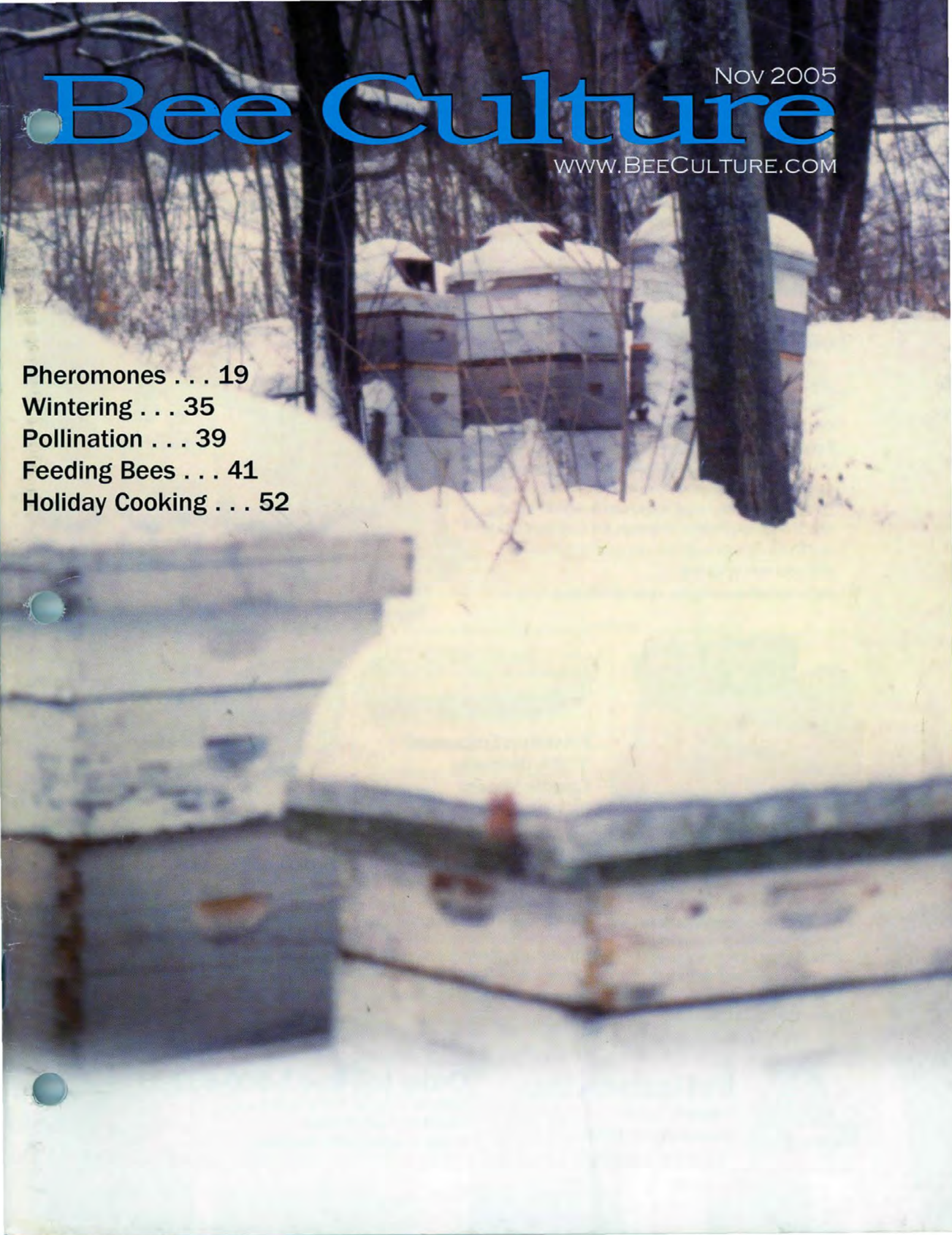

Bee Culture

Nov 2005

www.BeeCulture.com

In the North November shows the first hard hints of what's to follow: Winter. Snow and ice. Cold and wind. Gray and bleak. And long, dark times. Outside.

But within, bees and beekeepers keep warm and dry and busy. In November they settle in for the long haul, wrestling with honey and enjoying the short break from their outside tasks.

We don't know what the bees do about the holidays, but beekeepers are preparing for their November and December celebrations, and all of us here at Bee Culture *wish you and yours a safe and happy holiday season.* (photo by Kim Flottum)

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Subscription Information

U.S., one year, $21.50; two years, $41. 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), November 2005, Volume 133, Issue 11, is published monthly by The Root Candle Co., 623 W. Liberty Street, Medina, OH 44256. Periodicals Postage Paid at Medina, OH and additional mailing offices.

Contact Information

V800.289.7668 • V330.725.6677 • F330.725.5624 • www.BeeCulture.com • email: info@BeeCulture.com

Advertising

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

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

Bee Culture

THE MAGAZINE OF AMERICAN BEEKEEPING

NOVEMBER 2005 VOLUME 133 NUMBER 11

FEATURES

DEPARTMENTS & COLUMNS

Comments
Suggestions
Criticisms
Kudos, and
anything else

Reheating Honey

Quite often someone asks what to do with their honey which is granulated in the comb. Most likely they would prefer to get it from the comb – save the comb – and market the honey.

This can be done, if the process justifies the cost? If you have a fairly tight extracting room you can mount an evaporative air conditioner in one corner close to *the ceiling* AND place a thermostat controlled heater on the floor below the air-conditioner. Set the thermostat on 85° to 90° and close the doors. This air conditioner *must be* on the inside of the room *not handging out a hole or window!* It also has to have water to it. This method creates a humidifier Stack the supers eight high on drip boards and leave five or six inches space around each stack. In five or six days the honey will liquefy enough to extract it. It make take a bit longer for some honey.

Most honey which has granulated in the comb is low in moisture content therefore this operation will not raise the moisture content too much.

I know this will work for once an early hard freeze came on the plains of Texas before we had gotten the honey off and we used this method. We had about 1,500 modified supers with nine frames in each. We lost only about 50 combs.

James Ranne
Mullin, TX

DDT and *Varroa*

In response to the letter written by Anthony Keys in the September 2005 issue of *Bee Culture*. I was surprised to see him mention DDT as a possible use for *Varroa*. My brief internet search has shown just the opposite that DDT is harmful to honey bees. We must not forget what DDT did and can do to our entire eco-system? This is not speculation either, scientists have shown DDT to cause cancer, reduce birth weights, it is deadly to birds, aquatic life and other wildlife.

I agree that the *Varroa* is a problem for honey bees but DDT carries a lot of responsibility in its use and should not be considered lightly.

"There was once a town in the heart of America where all life seemed to live in harmony with its surroundings ... Then a strange blight crept over the area and everything began to change ... There was a strange stillness ... The few birds seen anywhere were moribund; they trembled violently and could not fly. It was a Spring without voices. On the mornings that had once throbbed with the dawn chorus of scores of bird voices there was now no sound; only silence lay over the fields and woods and marsh." -Rachel Carson, *Silent Spring.*

Ava Marshall
Colorado Springs, CO

1st Place Candles

I would like to thank you for your award for the 1st place winner of Class 17, Two Beeswax Candles, all others. The winning entry this year was submitted by Donna and Mike Brahms, Cumberland, IA.

Melanie Bower
Iowa State Fair

Kudos From Hans-Otto

Just want to tell you Hans-Ottos got his September copy of *Bee Culture* and he wants you to know he's very satisfied with how you have designed his article and made the language better The article has made impact already over here too.

Could be of interest to you that Hans-Otto and his projects are backed by the government in Norway and he has gotten quite a sum of money to help him realize all of his plans. And support is getting stronger. He has a new partner now in his projects, a microbiologist PhD.

Erik Osterlund
Norway

Iceland Beekeeping

I am a small hobby beekeeper, with five hives in Philadelphia, PA and two hives in Grass Valley, CA. I am also a Naval Reservist and as part of my duties I was sent to Iceland for a time. I have always been a connoisseur of varietal honeys so I researched the bee/honey resources of Iceland. It is one of the few internet searches that yields only one page of hits, and there is really only ONE site of relevance. It is "frontpage.simnet.is/egillrs" and I encourage you to visit it.

I sent an email to Egill, the site developer, and received a prompt reply from him. I called him when I was there and was invited to visit his home and his apiary. When I arrived he had a suit of Viking Bee Armor ready for me and we went to work the hives. He was looking for his new queens, or signs of them. As set forth in his website, his bees are aggressive, and during our time in the yard we were covered with bees. One stung me through my

thick leather glove (a rare and priceless red badge of courage).

On his excellent site you can read the somewhat sad, but very brave history of Icelandic beekeeping. There were no native honey bees in Iceland. Importations began in the 1930s and were hampered by climate, winds and political issues. There are not many beekeepers in Iceland. Bees have to be brought from Norway or Sweden. He brings them personally by ferry across the North Sea from Norway, then by van 700 Km (435 miles) to the capital, Reykjavik. It is an expensive and daunting process. Egill Sigurgeirson, a physician like myself, did his training in Sweden, and during that 10 year period kept bees. When he returned to Iceland, he naturally brought his bees with him. He struggled to get hives to survive the Icelandic Winters which, though generally milder in temperature than ours, are longer, darker and windier

My experience in Iceland, on two separate occasions, was that the wind blew pretty steadily at about 20 knots (23 mph). Often it would ramp up to 30 40 knots (28-46 mph), and not infrequently to 60-70 knots (69-80 mph). There was a rare day when it would not blow. Many birds seem to negotiate this, so I assume bees can as well. There seems to be adequate flora for bees. On the southwest tip of the island, there was an abundance of dandelions, clover, heather, Alaskan lupine and many other small flowers. I looked daily for bees but saw none. (This is one of the vegetationally most sterile and impoverished areas of the island, consisting mostly of lava fields.) I consider Egill the beekeeping pioneer of Iceland. He has recruited numerous independent beekeepers (mostly farmers, I think) in different areas of the island, supplying them with bees and forming the Icelandic Beekeeping Association. His website is entitled "Byflugur" which I think is a really neat name, and I have pirated it for my small operation. Needless to say they experience challenges that we never see in this country. There is precious little native wood in Iceland now, and the hive bodies I saw were made of Styrofoam. The frames were of wood, but he is contemplating plastic. Foundation was of wax or plastic. The bees were dark and not Italian. They were Carnolian or Russian, I think. They draw comb, make drone and queen cells and honey just like our more temperately placed bees. He takes ALL the honey off in the Fall, then feeds granulated sugar in the Winter.

Because mating of local queens is problematic given their constant low temperatures, he requeens every year or two. Aside from these differences, I recognized this right away as an apiary, and him as a serious beekeeper. Their Winters are very dark (in the south of the island the sun rises at 11AM and sets at 2 PM at solstice), and the Summers are correspondingly light. It is never very warm, with maximum temperatures in the Summer being in the mid 70s (for a day or two). Most Summer days are in the 50s or 60s, and the nights in the 40s and 50s. Egill manages 18 hives at his home just outside of Reykjavik, is an engaging person, and probably like most beekeepers has a yard full of projects relating to bees and half way done. I think his wife endures this passion of his, just as my wife does.

The bonus of my visit was that I came away with about a pound of Icelandic honey (representing perhaps 1% of the previous year's crop). For this rare delicacy I did trade 2½ pounds of Tupelo Honey (a GOOD deal) from North FL where I am now stationed.

J. Norris Childs, MD
Medical Corps, U.S. Navy Reserve

Sucrocide = Work!

If anyone is tempted to give the new mite fix called Sucrocide a try, my blessings on you. Having tried it, it is my considered opinion that attempting to spray every bee in a hive is every bit as insane as it sounds. Doing it three times over three weeks, as the directions suggest, is not thrice as insane, but more like nine times as insane.

I ordered a small bottle of Sucrocide in my last bee order, thinking what the heck. It sounded nuts but I've done lots of things that sounded nuts in the past, and we won't go there now.

The stuff comes in a small bottle, and mixes easily. I put two gallons of water in a standard garden sprayer, then added three tablespoons of the Sucrocide solution, shook it and pumped it up. That part was a snap.

I went to the first hive and popped the top. So far so good. Then I started pulling frames and spraying each one. On both sides. Thoroughly. I work mediums, so with three to four boxes per hive, at nine frames each, that's 27 to 36 frames, times both side. With confused bees flying everywhere. By the time I'd finished spraying (most of) my first hive, I was more drenched than the bees, in sweat. That first hive took 20 minutes and drained about half my energy. And I'll be thankful if I didn't kill the queen in the process.

Later, remembering the nifty multi-head sprayer I'd seen written up recently, I attempted to minimize the frame pulling step and just yank the busiest frames and spray the rest between the frames. That sounds like an easier way, but it saves only little and accomplishes even less, I believe. I doubt if I wetted 15% of the bees in hives where I used this, and most of those got a good drenching right in the face, as they peered helplessly up from between the frames.

By the end of it all, I was reduced to looking over the bees on the most busy frames, spotting a mite on the back of some poor bee, and giving that mite a good hosing down. My mind was stuck on Queen's song "...and another one bites the dust..."

I know managing *Varroa* will take a multipronged approach. I know Sucrocide will become one of those prongs for a select few, who don't mind going to the far end of "labor intensive management."

John Lewis
Winchester, VA

INNER COVER

We have over 100 honey reporters in the field. We survey them every month for the prices they are buying and selling honey for across all products, sizes and locations. Our list isn't static though, as we continually add new reporters to cover an area underreported, replace reporters who have left the fold, or add a dimension to the report previously undercovered. And we constantly fine tune the report to accurately reflect what's going on in all of the regions we cover.

In 2003 we surveyed our reporters for the November issue, asking how their Spring, Summer and Fall crops had fared, how prices were holding up, and their average yield per colony for the season. We improved that survey in 2004 and again this year, and have turned up some interesting figures.

Unlike the USDA which does not include beekeepers with five or fewer colonies for their survey, our reporter population reflects the cross section of the U.S. beekeeping population or as near as we can approach that ideal.

Our predictions from these surveys have been pretty close. In 2003, we predicted a 69.9 lbs/colony average – the USDA, in February 2004, found 70 lbs/colony was the average. In 2004, we said 70 lbs/colony, the USDA said 71.8 – thus, we're pretty confident in our numbers. Moreover, though the crop last year was short, our reporters scored it a 3.3 (1 = very good, 3 = average, 5 = terrible) which that 70 lbs. reflects. This year it's not so good. They scored this year's crop at 3.53, a lot lower than average, and, their numbers reflect what we found – our prediction this year is for an average 59 lbs./colony. Moreover, our research indicates a slight increase in the number of colonies in the U.S. this year from 2.556 million last year up to 2.60 million this year (based on increasing pollination in California). This will produce a U.S. crop of right about 153,400,000 lbs. The 'average' U.S. crop is about 220,000,000 lbs. You heard it here first.

With Chinese honey slow to get in due to high prices, and Argentina's next crop some time in the future, the question quickly becomes – where will that additional 66.6 million pounds normally produced here come from? Where indeed.

•

Some of this reduced crop can be blamed on the devastating storms that hit the gulf in September Wind and water destroyed, we are told, many colonies in the storm's worst areas. Commercial, sideline and hobby beekeepers lost not only colonies, but homes, honey houses, vehicles, stored equipment and even beeyards. Should you, or your local organization feel that helping a fellow beekeeper is the right thing to do, but don't know how, read on.

The folks listed below are officers in their State organizations, and have agreed to forward donations from you to those in their states that most need help. About a year from now we'll hear back to see how this was used. With honey prices just a tad higher this Fall, consider helping someone who is still looking for his hives.

Alabama Beekeepers Association
Mr. Jimmy Carmack, President
201 17th Ave. NW
Birmingham, AL 35215-5444

Louisiana State Beekeepers Assn
Mr William Hummer, President
287 Sligo Road
Bossier City, LA 71112

Mississippi Beekeepers Assn.
Mr Harry R. Fulton, Secretary/Treasurer
P.O. Box 5207
Mississippi State, MS 39762

Texas Beekeepers Association
Mr. Jimmie Oakley, Treasurer
1799 Goodson Court
Round Rock, TX 78664-3706

•

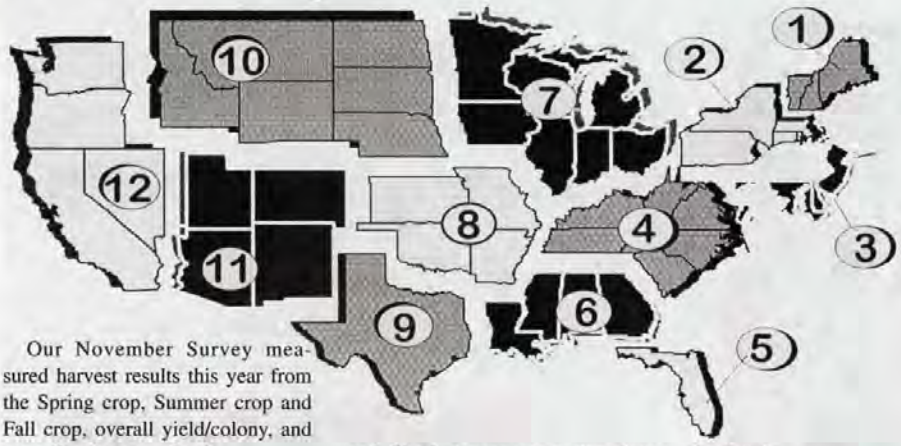
The expansion of the African honey bee into several new states this season has brought the subject of Press Relations from the back burner into the spotlight – whether you live in Florida or Massachusetts.

Have you hugged a reporter lately? Maybe it's time to reacquaint those old friendships. You can pretty well bet that if there's an incident of some kind in one of those new states, it'll be news, and you or someone in your association just might get that phone call from the local paper And starting now eases the way come Spring when lots and lots of bees are on big trucks and on the move. And every year, one or more manage to tip over So even if they aren't Africanized, that many bees make the news. You ready?

Kim Flottum

Predictions Hurricane Help Press Relations

NOVEMBER – REGIONAL HONEY PRICE REPORT



Our November Survey measured harvest results this year from the Spring crop, Summer crop and Fall crop, overall yield/colony, and overall prices received.

The scores are:

1 = Very good
2 = Pretty good
3 = Average
4 = Not too bad
5 = Very bad

Thus, a score of 1.5 means on average, the crop was half way between very good and pretty good. A score of 4.3, then, isn't very good at all.

Overall, across all regions, the Spring crop was judged 3.2 by our reporters, the Summer crop 3.7, and the Fall crop 3.9; these are *all* below average. If you carry this to national level, it comes out to an average of 3.53 – closer to 'not-too-bad, than average. We also looked at average yield/colony; and, like last year, are pretty close to what the feds find. How much? Not much, actually. 59 lbs/colony, across all regions. That ranges from 95 lbs/colony in Region 8, to 33 lbs/colony in Region 12.

Prices received by our reporters were above average, however, at 2.8, ranging from 1.5 in Region 8 to 4.7 in Region 6. Overall, this makes sense – a short crop in Argentina, limited Chinese honey due to the tariff and a short U.S. crop *should* equal a short crop and higher prices – supply and demand works!

Region 1
Spring 3.3, Summer 2.8, Fall, 3.9, prices 2.8, 3.4 overall crop. 79 lbs/colony average.

Region 2
Spring 4.0, Summer 4.3, Fall 4.5, overall 4.3, 36 lbs/colony average. Prices 2.3.

Region 3
Sprin 1.0, Summer 5.0, Fall 5.0, overall 3.7. 28 lbs/colony average, prices 2.0.

Region 4
Spring 3.0, Summer 4.7, Fall 3.0, overall 3.7. 41 lbs/colony average. Prices 2.7.

Region 5
Spring 3.3, Summer 3.8, Fall 3.0. Overall 3.4. 83 lbs/colony average. Prices at a low of 4.3!

Region 6
Spring 3.6, Summer 4.3, Fall 4.3, overall 4.1. 61 lbs/colony average, prices a low of 4.7!

Region 7
Spring 2.8, Summer 3.3, Fall 3.3, overall 2.6! 63 lbs/colony average, prices 2.9.

Region 8
Spring 2.5, Summer, 2.3, Fall 3.0, overall 3.0. 95 lbs/colony average, prices 1.5. Wow!

