know that about half the bees go. In that half will be all stages of adult bees, some of the drones, and the old queen. While the swarm is in transit, yet more mysteries abound. Swarms appear to move slowly – and they frequently do – but swarms can also move very, very fast. Slow swarm movers are usually headed for a temporary site where they hang for bit while scout bees search for proper new nesting sites. Fast swarm movers (apparently) already know where their new home site will be and they move much faster. Either way, new nest site selection is a complicated subject about which we know little.

The new home site

At the new home site, the pioneers set about putting a nice new home together in a nice new neighborhood. Since they have no brood to feed, and since a nectar flow is usually underway, wax production and colony development occurs rapidly. The old queen begins prodigious egg production for the colony must have both bee and food resources for the upcoming Winter. They can't tarry.

A modification

Frequently, the old queen can't maintain the frenetic reproduction pace and she begins to fall behind in her duties. In still yet another mysterious move, nurse bees begin supercedure procedures and new queens are developed. Some of these virgins emerge, fight it out (or are kicked out by house bees) until only one new queen remains. Somewhere along the way, the old queen is put out to bee pasture and the new queen takes charge of what is now a completely separate, functional, independent bee colony. Finally, after several months, the process of colony fissure is complete. A fairly simple story – right? No, not all. I would like to return to some of the points and junctures and expand on what is happening within the colony ***before*** the swarm leaves the parent colony. Maybe next month, I will review the swarm in transit and the establishment of the new home site.

Non-swarming honey bees

A strain of non-swarming bees *ain't gonna happen.* Think about it. Colonies that don't cast swarms are not going to multiply beyond the parent colony. Normally, beekeepers don't want **any** swarms to issue. They lose honey crops, queens, and time/energy resources. Again,

A populous colony with a crowded brood nest.

that *ain't gonna happen.* Swarming is the honey bee species' way of procreating itself. To ask a species not to multiply is a monumental request. Until super-science dictates otherwise, it stands that if you keep bees long enough, swarming will become an issue for you and your bees at some point.

Swarming bees

For eons beekeepers have chased swarms. In our recent beekeeping past, swarm acquisition was a common way for new people to begin an interest in beekeeping. *Varroa* changed all that, but that's another article for another time.

Beekeepers who gather swarms – from anywhere – are also concentrating a strong swarming characteristic in their bee stock. While swarming can't be stopped, it can be mitigated. Though very few of us do it, it would be a good idea to requeen new swarms with new queens and circumvent the whole swarm queen supercedure stage. I realize that only in a perfect bee would that recommendation routinely be done.

The swarming behavior may partially be the result of the evolution of absconding behavior or migratory behavior; otherwise, why does the old queen go with the swarm rather than the colony waiting around for the new queen to emerge and then go with her? It's commonly said that honey bees have a tropical ancestry where migratory and absconding behavior are much more prevalent. Whatever reason, the behaviors of swarming, supercedure, and absconding have obvious characteristics in common.

The swarm queen

Back in the parent colony, in late Winter, brood production started with probably just a few hundred eggs; a leisurely pace. As the season progresses and Spring pollen sources become available, that pace increases – dramatically. As things heat up, the queen's retinue nearly doubles and she is constantly having food pushed her way. For the queen, it becomes an eating and egg laying frenzy.

The *"balance"* of the colony is always important – at any time of the year. As the brood begins to develop and as all the readily available worker cells are filled, drones and finally new queens are produced. All the while, the brood nest has truly become a happening place. Increasingly crowded and hot – new bees, old bees, drones, few empty cells, and Spring pollen and nectar coming in; the colony balance is threatened. Too many nurse bees with full brood food glands and not much to do with the food and, no doubt, the queen, that has been laying eggs at a prodigious rate, has expanded beyond her ability to pheromonally suppress ovarian development in worker bees. The queen is abruptly put on a hard diet, but the colony has experienced the swarming stimulus. From this point on, the routine recommendation of adding abundant brood chamber space will no longer suppress the swarming response. The swarm switch has been triggered.

The queen must lose weight in order to fly – probably only the second period in her entire life when she will be outside the colony (other than to be assigned her final resting place). What triggers the reduced diet coming from the nurse bees to the queen? What level of reduction is enough? I don't know, but food reduction occurs and weight she loses.

Her abdomen shrinks and she becomes much lighter and mobile. She is treated brusquely by surrounding nurse and house bees. There is an air of excitement and energy throughout the colony.

To this point

To this point, at least four things have occurred within the colony:

1. The colony has significantly increased in population size
2. The brood nest has become congested
3. The worker age distribution has become distorted
4. The transmission of queen substances has been diluted per individual bee

It's elementary to say that swarming is a complicated issue when most things in beekeeping are complex beyond our comprehension, but having said that, swarming is truly a complicated event. Two broad theories are still the foundation of the swarming instinct – (1) the brood food theory and (2) brood nest congestion theory. The problem is that neither theory completely explains the swarm behavior. Clearly, brood food levels in nurse bees and congested brood nests are only part of the stimulus to swarm.

The genetics of swarming

Advanced honey bee genetics is a topic beyond my grasp. As I try to digest the research work of others, it seems as though there is a colony newsletter or a colony public address system within the swarming colony. Remember inside the hive it's hot, dark, and crowded. It baffles me how individual bees – so many individual bees – are informed and assigned. They know what to do. Why doesn't a queen that has been placed on a restrictive diet run around the hive searching for an uninformed nurse bee – one that would give that queen some food? Maybe she does. Or why does the queen not feed herself? She's not that helpless. She can go into any brood cell and find abundant food. Maybe it's not *the* food she is craving, but at least it's food. Certainly honey and pollen are all about. As is most of beekeeping, it's puzzling.

While brood food levels and brood nest crowding are clearly established tenets of swarming; they cannot be the only reasons. The genetic disposition to swarm (whatever that is) plays some role.

It takes a bee village

While I've spent much of my comments on the activities of the queen mixed with comments about brood food and colony congestion, it takes appropriate populations of multivariate aged brood, adult workers, drones, and queens to iniate and then comprise a successful swarm. To this list must be added the requirement for abundant food resources. Food must be abundant within and outside the hive or otherwise this discussion drifts toward either absconding or migrating behavior. For hive fission to successfully occur, many elements – both known and unknown must occur.

Eloquent vs. simplicity

"My colony is going to swarm (forget the academics) so I will clip off the queen's wings. That should shut them down." This describes an exquisite situation seemingly fixed with a practical solution. The 14th century Franciscan friar William of Ockam wrote, *"Of two competing theories or explanations, all other things being equal, the simpler one is to be preferred."* Occam's Razor (The Theory of Parsimony) is established in the scientific literature. When beekeepers, clip the wing of a queen, we are employing a modified version of this advice. Swarming is complex, confusing and costly. So we do simple procedures like clip wings or add more brood space – neither of which solve the problem, but may forestall the complex swarming event a bit.

What should you do to forestall swarming?

In this regard, little has changed since I last wrote about swarming – probably about this time last year. Essentially, you should add brood space well ***before*** it's needed by the colony and, second, you should keep a young, prolific queen as the colony monarch. If you hive a swarm (that is, capture a swarm while still deciding where it is to go) requeening it before it either starts those supercedure procedures, or before it produces drones that would propagate the swarming instinct in your stock, is a good recommendation. Though it probably won't help much, also providing adequate super space will not hurt. Bottom line: give space and keep the queens young.

What should you not do to forestall swarming?

I really don't care for queen clipping, but I know many of you do it. The queen will still leave the colony and will hop along the ground. She may or may not get back to the colony once she has tried to fly. When one of the new queens emerges, the colony will probably swarm with her.

Tearing down queen cells is busy work also. If you really don't want a colony to swarm, destroying a few cells won't hurt, but it certainly won't stop swarming either. Colonies with a high penchant for swarming will issue without any swarm cells at all; plus, you only have to miss a single cell to allow the swarming process to advance normally.

Caging the queen for a while – unless it's really a long time – probably won't help much either. Once the colony has undergone preparations for swarming, it's really difficult to change its mind. As with destroyed cells, some colonies will leave the caged queen and depart with one of the new queens (that may or may not be mated.

They're leaving

You've tried, but you've lost. Within the colony, on a warm day (probably mid-morning to mid afternoon) workers within the colony begin tearing around the colony disrupting events and literally pushing the queen toward the entrance. The swarm begins to issue. At some point, the queen exits the colony into the bright light of day. While she doesn't lead the swarm, her presence is vital to the swarm's departure. At this point, the swarm is in the air. It's a behavioral wonderment and I'm going to leave this swarm, suspended, in this position until next month. Maybe it will cluster somewhere close to the ground. Until then. BC

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DRONE MANAGEMENT

Necessary For Every Colony. I Like Them.

Walt Wright

Drones have historically been the subjects of bad press. Beekeepers recognize that drones are a drain on colony resources and some try to limit drone comb to reduce populations of drones. A study was conducted in recent years of the production impact of drone populations. As expected, the colonies with higher drone populations produced less surplus honey. While the results were a foregone conclusion, the degree may have surprised some. Drones have hearty appetites. Their job is strenuous.

The bee colony sees drones as a necessity. They will rear drones very early in the season to support mating of build up supersedure queens and have a large number of drones to maintain in the air for the swarm replacement queens. In anticipation of the reproductive (swarming) season, the colony will make provision for drone cells on a priority basis. To maintain good colony morale, they need to have about 20% of the brood comb surface in drone cells for most of the active season. Because of the larger size of drone cells the population head count increase does not equal 20% with fewer cells per square inch and the longer drone development time. That 20% may seem high, but it is based on observation of feral bees permitted to do it their way. If that number falls to 10%, the colony will often improvise additional drone cells. When they improvise, it might not be to the beekeeper's liking. Lumps of drone cells complicate inspection, and patches of comb converted from worker to drone cell size are permanent. The beekeeper is justified in not desiring drone brood cells in the basic over wintering brood nest. Patches of drone brood comb within the Winter cluster are not in his, or the colony's best interest.

In the wild brood nest, the drone brood comb is located on the outside of the total comb. It is sometimes separated from the worker brood comb by a comb of feed pollen. Irregular chambers at the sides, such as a hollow in the connection of a branching limb are often completely filled with drone cells. This arrangement serves them well. In mid-Winter, when brood rearing starts, the focus is on rearing working brood. Workers are needed to replace cluster population declining from fall worker bee die-off. Drones are not needed yet. Solid worker comb in the brood nest warmed area is the most efficient means to increase worker population. Rearing drones in mid-winter is an unnecessary drain on resources that should be applied to the early season objectives. Drone cells in the basic winter brood nest will be populated and create resource waste. Wintering is troublesome enough without wasting resources.

In my area, winter brood is "batched." Eggs are laid in a short period for the first and second brood cycles. As evidence of this batching, you can open a colony in February and all brood is capped, no open brood. If the queen were laying on a daily basis, there should be nearly as much (8/21) open brood and eggs as capped brood. We see this early brood batching as a safety margin in the honey bee survival format. During the first brood cycle in mid-Winter, the colony is still losing Fall bees and the cluster is shrinking. The cluster continues to shrink until emergence of the second brood cycle. The first batch didn't stem the tide of Fall bee loss because it was smaller, but the cluster often shows an increase in size with the second cycle emergence. The build-up is on. Be patient with this discussion – this line of thought is headed toward application of these concepts.

The experts cannot think in terms of brood cycles. They are locked into the population growth curves generated by C.L. Farrar more than 50 years ago. Those exponential growth curves were developed from package bee growth. The starter colony, operating in the establishment mode, builds comb as fast as possible and populates that comb as they go. Data in that mode is not relevant to the process of the over wintered colony. In my area, the over wintered population growth shows a temporary increase with emergence of early brood cycles and a decline due to continued fall bee losses between emergence periods. At the end of the second brood cycle, the decline is often more of a leveling off than a real decline. But the total population can show increase, no gain, or decline in different colonies. This makes a rather lumpy curve for population growth of the over wintered colony at the lower, early season starting end.

Toward the end of the second brood cycle, in late February here, the colony is ready to start rearing drones on a priority basis. They may have reared a few in random cells along the way, but drone rearing takes on urgency at this point. It takes over a month to get mature drones on the wing in sufficient numbers to support the impending mating season. And the swarm issue season starts in about five weeks. Note that in the interest of efficiency, they delayed mass drone rearing as long as possible. Now, its mandatory to support species survival requirements.

If the colony does not have a comfortable number of drone cells in handy reach of the cluster, they are forced to improvise more drone cells to populate. Several options are available to them. Some of the popular options follow: If there is excessive bee space between the brood chamber top bars and the bottom bars of the next higher box, they can put a whole row of drone cells crosswise in between on each frame of the brood nest. If there is extra space within the cluster, they will sometimes build clumps of drone cells that jut out into those spaces between frames or into the bottom board access space. It's sometimes amazing how much wax the colony has stored that can be used for those special structures. Of those two options, the rows of cordwood drone cells in the interbar space gave me the most grief. The problem separating the two boxes was bad enough, but what concerned me more was the terrible waste of colony energy. The colony had invested resources in those drone pupa that were wiped out in a minute by the bungling beekeeper. Over time it was learned that the condition could be avoided by insuring proper bee space between the frames of the boxes. Haven't seen it in years.

It seems that the colony would rather build drone cells with available old wax than convert worker brood cells to drone cell size. This preference may just be forced on them because they are rearing all the worker brood they can safely protect. If the worker brood cells are populated with an arch at the top of the frame, upper outside corners of the frame can be reworked from worker cells to drone size cells. Barring that option, as a last resort, they will convert cell size anywhere within the basic brood nest.

One other work-around that is sometimes used provides some evidence of just how acute the need actually is. If they find drone cells in the overhead capped honey, they will use them. Even outside the cluster, they will move or consume the honey and prepare those cells for eggs. They do this with a remote mini-cluster, and escort the queen up there to lay. A contingent of bees maintains the mini-cluster to care for and warm the drone brood.

Changing the subject abruptly, the literature tells us that the colony doesn't like to store pollen in drone size cells. There is little, if any, definition of how to apply that tidbit of information to your hive management. Also missing is the information that the colony doesn't mind storing honey in drone cells at all. I see the colony's reluctance to store pollen in drone cells as another case of advance planning in the survival traits of the honey bee. Pollen is difficult to move, and generally must be consumed as feed. When the colony reaches that point in the build up where drone rearing becomes urgent, drone cells with stored pollen would be detrimental. Honey in drone cells can be consumed or moved, the old "ounce of prevention" thing. Applying this colony preference to hive management is part of following recommendations.

Application of all of the above is quite simple. First, you need to accept an amount of drone population that creates a sense of well being in the colony (morale). Then, you need to provide enough drone comb to accomplish that. To make it easy on yourself, provide the drone comb where the colony work-arounds impact your work load or convenience the least. The following recommendations do that.

Help the colony do it their way. Place drone comb in the outside slots of the brood chamber(s). Drone comb in the outside slots has multiple advantages for the colony. The delayed need for drones in the build up has already been mentioned above. The reverse is true in the fall. Worker brood rearing is normally extended beyond drone rearing. This permits the colony to fill that outside frame with honey sooner. They want that outside frame filled with honey, regardless of cell size. Generally, the second frame in is used for feed pollen. The smaller cluster has both Winter brood rearing feed requirements in just a few frames, and they often migrate to one side or the other for that very reason. They can feed on that outside frame of honey in mid Winter and free up cells for drone brood when required.

Select or create frames of drone brood comb that when placed in both outside slots total about 15 to 20 percent of the worker brood surface area. In my nine frame brood chamber, normally with five frames of worker brood in the center, two frames of half or more drone cells comes out about right. Scale that up some for the 10 frame brood chamber.

Brood to the outside walls of the box has advantages of its own. For the bees, it is an advantage in the late Winter, extreme cold snap. Any brood lost to chilling at the outside is drone brood. Loss of drone brood has less impact on the colony than loss of workers. For the beekeeper, there is less "stove piping." With ➤

Tip of The Month

Make it easy to separate boxes in the field. Insure that frame dimensions match the box dimensions. For top bee space boxes, top bars of frames should be recessed ¼ to 3/8 below the top edge of the box and bottom bars should be flush with the lower box edge. Bees put very little comb between frames properly spaced in the brood chambers. Note that deeps with frame rest rabbets sized for the stand-up rail leave too much space when the rail is not used.

Go the extra mile and taper the outside corner at the top of the box to leave a crack you can see for insertion of the hive tool. With a rasp or sander, take off a small amount of wood at the extreme outside of the top corners. A hive tool at both back corners will pop the propolis seal with a little leverage, and the upper box is ready to lift off.

wall-to-wall brood nest warmth, the heat rise is spread out. As you know from your fireplace or campfire, heat rise tends to converge to the center. The same is true on a smaller scale at lower temperatures. When cluster warmth is distributed across the whole width of the brood chamber(s) the heat rise is more laminar. With the heat rise spread wider, the colony is more likely to maintain brood over more frames and less likely to "stove pipe," as the brood nest expands upward.

A more regular advantage to the beekeeper is that the outside frame is easiest to remove. If you inspect for *Varroa* mite by pulling some drone pupa or remove drone brood to reduce *Varroa* mite population in their adolescence, the outside frame is where you want your drone brood. Time is money, and time saved is money in the bank. But you already know that.

Cycling drone brood to the freezer has gained some popularity in recent years. It's a fairly benign *Varroa* mite control measure that the organically inclined honey producers can endorse. But to maintain colony morale, it's not recommended that you remove *all* the drone brood at any one time. That's just one more reason to distribute drone comb in both outside frames of the brood chambers.

Let's close this out with my description of the subject creature. He is not very bright. Like some of our professional athletics, deep thinking is not a requirement for his job. His task is physical. He needs good vision, stamina, agility on the wing, and a tolerance for boredom at work. He doesn't even need to be able to find his way home. He is welcome at any other colony he finds in his travels. I personally am quite fond of the big, ugly rascal. He supports my management system of requeening by supersedure. BC

Walt Wright is a retired engineer and a hobby beekeeper in Tennessee.

STAYING IN THE BEE BUSINESS – 2006

A New Era Of Mite Control

David **VanderDussen**

In the last five years beekeepers have seen huge changes in the business of beekeeping. We have seen record high honey prices, followed by the price collapsing to well below the cost of production. At the same time significant colony losses have occurred, mainly due to *Varroa* mites developing resistance to available chemicals. This has led to shortfalls in the colony numbers required for the pollination needs of major cash crops, most notably the almond groves in California, resulting in record prices to be paid for hive rentals.

This swing in the source of dollars for the commercial beekeeper underscores the need for the ability to change and focus on getting those dollars. Beekeepers have been on a continuous learning curve with no end in sight. This article is an overview of the current North American beekeeping reality and outline various mite control treatment options.

Beekeeping Income Sources

Honey

Honey income looked very good for the beekeeper a couple of years ago. Chloramphenicol and nitrofurans (antibiotics)found in offshore honey led to trade actions, causing a shortfall in the domestic market and a spike in prices. Honey buyers started looking for other sources of cheap honey, bringing new importers into the market place. These importers, encouraged by high honey prices, have become established sources of competition. That, along with the Chinese honey coming back into the market place, means that North American beekeepers are again competing against lower offshore production costs.

Approximately 60% of honey consumption is in the industrial market. At the time of high honey prices, honey use in the industrial market was being re-evaluated by companies due to expense in the recipes and a tarnishing of the image of honey. Food processors love to have the word "honey" on their product to boost consumer appeal. Any loss of "image" can have a dramatic effect on consumption. Also, once recipes are changed or product lines dropped, they are very hard to get back.

North American honey packers have become very aware of the risks and costs of chemical contamination of honey, and even domestically produced honey is being checked for illegal residues. Beekeepers may be forced to comply with on farm food safety programs as part of emerging consumer and government demands for food security documentation.

The good news in all this (at the time of writing, December 2005) is that it appears the supply side of honey globally has stabilized and reports are the market has firmed up. Whether or not this will lead to a major increase in honey prices has yet to be seen.

Pollination

The beekeeping industry has historically claimed that its true economic value lies in the pollination bees provide. With the decline in feral colonies and the increase in monoculture ag practices, meeting pollination requirements has become a budget item for many growers. Beekeepers are trying to adapt to this rapidly emerging need and seize the income opportunity it offers. If there is a bright light for the beekeeping industry it is the growing recognition of the value of the honey bee to other agriculture commodities.

Livestock (queens, packages and nucs)

Raising and selling bees as livestock is another segment of the beekeeping industry. *Varroa* resistance to hard chemicals, comb contamination, the spread of Africanized bee genetics, and queen viability, have all affected the package/queen bee industry. Adapting by embarking on comb replacement programs, using soft chemical IPM programs for mite control, switching to lines of bees showing *Varroa* tolerance, and locating mating areas away from Africanized drone sources, this segment of the industry is planning for the future. North American queen/package producers cannot meet the current demand, and offshore sources of bees are already used by the rest of the industry. Bees from Australia are now being advertised in trade magazines for the U.S. market.

Colony Management

There are the basics: equipment maintenance, timely divisions swarm control, making sure the bees have enough feed, good locations, and timely supering. Add to that, good basic beekeeping skills, including disease recognition, queen assessment and replacement skills, and mite damage identification. Plus a rotation program for removing old combs is important.

The next level is pest management, hopefully IPM. A strategy is required for AFB, EFB, chalk brood, sac brood, monitoring tracheal and *Varroa* mite levels and, in some areas, small hive beetle. Determining the level of *Varroa* resistance to hard chemicals is of extreme importance, if there has been a reliance on these chemicals for *Varroa* control.