Region 9
Spring 2.3, Summer 3.5, Fall 4.3, overall 2.6. 72 lbs/colony average, prices at 2.9.

Region 10
Spring 5.0, Summer 3.0, Fall 4.7, overall 3.7. 51 lbs/colony average, prices at 2.6.

Region 11
Spring crop 2.5, Summer 3.7, Fall 3.6, overall 3.3. 66 lbs/colony average, prices 2.6.

Region 12
Spring 5.0, Summer 4.0, Fall 4.5, overall 4.5. 33 lbs/colony average (Terrible!), prices at 4.0 – equally *terrrible*!

	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	0.96	0.90	1.00	1.00	0.73	0.70	0.91	0.96	0.96	0.80	0.99	1.13	0.70-1.13	0.92	0.92	1.11
55 gal. Amber	0.91	0.70	0.91	0.98	0.55	0.68	0.86	1.25	0.65	0.91	1.01	0.95	0.55-1.25	0.86	0.78	1.04
60# Light (retail)	95.00	122.33	103.08	100.00	98.50	107.50	84.22	103.33	106.67	103.08	125.00	97.50	84.22-125.00	103.85	104.78	105.52
60# Amber (retail)	95.00	116.67	85.16	94.73	92.00	98.00	85.14	102.50	71.67	115.00	118.40	80.00	71.67-118.40	96.19	97.23	108.34
Wholesale Case Lots																
1/2# 24's	43.68	43.58	58.63	53.00	59.04	37.50	41.27	58.63	58.63	58.63	30.00	58.63	30.00-59.04	50.10	38.16	40.12
1# 24's	55.84	58.94	60.10	50.20	54.46	42.00	62.69	62.40	42.61	92.40	74.30	72.60	42.00-92.40	60.71	61.85	61.38
2# 12's	77.28	54.79	65.70	53.95	60.12	48.00	56.42	66.00	46.90	65.70	31.00	61.80	31.00-77.28	57.30	54.76	52.38
12 oz. Plas. 24's	51.72	52.94	54.18	49.90	52.44	48.00	50.56	51.60	47.09	48.00	69.60	55.20	47.09-69.60	52.60	52.66	51.58
5# 6's	56.37	65.93	65.04	52.72	65.04	60.00	62.53	50.00	55.80	51.00	70.70	72.00	50.00-72.00	60.59	59.03	64.38
Quarts 12's	84.21	100.35	84.21	68.70	74.82	76.00	85.06	76.00	70.00	110.88	85.00	84.00	68.70-110.88	83.27	84.63	82.49
Pints 12's	45.69	49.95	45.69	56.67	43.60	59.00	59.10	44.00	37.75	69.00	28.99	51.00	28.99-69.00	49.20	51.74	48.57
Retail Honey Prices																
1/2#	2.42	2.48	2.68	2.61	1.79	2.99	2.65	2.29	2.68	2.69	3.06	2.68	1.79-3.06	2.59	2.49	2.43
12 oz. Plastic	2.88	2.95	3.99	3.10	3.06	3.25	2.76	3.52	2.89	3.02	3.79	3.25	2.76-3.99	3.20	3.29	3.09
1 lb. Glass	3.54	3.61	3.79	3.85	3.51	3.75	3.53	4.48	3.80	3.83	4.41	4.15	3.51-4.48	3.85	3.95	3.84
2 lb. Glass	6.75	6.38	6.79	5.56	6.39	6.99	6.06	8.12	6.64	6.71	6.00	7.72	5.56-8.12	6.68	6.73	6.48
Pint	4.63	6.88	6.75	5.54	5.37	4.75	6.06	5.50	5.88	6.31	5.56	6.00	4.63-6.88	5.77	5.96	5.68
Quart	8.38	8.55	11.79	7.94	7.76	7.50	9.28	9.09	7.50	12.81	9.34	10.00	7.50-12.81	9.16	9.51	8.68
5 lb. Glass	11.50	13.56	12.06	12.58	14.00	14.00	13.18	15.99	13.85	13.02	12.58	12.06	11.50-15.99	13.20	13.63	12.85
1# Cream	4.13	4.40	3.29	6.10	4.29	3.75	4.95	4.58	6.84	4.73	5.29	3.97	3.29-6.84	4.69	4.69	4.52
1# Comb	4.38	4.25	6.59	5.35	6.40	4.75	6.03	4.37	6.59	6.59	6.00	6.00	4.25-6.59	5.61	5.56	5.00
Ross Round	5.27	4.06	5.27	5.26	4.00	3.00	5.95	4.99	5.00	5.25	4.84	5.27	3.00-5.95	4.85	4.90	5.06
Wax (Light)	2.94	2.58	2.45	1.90	1.57	2.00	2.60	2.38	2.65	2.45	1.83	2.50	1.57-3.45	1.99	2.31	1.83
Wax (Dark)	2.10	2.35	1.52	1.60	1.38	1.75	1.00	2.00	2.58	1.52	1.40	2.00	1.00-3.00	1.73	2.24	1.53
Poll. Fee/Col.	50.00	70.00	38.00	36.50	40.00	44.00	45.33	60.00	77.50	69.04	75.00	65.00	36.50-77.50	55.86	48.85	40.43

RESEARCH REVIEWED

Explaining • Defining • Using

Steve Sheppard

"Now hiring – only experienced workers need apply."

Within the honey bee, the tendency of workers to perform specific tasks at different times of life has been called "age-based division of labor" or age-based polyethism. Young adult workers typically perform in-house duties, including brood care, food processing, wax production and so on, while older workers move out to the great big world to forage and keep the colony supplied with adequate supplies of pollen, nectar, water and propolis. When specialized tasks are performed by groups of workers of a generally similar age, these "temporal castes" maintain some ability to change jobs if necessary. This has been demonstrated by experiments that removed a certain age class of worker and recorded the response of the colony as it attempted to make up for the loss. For example, when the foraging force of elder bees is experimentally removed from a colony, younger bees can move up their personal timeline to become "precocious foragers." Likewise, if the individuals of nurse bee age are removed experimentally, some older workers can resurrect their physiological ability to produce brood food and revert again to caring for developing larvae. However, there remains uncertainty over the nature of the flexibility at the colony level. That is, are workers flexible enough that they can switch "easily" to other tasks as needed or is it a rather "costly" affair for the colony?

The issue of the flexibility of the temporal castes of honey bees was investigated recently by a researcher from Cornell University (Johnson, 2005). Over the course of two separate trials, Dr. Johnson set up a total of 12 queenright observation hives with similar bee populations, brood and food conditions. Individual bees used to set up the experimental colonies were taken from the brood nests of parent colonies and presumably contained few or no foragers. For each trial, three colonies were set up a week to ten days prior to the establishment of the remaining three. On the third day following the establishment of the latter colonies, the researcher undertook observations of foraging activity in all colonies. Foraging activity was measured by taking counts of the number of foragers returning to the colony within a five-minute period of each hour Pollen foragers were tallied and foragers returning without pollen were counted as nectar foragers. On day three of the foraging observations, the author used a plastic grid overlay and estimated the bee population, the number of empty cells and the number of cells containing brood, pollen and nectar. The period of foraging data collection continued for five days (day three – day seven).

Based on the grid overlay estimates made during the trials, population sizes between the newly set up colonies and those that had recovered for seven to 10 days were not significantly different. This was attributed to the effort made to equalize the observation hives at the start of the experiment and to include only young brood that would not emerge during the course of each trial. Similarly, the amounts of stored honey, brood and empty cells were not significantly different between the two groups. However, significantly more stored pollen was found in the group that had more time to recover before the experiment began. The author pointed out that high levels of stored pollen are known to reduce pollen foraging by colonies, so the fact that the higher pollen containing recovered colonies actually foraged more during the second week (than the newly set up colonies that contained less pollen) indicated that both groups were still "pollen deficient." Overall, there was a significant difference in foraging effort between the colonies given a week to recover and the colonies that were recently set up. The "recovered" colonies foraged at a higher level for both nectar and pollen than colonies that had been recently set up.

Based on the significant differences in foraging found between the two experimental groups, the author concluded that "honey bee colonies do not recover quickly from the loss of their foragers." Even at the end of the experiment, the recovered colonies (that by then had been set up for two weeks) were foraging at a higher rate than were the colonies that had been set up for one week. These findings were consistent with published research showing that honey bee foragers become more skilled in their task as time goes on. Thus, the colonies that had the week to 10 days of "extra" time to recover most likely had a more skilled foraging work force than the other group. While the current study did not contradict earlier research that reported the potential for task switching or physiological changes by individual workers in a colony following catastrophic worker losses, the author pointed out that

some studies may have exaggerated the importance of such processes. The task switching ability of most individual workers or the ability of a colony to quickly recover from catastrophic losses of workers, therefore, may be more limited than has been proposed.

Dr Johnson suggested that one way to put together his finding of the high cost of adjusting to forager loss with previous reports of flexibility is that a colony may indeed contain a limited number of individuals that can switch tasks relatively easily Evidence for this comes from studies demonstrating the occurrence of precocious foraging by some young workers even in unstressed colonies. In summary, Dr. Johnson concludes that his research "... clarifies a significant misunderstanding concerning the flexibility of honey bee colonies...." He also points that "task allocation, the study of how individuals know what to do and when, is equally important."

While the paper is clearly about honey bees and unraveling mysteries that remain about the organization and conduct of work within their social system – it is tempting to muse about parallels in the human condition. We all have the potential to change our jobs and devote ourselves to an entirely new vocation, if necessary. Some folks like the challenge of changing their vocation a number of times within their adult life. However, it seems more typical that, once we reach some level of specialization at some age within our social system, we humans find it more comfortable, profitable or otherwise rewarding to remain in that job. Of course, the trick is to keep our chosen "task specialization" as diverse and interesting as possible because, unlike the honey bee (as far as we know), we also want to have fun. BC

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Johnson, B.R. 2005. *Limited flexibility in the temporal caste system of the honey bee.* Behavioral Ecology and Sociobiology. 58: 219-226.

DOES THIS SMELL RIGHT TO YOU?

A slightly heavier look at pheromones.

Dick Marron

Last year someone told me that if you save dead queens in a bottle of alcohol, you could use this as a swarm lure. "Yeah, right," I said, but I put a couple of queens in a jar when I replaced them. With no inspiration on what to do with them, I kept them in my toolbox in my van. About six months ago I found the jar had overturned and a lot of that precious liquid had leaked out. I added alcohol and more queens. These ladies seem to bite the dust at the drop of a hat these days so the tool box had collected a handful of empty cages as well.

One day this Summer I moved a couple of frames of bees to take advantage of their queen cells. I'm hoping my own queens will live longer. Somehow I had half a pint of bees left homeless. I shook them out in front of the nearest hive. (On that hot day a half pint of beer would have found a home faster.) Having finished that first chore, I went on to other jobs in the apiary.

An hour later brought me back to the truck. I was ready to go home but the truck was full of bees. "Oh, no," I thought. "I left honey out and started robbing" Not so, I quickly reasoned because I didn't have any honey yet and I'd cleaned up last years. Following the trail, I found a cluster of bees on those old queen cages. Right next to them was the jar of deceased queens. I picked it up with its adhering bees. It seemed as though, for a moment, that they could look through the glass at the dear departed. Is that called irony? Pathos? I'm sure it's called something!

All this was interesting but I did have beer at home and needed to get moving. I didn't want to drive through the neighborhood in my bee-veil. They think I'm nuts enough. The "costume party" explanation they rumored last time would wear thin. Besides, I'm of the opinion that it's usually a lot safer to see where you are going.

Most of the people who read this magazine are pretty smart. You know the solution to my dilemma that day, don't you? Why read on? The rest of you, still reading, may have interest. I set up a nuc box near the truck. Inside this box I put all the cages and the jar I sat back to wait. Nothing happened. Being patient, I tried again. I painted a little of my bee elixir near the entrance. Then I sat again. Am I the only one who has a plastic lawn chair in the beeyard? It accounts for a lot of my best work.

Brood, too, has its own message.

It took half an hour. A few bees at first, then a few more clustered at the entrance. Then they started their Nasanov trick. You know, the one where they get in that ungraceful position with the Nasanov gland in their butt exposed and use their wings to fan air past it? I'm told this smells like lemons. That's a break, isn't it? Eventually the van emptied and my artificial swarm was hived. My needs were met but the bees were only slightly better off. They were inside a dead hive. The only behavior they knew had led them to a dead end.

This same behavior, within its proper context, would normally have led to something different. That context would be the *system* of the hive. To study this behavior in isolation would be like a study of one organ, say a liver, to learn about the human body There are about 50 pheromone elements in the hive as counted by good counters. To study them we must isolate them to see what reaction the bees have to the individual chemical. It's like studying chlorine to see why salt is salty. (Salt is sodium chloride). People sent out to taste chlorine never reported back. Sodium may be saltier but it catches fire in air before you can taste it. Point being that some things, like beehives and salt, are more than the sum of their parts. While we are here I should mention that saltiness is an *emergent* property. It emerges from its components as something that wasn't there before. These two new words: "system" and "emergent" are as far as I'm going. Relax. Swarming is an emergent behavior.

A system is like a "mobile." (Dictionary: a hanging sculpture, easily moved by the wind). You parents know what I mean. They used to be

Calling all wanderers, come on home.

hung over every crib to give babies something to do in their long days while they plan their takeover Give a mobile a spin and it will come to rest in a new location but perfectly balanced. Your body is a system. So is your family. Your job fits you into a system. A system corrects itself and is more than the sum of its parts. On the larger scale we talk about weather systems. We are learning about them but there are too many variables to keep track of. It's been said that a butterfly could flap its wings in Beijing and affect the weather . . on the other side of the world.

A good example of a system in action, albeit smaller, is your right arm. Or left, if that's your persuasion. To smoothly lift a hand and scratch your nose, several muscle groups must act in concert. If they didn't, you'd slap yourself in the mouth. Coincidentally, that's exactly what I did when I started this article!

The beehive has those 50 pheromone elements to interact with things like temperature, forage, space, amount of brood, number of foragers, time of the year, and the chaos involved with dealing with a beekeeper. Since *they all interact at the same time* what chance do we have to really understand? Still we must pick away at it.[2]

The first division is between two classes of pheromones: those that release an immediate response and those that prime the pump for a later response. Releasers and primers complete with a way to remember them. Seems simple enough, doesn't it? A minor problem arises when you find that some of them do both.

The aggregate of the queens' pheromones act as a primer to inhibit queen cell building. The upshot of this one item affects all the others. This queen pheromone also stimulates foraging, hoarding and comb building. When the bees aren't flying one thing to check is the queen. You knew that. Another primer is brood pheromone. While the collection of pollen occurs to raise brood the obverse is also true. The presence of brood stimulates pollen collection. (This is the same brood that was fed royal jelly laced with that heavy pheromone from the workers' hypo-pharyngeal and mandibular glands). Collection of pollen was raised more than twenty percent when bees had to walk through the brood chamber with their load. Drone brood has some sort of self-regulation mediated by pheromone. If one removes drone brood from a colony they make more. If you give them more, they cannibalize some. Occasionally the genetics of the queen and her mating result in the laying of diploid drones. This is the only time a drone has a father and they have no place in the hive. Apparently, they arrive exuding a "cannibal" pheromone, and the eggs are eaten. This accounts for one type of "shotgun brood."

There's a new kid on the block with the primers. Her name is Ethel Oleate and she makes girls out of potential adults. She understands the power of her chemistry. In fact ethel oleate is a chemical. Credit goes to many contributors from the U.S., Canada and France; another mystery has been solved. For many years researchers wondered how the oldest bees could keep the next youngest from maturing into foraging. Apparently older workers (who are the foragers) keep a supply of this material in their body and feed it to the housekeepers with the result that they stay in the job. If there is a die-off (like a pesticide kill) of foragers, less of this material is available to be fed and more bees grow into the job of foraging. (When *we* want to keep a kid immature, we just overprotect them).[5]

The Nasanov pheromone is a releaser The behavior released is "come to this place." The normally covered gland is in the caboose of the bee (seventh dorsal abdominal tergite, if you must know) and, when activated, exudes a liquid with seven or so known components. This is swept into the air by the bees fanning air past it with their wings. Quick evaporation means quick communication. On a normal day this can be seen at a water source as bees call in others to haul water Water of course has no odor (though nothing is certain) so directions given in other ways could be difficult to follow. What pheromones help a bee decide that she's a water carrier, I don't know. Bees have shown an affinity for nasty smelling water though. Maybe it's because it's easier to find. This week they were working a few damp spots in the drive where I threw some salt to kill weeds. Clean water they mark. They don't mark good nectar sources though, but they will mark unperfumed sugar syrup. Disoriented bees will mark the entrance to the hive. Nasanov comes into play big when it's swarming time. When the scouts find a likely new home they mark it with scent. They fly back and forth marking the path. More bees add to what should be a riot and eventually the queen is airborne with her personal chemical pack (QMP). Somehow she is encouraged to the front of the pack and the whole swarm smoothly follows. If you have a few minutes this week *you* figure out how to move 25,000 individuals smoothly. Oh, yes, the only thing you can use is the smell of lemons.

The next simple releaser is the alarm pheromone. If you are working your bees and you smell a strong banana odor, it means something. Your nose is too sensitive and your

bees are mad at you. Others say they smell it; I never have. Certainly, the bees can smell it. A fruit salad, discovered at a picnic, would seem to create a crisis of ambivalence for a bee.

Alarm pheromone originates in and near the sting apparatus. Even those of you who bought "Beekeeping for Dummies," know where that is. I would have put it somewhere else but like anything airborne I guess there's only just so many places to attach armament. There's no place on the drone, for instance, and they live their amorous life without protection. There isn't much protection in a sting anyway because, like the kamikaze, the bee dies when she stings. (Actually, so does the drone when he . . does his thing, only he more or less explodes!) Barbs on the stinger hold it to the interloper and the entire sting with its poison sac still pumping, detaches from the bee. All that equipment is laden with pheromones and contributes to a very definite marking of the enemy. For stinging to continue, even in this environment, the quarry must be moving, preferably jerkily. The queen has none of those barbs and in the snobbery of royalty reserves her stinging for other queens. Enough about stings.

Oops, a little more. Alarmed guard bees will open their sting chamber and, ala Nasanov, fan air past it. They then run into the hive and spread the odiferous word. The body language changes and they are primed for action as recruits join them for a defensive battle. A secondary alarm pheromone is produced by the mandibular glands but is not so well understood. It may be a warning at the entrance or may mark robber bees that have been bitten and held. It may mark nectar sources that have been depleted. As you may have guessed there are a number of components to these alarm scents. In the *system* of the hive the threshold at which bees react and the amount of pheromone produced, (both genetic endowments) are mediators. Nasanov and alarm pheromones are not specific to hive or race of bee. This sort of explains why the last hive you open is likely to be the most defensive. The African bee has an additional component to its alarm pheromone.

"There's a new kid on the block with the primers. Her name is Ethel Oleate and she makes girls out of potential adults."

European bees respond to it.

It's 10 o'clock; do you know where your mandible is? It's your jaw, silly. That was easy. Do you know where your tarsus is? It's your ankle. If you said it's a city in southern Turkey, you get partial credit. The mandibular gland and the tarsal gland are named for where they are. How about the hypopharyngeal gland? My pharynx is below my larynx and "hypo" would be below that. I'm sure I don't have one. (I know I have a pharynx because the military told me I had pharyngitis for weeks. Luckily, it turned into pneumonia, which they understood better and cured). In the bee it's in the front of the pharynx (read: throat) and below it. In a competition of "which is the most important gland", this guy is right up there. With the mandibular gland it produces food additives in the nurse bee, (including a heavy pheromone: 10HDA)* This gland changes function as the nurse bee matures and produces "invertase" to process nectar into honey in the adult bee.

There is a tarsal gland on the deer It smells like turpentine. To the extent that feet smell differently than the rest of us . . we may have a vestigial tarsal gland. OK, let's not go there! (Except for those of you with a foot fetish). Certainly the queen has a tarsal gland. Actually six. They feed "trail pheromone" down to her little footpads so that wherever she moves she spreads her influence through her feet. Part of the inhibition of laying workers and queen cell construction come from trail pheromone. Queen cells are built on the edge of the comb where the queen rarely walks. Perhaps it is the fading of this material that allows so-called supercedure cells to be built in the middle of a comb. Workers have these too but the queens' put out 13 times more of it.

On the top of the queens' abdomen are the "tergite" glands. Bees in the queens' retinue will touch her and lick her. This pheromone is spread by touch and has a role in forming her court, inhibiting queen cell building and laying worker formation.

Because it's complex I saved the best for last. The pheromone(s) that really regulates things in the hive are found in the queens' mandibular gland. (e.g. QMP) There are 40 or 50 elements (depending on who you read) in this magical material. Within this matrix there is a changing relationship between components. For instance, one element promotes swarm cluster density while another encourages cluster dissipation. It is spread by touch, transfer of food by bees that have licked the queen and through the air. (Good people argue about this.) If the queen is removed from the hive the bees know it in 30 minutes and fan Nasanov at the entrance apparently in an attempt to facilitate her return.[1] I'd guess that's the "roar" that a queenless hive will put out. If she stays away, the proverbial stuff hits the fan.

If she stays away, the sword of Damocles falls. The matron has held this calamity in suspension almost single-handedly. The desperation with which the workers attached themselves to my little jar is understandable. The workers in a queenless hive will search out young larvae and start queen cells, usually within 24 hours. How many depends on the size of the hive and the density of it as well as the amount of brood. But there will be a limit to the number Bees will visit these open cells often, taking away some reassurance that all will be well. When the cells are capped just a little over a week later, they are still visited often. Something emits through the capped cell that allows the hive to continue. A hive with a queen cell feels itself queenright. Looked at from that vantage, they must have built just enough cells to serve their pheromone needs. In fact, when a queen

is failing, in an unlikely balancing effort, they have been known to build cells and then later tear them down.

If all goes well the first queen to emerge dispatches the others and life goes on. One could see that nature would select for fast growth and emergence of queens in this case. Slower growing queens wouldn't have a chance. Then she faces the bird-dodging hazards, lack of drones, entering the wrong hive and a plethora of evils waiting for her. If it doesn't go well, things decline further in the colony. In the classic view, workers have been standing by with their undeveloped ovaries, for a last ditch effort. Thousands of ovaries have been held captive by the QMP, Trail, and brood pheromone. (The presence of brood alone will postpone this event) Eventually they start to lay eggs. Since they can't mate, these infertile eggs produce only drones. Colony death is just around the corner

But wait! These bees have relatives where new queens emerged from this situation. Maybe all is not lost. Some have said that this drone rearing is an effort of the bees to throw what resources they have left into creating drones so as to at least have a genetic input to the pool of colonies in the area. I think it more likely that their common ancestry with other bees that *can* recover from this point has left this sliver of behavior as a little joke. Who is going to laugh last, though? They could still make a new queen through parthenogenesis via automatic thelytoky. There. Now you can say you read a highly technical article on bees.

(I'm laughing now because you thought you were safe from oversize words and those are two of the worst I've come across). While it's highly unlikely to happen in our bees, it does happen rarely, that a worker lays an egg that is diploid. (Female, capable of reproducing). They *could* come up with a new queen. One strain, *Apis Capensis*, the cape bee, in Africa, is taking over domestic hives there without mercy The workers move into these hives and lay eggs with the eventual demise of the hive. And what bee are they a parasite of? The African bee, *Apis: Scutellata*! Serves them right, I say. I'm not sure it's funny to the African beekeeper. I take it back.[3]

I can't quite leave this subject until I tell you that the laying workers may not be waiting their turn. Some people say that up to seven percent of the eggs laid in our hives are laid by workers and eaten by the egg police. This is studied as being a normal thing. How do they know which eggs to eat? Those little eggs all look the same to me. Pheromones from the eggs, would you believe?[4]

So my little jar of queens really does contain magic. Not only extracts of QMP but also traces of tarsal gland and tergite gland pheromones, and maybe something from the Koschevnikov gland as well. There are more glands but everything isn't known about them and I have to stop somewhere.

This remarkable method of communication wouldn't work without the specialized receptors found in the antennae of the bee. There are receptors there that cause physiological changes in workers. It may cause them to emit further signals. They are used to gather and to transmit pheromones by touch. Bees are often seen "chatting" antennae to antennae. The more we know the more there is to know.

* 10HDA is shorthand for a form of Decenoic acid. Other forms exist in the pheromone world of the bee. (9ODA,9HDA,10ODA) I'm trying to shield you. BC

Dick Marron is a retired psychologist living in a beeyard in Connecticut.

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[1]I relied heavily on the book by John B. Free, "Pheromones Of Social Bees. Cornell University Press, 1987

[2]Cued in: Honey bee pheromones as information flow and collective decision-making Tanya Pankiw, Apidologie 35 (2004) 217-226.

[3]Parasitism of African honey bee colonies by Cape honey bee workers Francis L.W. Ratneiks Pages 81-83 in Garafalo, C.

[4]Do policing honey bee (Apis Mellifera) workers target eggs in drone comb? L. A. Halling and B.P. Oldroyd: Behav Ecol Sociobiol. 2002 51:590-591}.

[5]Regulation of behavioral maturation by a primer pheromone produced by adult worker bees: Proceedings of the National Academy of Sciences. (PNAS) Leoncini, et al: PNAS, Dec 14, 2004/ Vol. 101/no.50/ 17599-17564.

BEE PRECAUTIONARY LABELING STATEMENTS: INTERPRETATION AND ENFORCEMENT

Sylvia A. Ezenwa, J.D.

If you take only one thing from this article, let it be the realization that the enforcement of pesticide label violations by state regulatory agencies and courts is very often skewed against the beekeeper.

Misuse of pesticides kills bees – either by drift or overspray onto nearby apiaries, or from bees foraging on pesticide-treated fields. So it is no surprise that controversy surrounds the bee precautionary labeling statements or *"bee cautions"* for pesticides which are toxic to bees. Beekeepers typically bemoan the enforcement (or lack thereof) of bee caution violations by state regulatory agencies. And passions understandably run high with beekeepers' livelihoods at stake, but so does the spread of misinformation. So the purpose of this article is to take a *dispassionate* look at the federal and state laws, regulations, and policies governing the interpretation and enforcement of bee cautions.

A. The Basics of Labeling Law

(1) Pesticide Use Regulation

The United States Environmental Protection Agency (EPA) and state regulatory agencies (usually, state departments of agriculture) are responsible for regulating the use of pesticides in the United States. The EPA's power to regulate pesticide use comes from the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). The States' regulatory powers come from FIFRA, and from state pesticide use laws.[1] FIFRA's primary approach to pesticide regulation is through registration, so FIFRA gives the EPA the power to prescribe federal regulations limiting the distribution, sale, or use in any State of any pesticide not registered with the EPA.[2] The first step in the registration process is filing, with the EPA, a statement that includes: *"a complete copy of the labeling of the pesticide, a statement of all claims to be made for it, and any directions for its use."*[3] [Refer to the United States Code (U.S.C.), either in print or online, for the provisions of FIFRA (**http://www.access.gpo.gov/uscode/uscmain.html**)].

FIFRA grants the EPA the authority to prescribe *"implementing regulations,"* i.e., regulations that help carry out the provisions of FIFRA.[4] Using that authority, the EPA has issued implementing regulations that specify the labeling requirements for pesticides.[5] One requirement is that a label must clearly and prominently show hazard and precautionary statements for environmental hazards.[6] Regarding bee cautions, the regulations say: *"For uses involving foliar application to agricultural crops, forests, or shade trees, or for mosquito abatement treatments, pesticides toxic to pollinating insects must bear appropriate label cautions."*[7] [Refer to the U.S. Code of Federal Regulations (C.F.R.), either in print or online, for FIFRA's implementing regulations (**http://www.gpoaccess.gov/cfr/index.html**)]

Finally, it is a violation of FIFRA, i.e., federal law, for any person *"to use any registered pesticide in a manner inconsistent with its labeling."*[8] State pesticide use laws usually contain a similar or identical provision, making it a violation of state law as well to use a pesticide in a manner inconsistent with a label.[9]

B. The Basics of Label Interpretation

(1) Labeling Requirements vs. Policy Statements

Labeling requirements are the *"specific requirements for label language and format and, therefore, govern what must (and what cannot) appear on the label."*[10] A labeling requirement is *"binding,"* which means that it is an enforceable, federal or state law or regulation, and must be followed. Labeling requirements can be found in: (1) FIFRA and its implementing regulations; and (2) state pesticide use laws and regulations. As mentioned earlier, one labeling requirement is that a pesticide label clearly and prominently show hazard and precautionary statements for environmental hazards.

In contrast to a labeling requirement, a labeling policy statement is *"non-binding,"* which means that it is **not** a federal or state law or regulation, but merely a statement of EPA policy, and is, therefore, unenforceable. Labeling policy statements can be found in documents such as the EPA's Label Review Manual and Pesticide Registration Notices. These documents are only meant to provide guidance on how the EPA interprets the labeling requirements in FIFRA and its implementing regulations. Compliance with labeling policy statements is recommended by the EPA, but is not required; and the EPA may revise or depart from its policy statements at its discretion, and without prior notice.[11] [Refer to the Label Review Manual (3rd ed.) at **http://www.epa.gov/oppfead1/labeling/lrm/**; and Pesticide Registration (PR) Notices at **http://www.epa.gov/PR_Notices/** for EPA labeling policy statements].

Beekeepers who file claims (and lawsuits) against pesticide applicators for colony damage should not mistake "labeling policy statements" for "labeling requirements." If they do they base their claims almost entirely on policy statements from the Label Review Manual or Pesticide Registration Notices. Such statements are non-binding, and thus, unenforceable, against an applicator. Therefore, use labeling policy statements to support your allegations of pesticide

misuse, but remember that your damage claims must ultimately be proven with documented evidence of the applicator's violation of enforceable labeling requirements.

(2) Mandatory vs. Advisory Statements

Bee cautions on pesticide labels may consist of both "*mandatory statements*" and "*advisory statements.*" Mandatory statements generally provide directions for the proper application of a pesticide to prevent damage to non-target organisms. Mandatory statements use imperative or directive words (e.g., do, not, shall, and apply); they are enforceable and must be complied with. Conversely, advisory statements are only meant to provide guidance on the safest and most effective application methods. Advisory statements use descriptive or nondirective words; they are unenforceable, and compliance with them is recommended, but not required.[12] [Refer to Part C below for examples of mandatory statements].

C. The Basics of Labeling Enforcement

(1) Enforcement Responsibility

FIFRA grants States *"primary enforcement responsibility"* for pesticide use violations, so long as a State: (1) has adopted adequate pesticide use laws and regulations; (2) has adopted and implemented adequate procedures for the enforcement of state pesticide use laws and regulations; and (3) will keep records and make reports that show compliance with state pesticide use laws, regulations, and enforcement procedures.[13]

For a beekeeper, this means that if you suffer colony damage as a result of an applicator allegedly violating the bee caution on a pesticide label, it is your responsibility to file a damage claim against the applicator with your state regulatory agency, using the damage reporting procedures set forth in your state pesticide use law. Then it becomes the agency's responsibility to enforce the law by investigating your allegations, and determining whether a violation of the bee caution did in fact occur Some state pesticide use laws require that you file a damage claim with your state regulatory agency (and await the agency's decision) before you will be allowed to file a civil lawsuit against an applicator in court.[14]

Each State has its own pesticide use laws, regulations, and enforcement procedures, so the outcomes of trials and regulatory investigations differ from State to State. And though States may be influenced by each other's judicial and administrative decisions, **no State is bound by the court decisions, laws, regulations, or enforcement procedures of another State.**

(2) EPA's Four Current Bee Cautions

In the early 1980s, the EPA introduced four standard bee cautions, which currently appear on most pesticides toxic to bees. The slight differences in wording of each bee caution is based on: (1) the level of toxicity of the active ingredient; and (2) whether or not extended residual toxicity is displayed on the label.[15] Each bee caution and its toxicity grouping is shown in Table A:[16]

Table A: Honey Bee Toxicity Groups and Four Cautions

Toxicity Group	Precautionary Statement if Extended Residual Toxicity is Displayed	Precautionary Statement if Extended Residual Toxicity is not displayed
I Product contains any active ingredient with acute LD_{50} of 2 micrograms/bee or less	(Caution 1) This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.	(Caution 2) This product is highly toxic to bees exposed to direct treatment on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds while bees are actively visiting the treatment area.
II Product contains any active ingredient(s) with acute LD_{50} of greater than 2 micrograms/bee but less than 11 micrograms/bee.	(Caution 3) This product is toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply thisproduct if bees are visiting the treatment area.	(Caution 4) This product is toxic to bees exposed to direct treatment. Do not apply this product while bees are actively visiting the treatment area.
III All others.	No bee caution required.	No bee caution required.

To determine whether an applicator has violated a bee caution shown in Table A, the state regulatory agency or trial court may have to consider the following questions:

(i) Is each bee caution enforceable?

The four bee cautions in Table A are labeling policy statements, because Table A is contained in the EPA's Label Review Manual, which is a guidance document. Labeling policy statements, as mentioned earlier, are non-binding, and typically, unenforceable – but not here. FIFRA and state pesticide use laws contain provisions making it unlawful to use a pesticide in a manner inconsistent with a label. Therefore, once a bee caution is placed on a label, *it becomes enforceable*, because violation of the label (which contains the bee caution) is a violation of a specific provision of FIFRA and a state pesticide use law.

(ii) Which part of each bee caution is a mandatory statement?

The second sentence of each bee caution in Table A (i.e., *"Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting (or actively visiting) the treatment area."*) uses directive or imperative words, indicating that the sentences are mandatory statements which are enforceable against a pesticide user, and must be complied with. Many pesticides use the term "foraging" instead of "visiting" or "actively visiting," in which case, the mandatory part of the bee caution would be: *"Do not apply this product or allow it to drift to blooming crops or weeds if bees are foraging in the treatment area."*

(iii) What do the terms "visiting" and "actively visiting" (or "foraging") mean?

Regarding the four bee cautions in Table A, the EPA has said, *"[u]se of the labeling statements recommended by the 1980s policy requires the pesticide user to judge whether bees are "visiting" or "actively visiting" the treatment area."*[17] This is the crux of most conflicts between beekeepers and applicators, because each has a different interpretation of what the terms "visiting" and "actively visiting" (or "foraging") mean. Beekeepers interpret these terms to mean that a pesticide cannot be applied if *any* bees are foraging in a treatment area with *any* blooming crops or weeds while *any* pesticide residues are present.[18] But this interpretation may effectively prohibit the application of certain pesticides with longer lasting residues to blooming crops and weeds. So naturally, applicators disagree, instead, interpreting the terms to mean that a pesticide cannot be applied only if a *significant* number of bees are foraging in a treatment area with a *significant* number of blooming crops or weeds.[19] The question is: Which interpretation is correct? And who makes that determination? Unfortunately, the EPA, in the Label Review Manual and Pesticide Registration Notices, provides no real guidance on the matter.

Remember, States have primary enforcement responsibility for pesticide use violations. Part of that responsibility involves state regulatory agencies investigating beekeepers' allegations of bee caution violations. Such investigations necessarily require the state agency to determine whether bees were "visiting" or "actively visiting" (or "foraging in") the treatment area during spraying. Of course, a beekeeper, if dissatisfied with a state agency's determination, can appeal to a state trial court for review of the agency's decision. However, it is worth noting that a court will most likely accept a state agency's decision as to whether or not bees were "visiting" or "actively visiting" (or "foraging in") the treatment area. This is because of a longstanding principle of law, which says: *"An agency decision is presumed to be correct, and courts give deference to the agency's expertise and special knowledge in the field of its technical training, education, and experience. The decision will be reversed only if it reflects an error of law, the findings are arbitrary and capricious, or the findings are unsupported by substantial evidence."*[20]

"What constitutes a state bee protection program? Practically anything - the EPA neither approves nor sets standards for state bee protection programs, although it does recommend programs."

(3) EPA's Revised Bee Caution

The four current bee cautions in Table A have many detractors. Beekeepers complain that the bee cautions provide inadequate protection for foraging bees; growers complain that they are too restrictive and inhibit effective pest management of blooming crops; and applicators complain about the danger of aerially spraying at night when crops are not in bloom. Perhaps, most importantly, state regulatory agencies complain about the difficulty in enforcing the bee cautions when both beekeepers and applicators are unclear about the extent of an applicator's obligations, if any, to protect foraging bees.[21]

The EPA's response has been to consult with beekeepers, applicators, growers, and state regulatory agencies, and recommend a single revised bee caution to be used in place of any of the four current bee cautions in Table A.[22] The single revised bee caution is shown in Table B:[23]

Table B: Revised Honey Bee Caution

*"This product is toxic to bees exposed to treatment and for _X_ hours/days** following treatment. Do not apply this pesticide to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period. The _X_ hour/day limitation does not apply if the applicator follows all applicable requirements of a state-approved bee protection program designed to ensure that managed bees are not present in the treatment area during this time period."*

"**The time period to be inserted is based on the residual toxicity data for the product submitted to the Agency. If no bee residual toxicity data are available, the time period should be 24 hours."

Despite the EPA's recommendation that pesticide registrants begin using the single revised bee caution after October 1, 2002,[24] most pesticides toxic to bees, including *Malathion, Imidan 70-W, Penncap-M, and Sevin XLR Plus,* continue to bear one of the four current bee cautions in Table A. However, the pesticide *SpintTor 2SC, Success* does bear the revised bee caution shown in Table C:[25] (SpinTor 2SC is used on a variety of pollinator visited crops, including cranberries, citrus, vegetables, apples, strawberries and many, many more crops.)

Table C: Example of Revised Honey Bee Caution

SpinTor 2SC, Success – leaves residue for two days:

"This product is toxic to bees exposed to treatment for three hours following treatment. Do not apply this pesticide to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period.

The three hour limitation does not apply if the applicator operates in a state with a formal, state-approved bee protection program, and the applicator follows all applicable requirements of the state approved program designed to ensure that managed bees are not present in the treatment area during this time period."

To determine whether an applicator has violated the bee caution shown in Table B, the state regulatory agency or trial court may have to consider the following questions:

(i) Is the bee caution enforceable?

The bee caution in Table B is a labeling policy statement, because it is contained in Pesticide Registration (PR) Notice 2000-XX, which is a guidance document. Labeling policy statements, as mentioned earlier, are non-binding, and typically, unenforceable – but not here. FIFRA and state pesticide use laws contain provisions making it unlawful to use a pesticide in a manner inconsistent with a label. Therefore, once a bee caution is placed on a label, *it becomes enforceable,* because violation of the label (which contains the bee caution) is a specific violation of a provision of FIFRA and a state pesticide use law.

(ii) Which part of the bee caution is a mandatory statement?

The second sentence of the bee caution in Table B (i.e., *"Do not apply this pesticide to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period.")* uses directive or imperative words, indicating that it is a mandatory statement. This statement is enforceable against a pesticide user and must be complied with UNLESS, pursuant to the mandatory language in the third sentence (i.e., *"The _X_ hours/day limitation does not apply if the applicator follows all applicable requirements of a state-approved bee protection program designed to ensure that managed bees are not present in the treatment area during this time period."*), the pesticide user is participating in a state bee protection program. Significantly, the EPA concedes that the option for pesticide users to participate in a state bee protection program instead of complying with the "_X_ hours/day" limitation on a label effectively allows pesticide users to apply some pesticides whose application would not otherwise be permitted by the label.[26]

Fortunately, the EPA does provide guidance to a pesticide user on how to comply with these mandatory statements, by saying that: *"Use of a pesticide to treat a crop which is blooming, shedding pollen or producing nectar would be allowable if: (a) the period of toxicity stated on the label is short enough (e.g., less than 12 hours) to allow evening or night application when bees will not be foraging (and the application is made at night); (b) the application method (e.g., soil incorporation) does not result in residues on "blooming, pollen-shedding or nectar-producing parts of plants," so that bees are not exposed; or (c) the user participates in a state-approved plan for the protection of managed bees.*[27]

(iv) Does the State have a bee protection program?