Mite Control Treatment Options

Current proven *Varroa* mite treatment options include using tolerant stock, drone brood removal, ApiLife Var (a thymol product), Apistan (fluvalinate), CheckMite+ (coumophos), Sucrocide (soapy water/sugar), and Mite-AwayII™ (Formic Acid Pads). Just released is Apiguard (a thymol

New Mite Treatments Are Safe, And Sane.

product). Still on the blackboard are 2-Heptanone, oxalic acid, and fungal controls. Current proven tracheal mite treatment options include tolerant stock, menthol crystals, and MiteAwayII.

Tolerant Stock: Hopefully the way of the future, a stock of bees not only bred for *Varroa* and tracheal mite tolerance but economically viable with good honey production, over wintering capabilities, and gentle temperament. Dr. Marla Spivak's hygienic stock appears to be the most promising at the moment.

Menthol crystals: Menthol crystals are available in bulk to control tracheal mites. Preparing the 50 gram packets cost $0.65 per treatment[iii], plus packet and labor. Application can be worked into existing management routines, when beekeepers are already in the yards. Menthol has some temperature restrictions.

Drone Brood removal: It is labor intensive but it is possible to achieve an acceptable level of control, especially if combined with a soft chemical treatment product or tolerant stock. Colonies will often restrict drone production in the late summer, causing *Varroa* to shift into worker brood. Drone brood foundation is now available in the market place.

ApiLife Var: A soft chemical treatment currently under EPA Section 18 registration in many States, and is in the Section 3 registration process. Each treatment requires three applications 7-10 days apart. Where I can purchase it, each treatment costs $3.54 plus travel. ApiLife Var has some temperature restrictions.

Apiguard: A new thymol product is available this Spring. Two treatments, two weeks apart are required in the late Summer. Prices are comparable to the other products, as is efficacy on *Varroa*.

Apistan and CheckMite+: The two "hard" chemical treatments, fluvalinate and coumaphos, have been the workhorses for varroa control. Initially giving close to 100% control, side effects and resistance are leading to these two products being abandoned by many beekeepers, or at least shelved for a period of time. Apistan strips are a bit less than $2.00 each, about the same for CheckMite+™[4]. Used according to the label, two strips are required per average hive, costing about $3.50 per treatment. Labor is minimal, with the strip formulations being an excellent way to apply the active ingredients in a beehive. These can be worked into existing management routines, when beekeepers are already in the yards.

Sucrocide: Sucrose octanoate ester is a soft chemical *Varroa* treatment that is EPA Section 3 registered. Very safe to work with and can be used at any time, even during honey flows, at about $0.70 per treatment. Each treatment requires three applications 7-10 days apart. However, it requires the full breakdown of the hive with both sides of every comb being sprayed with the sucrocide/water solution, soaking the bees, making it even more labor intensive than drone brood removal. One quart of mixed solution is used per two story hive per application.

Mite-AwayII formic acid pads: MAII is effective on both *Varroa* and tracheal mites. It is a soft chemical treatment that received USA-EPA Section 3 registration and Canada's PCPA registration in the spring of 2005. The 2006 bulk price, is a bit under $3.00 per treatment. Labor is minimal, as treatments only require a single application that is applied on the brood chamber. These can be worked into existing management routines when beekeepers are already in the yards. An extra 1.5 inch deep spacer rim on the hive is required to accommodate the MAII pad, along with the sticks holding it up off the brood chamber frames top bars. Some beekeeper's have built these into their inner covers or hive covers, rather than having to handle an extra piece of equipment. Some beekeepers "candy boards" are the right dimensions to be used as a spacer. MAII has some temperature restrictions.

On the drawing board:

2-Heptanone: Nick-named "preparation-H", it has potential as a future *Varroa* control product, but is still in the formulation stage. Naturally occurring in a beehive from the bees themselves as they build comb, it is highly volatile and has no residue concerns.

Oxalic acid (oxalic dihydrate): Oxalic acid has just been registered for use in Canada but is not legal in the U.S. It is only truly effective when colonies are broodless, and during broodless periods, control is excellent. Oxalic is very cheap to use, at just a few cents per colony. It can be applied in a vapor form or by trickling. Vapor application requires portable heating devices and sealing the colony shut for 10 minutes. Trickling requires double brood chamber colonies to be cracked apart in cold weather. Oxalic acid will probably need to be combined with other treatment methods during times when brood is present in the colony. It is a single application treatment, effective, but somewhat labor intensive to apply.

Fungal controls: Hope springs eternal, but there is nothing on the market yet, and the future of this product seems uncertain.

Conclusion:

The learning curve will continue. New resources and tools are available and on the horizon for the beekeeping industry, but choosing and adopting these to individual outfits will challenge beekeepers for years to come. Education and wisdom, rather than "what we always did", will determine success in the future. BC

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[1] All prices are in US$
[2] B & B Honey Farm, *2005 catalog*
, Minneapolis Outlet, Cannon Bee Honey, 6105 11th Avenue South, Minneapolis, MN USA
[3] Brushy Mountain Bee Farm 2005 catalogue
[4] ibid

THE GRAFTING METHOD OF CELL PRODUCTION

Larry Connor

In this final article of three dealing with queen cell production, we will look at the methods laid out by G.M. Doolittle and published in his book *SCIENTIFIC QUEEN REARING* in 1888. Doolittle's methods have been studied and then modified by nearly every beekeeper that has used them, yet the core ideas remain constant, and have served as the starting point for a majority of queen cells produced in the world. I'm not going to rely on Doolittle's discussion, but rely on my own experiences raising several thousand queen cells each week from February to October, and doing it for several years. My own training came from Dr. G.H. "Bud" Cale, Jr., creator of the Starline, Midnight and Cale 875 hybrid bees, as well as Harvey York of the York Bee Company in Jesup, GA.

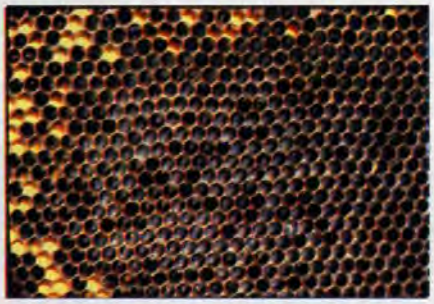
Beekeepers sometimes reject the grafting or transferal method of cell production because they have had a bad experience trying to graft larvae. I like to remind them that many commercial beekeepers use young employees specifically for this reason, for their eyes are sharper and change focus with great ease. If you have not grafted before, and you are 50 years old or older, grafting may be a challenge for you. But it can work – just try it – again and again if necessary. Use a hand magnifying lens and a flashlight if that helps. Then find a neighbor kid to mentor or hire, who is reliable, and have them help you out!

Let's go step by step through this process, and raise a few queens.

1. Grafting Mother Colony. Any colony with a queen laying fertilized eggs may be used as a source for larvae for grafting. You should, of course, select the *best queens you have* and set them in the area where you plan to raise cells. Most commercial queen producers keep grafting mothers in the area immediate to where they produce queen cells. This speeds the grafting process, since they do not have to move colonies or brood frames in and out for grafting. In the case of valuable grafting stocks, these colonies should be kept in a secure location, at least behind a locked gate. Many producers restrict the queen to a single deep hive body so it's easier to find the queen and her graftable larvae. The queen in the colony shown here is kept in a queen excluder limited region located in the center of the hive, and has access to one frame at a time. Rotated every day, these frames provide a steady supply of correctly aged larvae (average of 24 hrs) for grafting. Unfortunately, it means someone must rotate the frames every day, so only those operations that produced cells six or seven days a week will find this useful.

The concept is easily modified for single grafting events by adding drawn comb four days before the graft date, and biologically restricting the queen to this frame by eliminating other open combs. If the queen and colony desire to produce eggs, this will be where they must deposit them.

Most beekeepers find larvae while grafting by using a hunting process, locating the larvae of the correct size on a variety of frames in the hive. These larvae are usually on the outer edges of the comb, where they are subject to the greatest temperature variations of the cluster. This is one reason why is possible to select a larvae that looks the right size, but is older than it appears.



2. Graftable larvae. This frame is one from a colony managed for uniform aged larvae. These larvae are up to 24 hrs past emergence (average 12 hrs). The colony has been fed sugar syrup and there is plenty of pollen in the colony. This has stimulated copious amounts of royal jelly production, and the newly hatched larvae float on the bed of royal jelly. This jelly makes it easier to move the larvae, since the grafting tool will go into the jelly layer and *under* the larvae.

3. Priming Queen Cell Cups. One challenge of grafting is to maintain a humid environment within the queen cell. I use royal jelly diluted 50:50 with tap water (The royal jelly is kept frozen until used). A small amount of royal jelly is placed at the center of each cell cup. Here wax cell cups have been fastened to grafting bars with hot wax. There are also plastic cups on the market. I would not mix wax with plastic cells, but lack data to show side-by-side preference. The dilute royal jelly mixture is ultimately removed by the bees and new royal jelly supplied to replace it. During the grafting process the beekeeper is easily able to remove the larvae by floating it off the royal jelly. The dilute mix also keeps the environment around the larvae moist.

When I do not have royal jelly in the freezer, I dry graft, which means that I put the larvae on the bottom of a queen cup without any additional moisture. (You cannot use water, for it will kill the larva). When I do this I only graft a few cell bars at a time before I put them into the hive. Plus, I keep the grafted cells covered with a moist towel. Cell bars are put into grafting frames. They are narrower than regular frames (facilitating movement in and out of the hive), and may be one of several designs.

During a large graft, take grafted cells to the starter colonies a few at a time. Do not wait until the end of the graft or you will have a lower acceptance.

4. Grafting Tool with Larva. The small C-shaped larva in the bottom of the brood cell must be located and removed by a grafting tool. I made this stainless steel tool from a commercial model I ground, filed and polished to a very fine point. I like to lift the larva by the center of the C, and then reverse this on the bed of royal jelly mixture in the bottom of the cell bar. I try to avoid turning the larva over, as this may kill it. While grafting it is routine to damage the wax comb in the effort the remove the larva. This is why the grafting tool has wax on it above the tip. There are many grafting tools on the market. Try several until you find, or make one you are comfortable with.

5. Grafting Set Up. With a light aimed down into the cells, the grafter has a well-lit work area, and can see the larvae by repositioning the comb against the upright support. The cells laying on the table, are then filled in sequence from one end to the other. I often turn the frame over, as this person has done, so I am able to see the larvae better.

6. Starter Set Up. This is a five-frame nucleus box made into a starter. About five pounds of nurse bees were shaken from several colonies to provide a large amount of royal jelly production. The bottom of the starter is screened, and a feed can is placed on the lid, where syrup is taken through a hole. I like to graft in the afternoon, put the grafted cells on here overnight, and then move the started cells in the morning. The bees in the starter were used two or three times and then put into a hive with a queen. The starter contains the grafting frame, one or two frames of pollen and honey, and empty comb for syrup storage.