It bears repeating that, with the bee caution in Table B, a pesticide user who participates in, and follows all the requirements of, a state bee protection program does not have to comply with the "_X_ hours/day" limitation on a label. But what constitutes a state bee protection program? Well, practically anything, because the EPA neither approves nor sets standards for state bee protection programs, although it does recommend programs like requiring registration of beekeepers, notification of beekeepers before spraying, and permits for the use of pesticides toxic to bees. Most States already have one or more of these programs in place as part of their state pesticide use laws and regulations.[28]

The State of Ohio, for example, has implemented the following regulation: *"No person shall apply or cause to be applied any pesticide that is required to carry a special warning on its label indicating that it is toxic to honey bees, over an area of one-half acre or more in which the crop-plant is in flower unless the owner or caretaker of any apiary located within one-half mile of the treatment site has been notified by the person no less than twenty-four hours in advance of the intended treatment; provided the apiary is registered and identified as required by section 909.02 of the Revised Code of Ohio, and that the apiary has been posted with the name and telephone number of the owner or responsible caretaker."*[29] This regulation allows a pesticide user to **not** comply with a bee caution on a label, so long as the user follows the notification requirements of Ohio's bee protection program. Evidently, the EPA supports the idea of participation in state bee protection programs as an alternative to strict compliance with bee cautions on pesticide labels, be-

cause it believes that such programs *"[b]alance pest control needs with reasonable assurance that effective precautions to protect bees will be taken. The language providing for an alternative to a time-period limitation on use, i.e., participation in a [sic] state approved plans for bee protection, is intended to achieve this balanced result."*[30]

Conclusion

If you take only one thing from this article, let it be the realization that the enforcement of pesticide label violations by state regulatory agencies and courts is very often skewed against the beekeeper. Therefore, the onus – however, unfair – is on you to safeguard your bees from pesticide misuse. Remember, *after* colony damage has occurred, you may have no choice but to rely on state agencies and courts for redress. But *before* colony damage occurs, you can meet and communicate with nearby growers about your apiary locations and bees' foraging times, and you can request advance notice before spraying occurs. Of course, there are no guarantees, but such precautions just might spare you the high cost of both colony damage and litigation. BC

References

1. *See* Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. § 136 *et seq.*
2. 7 U.S.C. § 136a(a). *See also* 7 U.S.C. § 136w(a)(1).
3. 7 U.S.C. § 136a(c)(1)(C).
4. 7 U.S.C. § 136w(a)(1).
5. *See generally* 40 C.F.R. § 156.10.
6. 40 C.F.R. § 156.10(a)(1)(vii).
7. 40 C.F.R. § 156.10(h)(2)(ii)(E).
8. 7 U.S.C. § 136j(a)(2)(G).
9. *See e.g.*, Minn. Stat. § 18B.07, subd. 2(a)(1).
10. U.S. Environmental Protection Agency, *Label Review Manual* ch. 1, § I(B) (3rd ed.).
11. *See* U.S. Environmental Protection Agency, *Label Review Manual* ch. 1, § I(B) (3rd ed.); *Pesticide Registration (PR) Notice* 2000-XX p. 7
12. *See* U.S. Environmental Protection Agency, *Label Review Manual* ch. 3, § III(A), (B) (3rd ed.).
13. 7 U.SC. § 136w-1(a).
14. *See* Sylvia A. Ezenwa, Honey Bee Law: Principles and Practice 98-99 (2005).
15. U.S. Environmental Protection Agency, *Pesticide Registration (PR) Notice* 2000-XX p. 1; *Label Review Manual* ch. 8, § II(E)(4) (3rd ed.).
16. U.S. Environmental Protection Agency, *Label Review Manual* ch. 8, § II(E)(4) (3rd ed.) (parenthetical language added to Table A for clarity).
17. U.S. Environmental Protection Agency, *Pesticide Registration (PR) Notice* 2000-XX p. 3.
18. *See e.g., Anderson v. State*, 674 N.W.2d 748, 754 (Minn. App. 2004), *aff'd in part, rev'd in part, and remanded by* 693 N.W.2d 181 (Minn. 2005).
19. *Id.*
20. *Anderson v. State*, 674 N.W.2d 748, 755 (Minn. App. 2004), *aff'd in part, rev'd in part, and remanded by* 693 N.W.2d 181 (Minn. 2005).
21. *See* U.S. Environmental Protection Agency, *Pesticide Registration (PR) Notice* 2000-XX pp. 1-2.
22. U.S. Environmental Protection Agency, *Pesticide Registration (PR) Notice* 2000-XX p. 2.
23. *Id.*
24. U.S. Environmental Protection Agency, *Pesticide Registration (PR) Notice* 2000-XX p. 6.
25. James C. Bach, *Pesticide Labels—Meaning, Reading and Enforcing*, BEE CULTURE, June 2005, at 32.
26. U.S. Environmental Protection Agency, *Pesticide Registration (PR) Notice* 2000-XX pp. 3-4.
27. U.S. Environmental Protection Agency, *Pesticide Registration (PR) Notice* 2000-XX p. 4.
28. U.S. Environmental Protection Agency, *Pesticide Registration (PR) Notice* 2000-XX pp. 4-5.
29. Ohio Admin. Code § 901:5-11-02(B)(15).
30. U.S. Environmental Protection Agency, *Pesticide Registration (PR) Notice* 2000-XX p. 4.

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

WILBANKS APIARIES

Jennifer Berry

Since my introduction to bees, I have attended numerous beekeeping conferences, and during those events I have met many interesting people. This has been a highlight of my job. Everyone has a story to share, an idea, a trick for this or a tool for that. So, why I am telling you this? I've been trying to gather stories focusing on the fundamentals of beekeeping in the Southern U.S. This was a challenge. How does one incorporate information on an area with such a wide variety of honey plants, soil types, and climates? What Maryland beekeepers are doing in October is different from beekeeping activities the same month in Georgia. So, I decided to drop the "Beekeeping in the South" idea in favor of visting with personalities that are uniquely southern. We'll visit commercial operators, hobbyists and researchers during my journey visiting beekeepers in the South. We'll find Southern beekeeping practices, different modes of operation, and tricks of the trade rather than seasonal beekeeping tasks. We'll explore research programs across the area, and may just find some interesting personalities to boot. Hopefully, it'll teach us a thing or two and no doubt, we'll come across that one in a million tall tale to share.

First, let me clarify what I mean by "the South," which includes states east of Texas (including Texas) plus the states south of the Mason Dixon line. That's the "South" where I came from.

Let me introduce to you one of Georgia's own, Mr Reg Wilbanks. Reg comes from a long line of beekeepers, himself being the fourth generation. Reg is owner and operator of Wilbanks Apiaries, Inc. It is one of the country's largest commercial operations that ships package bees and queens nationally and internationally.

The Wilbanks business started when Reg's great grandfather, Gresham Duckett, gave his grandfather, Guy T Wilbanks, four hives of bees as a wedding present back in the 1800s. With hard work, dedication and the help of his son, Warren Wilbanks, Reg's grandfather, soon turned those four colonies into three hundred. In the early years the business focused on honey production. At that time their family resided in Banks County in North Georgia located at the foot hills of the Appalachian Mountains. Their honey market ranged from the surrounding area all the way to Atlanta. North Georgia is known for its sourwood honey which blooms during the Summer months. However, honey flows can be un-dependable, being almost non-existent some years. Just ask any of the north Georgia beekeepers today The past four years have seen little sourwood honey.

Back to the story. In 1946, the family home was destroyed in a fire so Guy and Warren Wilbanks moved to south Georgia, where floral sources offered larger honey crops and had a reputation for being more dependable than their northern counterparts. However, the first year after their arrival, the honey crop was a disaster No crop, no money So Guy T Wilbanks had to take a job in the shipyards in Brunswick, Georgia. Warren Wilbanks, Reg's father, also needed to make ends meet so he went to work for the Georgia Department of Agriculture as a state bee inspector. The job not only offered an income but also an opportunity to travel and learn about different honey bee operations, primarily the queen and package bee industry. The family decided to branch out from solely producing honey to producing package bees and queens. A year later, the family moved to Claxton, Georgia, their present location.

Reg was involved in the family business taking only a short break to attend college. After receiving a BS degree in Industrial Management from Georgia Southern University in 1972, he returned home, eventually

Webbs Win At Apimondia

In August the world convened in Dublin, Ireland for the 39th Apimondia International Apicultural Congress. Along with lectures and exhibitors there was the world honey show in which America stole the stage. Here are the results.

Virginia Webb, from Clarkesville, Georgia, won a Gold medal for her 24-Jar entry. It is hard to overstate the significance of this award. It is considered "Best in the World," crème de la crème, number one. This award is the one that other honey exhibitors covet because it is the hardest to achieve. Virginia took home several other awards: a Silver in Decorative Display of Honey, a Silver for two Jars Light Honey and two Jars Medium Honey, and a Bronze medal in Dark Honey. Virginia was the top medal winner in the honey show. The U.S. National Honey Board sponsored her Display Class while Gamber Containers sponsored her other entries. Other winning Americans included Wayne Morris from Montana with Gold Medals for his Ross Rounds and Section Comb Honey and a Bronze Medal for Chunk Honey. Judy Schmaltz from Clarkston, Minnesota won a Gold for Crystallized Honey, and Ray Nicholson from Wadena, Minnesota won a Bronze for his Ross Rounds. Finally, Carl Webb, husband of Virginia, won a Bronze for the 24-Jar Class and a Bronze for his Beeswax Block.

Let me explain why the 24-Jar entry is so difficult. First, each jar must be in the same and perfect condition: no honey on lids, filled to an exact proportion, no smudges on the glass, no debris in the honey, etc. The 24-jar entry must also conform to European Union label regulations.

So how did Virginia get all that honey to Ireland, you ask? She mailed it to the hotel where she and Carl were staying. After arriving in Dublin, Virginia spent days in her hotel room cleaning jars, removing air bubbles, attaching labels, and ensuring proper levels of honey in each container. Not only does the honey have to be world class, but the container as well. Virginia and Carl Webb started working on their entries a year in advance. That's the kind of dedication it takes to win best in the world. Congratulations to all our stateside winners.

becoming president of Wilbanks Apiaries, Inc. Since that time he has been active in all aspects of the beekeeping industry. He was president for three consecutive terms for the Georgia Beekeepers Association and the American Bee Breeders Association. He's served as Chairman of the Georgia Farm Bureau Honey Bee Advisory Committee and as president of the American Beekeeping Federation in which he is still involved as a member of its Board of Directors. He served as a member of the American Farm Bureau Research Advisory Committee for fire ants and Africanized honey bees. In 1987 he was appointed by the U.S. Secretary of Agriculture to represent the U.S. beekeeping industry on the USDA *Varroa* Mite Negotiating Rulemaking Committee. He is a member of the National Honey Board and represents producer region six which includes Georgia, Florida and Puerto Rico. He is the past chairman of the University of Georgia Agricultural Experiment Station Research Advisory Board, and in 1984 he received the Georgia "Beekeeper of the Year" award. He also has numerous civic, state and local appointments to his credit. Reg is not only dedicated to his business, but also to the community in which he works and lives.

Wilbank's Apiaries operate approximately 6,000 colonies primarily for the production of package bees, which results in 15,000 – 20,000 packages a year. As for the queen rearing side of the operation, they run close to 15,000 mating nuclei which produce over 60,000 queens annually for sale worldwide. The colonies and nuclei are spread out over a six county area which keeps Reg and his employees moving. It is an impressive operation, and when I visited he and his crew of 20 were about to depart on a deep sea fishing adventure. After they returned to shore, Reg was treating them to a weekend of relaxation on the beach at Tybee Island. This business is hard work. He and his crew hustle year round from sun up till sun down. Reg realizes this and rewards his employees each year

Before we finish, let's look at a typical year for Wilbanks Apiaries. South Georgia in January is still a little on the cool side. Red Maple, which marks the beginning of the season for Georgia, is fixing to bloom and a rigorous feeding program has begun for colonies selected for package production. This, in combination with the pollen collected off the Red Maple stimulates the queen to begin laying and colony populations explode overnight.

By the middle of February the grafting operation begins and newly grafted queen cells are coming off by the first week of March. These cells are placed into baby nucs which have been stocked and are ready for production. If all goes well, including no major weather systems or unforeseen problems, the first round of mated queens are ready for sale by the last week of March.

By the first week of April, an additional crew comes in to start shaking packages. This will last several weeks, usually subsiding by the first week of June. However, they will continue to raise queens through September After the last of the packages are mailed out, the "shaking" crew shifts gears and begins to requeen every colony. As they enter each colony, they clean bottom boards, scrap off lids, and remove burr

comb between the frames, the top bars, sides, etc. When trying to produce 20,000 packages and 60,000 queens annually, speed is important. Colonies must be clear of burr comb and debris so frames come out easily without rolling bees and damaging queens. Materials that were ordered the first of July are arriving in the fall. By winter, packages are being assembled and repairs being made. Just as the hammer is put down January has arrived and the cycle begins again.

When I asked Reg why he choose beekeeping as a career he told me he enjoys working outside and with nature. He enjoys the constant challenge that beekeeping delivers on a day to day basis. How the nature of the job changes each day, each week, each month. He told me "beekeeping is in my blood" and in the blood of my sons. His two sons, Patrick and Timothy, comprise the fifth generation of Wilbanks beekeepers. When he was talking about why he loves working with bees and the challenges he faces, it sounded like so many other beekeepers I have spoken to over the years. I think there is something inherent in all beekeepers – a desire to work with one of nature's most fascinating insects.

Or else we're all a little crazy? Take your pick.

As we say in the south, see ya'll soon. BC

Jennifer Berry is the Honey Bee Research Technician at the University of Georgia Bee Lab.

An Unclear Case of American Foulbrood (Revisited)

James E Tew

Is it logical to treat AHB as a black and white situation?

I can never tell

After all these years I admit that I still cannot tell what's going to light you up. Apparently, I fired some of you in the September, 2005 issue of *Bee Culture* with my piece on *"An Unclear Case of American Foulbrood."*[1] Let me address some of your concerns again.

A troublesome subject

I make no claim to being a trained microbiologist, but I have seen and dealt with American foulbrood many times. The first fundamental problem is that beekeepers generally cannot predict which colony will be resistant and to what degree. I crudely put bee colonies into three broad groups: (1) AFB Resistant, (2) Some resistance, but express symptoms of AFB, (3) Susceptible with clear symptoms. Category #2 is the section that causes me the most problems. No one wants AFB, but if I do have it, I want it to be a clear case. Fact is, sometimes it is not a clear case.

From a regulatory standpoint

Yesterday, at the university book store, I saw a book entitled (something like), *"Things Your Doctor will not tell you."* I quickly wondered exactly how much I wanted to know from my physician. Do I want to always know everything or do I want to know what I need to know? Recently, I strained an abdominal muscle. After several weeks of low-level gut pain, I went to a specialist, who ironically was also a beekeeper. A thorough check indicated that I was simply 57 years old with concurrent aches and pains. The muscle would ultimately heal. It did. But during the course of the evaluation, my physician commented that I had some noticeable spinal curvature that would significantly limit my backward motion. *What?! What do are you talking about? I'm here for my achy gut – not my back.* Now, my abdominal muscle is fine, but I wander around wondering exactly what this (painless) back thing is all about. What will the ultimate effects be? I don't know.

As I again try to address this troublesome AFB topic, I am reminded of my experience with my physician. How much information is proper? From a regulatory stance, it is logical to treat AFB infections as a black & white situation. Common thinking is that either your hive passes the test for AFB or it doesn't. Yes and no. Right and wrong. Up and Down. Black and white. Apparently there is nothing in the middle. Fact is, there is a middle every time. In the beekeeping world, I agree with the regulatory tenet to burn when detected. The best general rule for AFB suppression is to destroy it – at any level of infection – simply because you can't predict the outcome.

Some of you are going to want some of this

I have no doubt that some of you are going to want to argue about this direct recommendation. At this point, what kind of specialist do I need? A state regulatory authority? A psychologist? A sociologist? A lawyer? Maybe a biologist? Or Some combination of all. Why this mix? Because beekeepers are of diverse personalities who are managing bee colonies having a range of resistance or susceptibility to AFB. That's a lot of variation.

True, some of you would do whatever it takes to help an AFB diseased colony recover. You would monitor every aspect of the pathological problem. Others of you would have the best intentions to monitor but, for many of life's reasons, get off schedule and increasingly, the AFB infected colony would be left to fend for itself. Still others of you are totally intolerant of the disease and immediately destroy everything anywhere close to the disease source.

The second fundamental problem is that it is difficult to tell which beekeepers will always control existing cases of AFB and which beekeepers have good intentions of controlling the problem but will fall short; therefore (again), *the safest and simplest recommendation is to destroy the afflicted colony or colonies.* Before you decide to attempt to bring a colony back from the American foulbrood brink, consider some important factors.

Before you attempt to help American foulbrood- infected colonies

Your commitment

At first, every one of us, who starts an AFB medication program, fully intends to treat the afflicted colony as if it were a family member. Then it rains or the weather gets cold. Maybe my curvatured back starts to give me problems. My house needs painting. For whatever reason, my commitment wanes and the disease source sits there – exposing my remaining colonies and that of my beekeeping neighbors. Treating a colony for American foulbrood is a lot like becoming physically fit. You have to always work at it.

Your beekeeping neighbors

Some beekeepers are tolerant of American foulbrood situations while others are highly intolerant – even

[1]Tew, James E. *An Unclear Case of American Foulbrood.* Bee Culture Sept. 2005 Vol 133 (9) pp 23-25

superstitious. If the word gets out that some of your colonies have the AFB scourge and that you are *"treating"* it, there is a good chance your name will be considerably worse than Mudd. There is also a good chance that your operation will become the suspected source for subsequent outbreaks in the colonies of other beekeepers. True, you can try to keep the situation secret, but if it should become public, your (apparent) sin will appear even worse. Be sure your colony is worth the societal price you will probably have to pay.

Your state beekeeping regulations

You may not have the option of treating. The regulations of individual states vary. Obviously, you will need to adhere to state regulations. As I wrote earlier, the easiest path and the simplest recommendation is to destroy the colony as most state regulations require.

So, if you are truly committed to long-term treatment and if you sense that your beekeeping neighbors would support your treatment program and if your state regulations allow you to do something other than destroy the colony, you have other options. These are serious commitments Don't take them lightly.

Not a common idea of a sick colony.

So, where do American foulbrood outbreaks come from?

My slightly sarcastic answer to this common question is that my AFB outbreaks come from the colonies of someone else; hence my concerns expressed above about irate beekeeping neighbors. Even outbreaks that occur years later are sometimes attributed to disease sources long gone. It's common human nature. So, if I just found AFB in one of my colonies, my bees must have been visiting somewhere dirty. Short of having access to technology seen only on innumerable TV crime scene shows, the source of the current outbreak will normally remain unknown. But, it's always easier to blame someone else.

Importantly, we don't know how often AFB symptoms are expressed within a colony and whether or not the colony deals with it before we ever see it. Due to the need for general, simplistic recommendations, we assume (1) if a colony shows symptoms, it's going to die; (2) the infection came from somewhere specific; and (3) destroying the colonies in question prevents subsequent infections. Maybe and maybe not. I don't know what percentage of colonies die upon getting an AFB infection[2]. It is suggested that AFB infections are lessened during a nectar flow – probably due to the incoming nectar diluting the bacterial spores causing AFB. If we rarely know – for sure – where the infection is from, how can we be sure that the surviving colonies won't get in trouble, too? Would not the surviving colonies also send foragers to the same forbidden source that is unknown to us? Historically, we blame such spontaneous infections on dirty neighbors, on bees foraging in dumpsters or on wild cases of AFB. Once in my beekeeping life, my colonies clearly got a serious outbreak of AFB from the bees of a friend as our colonies shared a yard. Otherwise, I have no specific instances of bees foraging on discarded diseased honey and secondly, I have never seen a case of AFB in a wild colony. The question is begged, *"To what extent is AFB always in my colonies and housecleaning bees are suppressing it?"* Another question of the same genre is, *"Within the same colony, when is it a new outbreak and when is an old outbreak that is simply re-expressing itself?"* Researchers have reported that the activities of house cleaning bees may frequently limit the infection; however, spores can remain active for decades and may resurface at later times[3]

Individual AFB scales can produce millions of spores. Larvae up to 24 hours old can be infected by as few as 10-35 spores. Yet millions of spores are required to infect larvae that are two days old. Nurse bees are able to detect infected larvae and, in some tests, removed 10-40% of the infected larvae before they were sealed over In other studies, about 50% were removed before spores began to form in the infected larvae. In general, when the disease kills a "few hundred larvae" the disease overruns the colony and it dies[3] In my observational experience, I have seen colonies with more than a few hundred cells recover, but clearly there is a point when the colony is overrun by the outbreak.

So it would appear

(1) There may be instances when the foulbrood outbreak within a specific colony is from previous AFB inoculums within the same colony – possibly even years earlier

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[2] Frequently, AFB cases are described as "light" or "heavy." The assumption that all light cases will become heavy if left untreated. I wonder how often these light cases are instances in which the colony is restricting the AFB outbreak from reaching the "heavy" phase without help from the beekeeper. Such colonies don't fit our yes/no concept of American foulbrood infected colonies.

[3] Bailey, L. and B. V. Ball. 1991. *Honey Bee Pathology*. Academic Press, NY. Pp 36 - 41

(2) American foulbrood can occur at low levels and bees restrict or even eradicate it (or possibly mask it).
(3) Robbing and beekeeper equipment exchange are still primary methods of disseminating the disease.
(4) There is only a small window for infection of very young larvae; otherwise, older larvae are resistant.
(5) AFB has a remarkably low spread rate – probably due to bee hygienic behavior and the fact that only very young larvae are affected. Things like gloves, hive tools, smokers, and the tires on the inspector's vehicle are not significant sources of infection.
(6) Hygienic behavior, either physiological or behavioral, is important in the colony's resistance to AFB.
(7) Periodic comb replacement would seem to be a helpful management procedure. Not only would acquired AFB spores be removed, but accumulation of various mite control chemicals contained within the wax would also be eliminated. However, this will be a lot of extra work for both the bees and the beekeeper

Are our colonies up to their ears in American foulbrood?

Several of you corresponded with me wondering if we should all be paranoid about AFB being everywhere all the time. I don't think so, but I have many more questions than I have answers. I only suggest, based on the observations of bee researchers, that AFB is present, at varying levels, more often than we realize.

Is that good or bad news?

I'm not sure it's even news of any kind. From the view of a beekeeper and not that of a scientist, let's consider a hypothetical example. A beekeeper opens a hive for the first time in months and sees all the symptoms of AFB. The time-honored recommendation is to burn it. Nothing new there. Second scenario: A beekeeper opens a hive and overlooks a few cells of AFB which the bees remove within a few hours of the opening. A full year passes before the disease shows itself again. Why now? I don't know – a change in queen stock, increasing robbing behavior, or colony stress – whatever The point is that the colony now shows symptoms of AFB. Now enter the beekeeper asking all the old questions – where did it come from? A neighboring beekeeper has contaminated me. Whatever My point is that you – the beekeeper – do the same thing as in scenario #1 –destroy the colony.

AFB is still AFB

I keep hammering on this subject because it troubles me as much as it troubles you. Sometimes cases of American foulbrood can seem to come out of thin air, while at other times we blame our beekeeping neighbors or some unknown mystical source. AFB is still AFB, but it is not particularly mysterious and interestingly, not particularly infectious, but once this disease gets beyond the control of the bees, you had better be able to recognize it or else you become the problem as you unintentionally spread it throughout your operation. AFB is not a mystery, but it still merits your close attention and respect. BC

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WINTER
In The Northeast

Larry Connor

Experts speculate on how European honey bees migrated from tropical Africa to the forests and mountains of Europe, and, as they moved, developed the behavioral modifications the bees needed to survive in the new, much-different environment. In Africa the bees were successful with high levels of brood rearing to produce multiple swarms and by migrating to nectar flows. In Europe, the bees focused on food storage to ensure their survival during periods of prolonged cold. The bees in Europe also developed the Winter cluster behavior, where the bees maintain a temperature of 57°F preventing individual bees from freezing, and a brood rearing temperature of 92°F to grow the colony during periods of cold and confinement.

In this hemisphere environmental and biological conditions in the northeastern quadrant of North America most closely resemble the conditions where European bees developed since the past ice age, although many microclimates in the rest of the Americas are undoubtedly similar What are the key features of these conditions?

- A period of prolonged bee confinement within the hive, without foraging flights.
- The need for large amounts of stored carbohydrate and protein foods consumed to survive this confinement and initiate Spring buildup.
- Mechanisms to manage the waste products of a living hive: water, carbon dioxide and feces.

Let's look at each of these topics in detail and consider how this applies to NE North American beekeeping.

Prolonged Confinement

Keeping bees a few miles from Long Island Sound, I expect our colonies in this area to experience a maximum confinement of four to six weeks without flight during the mythical New England "average" Winter. Of course Winters are either warmer or colder – there is no predicting in advance, *The Farmer's Almanac* notwithstanding. This confinement period is the longest time span where bees are restricted to the hive, unable to fly outside the hive to void waste products, and to break cluster to reach unattached areas of stored food within the nest. In this area, we usually have sequential periods of confinement alternating with warm spells that allow flight. 100 miles north in Massachusetts, I would expect that the longest period of confinement during the Winter is significantly longer, perhaps averaging eight weeks without a break in the Winter weather At 300 miles from Long Island, up on the Vermont/Quebec border, the period of time bees cannot get out of the hive may jump to an average 12 or more weeks. There may few breaks in the weather in this area, with far fewer chances for the cluster to break.

Colony in fall. Started as a package in the spring. Note the feeder. Frames of honey are between the cluster and the feeder. The colony survived the winter, but required repeated March and April feeding.

You can project similar comparisons going from southern Pennsylvania to the lower counties of New York, and then moving to northern New York into Ontario. The same differences appear from southern Ohio (Cincinnati can seem downright tropical some Winters), to areas around the Michigan/Indiana/Ohio region (Toledo, Fort Wayne, Detroit) to areas in northern Michigan (Traverse City).

It is important to add your apiary's elevation to this discussion, for the higher the elevation, the colder the Winter and the longer the confinement. So, if you live in the southern part of New York State, but at 1,500 feet elevation, expect a longer confinement than someone at the same latitude in eastern Massachusetts or Ohio.

Also consider your apiary microclimate. If you selected a wind-protected location, with good sun exposure, air drainage and protection from severe weather, you will find bees able to break cluster more often than if placed on a ridge top with full exposure to Winter winds. Use your own physical comfort to determine the best site – avoid areas where you must button up your Winter coat to stay warm, but select sites where you are warmed by the sun and protected from the wind and can unbutton your coat.

Bees form the cluster at 57°F, when they leave the corners of the hive and group in the brood area (if there is brood), ideally at the lower part of the stored food in the nest or hive. The queen is present, plus thousands of worker bees – and all the drones have been expelled unless some essential factor supporting drone survival (queen replacement, an exceptionally rich Fall flow) is present in the hive.

As the temperature falls, the bees form a tighter and tighter cluster, occupying a smaller and smaller volume. Think of a volume of bees the size of a beach

Strong overwintered colony.

ball. As the temperature falls the size of the ball decreases in size (volume) and may become very dense, like a large softball, during the coldest period of the Winter. Within this cluster the bees in the inside are the warmest, and the bees on the outside are the coldest. They rotate positions so all bees take turns being warm and cold.

By the end of the season, the size of some clusters may be no larger than the size of a fist. Only a queen and a few hundred bees may survive. Some strains of bees have the ability to over Winter with very few bees, but for most beekeepers, such a colony is not usable the next season.

Honey is consumed at a moderate rate to maintain the 57°F level in a broodless cluster – the exact amount is determined by the number of bees and the average outside temperature during this period. Sometime in January the bees sense the increasing lengthening of the daylight. This is not noticeable to humans until sometime in the first or second week of January. Most colonies will have a small patch of brood – maybe just a few square inches – in late January or early February.

Then the starvation risk increases dramatically. From the time the wintering colony starts rearing brood to the time of frequent breaks in the wintering cluster for cleansing flights and pollen and nectar foraging flights, the bees and the entire colony are at increasing risk of running out of food. In the northeastern part of North America this risk peaks in late February and into March, making late Winter apiary visits with feed essential to colony survival. Any advantage of a few days of foraging in late February or early March may be thwarted by a two to three week spell of clustering weather in March, and even early April in northern regions.

Results of cleansing flight in February snow.

This is when colonies die of starvation. Every new beekeeper learns how to recognize this, often painfully, finding broodless colonies with bees that have crawled into the depleted cells, holding whatever residual heat their bodies produced from final respiration of the last drops of honey – and died. In periods of intense cold, the beekeeper sometimes finds remaining honey separated from the cluster area perhaps only a few inches away.

The need for large amounts of stored carbohydrate and protein foods consumed to survive this confinement and initiate Spring buildup.

It is in the bee colonies' best interest if the beekeeper allows them to keep abundant stores of honey or feeds sugar to supply honey they never produced or that the beekeeper has harvested.

There have been many estimates of the amount of stored honey or sugar a colony needs to survive the Winter In our locations mentioned above, the lower New England, southern Pennsylvania colonies near sea level, and the southern Ohio regions will require between 25 to 50 pounds of stored food to survive the Winter Because the colony that is short just one ounce of honey during this confinement is called DEAD, I suggest providing a 20-pound buffer of extra food during the Winter So, if locals say you need 50 pounds for Winter survival, provide at least 70. It will require more feeding, but it insures the bees will have adequate food stores during the Winter This also agrees with the observations of Doolittle I have discussed in earlier articles, that bee colony behavior changes when they have less than three frames (20 pounds) of stored food in their hive.

Stored in the comb, surplus honey or fed sugar is not lost in an apiary. It does not turn bees lazy or fat. Instead it guarantees the colonies' survival if the weather is at the extreme end of "average." If the hurricane season is any prediction, we may see some extreme "average" this Winter

What to feed the bees?

Bee colonies should be feed beet or cane sugar (50:50 with water), or high fructose corn syrup that is used in soft drinks (the corn sugar molecules are modified so the bees are able to digest them; bees cannot feed on bottled kitchen corn syrup). Beekeepers with smaller numbers of colonies will often find the best sugar prices at food warehouses (Costco, Sam's Club), while intermediate and large beekeeping operations will need to contact one of the supply dealers for the best price on sugar or syrup. Liquid sugar syrup is now available in some places, so don't overlook this labor saving resource.

Do not feed sugar mixtures that include impurities, including maple syrup, molasses, powdered sugar, or waste sugar with flour or any other food materials spilled into the product. When in doubt feed a colony

or two in advance and watch for dying bees, dysentery or other symptoms of nutritional imbalance.

Not all honey sources are considered equal. In this area, honey from the Spring and Summer (especially clover) is ideal wintering food. Honey from purple loosestrife, goldenrod and aster are generally not as good for prolonged wintering, and may result in increased dysentery. If there is no choice, leave the honey ON the colony rather than letting it starve.

I personally prefer to use division board or frame feeders – wood or plastic feeders that replace one or two frames. I also use top feeders, especially the plastic feeders that allow the bees to enter the feeder and clean it out after it has been emptied.

Timing

Feed in the Fall, after the honey crop has been removed, which, depending on your area and Fall nectar flow, may start in early September in northern locations and October for locations in the southern area. Your goal is to fill AT LEAST two deep or three medium brood boxes with stored honey and syrup, and more further north. Yes, it is possible to over Winter on less food, but the starvation risk increases. Keep in mind the lack of accessibility of the apiary, for this may delay your visits in the Spring to check the colonies and provide food if there is snow, or ice, or mud or a mixture of all three between you and your bees. There is an interesting observation on human nature here – I've noticed that beekeepers tend to leave more honey on colonies that are remote from their home base, and are often late in visiting them in the Spring. The colonies with extra food reserves often survive better.

Continue to feed until brood rearing has ended, and the entire brood area is filled with stored carbohydrate and pollen. The bees will instinctively move to the bottom of the area of food storage.

Emergency Winter-feeding is done by many beekeepers, and will be discussed in a later column.

Sugar Mixture

A 50-50 mixture of sugar and water will provide a think syrup that requires the bees to reduce the moisture by 30% before they store it in the combs. This is not the syrup to feed if the bees are expected to draw out foundation. That may be done earlier (late August) in the feeding cycle with thinner syrup. However, I think that Fall is not the best time to draw out foundation, a lesson the bees taught me years ago.

Pollen sources

In much of the northeast, the aster and goldenrod families provide the single largest source of pollen collected by bees in the Fall, and are two of the top seven pollen providers all season (the others are the sweet clovers, fruit blossoms, corn, maple and the willows). There are many, many species, and the "mix" varies considerably through the region, and even from one town to the next. Some asters are very frost and even freeze tolerant, and still produce pollen into December.

In seasons when there are poor foraging conditions during the Summer, it is often suggested that beekeepers feed pollen or protein supplement in the Fall. So far, there is no indication that this benefits the bees, but we'll look at that later. I know it is beneficial to feed protein in February and March, placing pollen or substitute patties immediately over the brood area.

Some clever beekeepers remove frames of pollen from colonies in the Spring and Summer and add them to colonies that may need them in the Fall or the next Spring.

Mechanisms to manage the waste products of a living hive: water, carbon dioxide and feces.

As colonies consume honey or sugar syrup inside the cluster, they metabolize the carbohydrates much as humans do, and convert the sugar into energy, water and carbon dioxide. The energy keeps the cluster warm as bees vibrate their wing muscles while not moving their wings. This releases heat energy. The water is released as vapor and in a well ventilated hive escapes through the hive entrance and other ventilation openings. In a tightly sealed colony, water vapor collects on the cold outer surfaces, and may even form an ice rime that eventually melts and drips on the bees. The carbon dioxide also ventilates out of the entrance and cracks in the hive, but may be sealed into a tightly wrapped hive and cause suffocation. This is a frequent problem in inside wintering systems, where carbon dioxide buildup is a key concern – in fact elaborate ventilation systems are used to either drain off the heavier-than-air carbon dioxide or through a combination ventilation and air conditioning system.

In addition, as the bees consume pollen, they extract key growth materials (the nitrogen) from the pollen, as well as any sugars, vitamins and other nutrients found there. The waste products are held in the lower part of the bee's digestive system, the rectum, and are ordinarily not voided until the bee has a cleansing flight. The waste products support natural bacterial growth. If the stores of the colony contain high amounts of indigestible materials, the rectum will fill quickly, requiring more frequent cleansing flights.

When bees have full rectums but are unable to fly they void inside the hive in a condition called dysentery or diarrhea. This is unsanitary, unsightly and reflects prolonged confinement or poor quality stores. It does not necessarily associate with the adult bee gut parasite *Nosema apis*. This amoeba parasite of the midgut works independently of the waste food disposal system. Remember, actively flying bees will often have the *Nosema* parasite, especially in the spring. Even newly mated queens will potentially have the parasites.

Next

Next month we will look at those things beekeepers are able to do to improve the conditions within the hive, and discuss location, which may be very different from where they spend the buildup and nectar flow during the season. BC

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Almond Pollination 2006 and beyond

Fear & Greed will probably rule
Do your homework before you go

With the bee shortage of 2005 receding in the past, both almond growers and beekeepers are curious as to what the 2006 season will bring. 2006 pollination prices have doubled over 2005 and are in the $100 to $150 range (the highest prices for the strongest colonies). The two entities that drive the stock market, fear and greed, are also in play for almond pollination: fear (of going without bees) on the part of almond growers, and greed on the part of a few beekeepers who feel they are entitled to a $150 rental fee for substandard bee colonies. Beekeepers can also experience fear – of theft, of excessive Winter losses, of growers not paying their pollination bills.

The driving force behind 2006 pollination prices is the unprecedented high prices for almonds – $3 to $4 a pound vs. $1.00/lb a few years ago. Growers don't mind paying high prices for bees if they know that they are dealing with a reputable supplier that delivers a quality product. There will be only a modest increase in bearing almond acreage in 2006, perhaps 20,000 more acres than 2005; the real crunch for bees will come in a few years when bearing almond acreage hits 730,000 acres (vs. 550,000 today). Growers are looking to lock in long-term relationships with bee suppliers and are actively courting beekeepers; beekeepers are in the heady position of being able to pick and choose among anxious suitors (a position that can lead to a temporary "Master of the Universe" syndrome, if one is not careful). What happens when almond prices drop back to $1/lb, as many expect they will, is anybody's guess.

If you've never brought bees to almonds before, you need to do some serious homework, just as the most successful pioneers that settled the early west were the ones that did sufficient homework before embarking on the trek. Good contacts are invaluable in this respect. Talk with beekeepers that have made the journey Have a thorough knowledge of whom you're dealing with on the other end, whether it be a broker, a grower or another beekeeper that is placing your bees. Know that the most desireable almond locations are taken first and your truck may wind up in a muddy orchard or be forced to spend a day or more scattering bees to 10 different orchards 10 miles apart. Know the specific orchard where you will be taking your bees. Dealing with good people can mean the difference between a happy or a dismal experience. If you're dealing with strangers, ask for references and follow up on these references.

If you live outside of California, getting a reliable trucker is a key to being successful in almonds. Here again it pays to do some diligent homework. Ask for recommendations from other beekeepers – you don't want your trucker taking a four hour break in Las Vegas on a warm afternoon. Get someone experienced in hauling bees and line up trucks well ahead of time. Give your trucker exact pick-up dates and make sure he meets those dates even if it means multiple phone calls.

If you're from a southern state, make sure your equipment is free of Red Imported Fire Ants (RIFA) and arrange for an RIFA inspection certificate from your home state (current RIFA rules require an inspection certificate from the state of origin). Your load will also be thoroughly inspected at the CA border and if more than five ants are found (up from zero ants in 2005) your load will be turned back (an expensive one-time clean-up at the border and another go at crossing

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Finding holding yards can be expensive and lucrative.

Fire ants are this small, but cause BIG headaches.

is an option). In order to pass border inspections, most beekeepers transfer bees to new or steam-cleaned pallets and pre-treat the ground in their holding yards with pesticides. Loads can also be rejected for weed seeds. Any debris of any kind on hives or pallets will trigger a meticulous inspection of your load of bees at the border. Know the exact location where your bees will wind up in California (you will be asked this at the border). Make every effort for the bees to arrive in CA on a week day so that county inspectors are more available to check the load on arrival. For the latest RIFA regulations, call (916)653-1440.

It is difficult for many beekeepers in eastern states to work up enthusiasm for almond pollination since most got into beekeeping for the life style and to make honey, not to put their livlihood on a truck and ship it to California (that crazy left coast). Some are looking to sell their bee operations rather than submit to a new life style.

There is long-term optimism for higher honey prices as developing countries, particularly China and India become more affluent and become major buyers of U.S. honey. If every person in China put a teaspoon of honey in their tea every day, U.S. beekeepers would be hard-pressed to meet the demand. With both India and China producing 10 times as many scientists as the U.S., it is likely that by 2040 China will surpass the U.S. as a world power, esp. if the anti-science bias of our current administration continues. South Korea (South Korea!) already surpasses the U.S. in cloning success. According to Dr. R.E. Smalley, a Nobel Prize winning scientist from Rice University "by 2010, 90 percent of all PhD physical scientists and engineers in the world will be Asian living in Asia. (*Imprimis*, February 2005).

The best and brightest of our young people are looking to become lawyers rather than scientists (or beekeepers – and many beekeepers, whether they know it or not, are also scientists) because that is where the money is (and the accumulation of money is deemed to be a virtue in a capitalistic society). No other country comes remotely close to the U.S. in the number of lawyers per capita. Our bright young (and old) lawyers have a negative effect on the gross national product of our country.

What a waste – and what a drag on the long-term prosperity of America.

But never mind. Looking at the world 30 years from now, U.S. beekeepers, although considered 2nd class citizens compared to the average Chinese, should fare well in the new world order. They should find a ready market in a prosperous China as millions of affluent Chinese peruse their (China-owned) Wall Street Journal while they sip their morning tea sweetened with premium U.S. honey. What a role reversal!