7. Cell bars on frame covered with bees. Several pounds of nurse bees cluster over the started cells. The frame is turned over and the bees carefully shaken back into the starter box.

8. Double rows of cells in starter. With the bees removed, you can see the success of the graft. This frame is holding six grafting bars of 15 cells each, but can hold as many as nine grafting bars. As a result of my experience, I feel that the larger numbers sometimes used in operations are ideal for a limited time period, and must be reduced whenever the percentage of started cells or the quality of the food stores is reduced.

9. Started cells on cell bar. These cells show the amount of feed given the larvae in a cell starter. The edges of the cells are chewed and thinned (in tender wax cups) or wax is added (in plastic cups and tough cells made from older wax).

10. Started Cells on frame. These are cells from a starter. This frame holds two cell bars. The number of cells was reduced to increase the percentage of acceptance. Staples are driven into the frame to hold the cell bars. These frame and cell bars will be moved into the cell finisher.

11. Cells in cell finisher. These two cells are from a cell finisher colony. This clearly shows where the bees have added wax to the cell cups. These cells were not produced during the peak of the season, as evidenced by the darker color of the cell wax used in the cups. Bees will continue to add wax and the cells will become more and more mottled.

12. Multi-aged cells in finisher. This is a cell bar from another beekeeper's finisher colony. This operation adds one bar of cells at a time, and keeps up to three different ages of cells in the builder at all time. This has the possible advantage of only a small number of new cells being fed and under construction at any one time.

13. Well-drawn queen cells. These are some cells from a cell builder. The bees have finished cell production, but will continue to add wax as the queen larvae become pupae and then adult queens. Workers continue to be attracted to the cells throughout this period, and will chew the tips of the cells to reveal the queen pupal silk a day or so before emergence. They are apparently responding to the queen pheromone being produced by the developing queen.

14. Dissected queen cell. Once the queen larva has finished feeding on royal jelly, it becomes a prepupa and then a pupa (neither feed). This leaves evidence of the food the bees have provided. The royal jelly fills the cell base in well-fed queen cells, and may be used as proof of good rearing conditions.

15. Cold weather grafting frame. When the season starts up, many cell producers use a grafting frame that puts the cells against the smaller brood area typical of that time of the season. This makes sure the cells are kept warm on cold nights.

16. Queen Cell. This is a completed queen cell, mark of a good effort at queen rearing. The wood cell base serves as something to handle, as well as the part the beekeeper pushes into the brood comb before the queen emerges from the cell.

17. Queen Cells in Cages. Because we worked with instrumental insemination, we caged all our queen cells. Soon after the queen emerged, the wax cells were removed and queen candy was put at the end of the cage. These cages were useful for carrying queens (virgins or mated), queen holding, and for queen introduction.

18. Mating Nuclei Colonies. I recommend use of larger nuclei for mating in northern states and in Canada. A five-frame nucleus can hold two queens if the unit is divided and each unit is given a different entrance. I would set up a five-frame nucleus box with a frame of brood and an extra shake of bees. To this I would add a frame of honey and a ripe queen cell. At the end of the mating season, I leave the last queen to head the colony until I requeen colonies later in the season, build up the nucleus into a full sized colony, or keep the colony or nucleus over wintering.

References

Doolittle's *Scientific Queen Rearing* is easy to find, but the demand keeps the price up. Plan to spend $75 or more for a reading copy.

Consider two current books from Wicwas Press. For hobby beekeepers, consider Roger Morse's *Rearing Queen Honey Bees* ($18). For Sideline and commercial beekeepers the clear choice is Harry Laidlaw and *Rob Page's Queen Rearing and Bee Breeding* ($25).

For further information on any of these books, contact me at LJConnor@aol.com. These books are also sold by this magazine, by various bee supply vendors, and by on line vendors. BC

Dr. Connor may be reached on line at LJConnor@aol.com. When not speaking at beekeepers meetings, he is finishing a book on making new bee colonies, called Increase Essentials.

CONFLICT IN THE HIVE

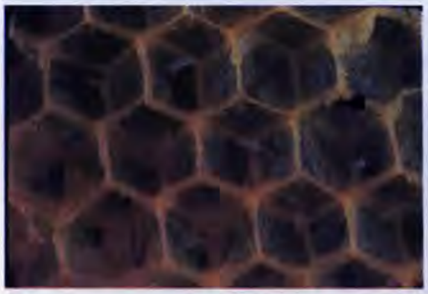
Dealing With Those Incorrigible Females

Nick Calderone

"Ask not what your colony can do for you, ask what you can do for your colony" – Anon. Bee Politician

At first glance, a honey bee colony appears to function like a well-lubricated piece of precision machinery – all of its parts perfectly meshed, functioning flawlessly and purposefully. Each worker embraces her role in the larger society, seeking only to maximize the common good. Unlike human societies, where conflict seems to play at least as much of a role as cooperation, worker bees need not be reminded of their duty to their colony.

There is one blemish in this



otherwise seemingly perfect union: 'laying workers' – those incorrigible females that develop soon after a colony has become hopelessly queenless. Once this occurs, the colony enters a death spiral, as workers abandon their common goal and seek to serve their own selfish interests. But such an occurrence is generally viewed as the exception to an otherwise harmonious existence, something that only occurs when the machinery has been irreversibly damaged. In other words, a laying worker is the exception that proves the rule.

Exception or not, the laying worker demonstrates that worker bees, though unmated, retain functional ovaries that can produce viable eggs that can develop into adult drones. Page and Erickson (1988) reported that a colony of laying workers may produce as many as 6,000 drones before finally dying. This raises the obvious question: are laying workers merely the uncontrolled and purposeless misfirings of a broken piece of machinery, or are they, to paraphrase Dr. Ian Malcolm of *Jurassic Park*, an example of life finding a way?

Recent advances in evolutionary biology appear to support Dr.

Malcolm. This emerging perspective retains a role for cooperation, but acknowledges the inevitability of conflict. Workers are caught in an eternal tug of war between their individual needs and the needs of the group.

One such conflict occurs over the maternity of the colony's drones. Francis Ratnieks examined this conflict (Ratnieks 1988) from the perspective of the genetic relatedness between a worker and the other members of the colony (Table 1). Think of relatedness coefficients as a measure of the likelihood that a gene will find its way into the next generation from the perspective of an individual bee. In the case where all queens are singly mated, a

Haplo-diploid species are those in which the male (drone) develops from an unfertilized egg and bears one copy of each of the many thousands of genes that make up the species' genome, that being the copy provided by its mother. Males are haploid. The female (queen or worker) develops from a fertilized egg (sperm and egg); and consequently, she bears two copies of each gene, one from her mother and one from her father. Females are diploid.

Since a male honey bee has only one copy of each gene, each of the 6 million sperm cells he produces receives the exact same set of genes. The female has two copies of each gene, and when an egg is produced, it receives one copy or the other, but not both. Because copies of each gene are allocated randomly, eggs have an average of 50% of the copies in common.

When a queen mates with one drone, all of the resulting worker offspring are related to each other by 0.75. This is because they all receive an identical set of genes from their father. Workers that share the same father are called super-sisters because of this unusually high relatedness. When a queen mates with many drones, the colony is made up of a number of subfamilies, each sired by a different drone. Workers with the same father are still related to each other by 0.75; but workers with different fathers are only related to each other by 0.25. This makes them traditional half-sisters. Consequently, a worker is related to her own sons by 0.5, to her super-sisters' sons by 0.375, and to her half-sisters' sons by 0.125.

worker is most closely related to her own sons (G = 0.50), and 'self' is the preferred source for the colony's males. Due to the haplo-diploid nature of the honey bee (BOX 1), a worker is related to her super-sister's sons (nephews) by 0.375, and they are her second choice. Again, because of haplo-diploidy, a worker is related to the queen's sons (brothers) by 0.25, and the queen is her last choice.

Multiple mating by queens changes things. When all queens mate twice, the situation is more ambiguous. However, honey bee queens mate with many drones, with estimates of the average number ranging between seven and 17. This changes some of the relatedness coefficients between an individual worker and her nestmates, and hence, changes her preferences for the source of the colony's drones. When queens mate with many drones, a worker's relatedness to her own sons and to her brothers remains the same; however, her average relatedness to her sisters' sons changes. Those sons still include the offspring of super-sisters (sisters that share the same father), but mostly they include the offspring of more distantly-related half-sisters (sisters with different fathers). A worker still prefers to rear her own sons, but her second choice is now to rear the sons of the queen (0.25) rather than those of half-sisters (0.125).

Genes come in many forms. For example, a gene for eye color may code for blue, green or brown. These alternative forms of the same gene are called alleles. Since a drone develops from an unfertilized egg, he has one copy of each gene, that being the allele provided by its mother. A female has two copies of each gene, one allele provide by her mother and one allele by her father. These alleles may be of the same form (homozygous) or of different forms (heterozygous). While there may be many alleles or alternative forms of a particular gene in the population, an individual male bee can only have one and a female bee can only have two.

Table 1. Coefficients of genetic relatedness (*G*) between an individual worker and males derived from various female sources. The superscripts indicate a worker's preferred ranking for each source of drones. *G* values for drones from random-sisters depend on the relative proportions of super-sisters and half-sisters present (*G* values shown for reference). When queens mate once, random- and super-sisters are the same because there are no half-sisters in the colony. With many matings, the proportion of half-sisters predominates, and the *G* value for drones from random-sisters approaches 0.125.

Source of male	**Self**	**Queen**	**Random sister**	**Super-sister**	**Half-sister**
1 mate	0.5^{1}	0.25^{3}	0.375^{2}	0.375	-
2 mates	0.5	0.25	0.25	0.375	0.125
Many mates	0.5^{1}	0.25^{2}	0.125^{3}	0.375	0.125

So, the conflict comes down to this. All workers prefer to rear their own sons. However, if all workers act that way, they will actually be rearing males with which they are less related. This is because most of the drones being reared will be the sons of other workers trying to do the same thing, and most of those workers will be half-sisters. One compromise is for everyone to rear queen-produced males (brothers). While not as desirable as a worker's own sons, they are more desirable than the sons of half-sisters. This appears to be how the colony has resolved its conflict; but isn't such a system open to cheating by selfish workers?

The general belief is that workers rear brothers and that laying workers only develop under abnormal conditions. Kirk Visscher studied this question using genetic markers that allowed him to distinguish worker- and queen-laid male eggs in a normal queenright colony. He found between 4% and 14% of the male eggs in a colony were actually laid by workers (average about 7%), a much higher figure than formerly thought (Visscher 1996). Now, previous studies have shown that only about one adult drone in a thousand is actually the offspring of a worker (Page and Erickson 1988; Visscher 1989). Therefore, even though 7% of the male eggs in a colony are laid by workers (about 1 in 10), something must be happening to them if only 1 in 100 actually become adult drones.