Getting back to almond pollination, the current situaton offers new opportunities for individuals with beekeeping experience:

Supplying bulk bees – with 3# of Aussie bees (+ queen) going for $100 an enterprising beekeeper in Alabama is offering 3# package bees (sans queen) for $45 to be delivered to CA just prior to almond bloom in order to boost up weak colonies.

Why ship all that wood to California when you can just ship the bees?

California managers – Many out-of-state beekeepers would like to ship their bees to California but don't want to go with them. They are looking for a reliable person in California to care for their bees in the Winter (if they Winter in California) and to deliver the bees to almond orchards at bloom time.

Winter location scouting – with Winter holding yards in California becoming increasingly scarce, a California based person could develop a good business securing yards and renting them to out-of-state beekeepers.

Colony strength inspectors – High pollination fees are causing almond growers to look more closely at what they are getting. A person should do quite well in a short period of time by offering an independent inspection program to growers.

Will there be a shortage of bee colonies in 2006? It depends on how your define "bee colony." There has been a shortage of strong bee colonies (defined as eight or more frames of bees) each and every year since almonds were first planted in California 100 years ago; 2006 will be no different if two strong colonies per acre is the accepted standard. There will likely be the requisite number of bee boxes to cover CA's 570,000 bearing acres in 2006 but the content of these boxes won't be known until almond bloom commences in early February. If almond growers are satisfied with two 3# packages per acre, as some were in 2005, we will see an influx of packages from Australia to make up any shortfalls. Florida bees will likely be used to cover any last-minute spot shortages of bees (as they were so used in 2005).

Whether there will be sufficient bees to pollinate 730,000 acres of almonds in 2010 is a question without an answer at this time. One solution would be to supply the same number of bees now being supplied but in fewer containers (boxes). One strong colony per acre will do the work of three or four weak colonies and should be sufficient. Two colonies per acre is the accepted standard for almonds and it is difficult to convince growers to use less, no matter how strong the colonies are. If almond growers are satisfied with two 3# packages of Aussie bees per acre, as some were in 2005, why wouldn't they be happy with one 10-frame colony per acre?

The solution to the upcoming bee shortage will not come from the bee industry, but from developing March-blooming almond orchards so that bees can be transferred to these orchards when February bloom is completed. Genetic material is available for March-blooming almonds. Perhaps South Korea can be prevailed upon to use their cloning expertise to make March-blooming almonds a reality.

Joe Traynor is a pollination broker from Bakersfield, and author of the Almond Pollination Handbook.

FALL FEEDING

The literature recommends heavy syrup for Fall feeding This is valid if you've been both greedy and callous

Walt **Wright**

All the experts have had their turn at generating an article on the subject of feeding honey substitutes. Those articles generally provide the pros and cons of the various popular techniques such as top jar, division board, boardman, etc. There is no substitute for comb feeding when a large amount of feed must be moved in a short time. This is especially true in clustering temperatures. Other feeding techniques permit limited access to the source, as in a perforated mason cap. Comb feeding provides an expanse of open cells to encourage literally thousands of bees to move feed at the same time.

First some background on when and why Fall feeding is required. As is the case in most of my output, some literature bashing is included in the following treatment. The literature, coming from the northern tier of eastern states, does not seem to recognize that they are keeping bees outside the normal climate range of the European honey bee. Perhaps that opinion should be supported with a few brief statements: (1) If you trace the U.S./Canadian western border around the globe to Europe, it passes south of England and north of Paris in northern France. Neither English nor French Winters are in the same league with the winters in Minnesota. (2) The 60-degree boundary of northern Saskatchewan and Manitoba, Canada passes south of Helsinki, Finland. The southern end of the Scandinavian countries is well populated and the northern area of the Canadian provinces has mainly First Nation people living there. (3) Central Europe does not

"The ratio I use is ½:1, sugar:water."

have the equivalent of the "Alberta Clipper" moving southeastward that brings the polar air mass in Winter to the U.S. Northeast. (4) Latitude is not the only factor in Winter severity.

The point of this trivia is that European Winters are less severe than north central and eastern U.S. Winters. Do you know of a strain or race of *Apis M.* that is native to Central Norway? If so, I could be encouraged to re-think the opinion that north central and north eastern U.S. is outside the natural climatic range of the European bees we use. In our coldest regions, the honey bee survival traits are pushed to their marginal limits. One aspect of their survival format is pushed beyond limits. They want to Winter the cluster on a brood nest filled with nectar after brood rearing ceases in the Fall. In northern areas where frost/freeze weather stops forage availability while they still have brood, the colony cannot make it happen. They are forced to relocate up on solid capped honey.

To get back to feeding, this article will stop the discussion here with the note that feeding may be required to fill the brood nest for wintering. More details can be found in two earlier articles, the Nov. 03 and Sept. 04: *Bee Culture.*

The literature recommends heavy syrup for Fall feeding. That is a valid recommendation if you have been both greedy and callous in your harvest of honey. Were you not greedy, you would have left enough for the bees to Winter. Were you not callous, you would not offer a substitute for their hard-earned Winter rations. In case you hadn't noticed, I look at beekeeping from the bee's perspective.

In northerly locations where brood rearing extends beyond forage availability in the field, you need to consider assisting the colony in preparing the brood nest. In one of the earlier articles, you were invited to check these concepts by opening a couple colonies in December. If, on your last hive opening in the Fall the cluster was in the lower deep, and in the upper deep in late Winter, they may have relocated upward off the empty brood nest. You likely didn't check it out yet, but you have another opportunity to do it this week and through the month. The colony can be enticed to move back down to the brood nest if there is sufficient mild weather left to move the feed.

In early Winter the typical colony has gone into the conservation mode. After stopping brood rearing for the season, they go into essentially full-time clustering. Both those actions reduce honey consumption. Without brood, the cluster internal temperature is permitted to drift lower and the insulating bees of the cluster shell become inactive. Once they reach this conservation status, they are reluctant to break cluster. If the brood nest has been properly filled, the fuel to warm the cluster is readily available for early Winter. If the brood nest doesn't get filled, and they are forced to relocate up onto solid capped honey, mid Winter brood rearing is slowed.

The timing of the sequence above suggests a need to feed by a means that moves feed in minimum time. Comb feeding meets that objective. Assuming some mild days are present between waves of ever-colder days, there is some time to help your bees fill the brood nest. This beekeeper highly recommends taking the time to do it. You will be rewarded by better wintering of the colonies in your charge.

Filling comb with simulated nectar requires that you impart some velocity to the feed. The same surface tension that keeps nectar in horizontal comb cells resists penetration from the other direction. Dipping comb won't work. I probably shouldn't publicize my mental ineptitude, but several ways were tried to impart velocity to the feed. First, using a quart jar with perforated cap like a saltshaker. Two problems with that approach: slippery jar and it took as much time refilling the jar as filling comb. Then, a garden sprayer with a fan nozzle attachment was tried. Too much time pumping up the sprayer pressure. Finally, the light bulb came on: Try gravity. Gravity works very well.

The picture block shows the simple process. In the larger picture at the left, Perma Comb®(PC) is being filled with nectar substitute. PC is rugged and can stand considerable abuse. Both PC and natural comb in wooden frames will float in the tub of feed. Higher sidewalls on the tub of feed are recommended to contain the splatter of feed in the surrounding area. It's not advisable to antagonize the regular kitchen crew.

The stop action film shows individual droplets of feed between the can and the comb. In use, it looks like a sheet of feed and only takes a few seconds to empty a half can of feed. One pass, over and back, will fill most of the cells. If you want 100% filling, it may take another half can. Quick and dirty! Scoop up a can of feed, fill one side and flip the frame over to fill the other side. The lower right picture shows draining the excess off the comb. Invert the frame to avoid drips on the way to the transport box. Very little feed is lost en route to the bee yard. (That surface tension thing.) The transport tray is shown in the setup photo at upper right. Those are homemade telescoping covers that never got metal covers. There were so many uses for them, including this one, that the inside joints were caulked to make them watertight. Any drips collected can be poured into the hive when the comb feed is installed.

A three-pound coffee can is the main equipment needed for this process. The bottom line of holes is shown: center-right. This is not my best can. It just happened to come to the top first. Notice the staggered line of holes on the left side in the photo. That arrangement of holes works better than the solid line of holes on the right side. If the holes are too close, or too large the flow tends to converge into a stream. The top of the can is not shown. One side is squared off to make a scoop to pick up feed in the tub and the opposite rim is folded inward to make a finger grip.

Several years ago a time test was run to see how fast a super could be filled with this procedure – in case I ever got around to writing this article. In the hurry-up mode care was not taken to fill every cell (estimated at about 90% of capacity). And draining off the

excess was limited to a couple quick shakes over the tub. Nine frames could be almost filled in seven minutes. Moving boxes in and out of position, and mixing another batch of feed took almost as much time as filling a super. But a medium super could deliver more than two gallons at a time with one hive opening. There is no feeding system that is man-hour free. We consider this system to be competitive in man-hours spent and has advantages that others do not have.

The literature recommends a two to one ratio by weight for Fall feeding. That's fine for supplementing Winter stores overhead. But if the feeding is intended to fill the brood nest, the bees naturally use nectar. And what is the ratio of sugar to water in Fall nectar? It's certainly not two to one. In the September ABJ, George Ayers reports that the sugar content of New England aster is about 25%. Further he says that that amount is "fairly dilute." Until I get more data, I'm using 1/2 to one as a mixture ratio to fill the brood nest. That's roughly a four-pound bag of sugar to a gallon of water. In the past, I have cut 55% HFCS half and half with water. That's in the same ballpark. Those of you that have more time to burn can research this question further Let us know what you learn.

Some beekeepers recommend weighing hives in the Fall to verify adequate Winter stores. Like the "heft" test, preparation of the brood nest is not fully verified. There are so many variables in per-hive weight that it would be quite difficult to select a go/no go weight that proves proper brood nest filling. As an example, just the variation in honey weight in a full deep can obscure the nectar weight in a Fall brood nest.

"Try gravity when filling combs. It works."

In my area, colonies typically get the brood nest filled with nectar after brood nest close-out. But not always. One year there was almost none and another year about half filled. As we go north to the Canadian border, the probability gets worse to the point where its almost a certainty that it won't get done. When you get a killing freeze before brood nest close out, there is no field nectar. Since I live about six miles from the Alabama state line, there is a large area where this feature of colony preparations for Winter has some impact.

If you enjoy Winter losses, you can totally ignore this article. BC

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

Honey Plants

Connie Krochmal

Rosmarius Ben Blue

Late-Blooming Bee Plants

In colder areas of the country, early frosts bring an end to the last of the Fall flowers. Elsewhere, the bees are as busy as ever During November and December, a number of late blooming species can be found in warmer regions. Among these reliable bee plants are trees, shrubs, and vines.

CORAL VINE (*Antigonon leptopus*)

A vigorous, quick-growing evergreen, coral vine reaches 25 to 50 feet in length. The tendrils grow from the ends of the slender, jointed stems. Three to four inches long, the heart-shaped leaves are hairy. These have a papery texture. With wavy edges, the light green foliage is arranged alternately.

Native to tropical America and Mexico, this produces dry, pointed, three-angled, hard seed pods. Blooms emerge throughout the year in long sprays from the leaf axils. Around 1½ inches in length, these are reddish-pink to bright pink. The centers will often be darker There is a cultivar with white flowers.

Freely yielding pollen and lots of nectar, coral vine blossoms are eagerly sought by bees who work them throughout the day. Humid, cloudy weather promotes the best nectar flows.

A member of the buckwheat family, this is related to knotweed. Other common names include Confederate vine, coral creeper, pink vine, Mexican creeper, Mexican vine, and Spanish vine.

Originally used as an ornamental in warm climates, this has naturalized in some areas. Coral vine is Winter hardy to zone eight. Frost can damage the foliage. However, the plant quickly recovers once the cold snap is over

Regarding its cultural needs, this bee plant requires full sun. Even though it has no tolerance for salty conditions, it does withstand drought. Normally, coral vine has few pest problems other than chewing insects and caterpillars. For best results, it needs an arbor, trellis or other strong support on which it can climb.

When the plants are abundant, coral vine can produce a surplus of honey. This varies greatly in color from water white, light to dark amber Thin bodied, it has a strong, distinctive aroma. The flavor is also unusual – strong and tangy yet pleasing. Some have compared it to aster honey. This seldom granulates.

LATE-BLOOMING HEATHS (*Erica spp.*)

There are several species of late-blooming heaths. Related to azaleas and rhododendrons, they offer nectar and pollen. These evergreen shrubs require a moist soil. Disliking drought, they will need some protection from harsh Winter winds. Winter mulches are also helpful.

Cornish heath and Winter heath are recommended for zones five through eight.

Cornish heath (*Erica vagans*)

Also known as wandering heath, Cornish heath is native to the British Isles and Europe. This dwarf, mounding shrub grows from 1½ to two feet tall. With freely creeping, arching stems, it can easily spread to 3½ feet in width. Cornish heath tends to be a vigorous, fast growing plant.

The needle-like leaves only grow to around ¼ to ½ inch in length. These are lance-shaped. In color they range from light to dark green above with silver on the underside.

This species blooms from September through November. Very showy, these small, tubular flowers crowd together along the lengths of the stems. Depending on the cultivar, they can be white, pink, or red. Like all heath blossoms, these are very popular with bees.

Cornish heath requires a well drained, acidic soil that is rich in peat. This species does not respond well to alkaline conditions. It thrives in full sun and partial shade.

Cornish heath honey doesn't become quite as thick or gel-like as that from ling.

Winter heath (*Erica carnea*)

Among the hardiest of the heath species, Winter heath blooms reliably from November until April. It assumes an upright shape when young.

Winter heath (Erica carnea)

As it matures, this European native tends to form a mat 2½ feet wide and 1½ feet in height. Needle-like leaves in tight clusters clothe the stems. Only ½ inch long, they are lance-shaped. Mostly purplish-green, these turn darker during the colder months. Some cultivars can have foliage in other colors.

Opening singly, the bell-shaped blossoms conceal the stems. Usually the flowers are white or varying shades of pink or red.

This quick growing plant has slightly different cultural needs than Cornish heath. It will tolerate slightly alkaline soils, but it performs best in neutral to acid conditions. Preferring partial shade, this will not bloom as freely in deep shade.

Winter heath honey can vary in color from yellow or reddish-brown to rich brown. It tends to granulate very quickly. This has a distinctive, sharp flavor

LOQUAT (*Eriobotrya japonica*)

A shallow-rooted evergreen tree, the loquat has a fast growth rate. It grows to about 25 or 30 feet in height with almost an equal spread. This freely branching fruit tree has a compact, broad, rounded shape. There are rusty hairs on the young stems.

Its branches are heavily covered with woolly foliage arranged in a spiral fashion. Up to a foot long, the dark green, lance-shaped leaves have sharply toothed margins. These display prominent veins. The underside is rusty gray. When they first emerge, the young leaves have a reddish tinge. A variegated cultivar is available with white along the margins of the leaves.

This tree begins flowering at a very young age. Also known as Japanese medlar, loquat blooms from the late Autumn through the late Winter. Opening in large, six-inch-long clusters containing 50 or more flowers, the fragrant blossoms are an inch wide. These appear at the ends of the stems. Cream colored to white, they have five petals. The clusters vary considerably in shape and growth habit from conical or cylindrical to upright or pendant. Both the blossoms and flower buds are covered with brown hairs.

Loquat fruit (Eriobotrya japonica)

The flowers are well loved by bees. This shouldn't come as a surprise. After all, this nectar and pollen plant is related to apples and pears.

The aromatic, edible fruits are produced in clusters. These can be rounded or pear-shaped. Slightly larger than a crabapple, they contain about five seeds. Loquats ripen in the Spring, turning yellow, orange, or reddish-orange. Juicy with a melting texture, these have white or yellow flesh.

Recommended for zones seven through 11, loquat thrives wherever citrus is grown. It performs best where Summers are relatively cool for prolonged heat waves can interfere with flowering. The tree can survive frost, but the flower buds and fruits will not tolerate temperatures below 29°F.

Loquat is adaptable to almost any soil so long as it is well drained. However, it grows best in a light loam with a pH range between six and eight. This tree has no tolerance for salt. Thriving in full sun, the plant will take some shade. Loquat can withstand mild drought.

Though most cultivars of loquat are self-fruitful, several require cross-pollination. In any case, pollination promotes better fruit set and higher fruit yield.

Like pears and other kinds of fruit trees, the loquat is susceptible to fire blight. This happens most frequently when a combination of high humidity and frequent rain are present during the Spring. The tree can also be attacked by scale and fruit flies.

Apparently the loquat originated in China and subsequently spread to Japan. During the 18th century, it was introduced to Europe, and eventually to California in the late 1800s.

Loquat brings both nectar and pollen. An excellent source of nectar, this routinely gives a surplus crop of honey when the trees are present in large numbers. The honey is profound amber, and well liked by consumers.

ROSEMARY (*Rosmarinus officinalis*)

All parts of this plant are aro-

Arbutus spp.

matic. Native to the Mediterranean, this fast growing species is an evergreen shrub. As an outdoor garden plant, it can be four to six feet in height with a spread of about four feet. Rosemary tends to be smaller when it is grown in containers.

Generally, the species is upright. However, cultivars with dwarf, spreading growth habits are available.

Rosemary features long, narrow, needle-like foliage with sharp, pointed ends. These lack leaf stalks. With a thick, leathery texture, the leaves are gray-green above and gray on the underside. This plant has white, scaly bark.

In warm climates, rosemary flowers generally appear from November through the Spring. From the leaf axils of the old wood, these open in small clusters. They are mostly pale blue. However, you can buy cultivars with flowers in other colors, including white, pink, lilac, and darker blue. Glance at rosemary blossoms, and you are sure to notice the distinct, two-lipped shape – typical of the mint family.

As far as its needs are concerned, rosemary requires minimal care. Adapted to poor dry soils, it withstands drought. Because it tolerates salt, this is suitable for coastal plantings. So long as the spot is very well drained, rosemary will thrive in most any soil. The optimal pH is between five and eight. Though the plant normally prefers full sun, some partial shade during the afternoon is helpful in very hot climates. Normally, rosemary has few pest problems.

Considered Winter hardy to around zone seven, rosemary suffers damage when exposed to sub-freezing temperatures. It is sometimes possible to grow the hardiest cultivars, such as 'Arp,' in zone six if the plant is given a sheltered position.

Yielding nectar and pollen, rosemary is considered an excellent bee plant for warm climates. This can yield a surplus crop, giving as much as 130 pounds of honey annually per colony. It can be white or water white with a characteristic aroma and rich flavor. Tending to granulate rapidly, it is fine grained.

Arbutus spp.

STRAWBERRY TREE (*Arbutus unedo*)

An evergreen, the strawberry tree is relatively long lived. This normally grows as a multi-trunked shrub or tree with a dense, symmetrical, rounded vase shape. It usually reaches about 15 to 25 feet tall with a spread of eight to 15 feet. Dwarf cultivars, such as 'Compacta,' are available.

A vigorous, fast growing plant, this tree has picturesque, twisted trunks, and low-hanging branches. The new twigs have a reddish tinge. When the strawberry tree becomes older, the shaggy, cinnamon to dark reddish-brown bark begins to flake.

Arranged alternately, the leathery leaves are dark green. They have toothed edges. With red veins and red leaf stalks, these reach four inches in length. They're rounded to oval.

Blooming from the Autumn through the Winter, strawberry tree flowers appear in small, arching, terminal panicles. These are two inches in length. The very showy, urn-shaped blossoms, either white or pink, resemble those of the blueberry for a good reason. They're members of the same family.

Harvested from September through November, the edible fruits have a warty, knobby texture like a strawberry. Their shape varies from round to globular These fleshy fruits are initially white, ripening to yellow and finally red. Their skin is tough.

Also known as the Killarney strawberry tree, this plant is best suited to zones eight through eleven. Though the plant may survive in colder areas, the foliage is damaged by frost.

This grows well in full sun and partial shade. Due to its long tap root, the strawberry tree has some drought resistance. It also shows a slight tolerance to salt. Like most other members of the Ericaceae family, this plant grows best in acidic soils. However, it will tolerate a slightly higher pH than some, up to a six. All soil types are suitable – even clay. This has no serious pest or disease problems.