Ratnieks (1988) proposed that the attrition of worker-laid male eggs was due to a "police allele" (Box 2) that causes workers to favor the production of queen-produced males over worker-produced males. Although 'self' is the preferred source for drones, the police-allele eliminates self-reproduction because all workers in the colony are disposed to eat worker-laid male eggs. This should keep the occurrence of laying workers to a minimum because there would be very little payoff for such behavior.

In 1989, Ratnieks and Visscher reported on a series of experiments they conducted to test this hypothesis (Ratnieks and Visscher 1989). First, they introduced a known number of queen-laid and worker-laid male eggs to a queenright colony; and then, they counted the number of eggs remaining after 24 hours. In one experiment, 150 of 237 (61%) queen-laid eggs remained after 24 hours, but only four of 204 (2%) worker-laid eggs. In a second experiment, 152 of 256 (59%) queen-laid eggs remained after 24 hours, but only one of 226 (< 1%) worker-laid eggs. Similar results were obtained in a larger third experiment. Overall, 0.7% of worker-laid eggs remained in colonies after 24 hours compared to 45.2% of queen-laid eggs. These results were obtained even though the authors controlled for egg viability, relatedness, comb history and colony odor. Cleary, workers are policing their sisters.

Ratnieks (1995) pointed out that discrimination between male eggs based on the caste of the mother (queen or worker) requires that worker police have access to information that accurately indicates the maternal origin of those eggs. He proposed that this information is provided by a queen-produced, egg-marking pheromone. He targeted the queen's Dufour's gland (one of several glands located near the sting) as its likely source. In one study, he placed four groups of male eggs in a queen right colony (queen-laid, worker laid, worker-laid treated with ethanol, and worker-laid treated with an ethanol extract of queen Dufour's glands). After 20 hours, the group with the greatest proportion of eggs remaining was the queen-laid group, followed by the worker-laid group treated with Dufour's gland extract. Almost none of the eggs from the other groups remained. When he repeated the experiment with lower doses of the extract (1/10 and 1/100 dilutions), the effect was lost.

So, workers appear to have come to a resolution of their conflict, albeit one mediated by worker police. Workers are not completely compliant and do manage to lay quite a few of the male eggs (about 7%); but non-compliant workers (cheaters) are kept in check by the police who eat about 99% of those eggs within a few hours of being laid. Worker police appear to use a pheromone produced by the queen's Dufour's gland to discriminate between queen- and worker-laid male eggs. In the end, only about one adult drone in a thousand is the offspring of a worker.

How many workers actually engage in cheating in a normal colony? Based on dissections of worker ovaries, Ratnieks (1993) and Visscher (1996) estimated that the worker-laid eggs are the product of about 0.01% of the workers. That's one worker in 10,000. Clearly, worker policing is very effective in minimizing the occurrence of cheaters in the colony, but it does not eliminate it; and not surprisingly, the tug of war takes a predictable twist. In 1994, Ben Oldroyd and company reported on a colony in which a number of workers were able to evade the worker police, laying male eggs in queenright colonies and getting away with it (Oldroyd et al. 1994). They called this phenomenon 'anarchy in the beehive', but that is another story. BC

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It's A Miracle But It Takes A Lot Of Drones . . .

Suzanne & Frederic Miracle

My wife and I own and operate Miracle Honey bee Company in Tucson, Arizona. We are a 1,000-hive-and-building migratory commercial operation. Our bees start their year pollinating Almonds. After Almonds they return to Arizona. Here they are requeened if needed, nuced, and put into production. The whole process would be fairly typical of many commercial operations, if it weren't for the fact that Arizona is "Africanized."

Raising queens in an Africanized area requires a lot of European drones and an understanding of drone mating behavior. The drone is the key to maintaining manageable colonies. While we cannot expect 100% control, we can tilt the odds in our favor by flooding DCA'S with our drones, and then placing mating nucs in close proximity to those DCA's. Our expections are to out number Africanized drones with ours. We expect a small Africanized influence but it is manageable and acceptable.

Africanized bees represent a genetic challenge that can be managed and if done properly, can benefit commercial beekeepers by adding desirable traits to their stock. These traits include heightened mite tolerance, increased brood production, better foraging behavior and increased hygenic behavior. Of course, some beekeepers allow their bees to go completely Africanized which is their choice. To minimize these drone sources, we maintain an eight to 10 mile buffer zone between our mating areas and other Apiaries.

We have spent many years working on our stock. Through careful selection over the years, we have developed a stock well acclimated to our unique southwestern environment, i.e. "hotter than hell"!! We use a variation of the closed population breeding program. We like to call it an open population breeding program. The way it works is each breeder, five to 10 per spring or fall, generates 50 to 100 colonies. Those are run through our circuit and the following season breeders are chosen from those. By choosing the drone colonies we can cross breeders in our mating area with open matings.

We sometimes do purchase outside breeding stock to incorporate traits into our stock, SMR for example. Daughter queens are reared and mated. These colonies are then evaluated over the course of the circuit. If they prove out, they are incorporated into the program, if they don't, we segregate them, dequeen, dedrone them and requeen.

Frederic Miracle with one of his queen cell frames.

Prior to matings, we kill any feral colonies we find. It is amazing the places we find Africanized colonies; gas tanks of old tractors, irrigation pipes in the ground, bird nests, etc. Anytime we find feral Africanized colonies, we kill them. When we come across one of our own hives that is displaying too much African, we mark it and segregate it out. We do not kill them. This is because we have an extremely successful protocol for taming Africanized bees.

To reign in an Africanized colony, we take the colony and kill all the reproductives, ie; queen and drones. We also kill all the drone brood. Then we nuc it; bust it into three framers, stack it up, let the bees settle, pull it apart the next day or so. Into this reproductiveless nuc we put a queen cell. When we put the cell in, we tear down any cells they have started. We then leave it


Loading bees for almonds.


Higher elevation production yard.

alone, in our mating area, flooded with our drones for three weeks. Three weeks later, we check for our queen. Generally, we get 75% take. We mate on four-way pallets. With our newly mated queen, the colony behaves like an European colony. There are still Aficanized bees present, but they behave European. We believe, as do some USDA researchers, that the queen pheromones influence colony defense behavior.

Another strategy we employ to maintain our stock is to run large yards, over a hundred colonies. We also run at least two yards in an area. Thus, if a queen supercedes, our drones are present. We do not believe we have a very high supercedure rate. Any given colony will have a year and a half old or younger queen. We requeen colonies every other year. For example, spring 05 nucs will be requeened Fall 06, Fall 05 nucs will be requeened Spring 07. Colonies with our young queens are less likely to supercede.

Our operational effectiveness is streamlined by the use of single broodnests year round. When we requeen a colony, we are also nucing it. Having only one box to search for the queen expediates the whole process. Usually, we can find a queen in a minute or less. This enables the two of us to run 1000 + colonies by ourselves without outside labor.

Once the queen is found she is quickly dispatched, the brood divided up and the whole thing stacked back up. The next day or two at sunset we pick up all the dequeened divided-up colonies and move them to the mating yard. As we pull them off the truck, we pull the divides apart, putting the new nuc on it's pallet and scatter them around. We use landmarks in the yard for orientation for the virgins. All matings take place on four way pallets. (Life is too short to handle hives individually for matings.) We generally get 75% take. Ones that don't take get a frame of brood and another cell or mated queen, depending upon time of year.

Do we buy queens? Sometimes. We are a commercial migratory operation, so economics do play a role in deciding whether we graft or bust out the checkbook. Before we decide to do our own, we size up our drone population. This past Summer, 2005, was brutally hot, with temperatures exceeding 110° several days in a row. Our drone numbers were depressed. We decided to buy queens because we didn't have the drone numbers to successfully mate three to four hundred queens. Poorly mated queens do not work for us. The colonies with purchased queens can be used as drone colonies if we choose.

Our honey production is modest by most standards. A 40-50 lb. average is considered good. Running bees in the desert can be very challenging when it comes to producing honey. If we get the rain, the desert comes alive. Greasewood, palo verde, catclaw, and mesquite all produce nectar that the bees turn into a unique desert honey. Some consider mesquite honey gourmet. Unfortunately, for many years now we have been suffering with drought conditions. Of course other states have this problem too, but combine that with a desert landscape. Mesquite, our primary nectar source is sensitive to this and thus unpredictable.

To improve production, we take advantage of the fact that mesquite blooms later at higher elevations. We have locations throughout Southern Arizona at various elevations. Sometimes we forego moves, because the higher elevation won't produce enough to justify the travel expense. Southern Arizona is geographically in the northern tip of the Sonoran Desert, which makes for some interesting beekeeping. Some examples: We lost several hives last year to 117° weather. My wife and I are no stranger to heat exhaustion. We have rattlesnakes under our pallets, or in our pollen trap drawers. Black widows like to make their homes between hives on a pallet.

But our Winters are nice. Our Springs are hot and windy. The Summers are dreadfully hot, but monsoons can help cool us off. Monsoons can produce 60 mph winds that can cause a dust storm in seconds. Imagine working bees when a dust storm hits. Monsoons also produce massive rain in minutes, causing flash flooding. Our yards turn into instant mud bogs.

The only time a "hot" colony is an issue is when Suzanne happens to open a hive that doesn't quite agree with her. Then that hive immediately becomes my white elephant. Because of our queen program, hot hives are cooled off, thus a non issue.

In our operation these management techniques work for us. We have spent years fine tuning things to the point where we have good manageable bees that make money with acceptable labor. For others in different locations, these practices might not work. But this works for us here and it shows that Africanized bees can be overcome. It just takes a lot of drones. BC

YELLOW JACKETOLOGY 101

Part 2 – The Job

Charles Martin Simon

A pro has to be prepared for every eventuality in his or her line of work. There's no such thing as taking just the easy jobs, although I know of some removers for whom that is the job description; they are not expected to last. (I've seen them come and go; they come in like lions and leave like lambs, just like the month of March.) Once you assume the responsibility of the position, you have to deliver. You are the one that distraught human beings call with their stinging insect emergencies (it's usually an emergency), and if you fail to help them, you are on your way out of business.

You Need

1. A good, heavy-duty bee suit – the best you can get, because none of them are good enough. Better have at least two.
2. Heavy vinyl gloves with long cowls, at least two pair
3. High rubber boots, two of them, one for each foot
4. Duct tape
5. Heavy duty, black plastic garbage bags

Special note about garbage bags and Yellow Jackets. When you bag a nest and you knot the bag, no matter how tightly you tie it, they will manage to squeeze through the knot and find their way out. I have been studying this phenomenon for years, and it still mystifies me. So you have to bag them in at least two bags or put the bag into a plastic bucket with a tight lid. This also applies to Paper Wasps. When you're a Yellow Jacket pro, you also have to do Paper Wasps. I've had two Paper Wasp jobs of special note this year, one with 67 nests under the overhanging eves of a school, and the other with 84 nests all around under the overhangs of a three-story house. This can get physically challenging: you have to go up and down a 28' ladder, move it a few feet, and go up and down again, move it again, up and down again, and so forth. You had better be physically fit if you want this job.

6. Five gallon plastic buckets, with lids
7. A shovel, a pick (maddox type), a digging bar
8. Pruning shears, limbing shears, pruning saws
9. A chain saw, a cordless Sawzall, a cordless drill with 3/4 inch bit
10. A stethoscope
11. Weather-resistant caulk and caulking gun – make it two because they fail
12. A two-gallon pressure spray canister for the killing solution, and a spare because they fail, usually right in the middle of a job when the bugs are most stirred up and nasty, and you often need two full canisters to complete a job completely. A third canister for plain water, because you will work in locations without a water source and might need to wash something, or mix up more solution, or wash venom out of your eyes.
13. A few clear glass bowls
14. A good supply of killing solution.
15. A vacuum setup with collecting bucket (the same as used for bees)

Have I forgotten anything? Probably.

You'll also need a vehicle to carry your equipment and get you to the job site. I prefer vans so I can lock my stuff up, but you might prefer an open truck. Your equipment will include some long ladders, so you need a vehicle with adequate roof racks.

You also need climbing gear – for when it gets up over 40 feet, or the logistics prohibit ladder use. I celebrated my 61st birthday by climbing 150 feet up a redwood tree to take down a yellow jacket nest. Would you be ready for that?

Now Let's Do It

Get suited up fully before approaching a nest. Use duct tape around the tops of the boots and any openings around the zipper ends no matter how small, and cover any other tears or holes anywhere in your outfit. Stinging insects are more likely to crawl up than down, so pants legs inside boots instead of boots inside pant legs. Gloves with cowling give good protection when they're new and the cowling is stiff, but after they break in and the cowling gets soft, the Yellow Jackets can and do sting right through with ease. Most stings will be to the wrists for the stated reason – and neck, *because* when you move your head the netting gets close enough to or touches your neck, and you will get stung

If you are afraid of heights, this may not be the right job for you.

It takes a sensitive ear to find these critters.

from time to time, maybe not so much as a beekeeper but definitely as a remover.

Keepers tend to be more stiff and upright, as all phases of the operation are more rectangular. But you will be working in some very non-upright, non-rectangular situations, for example lying prone in tight crawl spaces in attics, virtually *inside* the nests you are working on. I know beekeepers who pride themselves on never using protective gear. They believe the bees know them and have accepted them as a friend because their vibes are so good. I shudder to think of the inevitable, like if they encounter an Africanized colony or even a gentle European colony in the wall of a school after the (rotten) children have been throwing rocks at it for the past two hours with the tacit encouragement of their (rotten) teachers. If not getting stung is a point of pride with you, I think you should think about a different line of work.

Get your killing solution ready, and your shovel when they're in the ground, or your ladder when they are up high, and your vacuum, if you're going to use that. Just don't assume because you think you're protected you can march right up and start spraying or vacuuming, or you will be in for a painful surprise. Approach carefully, slowly, smoothly, no sharp or quick movements, no heavy footsteps. Do not underestimate the intelligence and perceptive abilities of Yellow Jackets. They will recognize you for who you are and what you're up to, and they will take appropriate action. But you are smarter than they are, at least I hope you are, and a little stealth goes a long way.

Outdoor Dining Tip

Yellow Jackets can make eating outdoors a serious problem, sometimes impossible.

Commercial traps can do some good but not much. Their net affect is to strengthen the nests, much like pruning vegetation strengthens plants. But if you have a scheduled outdoor eating event in Yellow Jacket country, such as a birthday party or wedding, the area can be protected effectively with the time-honored technique of bribery.

Get fish scraps, a significant enough amount to provide an irresistible attractant and not run out during the required time. Place them in a bucket and hang the bucket strategically from a tree just out away from the area designated for the festivities, or hang a few buckets around just outside the perimeter – high enough so they won't be tampered with by children or pets. Position the stations early the day before the event, to give the insects a fair amount of time to find and get used to them

Aerial Nests

To relocate, capture the entire nest in a brown paper shopping bag, gently, preferably at night or very early in the morning – or you will have to come back for the Yellow Jackets that are flying when you do it, and you might have to anyway. Often the nest will be integrated with many branches and it will be necessary to do some careful trimming before you can bag it, and the slightest unfamiliar vibration will evoke an immediate armed response. You might have to do it in two sessions, or wait for what can prove to be a long time after clipping until they settle down enough so you can proceed. Once you've got them, scrunch the top of the bag together and duct tape it securely. Hang the bag in a wasp-friendly location and cut a hole in it to correspond to the nest's original entrance. The Yellow Jackets will take it from there, integrating their paper with the bag paper in a very beautiful collaboration.

If you are not relocating but destroying, put the nest into a large, heavy duty black plastic garbage bag, tie it off and put that bag into another bag and tie that off, or put it into a plastic bucket with a tight lid. Don't discard until they are no longer alive. I prefer to compost the entire nest with the deceased insects. (I used to freeze the nests and separate out the bugs, thinking I could sell them to the pharmaceutical industry. But in all these years, I've never been able to encounter or find any entity that buys Yellow Jackets. Seems it's a big secret. (So, if anybody reading this knows of or is interested in a reliable supply of Yellow Jackets, please get in touch with me: cmsimon@pacbell.net) Don't ever put an undead nest into a garbage can or dumpster, assuming they will die there just fine, because the obvious disaster is likely to occur when somebody goes picking around in the garbage, and more and more human beings are picking around in garbage these days.

In The Ground

Stand to the side of the main flight path. Be inert, like a bush or a tree or a rock. This is one of the most important pieces of advice I have for you. Don't secrete adrenalin; Yellow Jackets can smell it. Don't be nervous, afraid or excited. Hold your spray wand like it was a stick directed at the hole. Start by spraying the insects coming and going. Or set up your vacuum with the tube end at the hole, partially blocking the hole, and suck them up. When the traffic has all but stopped, this can take around an hour, start digging out the nest. Once you crack into it, a shocking cloud of Yellow Jackets will explode into the air "mad as hornets," and if you just stand there, they will be all over you and digging in, and you will get stung, no matter how well suited-up you think you are. Remember to be especially aware of your wrists (crush them as soon as they get on you) and neck (careful how you move your head). And don't look up, or they will spray venom right into your eyes, and that is painfully disconcerting.

When you crack the nest, back off fast enough and far enough so they don't come after you, and wait for them to settle down. Crush the ones already on you. Then approach again, spraying the flying cloud, which now should be centered close enough around the nest to make hitting them *en masse* practical, and keep knocking them down until it gets quiet enough so you can dig up the nest. Chop it up and saturate it, re-bury it, and you're done, basically.

But now, depending on proximity to human beings, you might have to wait for and eliminate the remaining insects that come back from the field. This part can take another hour, but it will insure the best possible chance of avoiding negative after effects. Otherwise, you can leave the left-over insects to die off on their own.

Left-over Yellow Jackets will not be aggressive. They will be distressed, flying around and around the spot trying to find the nest, until they exhaust themselves and expire. Sometimes, if enough are left over, they will group up and camp out under a rock or piece of wood or cavity or hole in the ground, as close as they can get to their old nest site. They can't last too long when they do this, but they can last a few weeks and develop defensive behavior. If that happens, you have to do a follow-up, probably at no charge, so you always want to do it right the first time.

In Walls, Roofs, Trees Or Other Cavities

If you have good access, you can saturate the nest with the killing solution, plug up the hole, spray returning insects, and be done. But it's usually not going to be that simple. It can be hard to figure out just where the nest is, because they can be going in a hole

Staying calm and still and quiet is the key to dealing with underground nests.

and traveling through a wall to an entirely different location, so no matter how much you spray in the hole, it's not going to faze them much. That's where the stethoscope comes in. You locate them, drill a three-quarter inch hole, and spray them through that.

A Trick For Special Occasions

There are those times when you will have to eliminate nests without spraying anything at all, not even if you use a bio-degradable killing solution. Sometimes, the owner will be extra sensitive. Sometimes other restrictions will apply.

Sometimes, if the nest has a clear hole and the ground configuration is conducive, you can use a clear glass bowl inverted over the hole. It has to be set in place carefully and completely sealed all around the edge (with dirt), and if there are any other holes, make sure you plug them well or use a second bowl. This is not a new technique; it is a perennial favorite with the no-insecticide bunch, but what they don't tell you is it takes two or three weeks and requires inspection and adjustment nearly every day, because they will dig or make or find new holes and you will have to keep ahead of them. The same method can be used on a cavity in a tree or wall, adhering the bowl and sealing holes with duct tape. A downside is this type of operation is prone to vandalism by miscreants and environmentalists.

Conclusion

My advice if you want to be a Yellow Jacket professional is don't do it. Having said that, if you're still considering it, consider this: Nobody can teach you the important part, the feeling and attitude you need to do it right. You have to get that all by yourself, and the only way to get it is with experience. It takes good judgment to not make bad mistakes, but good judgment only comes from making bad mistakes. And with Yellow Jackets, that means pain, lots and lots of pain.

Part III next month will cover the business side of this occupation. Don't miss it! BC

Charles Simon removes yellow jackets, and other in-the-way insects, and keeps bees near his home in Soquel, California.

The Honey Garden

Connie **Krochmal**

Combining the best of honey bee pollinated garden crops with honey recipes. The best of two worlds.

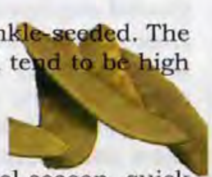
PEAS Gardeners are an eager bunch. Long before the danger of frost is past, we want to get going. Put that pent-up energy to good use by planting cool season crops, such as garden peas.

These thrive in cool Spring weather. Peas can be planted as soon as the ground can be worked.

Garden peas are also known as English or green peas. Though they are sometimes called sweet peas, these should not be confused with flowering sweet peas, which are poisonous.

Peas have tendrils, which help them attach to anything within reach. The pea pods develop from white blossoms. Appearing in the leaf axils, these are mostly single or in pairs.

Peas may be smooth-seeded or wrinkle-seeded. The latter are slightly sweeter flavored, and tend to be high yielding.



Growing Conditions

Peas dislike Summer heat. As a cool season, quick maturing crop, these are usually planted during the Spring or Autumn. In warmer regions, such as the Deep South, they can also be grown during the Winter months.

Spring crops are generally more successful since Fall weather can be unpredictable. Peas are hardy plants. The seedlings can tolerate temperatures slightly below freezing.

Choose a sunny spot for peas. Any type of well drained soil is suitable for this vegetable. Peas will not tolerate waterlogged conditions. These prefer a fairly neutral pH, 5.5 to 6.8.

By the way, the growing conditions and care are identical for all kinds of peas – garden peas, edible-podded peas, and sugar snaps.