Native to Europe, Ireland, Asia, and Africa, the tree is self-fertile. So, one is sufficient for fruit production.

Providing nectar and pollen, strawberry tree blossoms always attract lots of bees. The unusual, chestnut-colored honey has a spicy, sharp flavor with a hint of pepper or menthol.

In warm areas of the country, bees are able to fly almost any time of the year. When they're foraging in the very late Autumn, they'll find blooms of the strawberry tree and other plants eagerly awaiting their arrival. BC

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Malcom T Sanford

Thoughts On Survivor Bees

"The symposium looked at biodiversity, but our respondants worried more about the beekeepers."

In my August 2005 article on survivor bees around the world, I mentioned the Russian Primorski stock that has now been introduced into the United States. A recent review of this program includes the rationale, process and timeline for this introduction, which is now entering a new phase, more heavily dependent on beekeeper input.[1] Although the success of this project cannot really be gauged at this time, many beekeepers have voiced disappointment. Complaints consist of the fact that these bees do not produce as much honey as hybrid bees currently in use, are much more difficult to requeen, and supersede quickly because they continuously build and tear down many queen cells. However, these behavioral traits may mean a lot in terms of Varroa tolerance, the reason the Russians were introduced in the first place. The long-range solution will no doubt be that U.S. beekeepers faced with Russian stock behavior will adapt their management to its peculiarities to be successful.

Humans historically have adapted to honey bees that are endemic in a specific region. They engage in purposeful introduction of other bees from elsewhere at considerable risk to their enterprise. The history of worldwide introduction of *Varroa destructor* speaks eloquently and sadly to this fact. Biogeography of honey bees, thus, is an important area of study. Unfortunately, it has never been much of a focus for investigators in the United States, perhaps because funding for this kind of research is extremely scarce. However, it remains of great interest to Europeans.

A symposium at the Third European Congress on Social Insects, sponsored by the European branch of the International Union for the Study of Social Insects (IUSSI) held in St. Petersburg, Russia, August 22-27, 2005, focused on biodiversity of honey bees. Ibrahim Çakmak, Uludag University, Turkey revealed information on the various races of *Apis mellifera* found in Anatolia. These include *A. m. anatoliaca* (populations of this race also differ from east to west in Turkey), *A. m. carnica* (Thrace), *A. m. armeriaca* (convergence of the Black Sea, Ilgaz and Taurus mountain ranges), *A. m. caucasica* (eastern Black Sea), and *A. m. syriaca* in eastern Turkey, bordering Syria and Iraq. He concluded that honey bees in Turkey differ not only in morphometrics, but also in foraging behavior, and this diversity can be exploited in finding bees tolerant to diseases and pests. There is evidence, however, that hybridization between races is occurring at a rapid rate due to migratory beekeeping in the country. Fortunately, pockets of endemic bees can still be found managed by stationary beekeepers.

A.G. Nikolenko, Urfa Scientific Center, Russia, reported on the critical condition of the black European honey bee (*Apis mellifera mellifera*). Much of the decline in this subspecies has to do with habitat destruction; however, hybridization through migratory beekeeping is also taking a toll. Four intact local populations, nevertheless, have been identified based on immune response, measured by levels of antioxidants such as glyukozo-6-phosphatedehydrogenase. Immune responses, the author concluded, can be used to separate races and also be employed in breeding programs. Specific population buildup data for bees in Northwestern Caucasia, Krasnodar region were also reported by Larisa Moreva, Kuban State University, Russia.

A symposium on swarming in honey bees somewhat paralleled that concerning biodiversity. Again Ibrahim Çakmak took the lead by reporting information on swarming by the various races of honey bees found in Turkey. *A. m. caucasica* swarms at most once a year in its native range, producing only 10 to 20 queen cells, whereas *A. m. carnica* may cast as many as three swarms per season and builds more swarm cells. Both races, however, swarm far less than *A. m. anatoliaca*, even though they all appear to be adapted to cold Winters in their native range.

Correlated with higher swarming rates in *A. m. anatoliaca* is a dry hot Summer season. The same is true for *A. m. syriaca*, which swarms far more frequently and may build hundreds of queen cells. This is due to a combination of several things, including unpredictable weather (hot, dry desert conditions) and the fact that it does not have to store as much honey as bees in the north because the Winter season is typically wet enough to promote vegetative flowering. In addition, this race is often challenged by an enlarged group of predators, including two wasps, known to kill entire colonies on occasion. Although not mentioned in the paper, this author would add the bee eating bird (*Merops. sp.*) to this list. Swarming to avoid predation, therefore, is not out of the question.

Readers may remember my musings on Iraqi beekeeping in the August article: "It could be that in a rural village without many resources, a system based on many more traditional, smaller colonies that are not treated and encouraged to swarm and become 'survivors' would be more productive in the aggregate than one founded on

larger moveable-frame colonies that require treatment and more resources. Frequent reproductive and migratory swarming are also thought to be one of the reasons that Africanized honey bees in Brazil are mite tolerant and require no treatment."

I then asked for feedback from readers based on the following questions:

1. If you were to counsel those beginning from "scratch," in a region where the bees and people have been devastated by conflict, how much would you suggest relying on local "survivor" bees? How long could or would you recommend waiting for an industry based on such a stock to develop?
2. If you needed new genetic material quickly, how would you go about importing queens from the rest of the world with minimal risk? (Note: so far *Acarapis woodi* has not been found in Iraq and AFB and EFB are present, but apparently not at epidemic levels; small hive beetle has yet to make an appearance).
3. In rural villages with established populations of bees in traditional hives made of narrow woven baskets covered with wood ash as a wattle, would you recommend immediate transfer to Langstroth moveable-frame hives and elimination of the traditional hives as is currently proposed? If not, what would you recommend with reference to developing sustainable and appropriate beekeeping in this setting?

Several subscribers were kind enough to send me their observations. The majority of the remarks can be summarized in the following from a bee regulator:

"The proposal of relying on the recovery of local stock is preferable for many reasons. Being in the foothills of the Caucasus Range, it is particularly valuable to retain the qualities of the native stock. While we like to see them recover quickly and re-establish a flourishing beekeeping industry, the rate of recovery is determined by many factors including the economics of beekeeping and the ability of producers to sell their hive products at a reasonable price. All what I am saying here is that the effort and support for the recovery of the beestock should go hand-in-hand with the rehabilitation of the infrastructure. This may take quite a few years even when it is backed up with outside financial and logistical support.

"I recommend that this "back up" import stock should come from the region instead of overseas sources. For example, northern Iran along the Caspian Sea has had a significant beekeeping industry and it could provide significant quantities of stock.

"Transfer to Langstroth may be ultimately desirable, but for the purpose of development, it is important to first assess the ability of local beekeepers to pay for such high input costs. If much of the region is busy with reconstruction, the availability and affordability of lumber may be out of reach for many. If woven bee hives have been a traditional hive form in the region, why not aim for a hive body using the same basic materials? I am thinking here of a modified Kenyan Top Bar hive. Instead of using lumber for the hive body, a woven basket can be used that is attached to a wooden frame on which the top bars rest. The input costs will be far lower and construction of woven baskets may offer some local employment (e.g. women's groups, etc.)

"The manufacture of hive bodies, although light industrial, still needs machinery, electricity, spare parts, in some centralized location. This immediately brings up the question of the logistics and costs of distributing hive bodies to villages and outlining areas. Even though Langstroth hive bodies may potentially provide the highest production levels, if the operating environment and infrastructure are not sufficiently established Langstroth hives will simply not be the right technology at this time. My recommendation is to tailor-make a development project with the focus on local input, providing rural families the opportunity for generating some cash flow through simple technology that is locally available and sustainable."

I received this from a long-time commercial beekeeper:

"If you look at history, when bees were kept in skeps, hollow logs and box hives, the production was

around five pounds per hive per year and disease was rampant. When laws were passed requiring moveable frames production increased to the 70 100 lb range. Modern hives are easier to manage in all respects; requeening, moving for pollination or to maximize production, making splits, etc. I would definitely go with modern hives.

"As for survivor bees, you need to have some understanding of how they survived. It is my conviction that most survivor hives have survived because of environmental conditions rather than genetics. Hives in the wild usually have a deep void under them and most mites that fall off do not make it back up to the colony. Wild hives also swarm often, breaking the reproductive cycle of both the mites and the bees. After swarming the bees rebuild faster than the mites and therefore can survive longer Those that don't rebuild faster do not survive. Neither mechanism is adaptable to modern beekeeping.

If you go with the non-movable hive then I would go with survivor stock. But everyone should be aware that it will take 15 to 20 traditional hives to equal one moveable frame hive."

And this from a bee scientist:

"Stay with the old bees and the old bee equipment. Changes will only be possible once you have a group of beekeepers working as a unit or a team."

Another observation:

"Wholesale transfer to moveable frame hives without appropriate guidance is probably the fastest way of getting AFB and EFB up to epidemic proportions and thus eliminating the incipient beekeeping industry or forcing it into being dependant on chemicals. Beekeepers are always reluctant to renew brood comb and it is so easy not to with moveable frames in stacks of boxes, thus allowing disease organisms to build up.

"Depending on what is traditional in that area and the forage available and the habits of the native strain, a life cycle of two to three years for each colony with renewals from swarms could be indefinitely sustainable and rely only on local inputs. Output would not be maximized but could be high value, including as medicine. There would also be a regular harvest of wax which has a multitude of uses and can be turned into value added products, often on a small scale as cottage industries.

"This approach keeps the income close to the original producer and may be a way of bringing income and therefore power to the distaff side. The beekeepers would probably do well to supply high quality products in limited quantities for the local market at a good price rather than to over-produce and have to dump surplus through packers onto the over-supplied world market.

"I can't remember the name of the economist who made a study of the subject as if people mattered (cobblers is in my mind) but he coined the phrase 'small is beautiful' and I think it is appropriate in this instance."[2]

Finally, I am preserving the words and tone in this comment. Sometimes English spoken from non-native perspective has greater impact than when conventionally expressed.

"I play with the notion that men trying to impose it's will to nature's doings and more often than not we find ourselves at the short end of the stick So, to me it became cut and dry: The genetic features are to be preserved and helped along the way to survival of the species without stepping on the creature's feet.

I am on the warpath with those prohibiting any transport of queen bees with attendants. Is there evidence that queens had phoretic mites? Can an inspection be of validity? Yes! Therefore queen shipments of SMR queens would give the start up a boost. I take a dim view of bureaucratic arguments since all this quarantine stuff and associated ballyhoo did nothing to prevent the spread of critters or diseases but guaranteed the salaries of the officials." BC

"Relying on the recovery of local stock is always preferable."

References:

1 Rinderer, et. al. 2005. "A New Phase Begins for the USDA-ARS Russian Honey Bee Breeding Program," *American Bee Journal*, Vol. 145, no. 7 pp 579-582).

2. Schumacher E.F 1989 *Small is Beautiful: Economics as if People Mattered* (Harper Perennial Press **ISBN:** 0060916303).

Queen Rearing Workshop 101

This year, grow your own!

Ann Harman

As queen problems become more apparent, quite a number of beekeepers have become interested in do-it-yourself queens, those raised locally, for requeening and perhaps some for sale. Short courses given by local beekeeping associations are very useful for the more experienced members who wish to raise a few queens. Since this project is a specialized endeavor it may be practical for two or three local associations to work together

Before you begin planning a queen course for next Spring it is important to differentiate between queen *breeding* and queen *rearing*.

Breeding involves a good foundation in genetics and intense attention to detail. Breeders are looking for specific traits and are programming their breeding to achieve one or more specific traits Artificial insemination is an important part of breeding. Bee breeding is not for the casual beekeeper wishing to raise some queens.

Queens and drones and special equipment.

Queen rearing, on the other hand, is the raising or production of queen bees. True, some knowledge of genetics and biology is useful, and timing is essential. Those beekeepers who are raising queens will also be involved with selection, just as the breeders are.

Now for the first step in planning your queen rearing course. You need to make some decisions on the techniques you, and those who may be helping you, will teach. Perhaps the best thing to do for you and any other instructors is to carefully read three books. Yes, other books have queen rearing information and will be help, but queen books are not common. You may wish to select one or more as a text for your course. Whatever decision you make encourage your students to own, read and use all three.

Rearing Queen Honey Bees by Roger A. Morse has excellent information. Although written some time ago, 1994, it is an important book. It is still available from equipment suppliers.

Successful Queen Rearing Short Course by Marla Spivak and Gary Reuter is full of diagrams and careful explanations. The queen rearing wheel of important events makes timing foolproof and is a very clever addition to the manual. This book also has a list of Suggested Reading, although most of the books are only available on the second-hand market. A video is available for this particular book and should be used as a teaching tool. The only drawback is that the book features only the Doolittle method of raising queens – grafting young larvae.

The third book is *Queen Rearing and Bee Breeding* by Harry H. Laidlaw, Jr. and Robert E. Page, Jr. The quote on the back cover describes the theme of the book quite well: "Written for beekeepers who know little about genetics and geneticists who know little about beekeeping."

This book, with its many photographs, is essential to those who will teach and those who will take the short course. The section on genetics is not too technical but does give a thorough background for those who wish to improve their stock. A chapter on Artificial Insemination is a brief introduction to that technique. Four methods of raising queens are explained, including the Miller method, useful for raising

a small number of queens. The Doolittle method receives the most explanation. No mention is made of such methods as the Jenter or similar queen rearing kits.

Since grafting can be a problem for those who have difficulty seeing the very young larvae, or even eggs, it would be wise to order a Jenter or similar kit from equipment suppliers. In this way the students of the short course will be exposed to a number of different ways to approach queen rearing. Students can then choose a method that suits their needs. Encourage them to experiment even if it means some failures. Successful queen rearing is not something that can be accomplished "overnight."

Equipment, lots of equipment, is essential to a good queen rearing course. You may need to spend some money assembling everything that you think you might need. Review the queen equipment in several supplier catalogs. Some items are essential, some are nice and others not so important. If you will be teaching grafting it would be nice to have an assortment of grafting needles for the students to try. Do not skimp on equipment. Keep track of your expenses so that the tuition you charge covers your expenditures (including some refreshments).

Queen rearing is not a one-day short course. Ideally it should begin with lecture sessions that include equipment, lots of equipment, to illustrate the lectures. Your students may have a good knowledge of beekeeping and its vocabulary, but queen rearing has its own and needs to be introduced. Schedule plenty of time for explanations of such terms as "starter colonies," "finisher colonies," "cell builders," "drone mothers," and "swarm box." Don't just assume your students know the terms you are tossing around.

For classroom sessions you can have a hive empty of bees but have frames labeled and manipulated so students get some idea of what you are describing. Some people learn by listening, others by seeing and all by doing.

Lecture sessions can be held almost any time of year. But beeyard sessions need good weather. If you and your instructors have several hives of good-natured bees let the students make the starters, finishers, nucs, grafting, and other activities. Your bees may be a bit confused for a few days but at least you have guided the students into good practices. True, some students may find that queen rearing is not as quick and easy as a honey crop but at least you have satisfied their curiosity. They can always buy some queens from the successful students. However they are now better beekeepers because they have a better understanding of the world of bees.

The Miller method is a good way of raising a few queens by the hobbyist beekeeper. However, for some reason it seems to be the most confusing to explain. I have seen a room full of beekeepers absolutely confounded by an explanation. Here is where equipment is needed for a lecture. The lecture should be followed by several beeyard sessions. The queens do not have to be raised to completion but the initial steps of placing foundation pieces in a frame and putting that frame into a colony and the subsequent cutting of the comb and the start of queen cells does have to be demonstrated. It is possible to do this in one day with prior preparation. That is, have several hives with the strips at various stages. That's reminiscent of the television chefs who stir up a cake and pull the finished one out of the oven one minute later.

Drones may be the least mentioned part of queen rearing, even beekeeping in general. It is definitely worth devoting a full session, or even more, to drones. All too many beekeepers look upon drones as boring, if not a waste of the bees' efforts. Attention gets focused on the queen. Your task will be to bring drones and their importance to the attention of the beekeepers in your course. After all they are half of the worker's characteristics. Go back to the books and prepare a nice presentation on drones.

You may well have to demonstrate how to mark queens. The importance of marking queens is found in the three books. Testors® paint pens, found in hobby shops, come in the five international colors or you can order a set of five paint pens from some of the suppliers. Let the students practice on drones – they don't mind and they lend a bit of color in the hive.

Handouts on various topics are always appreciated. The Winter months ahead will give you a chance to read and re-read the books. Look for topics that you feel will need some expanding, updating, or a fuller explanation. You might wish to prepare a vocabulary for your students. If you are adept at drawing you can augment the illustrations in the books.

If this is your first queen rearing course, make notes of the questions asked and of those topics that produced the most questions. After the course is over, use your notes to determine what you need to include, emphasize or demonstrate better next year.

Announce your queen rearing short course to beekeepers in your area. A public announcement would not be appropriate. Be prepared to limit the number who wish to attend if you live in an area with many beekeepers. If demand is high you can plan two short courses – one for those merely interested but not planning to do much and another, in depth, for those seriously planning to rear queens.

A nice touch to your course would be a certificate. Blanks for these can be obtained at any big office supply. If you are handy at the computer you can create a simple certificate that says the student has completed an introductory course in queen rearing. Such a certificate may be helpful in the future if the student is planning to sell some queens.

Remember – the approach to your queen rearing course should be the *why* of all the steps or the *how* may make no sense. BC

Ann Harman teaches teachers full time, from her home in Flint Hill, VA and around the world.

CHRISTMAS DINNER 2005

Goosey, Goosey Gander - a recipe for a Bee Handler . . .

Michael Young

Goosey Goosey Gander where shall I wander, upstairs, downstairs and in my lady's chamber. There I met an old man who wouldn't say his prayers; I took him by the left leg and threw him down the stairs A classic, historical, English rhyme with typical political overtones. How many of us as parents have not sang this to our children when trying to force them to sleep? I use the word force purposely because one of my daughters, Jamie, must have been the baby from hell. She cried until the cows came home and then turned their milk sour with her high pitched screams. I blame myself really as I put so much honey in her bottle she started to grow a curled tongue. Although all is forgiven I love her to death.

This lovely nursery rhyme is believed to date back to the 16th century. The 'lady's chamber' was a private room that the lady of the house would have, it's a place that Catholic priests were known to hide hence called 'Priest Holes.' Priests hid to avoid persecution from fanatical Protestants against the Catholic religion.

If caught both priests and family members found harbouring them were executed and plenty were. The moral in Goosey, Goosey Gander's lyrics teaches us that something unpleasant would happen, if not saying their prayers properly – meaning the Protestant Prayers said in English as opposed to Catholic prayers which were said in Latin!

Mother Goose rhymes and tales have appeared in manuscripts since the time of Henry VIII of England. Some have links to earlier oral traditions and goose has been sung about as far back as the ancient Druids. Therefore, goose is in, and has been for a long, long time.

No Christmas is complete without a traditional roast goose. It offers a marvellous change from the usual turkey and it is the only seasonal bird available today so therefore I have conjured a cracker of a recipe for you. It's time to bring back the Goose.

Goose is not half as boring as Turkey. I've heard it said that the Turkey tradition in the U.S. only goes back as far as the founding of the National Turkey Growers Association, "Dedicated to the preservation and promulgation of dry, tasteless fowl for the masses." Say no more, I told you so, and it is written in stone! So Bob's your uncle and lets move on.

Goose is farmed but is still very much a seasonal bird. The season starts in late September when the bird is small but ready to serve for the traditional Michaelmas Day feast on 29 September Tradition also meaning that the farmers gave a goose to his landlord as soon as the harvest had been collected in. Cunningly, hoping that the following years rent would not be increased and of course near Christmas the goose is mature and getting fat.

No truer word spoken, goose does hold a thick layer of fat, but most of which melts away during roasting, leaving tender, slightly gamey meat. (*Brings salvia to mouth just thinking about it*). The melted goose fat can be used for many things. Goose wings were used to sweep the hearth, feathers were used as quill pens, fishing flies, archer's quills, eiderdowns, cleaning the kitchen range, hand cream, covering sore nipples of nursing mothers, (*I am really not making this up, my mother told me this)* and endless uses, just like beeswax. However, more so in Ireland; goose was the traditional meal for Michealmas day.