Planting

The soil type determines the proper planting depth. Pea seeds should be planted two inches deep in sandy soils. For clay and loamy soils, one to 1½ inches is fine. Seeds germinate in about a week or so. Allow about two to three feet between rows.

If you haven't grown peas in the garden before, coat the dampened seeds with a bacterial inoculant powder before planting them. This only needs to be done once since the bacteria remain in the soil. Packs of inoculant are usually available from some garden centers and mail order catalogs you order seeds from.

RECIPES

Ann **Harman**

Peas are a very neglected vegetable in our kitchens even though we have an interesting selection of types: green peas, snow peas, split peas, and petits pois, but not black-eyed peas – they are really beans. Green peas are frequently served just plain. To be a bit fancy we sometimes put in a sprig of mint during cooking. Pearl onions or mushrooms can be combined with green peas. A small dribble of honey definitely enhances the taste.

Did you know that peas are rarely served at banquets– because they tend to fall off the fork thus leading to embarrassing moments. The British have a cure for that – mash them onto the back of your fork.

The French combine peas with lettuce and the results are delicious. Try these two recipes with the French influence.

PEAS A LA FRANCAISE

4 cups fresh green peas
12 small new onions, chopped
1-1/2 cups shredded lettuce
1 tablespoon chopped parsley
1 tablespoon chopped chervil (optional)
1/4 cup butter or margarine
1-1/2 teaspoons salt
4 teaspoons honey (mild is best)
4 tablespoons water

Place all ingredients, mixed well, in covered saucepan. Bring just to a boil, then simmer gently with lid on, until peas are cooked but still bright green, about 10 minutes. Serves 4-6.

Troy-Bilt Tiller Owner's Recipe Collection

BRAISED PEAS WITH LETTUCE

1/4 cup unsalted butter
1 head Boston lettuce
3 pounds green peas, shelled

Plant Care

Pea varieties that are 2½ feet or less in height require no support. Taller kinds need arbors, trellises, stakes, or fences. Get the support in position before the seedlings emerge. Doing so later can damage the plants.

Pea plants will need watering during dry periods, particularly after the pods begin to develop. When weeding, hoe or cultivate very carefully to avoid damaging the shallow roots of the plants.

For most reasonably rich soils, fertilizers aren't needed. Adding excessive quantities of nitrogen (the first number listed on fertilizer labels) can interfere with pod production.

For the most part, peas suffer from few serious insect problems. Aphids sometimes feed on the new growth, causing the plants to wilt. Usually, a spray of water from a hose gets rid of them. It may be necessary to repeat this several times. Pea weevils and pea moths can lay eggs on the pods. Once the larvae hatch, they crawl inside the pods, and begin eating the peas. The moths are most common in the North, while pea weevils are found throughout the country.

Diseases can occur if peas are planted in the same spot year after year. If you can't rotate crops, buy resistant varieties. Diseases that are most likely to attack peas are fusarium wilt, powdery mildew, and downy mildew.

Harvesting Peas

Don't delay. Begin harvesting as soon as the pods are well-filled. When peas get too mature, they become tough and starchy. Several harvests are needed. The plants continue to produce pods over a period of several weeks.

Try to harvest just before you prepare and cook this crop. Like sweet corn, the sugar in peas begins converting to starch as soon as the pods are picked. If you must pick earlier, refrigerate them.

I eat my peas with honey,
I've done it all my life.

It makes the peas taste funny,
But it keeps them on my knife.

anon.

Status as a Bee Plant

Though peas require no pollination, some cross pollination does occur. Peas are good bee plants. However, they are seldom plentiful enough to provide huge surpluses of nectar and pollen. The plants have produced crops of honey from time to time. Very light in color, its flavor is reminiscent of peas.

Varieties

With literally hundreds of pea varieties available, your best bet is to choose ones that are suited to your area. In regions with short growing seasons, early yielding varieties work best.

Pea varieties differ in the size of the plants and pods, and ease in shelling. In general, the taller varieties will tend to be more productive than dwarf ones. There are early, middle, and late maturing varieties with crops ready in about 50 to 70 days. Late yielding ones are best suited for areas with lengthy Springs.

Among the most commonly grown varieties are the following. These tend to be reliable and productive.

Alaska

Alaska pea begins bearing very early, only 50 to 56 days. Dating from the 1880s, this heirloom is especially recommended for locations with short growing seasons. It gives very good yields. About two feet in height, the plants produce 2½-inch-long pods with five to seven peas. This is resistant to fusarium wilt.

Green Arrow

Green Arrow is late yielding, 68 to 70 days. Reaching about two to 2½ feet in height, this plant needs no support. It shows resistance to fusarium wilt and powdery mildew. The gigantic pods contain nine to ten small peas. One of the most popular varieties, this is often used as a main season crop. ➢

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1 teaspoon salt
1 teaspoon honey (mild or rich, but not strong flavor)

Wash but do not dry the lettuce. Melt the butter in a heavy 2-1/2 quart saucepan. Cover the bottom of the saucepan with damp lettuce leaves. Put the peas on top, sprinkle with the salt, drizzle the honey and cover peas with more damp lettuce leaves. Cover tightly and cook over low heat for 20 minutes or until peas are just tender. Serve the peas with or without the lettuce.

James Beard's Theory And Practice Of Good Cooking

This next recipe has lettuce in it so I guess that is why it has a sort-of French name.

GREEN PEAS BONNE FEMME

1/4 pound Canadian bacon, cut into 1-inch pieces
1 tablespoon butter or margarine
3 cups fresh green peas
6 small white onions, peeled
Inner leaves of lettuce head
1/2 cup water
1/2 teaspoon salt
1/4 teaspoon pepper
1/2 teaspoon honey
1 tablespoon finely chopped parsley (garnish)

Fry bacon in the butter or margarine until lightly browned. Add peas, onions, lettuce, water with honey mixed in, salt and pepper. Cover. Cook 10 to 15 minutes until peas are tender. Drain. Sprinkle with parsley before serving. Serves 6.

The Encyclopedia Of Creative Cooking
ed. Charlotte Turgeon

Perhaps the French style of cooking peas originated back in 1696 when ladies of the court enjoyed an evening snack of green peas. These recipes may inspire you to have such an evening snack.

Knight

This variety matures in about 61 days. Resistant to nearly all pea diseases, this reaches about 1½ to two feet in height. Knight pea needs no support. The large pods contain six to eight flavorful peas. With a very good yield, Knight pea is among the best of the early yielding, large-podded varieties. This variety was bred at the Geneva experiment station in New York.

Laxton's Progress

This dwarf, hardy heirloom has long been a favorite with home gardeners. Laxton's Progress pea is especially productive. Resistant to fusarium wilt, it is particularly suitable for cool climates. Harvest begins in only 58 to 64 days. The large pods are easy to shell, bearing very sweet-tasting peas.

Lincoln

An heirloom dating from 1908, this heat-tolerant variety begins bearing in about 65 to 67 days. The bushy plant is compact and space saving. Only 1½ to 2½ feet in height, this needs no support. Lincoln produces lots of easy to shell pods, three to 3½ inches long. These have eight to 10, small, exceptionally sweet peas.

Little Marvel

This wrinkle-seeded variety has been available for nearly a century. Little Marvel shows resistance to fusarium wilt. Its pods are three to 3½ inches long. These contain six to eight, large, highly flavorful peas. Very productive, this begins yielding at an early age, about 62 days. The vines are only 1½ feet tall.

Mr. Big

Mr. Big was an All-America Selections vegetable winner in 2000. This variety is especially good for Fall plantings. Very early bearing, this produces crops in about 58 days. The vines are 2½ feet in height. It has thick, slender pods. Four to five inches in length, these are easy to pick and shell. They contain eight to ten, very plump, sweet-tasting peas. These retain their sweetness longer than most. Mr. Big is resistant to fusarium wilt and mildew.

Wando

This wrinkle-seeded variety is especially dependable in the South. Withstanding heat and cold, it yields in about 65 days even when it is planted late and the weather becomes hot. Released in the 40s, it was bred in South Carolina. The two-to-2½-foot-tall plants need no support. Up to 3½ inches in length, the pods have about seven to eight, medium-sized, flavorful peas. BC

Connie Krochmal is an award winning garden writer and a beekeeper in Black Mountain, SC.

DO YOU KNOW?

Various Beekeeping Topics

Clarence **Collison**
Mississippi State University

In the October 2005 column, answers to two of the questions were challenged by the readership and need to be clarified based on additional research. The first question that we need to re-examine is number 15. ___ Mated queens produce a more complex version of queen substance than virgin queens (True or False). The answer given was True, Virgin honey bee queens produce a less complex mixture of "queen substance" than is produced by mated queens. These differences in "queen substance" allows the workers to differentiate between mated and virgin queens. The queen pheromones affect queen acceptance during the requeening process. Dr. Tanya Pankiw, Department of Entomology, Texas A & M University, during her Ph.D. research found that all five chemical components associated with queen mandibular gland pheromone were detectable from the mandibular glands of virgin, drone laying virgin, and mated queens. What differed was total amount and relative proportion of each component. The pheromone is considered just as "complex" but changing in "quality" along a continuum from virgin to a mated and egg-laying queen. Further testing is needed to examine the role of queen pheromone blend quality in queen acceptance during the requeening process.

The other question that was challenged was question 20. ___ Inhibits or delays the initiation of foraging, and our answer was: D) Brood pheromone and E) Worker regulation pheromone. In addition, Dr. Pankiw and others have shown that supplemental amounts of queen pheromone, specifically components from the mandibular gland, has been shown to delay age of first foraging in small colonies. Further research has shown that brood pheromone acts as a two-way primer on foraging ontogeny, i.e. accelerating and delaying. One study showed dose-dependent responses to brood pheromone while another showed that some individuals were delayed while others were accelerated when using only one dose of brood pheromone. Chemicals extracted from the surface of adult workers and applied to the colony also affect the age of first foraging. Extractions from foragers increase the age of first foraging, while extractions from young pre-foragers decrease the age of first foraging.

Please take a few minutes and answer the following questions to determine how familiar you are with various beekeeping topics.

Level 1 Beekeeping

1. ___ *Varroa* mites have a lower reproductive rate in Africanized honey bee colonies in comparison to European colonies. (True or False)
2. ___ Colonies with the "*Varroa* Sensitive Hygiene" trait (formerly known as the SMR trait) remove both reproductive and non-reproductive *Varroa* mites from sealed worker brood cells. (True or False)
3. ___ Deformed wing virus and Kashmir bee virus can be found in honey, pollen and royal jelly in infested colonies. (True or False)
4. ___ An Apiguard® gel formulation was recently approved by EPA (section 3) for use in the United States and is effective against both *Varroa* and tracheal mites. (True or False)
5. ___ Requeening Africanized honey bee colonies is difficult since acceptance of European queens is significantly lower than when European queens are introduced to European colonies. (True or False)
6. What are the two basic steps when a queen kills her rivals while they are still within the queen cell? (2 points)
7. What happens if a drone encounters a queen with a mating sign during the mating flight and what happens to a mating sign when the queen returns to the hive? (2 points)
8. Name the two basic ways that queen mandibular pheromone is distributed within the hive. (2 points)
9. ___ When pollen and honey supplies are abundant in colonies, *Varroa* mite reproduction increases. (True or False)
10. ___ Tylosin (Tylan®) is fed to colonies in sugar syrup to prevent and control American foulbrood. (True or False)

Advanced Beekeeping

11. During the queen's mating flight what is the primary functions of the queen's mandibular gland and tergite gland secretions? (2 points)
12. ___ Bee Boost® is a commercial formulation of synthetic Nasonov pheromone. (True or False)
13. ___ Ethyl oleate, a component of the brood pheromone, is also produced by adult worker honey bees and acts as a chemical inhibitory factor to delay age at onset of foraging. (True or False)
14. Octopamine, dopamine and serotonin are associated with the honey bees ___________:
A. Circulatory System B. Reproductive Systems
C. Nervous System D. Respiratory System
E. Digestive System
15. ___ Newly emerged worker honey bees have higher levels of biogenic amines (dopamine, serotonin and octopamine) than older workers from the same colony. (True or False)
16. ___ The levels of biogenic amines (dopamine, serotonin and octopamine) found in worker honey bees are related to colony genetics (different queen lines), bee age, seasonal changes and amount of stress. (True or False)
17. Pheromones are either primers or releasers. Please indicate the differences in these two subclasses of pheromones. (2 points)
18. ___ A shortage of foragers in a colony leads to accelerated behavioral development and precocious foraging. (True or False)
19. ___ Brood pheromone is a blend of 10 fatty-acid esters found on the cuticles of honey bee larvae. (True or False)
20. ___ Pheromone that works in conjunction with queen mandibular pheromone to inhibit queen cup production.
A. Queen trail or foot-print pheromone
B. Feces pheromone C. Egg marking pheromone
D. Queen cell pheromone E. Queen retinue pheromone
21. ___ Brood pheromone affects the activity of hypopharyngeal glands and inhibits ovary development in worker honey bees. (True or False)

Answers On Next Page

?Do You Know? Answers

1. **True** *Varroa* mites have a slightly lower reproductive rate in Africanized honey bee colonies than European colonies because Africanized honey bee workers have a slightly shorter capping cell stage (about 20 hours), when compared to European colonies.
2. **False** Colonies with the *Varroa* sensitive hygiene trait (formerly known as the SMR trait) remove reproductive female *Varroa* mites from brood cells during the pink-eyed pupal stage. They do not remove non-reproductive mites.
3. **True** In studies dealing with the spatial and temporal movement of viruses within a honey bee colony and their association with *Varroa* mites, it has been found that both Kashmir and Deformed Wing Viruses were found in honey, pollen, royal jelly and brood food taken from the colony,
4. **True** Apiguard®, a thymol slow-release gel formulation was recently granted a section three registration by the Environmental Protection Agency for use against *Varroa* mites in the United States. It also aids in the control of tracheal mites.
5. **False** The acceptance rate of European honey bee queens in Africanized and European colonies has been determined. Queen introductions were performed with the traditional Benton mailing-cage method. Queen acceptance in both types of colonies was not significantly different.
6. The queen chews a hole in the side of the queen cell

   The queen inserts her abdomen into the hole and stings the rival queen
7. A drone mating with a queen who has a mating sign is able to push it aside and proceeds to mate with her.

   Back in the hive, the workers use their mandibles to remove the mating sign from the queen.
8. Direct queen to worker contact (worker licks pheromone from queen's body).

   Pheromone passed from worker to worker throughout the colony
9. **False** Research with Africanized honey bee colonies showed that when pollen supplies were abundant in the colonies, *Varroa* mite reproduction levels increased in comparison to times when pollen supplies were low. The amount of stored honey had no influence on *Varroa* mite reproduction. Additional studies have shown that when honey bee colonies are fed pollen paste, the number of fertile *Varroa* females (females leaving some type of offspring) increased. An increase in *Varroa* mite reproduction has also been observed in colonies fed pollen substitutes.
10. **False** Tylosin (Tylan®) was recently approved for the control of existing American foulbrood. It is ***not*** to be used as a preventative treatment. The drug is mixed with powdered sugar (not syrup) and colonies receive three single doses, each one week apart, for a complete treatment.
11. Queen mandibular pheromone serves as a primary sex attractant, attracting drones from a distance.

    Secretions from the tergite glands are effective in close range activity, stimulating the release of copulatory activity.
12. **False** Bee Boost® is a commercial formulation of queen mandibular pheromone. It consists of a cotton wick containing a specific amount of the pheromone. This product was developed from the research of Drs. Winston and Slessor at Simon Fraser University. They were able to define and synthesize five components of the pheromone and these are precisely blended together to form this lure. Currently it is commercially produced by PHEROTECH.
13. **True** Ethyl oleate is produced by adult forager bees and is most concentrated in the bee's crop. Through trophallaxis between older and younger bees, the chemical acts as an inhibitory factor delaying the age at which foraging starts.
14. C) Nervous System
15. **False** The levels of dopamine, serotonin and octopamine are significantly lower in the brains of newly emerged worker honey bees than in brains of older workers from the same colony.
16. **True** Research has shown that the levels of biogenic amines (dopamine, serotonin and octopamine) in the brains of honey bees are influenced by at least four factors: genetics associated with unrelated queens, season of the year, the age of the bee and the extent to which the bee is stressed. Levels of the amines were highest during June-September, corresponding to high levels of colony foraging activity.
17. Releaser pheromones stimulate a response instantaneously, comprising a behavioral response mediated by the nervous system. Primer pheromones on the other hand act to physiologically alter endocrine or reproductive systems of the recipient, which as a result may acquire a new repertoire of behavior patterns. Thus an individual's reaction to a primer pheromone is slower than with a releaser pheromone.
18. **True** Behavioral development in a colony is partially regulated by juvenile hormone levels within individual bees and rates of biosynthesis. Behavioral development is also influenced by the needs of the colony. A shortage of foragers leads to accelerated behavioral development and precocious foraging.
19. **True** Brood pheromone is a blend of 10 fatty-acid esters. These compounds are a mixture of methyl and ethyl esters of linoleate, linolenate, oleate, palmitate and stearate. The esters are non-volatile and are found on the cuticles of honey bee larvae.
20. A) Queen trail or foot-print pheromone
21. **True** Brood pheromone inhibits ovary development in worker honey bees and two components of brood pheromone, methyl palmitate and ethyl oleate, have also been shown to increase the activity of hypopharyngeal glands, which produce proteinaceous substances that are fed by nurse bees to larvae.

There were a possible 13 points in each test level this month. Check the table below to determine how well you did. If you scored less than six points, do not be discouraged. Keep reading and studying- you will do better in the future.

Number Of Points Correct	
13-11	Excellent
10-8	Good
7-6	Fair

Clarence Collison is a Professor of Entomology and Head of the Department of Entomology and Plant Pathology at Mississippi State University, Mississippi State, MS.

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BOTTOM BOARD

Heal Thyself

Peter **Sieling**

Late in the evening after the Fall harvest I wearily watched the last drops of honey drip from the extractor into a bucket. A solitary bee crawled across the concrete floor. I was talking to my ankle – rather my ankle was talking to me, reminding me of an accident many years ago. The doctor said that a break that serious doesn't always heal properly. I've thanked my ankle many times for healing so well, but lately he's been complaining.

"It's not that I think you don't care about me," he grumbled. "It's just that I feel like you've been taking me for granted. You don't seem to care about my feelings – you just go on working like I don't even exist, especially when you lift honey supers all day. You could do something nice for me once in a while to let me know you still care – maybe a hot bath or a relaxing vacation. At least you could get one of those hive lifters or use shallow supers or something. Maybe you could give up beekeeping and try stamp collecting instead..."

I didn't answer right away. I was contemplating a different solution, less expensive than a hive lifter and more interesting. I had recently attended a lecture on treating multiple sclerosis, rheumatism, plantar warts, and other medical conditions with honey bee venom. I had hoped to hear a researcher from a major university enumerate the latest research results obtained through clinical studies, show slides of indecipherable graphs and use big words that I could take home and drop into conversations with other beekeepers.

Instead Lester Shanks, a retired auctioneer, amateur phrenologist and folk healer rambled for two hours about the miraculous benefits of bee venom, propolis and honey. He told stories he'd heard from other healers, like the one about a man confined to a wheelchair since birth. After a few sessions of apitherapy, he ran in the Boston Marathon and later jogged to the top of Mt. Everest. From my seat in the back row, I smelled malpractice lawsuits. I decided to stick to magnetic insoles and aromatherapy.

There is anecdotal evidence suggesting bee venom may have a therapeutic effect. One theory suggests that when venom enters the body, antibodies rush to the site and attack the venom and every other foreign substance they encounter, including viruses, bacteria, organ transplants and WWII shrapnel. Who knows? It could be true. I needed someone to experiment on who wouldn't swell up and die on me. I looked down at my ankle. He was still complaining.

"...I mean, we used to do fun stuff together, you know – long walks, movies, soccer, ice skating. Now it's just work, work, work..."

At the county fair, Dan King, our legendary local beekeeper, always ended his demonstrations by grabbing a bee and stinging his arm to gasps of shock and horror from the crowd. It would be fun to impress girls – I mean audiences like that. Perhaps when Dan retires I could become the next local legendary beekeeper and a maybe a folk healer, too.

The lonely honey bee sipped from a drop of honey on the floor, six inches from my foot. I picked her up by the wings. She curled her abdomen toward my hand, exposing her stinger. I set my ankle on the opposite knee, found the tender spot with my thumb and took a deep breath.

"Ooh, a massage!" sighed my ankle. "Ah, that's the spot right there. Mmmm, you should have been a masseuse, or is it a masseur? What's in your other hand there? Hey!"

The bee took two seconds to plant the sting, then flew up and away towards the light.

"Ow!"

On a bad day I might get six to 10 stings working with bees. Sometimes they hurt a little. You ignore them and keep working. Deliberately planting a stinger on a sensitive spot is different. Great throbbing waves of pain swept up and down my leg. I limped to the house and fell through the front door. Nancy looked around from the kitchen sink. "Good Heavens, what happened!" she cried.

"Ice," I gasped. "A bee stung my foot."

"The ice is in the freezer. You'll have to get it yourself. My hands are wet." Once a woman bears a child, she loses all compassion. We should never have given them the right to vote.

The swelling and inflammation disappeared within a few days. After four more weeks the ankle pain miraculously disappeared, so I guess the sting must have worked. At least my ankle hasn't spoken to me since. Now at the slightest twinge, I treat it immediately: with two Ibuprofen tablets.