Goose, Goose, Goose I love this bird, it's a real little darling and no better respect one can give it but to cook it up and serve at Christmas dinner for your family and beekeeping friends.

Let's go further and put this recipe to bed, but first a couple of tips about cooking this little darling.

It is important to make sure that you have collected all the ingredients and equipment before starting cooking so relax and read the recipe first. You don't go to the hive without a smoker or hive tool do you!

Most recipes say to prick the breast with a skewer to help release the fat whilst cooking. However, I find it's not necessary if you place the goose on an oven rack and then place a dish (wider than the goose) of water on the next rack below. Ideally the steam created dislodges the fat from the

bird and drips into the dish of water This can be collected later This drains off the fat better and gives a leaner result. There is little danger of the meat drying out.

If you get an older goose, there is a much higher ratio of meat to bone. Therefore, if you're good with the gun shoot one that's really fat, one that can hardly get off the ground, around 4-5kg/9-11lb; think the size of your oven. Or, find one that size that's fresh, *not* frozen. You may have to order it ahead of time, just to make sure.

Before we embark into the kitchen it's just important to get into the right mood. Take a glass of your best mead and put your favourite CD on, whether it's Led Zeppelin or Jim Reeves, and relax or you will end up blaming me for the disaster. Another thing, if it's the male of the house cooking this recipe and you are using your wife's kitchen remember it's not *your* kitchen and never was. Even though you have lived there for a hundred years you have nothing to do with it. Therefore, buy her a manicure or something because two many cooks spoil the broth and you will always lose. If it goes the wrong way you really would have cooked your goose. You need to turn the oven on and preheat to 190°C/375°F/Gas5.

The *Bee Culture* Recipe

Oven Roasted Goose with a Golden Glaze accompanied by a juniper and mead sauce, gooseberry & honey coulis and a pomegranate sauce.

Preparing the goose ready for the oven

Ingredients: Fir st stage
1 oven-ready goose (9-11 lb/ 4-5 kg)
A handful of star aniseeds
1/2 lb honey

Remove neck and giblets from body cavity, as well as the wings. (Keep the liver and heart for the forcemeat (stuffing), and the gizzard etc. for the sauce. Place in the refrigerator for later. Trim excess fat from body cavity opening and neck skin.

So here we go, grab the goose by the neck and don't be afraid of it! Its dead it won't bite you, or come back and haunt you, believe me I know these things. So grab it by the scruff of the neck and give it a good wash under the running water, especially inside.

Take a large saucepan and fill it with water and the aniseed, when boiling plunge the goose in for about four minutes. If you only have a small saucepan, hold the bird firmly and take a ladle or measuring jug and pour the hot water over the bird.

Place the goose onto a civet, (a wire tray above a roasting tray) the bird should have puffed up and there should be no wrinkles like my granny, it should be as smooth as a baby's bum. Look at it closely and admire the work of art you have just created however, this is only the first primary colour on the canvas, so lets go for the oils.

A flavoured filling for the goose

1 orange cut in half
1 lemon cut in half
1 clove garlic cut in half
3 sprigs of thyme

Slap and tickle with honey

Right, here we go. Gently stuff the old gal with the lemons, oranges, garlic, and thyme. Then get a piece of string and tie the back legs together. An executive decision has to be made at this point because there are two routes in tackling this little darling. First you can hang it up by the legs and place in front of a fan switched on of course, and brush it every 15 minutes with honey. This needs to be done for about six hours. Wow! Just the smell of it air drying in honey, this is real cooking, unlike biscuits that any one can cook.

When finished and cooked this way the old girl will look so pretty you would want to take her out for dinner, literally. So go for it now the other route is just simply brush and slap and tickle the honey all over the goose as it sits on tray. Boring compared to the former, where is the respect in that, but mind you it tastes heavenly that way too.

Forcemeat (stuffing)

A forcemeat is basically stuffing with meat added.
4 sprigs each of freshly chopped, thyme, parsley
4oz of butter
1 loaf of bread made into soft bread crumbs
2 Eggs
8-10 Shallots
8 Apricots diced
6 Chestnuts diced
8 slices bacon diced
4 oz honey
A great veggie treat just leave out the meat.

This is not just forcemeat – this is sheer bliss

Whilst the old gal is feeling a little heat its best to prepare the forcemeat. Firstly, melt butter, add the finely diced shallots and bacon. Fry for two minutes in butter. Add the thyme, parsley and cook out a little; mix in the bread crumbs, finely diced apricots and chestnuts. Place the mixture into a mixing bowl and let cool (just enough not to cook the eggs when being added), make yourself a cuppa, you deserve it. Add the honey and beaten eggs mix well in. Place the mixture in a small greased roasting or cake tray and cook on the bottom shelf of the oven for around 50 minutes until it looks cooked, like a cake. When cooked, leave to cool and you can turn it upside down to remove it from the tray. The beauty about this is that you can cut it just like a cake and it tastes absolutely scrumptious.

So you want to cook your goose do ya?

Well let's get cracking. The goose is sitting pretty,

breast side up, on a wire rack as described earlier Brush liberally with honey and cover with foil. Roast in the oven's middle shelf for 3½ hours until the juices run clear, with the tray of water underneath as described previous. After cooking for one hour reduce the oven temperature to 325°F. Take the foil off 30 minutes before the end of roasting and brush liberally with warm honey; this can be repeated at the last moment to get a crispy blackened honeyed golden glaze.

When finished it is important to allow the goose to rest for 20 minutes before carving. "Tut, tut", "Don't Pick" just stare and wait. Lock your dog up because everyone knows that dogs like geese.

Stock/sauce

6 shallots, finely chopped
1 cup of dry mead
6 Juniper berries
1 tablespoon arrowroot
Liver and heart
1 pint chicken stock

Let's get saucy

No rest for the wicked. Another job you can do whilst our friend is getting there in the oven is to prepare the sauce just after the forcemeat has gone into the oven. At this stage you should be either enjoying the experience or stressed out so much that you want to scream. Just relax, life is like a cuppa tea "it's the way you make it" so take a cuppa or a nice glass of mead. Remember you can't have a rainbow with out rain.

Let's move on, beekeeping guests are arriving soon. Take a small saucepan, sweat off the diced shallots until nice and brown in a smidgeon of butter (this is important as this gives a nice colour to the sauce); add the diced gizzards and any other tit bits hanging around from the goose. Brown them off really well until they are actually burnt. The pan should be nice and hot, taste some mead and throw the rest in. Stand way back or else your face will melt in the steam. (If its good mead, it will steam. If its excellent mead it will flambé itself) Add a pint of stock and the juniper berries and bring to a boil, stirring constantly and cook out for about 20 minutes (take anudder glass of mead, "n ble happy at your wooork") (hiccup) excuse me.

Add a little water to the arrowroot to make a paste. Pour it into the sauce stirring constantly until it's cooked in and thickened your sauce. Strain and serve with the goose, just before it has been cooked (literally).

Gooseberry coulis

¼ lb honey
1 lb gooseberries,

The perfect accompaniment

Just a little more ways to go, a lovely fruit tart sauce, like a marriage made in heaven. A sweet meat with a tarty sauce (careful). Simplicity in itself take a ¼ lb of honey and 1 lb gooseberries blitz them in the blitzer or finish in food processor, process sauce until smooth. If the mixture is too thin, add a little mead or water. Taste it and if it's a little too tart add a smidgeon more of honey.

Pomegranate dressing

1 Pomegranate
2 oz honey
(Pearls if you have any spare)

Food from the Kings of Persia for the beekeeper

The pomegranate sauce was served at the banquets during the reigns of the Tsars of Persia and goes back thousands of years. The seeds were served in golden bowls mixed with pearls. However, we will stick to the sauce, it was a real Persian classic and a great delicacy to be served to royal guests as a compliment for goose alone. Simple to make, just prepare it the same as the gooseberry but half the honey as the fruit is not so tart.

Word of warning, try not to get any of the yellow pith as its taste is as sharp as my mother-in-law's tongue. The easiest way to prepare pomegranate is by cutting the pomegranate in four; place one quarter upside down in the palm of your hand with your fingers slightly open over a bowl. Using the back of a spoon gently tap repeatedly the skin of the pomegranate and Bob's your Uncle all the seeds will drop out into the dish below. Also great for garnishing the plate so keep some back.

Well that's me finished, I hope you try this at home and at the close of the day relax sit back and enjoy your goose. You have deserved it.

Next, *we'll* produce a Christmas dessert. It will be the famous exploding chocolate cup with a honeyed cappuccino mousse. Stay tuned. BC

Michael Young teaches Culinary Arts and is a beekeeper, wine maker, artist and honey judge in Belfast, Ireland.

? DO YOU KNOW ?

Immunity

Clarence **Collison**
Mississippi State University

Undoubtedly hurricane Katrina will have a serious impact on the beekeeping industry in the mid-south for many years to come. How many colonies have been washed or blown away? How badly has the beekeeping infrastructure been damaged or destroyed? What impact has the storm had on bee forage of the future? Only time will answer those questions. Under such devastating conditions, an individual organism's natural defensive mechanisms are often exceeded, resulting in death. Under natural conditions, however, there are numerous individual as well as colony related defensive mechanisms at work in protecting the honey bee society from diseases, parasites and various environmental factors. In a parasite-host relationship, the defensive mechanisms of both organisms are interacting and often in opposition to each other Specific examples for consideration include the development of resistance against antigens, pesticides and antibiotics. Understanding the immune responses of honey bees and some of their pathogens and parasites is a relatively new area of study. The specific mechanisms on how tracheal mites and *Varroa* mites kill their host is unknown.

Please take a few minutes and answer the following questions to see how well you understand these important topics.

Level 1 Beekeeping

1. ___ For pesticide resistance to develop in a population the genes for resistance must be already present in the population. (True or False)
2. Define pesticide resistance and cross-resistance. (2 points)
3. ___ Leaving a miticide or antiobiotic in a hive longer than what the label calls for can increase the rate in which resistance develops. (True or False)
4. Name three chemicals associated with the beekeeping industry that resistance has been documented. (3 points)
5. What is considered to be the most acceptable method of delaying the development of pesticide resistance. (1 point)
6. Please explain why the *Varroa* mite mating system enhances the development of resistance to a miticide. (1 point)
7. ___ Once pesticide resistance is established within a population, it is a stable trait. (True or False)
8. ___ Honey bee resistance to American foulbrood is primarily related to differences in hygienic behavior. (True or False)
9. ___ Italian bees were originally resistant to European foulbrood. (True or False)
10. ___ Africanized honey bees are considered to be more resistant to American and European foulbrood than the European strains. (True or False)

Advanced Beekeeping

11. ___ Resistance in a pest can come about by increased detoxification activity within the pest. (True or False)
12. ___ Resistant individuals in a population are usually "more fit" than susceptible individuals. (True or False)
13. ___ Resistance can come about by changes in the nerve target site within the pest. (True or False)
14. ___ *Varroa* mites suppress immunity in honey bees. (True or False)

Please match the following chemicals (immunity related enzymes) associated with the insect immunity system with their specific function.

A. Phenol oxidase
B. Glucose dehydrogenase
C. Lysozyme
D. Glucose oxidase

15. ___ Hypothesized to be required for killing of pathogens during an encapsulation reaction.
16. ___ Expressed in the hypopharyngeal gland and is secreted into larval food by the worker bees which provides a means to sterilize the food and is thought to prevent many larval diseases; a form of colony immunity.
17. ___ Thought to be part of the recognition system of foreign materials in insect immunity.
18. ___ The suppression of a honey bee's immune system due to *Varroa* mite feeding during the adult stage results in the amplification of the deformed wing virus. (True or False)
19. ___ Abaecin, apidaecin, hymenoptaecin and defensin are amtimicrobial peptides that show activity against bacteria in honey bees. (True or False)
20. ___ The bees immune system can be enhanced by exposing young larvae to nonpathogenic bacteria. (True or False)
21. ___ The expression of the genes encoding antimicrobial peptides and immunity-related enzymes have similar regulatory biochemical pathways. (True or False)
22. ___ Gram-negative and Gram-positive bacteria have similar gene encoding immune pathways. (True or False)
23. Larvae are no longer susceptible to American foulbrood after they are ___ hours old.

A. 24
B. 53
C. 36
D. 48
E. 30

ANSWERS ON NEXT PAGE

?Do You Know? Answers

1. **True** For resistance to develop in a population the genes for resistance must be already present in the population, even before exposure to the pesticide has begun. Exposure of a population with the given active ingredient kills the susceptible individuals, but leaves the resistant individuals alive.
2. **Resistance** of an insect or mite against a pesticide means it is capable of withstanding a dose that would ordinarily kill the majority of individuals in the population.
   Cross Resistance is associated with mechanisms that give resistance to one pesticide (active ingredient) plus also protects the organism against other closely related active ingredients.
3. **True** Timing of a pesticide application is important in the development of resistance. It is most desirable that the pesticide not be present continuously over a period of months or many generations of the pest. If every generation of the pest is exposed to the pesticide, then resistance will develop at a faster rate. Correct timing and duration of treatment are thus critical in managing resistance.
4. Apistan® (fluvalinate)
   Checkmite+ (coumaphos)
   Terramycin® (oxytetracycline)
5. The only way to halt the development of resistance is to stop using the pesticide or antibiotic for a length of time and possibly all related compounds that have a similar mode of action. Rotation of chemicals with different modes of action has been shown to be effective in managing resistance.
6. The brother-sister mating in *Varroa* mite biology within the capped brood cell (inbreeding) results in little or no mating with possible incoming susceptible mites. Thus, once resistance is present in a population, all mite offspring would be very resistant.
7. **False** Pesticide resistance is not normally a stable trait once it is established within a population. Resistant populations tend to revert back to some degree of susceptibility after the active ingredient is not used for a period of time.
8. **True** Research has shown that some strains of honey bees are more resistant to American foulbrood than others. Differences in hygienic behavior are usually related to these strain differences. Two distinct but related behaviors are involved: prompt uncapping of cells containing infected larvae and efficient removal of them.
9. **True** The first honey bees introduced into the U.S. were black German bees. This race tended to be very nervous, irritable and highly susceptible to European foulbrood. The first known successful imports of Italian queens was made in 1860. With extensive imports, queen rearing and requeening, beekeepers by 1920 largely replaced the black bees with the less nervous Italians that resisted European foulbrood.
10. **True** Africanized honey bees are considered to be more resistant to American and European foulbrood than the European strains. Africanized bees have been shown to be better at removing dead and diseased brood from the cells than are European bees. This hygienic behavior is considered to be an indicator of resistance.
11. **True** Resistance in a pest can come about by increased detoxification activity within the pest e.g., more or better enzymes in the pest that break down the pesticide to a harmless form.
12. **False** A genetic factor that affects the progression of resistance is the inability of resistant individuals to live and reproduce as well as susceptible individuals when there is no pesticide exposure. Resistant individuals are usually not as "fit" as susceptible ones, meaning they tend not to survive and reproduce as well as susceptible individuals when there is no pesticide present. After a period of time, a resistant population should revert to susceptibility as susceptible individuals out-compete resistant individuals, or immigrate into the population.
13. **True** Pesticide resistance can come about in a pest by changes in the nerve target site, e.g., the site on the nerve where the pesticide is suppose to fit to cause death, is altered in such a way as to prevent the pesticide from acting.
14. **True** Recent research has demonstrated that *Varroa* mite infestations suppress immunity in honey bees by reducing the transcription of genes encoding antimicrobial peptides and immunity-related enzymes. It is believed that this is the first instance of an ectoparasite immunosuppressing its invertebrate host.
15. B) Glucose dehydrogenase
16. D) Glucose oxidase
17. A) Phenol oxidase
18. **False** *Varroa* mites have been implicated in several viral diseases and the outbreak of parasitic mite syndrome. Deformed wing virus has been shown to be directly related to *Varroa* mite infestations. Recent research has shown that the increased replication of deformed wing virus in honey bees needs two components: *Varroa* mite parasitization and exposure to a bacterial factor that is received during mites feeding on the honey bee pupae. The virus rapidly replicates in mite-parasitized, bacteria exposed pupae, causing them to develop into deformed winged adults.
19. **True** Insects have an innate immune system composed of cellular and humoral immune responses. Four antimicrobial peptides (abaecin, apidaecin, hymenoptaecin and defensin) are produced in honey bees. Antimicrobial peptides are active at low concentrations and exhibit a potent and broad spectrum of activity. Most of these peptides act at the cell-wall membranes and act in synergy by attacking different components of the cell envelope.
20. **True** While testing the im-

Continued on Page 63

GLEANINGS

NOVEMBER 2005 • ALL THE NEWS THAT FITS

AHB IN LA

A recent announcement that Africanized honeybees have arrived in Louisiana didn't surprise many of the state's beekeepers."I've kind of expected them sooner than this," said Bobby Frierson, a beekeeper in Denham Springs.

He said beekeepers have watched over the years as the Africanized honeybees made their way north from South America into Texas.

Although there have been instances where Africanized honeybees – sometimes referred to as killer bees – have been intercepted around deep water ports, this is the first time the bees have entered the state through the expansion of their range, said Jimmy Dunkley, State Apiarist with the Dept. of Agriculture and Forestry. "It's long overdue," he said.

Alva Stuard, Capital Area Beekeepers Association president, said the statewide beekeeper association met recently and the general consensus is that the recent announcement shouldn't affect people in Louisiana too much.

It could be 10 or 12 years before these Africanized honey bees reach Baton Rouge – if they get here at all, he said.

Dunkley said bee traps were set up in the 1990s around Louisiana's deep water ports to determine if ships carried these Africanized bees into the state. More traps were put up over the years along the Louisiana/Texas border all the way to Arkansas. There are now traps about every two miles along that border.

"That gives us a pretty good coverage," Dunkley said.

The traps were installed to help notify the public, which might come into contact with the bees, and to alert the beekeeper industry to take precautions against having the Africanized bees invade their European bee colonies. Most beekeepers raise European bees.

The public's front line of defense against colonization by Africanized bees are the 406 registered beekeepers in the state, Dunkley said.

taken from The Advocate

MALAYSIA RAMPS UP

The Malaysian government is encouraging farmers to get into honey production to offset imports of related products.

Agriculture and Food Industry Minister Abdul Rahim Ismail said honey is a lucrative commodity that should be given serious consideration, considering that Malaysia imported some 2,520 tonnes worth 17.6 million ringgit (US$4.66 million) last year.

Malaysia imported some US$1.33 million worth from Australia, US$1.16 million from China, US$928,000 from New Zealand, US$424,000 from the United States and US$10,000 from Vietnam.

Rahim said the imports reflected insufficient local supply to meet demand and farmers should take advantage of a lucrative market for honey.

The Rural Development Corp. has developed a plan to attract some 200 entrepreneurs to the honey production industry by 2010.

NHB WINS SUIT

The national honey checkoff program was recently ruled as constitutional by U.S. Dept. of Agriculture Administrative Law Judge Jill S. Clifton, whose decision supported the National Honey Board and denied petitioners' claims.

"This ruling is great news for honey producers and the honey industry," said National Honey Board Chairman Lee Heine, a Wisconsin honey producer. "We need to continue conducting the many successful and innovative honey market development and research programs funded through checkoff dollars."

In 2001, eight honey producers filled a petition, which objected to paying the honey checkoff assessments and stated that the assessments violated their First Amendment freedom of speech rights.

In May of this year, the U.S. Supreme Court ruled that the national beef checkoff program was constitutional, overturning lower court decisions. In addition, the national watermelon checkoff program was recently ruled as constitutional.

HUGE AG SHOW IN MO

The largest annual small farm trade show in the U.S. – The National Small Farm Trade Show and Conference™ – had over 4,400 attendees and 270 exhibit booths last year! Now in its 13th year, the Conference takes place November 3 to November 5, 2005, in Columbia, MO, at the Boon County Fairgrounds.

The theme for 2005 is "Profit from Small, Family, Hobby, and Lifestyle Farms" promoting small farms and rural life. There will be 27 half-hour Farmer's Forum talks, 19 one-hour seminars and six three-hour short courses, all taught by successful farmers. Ideas and information on income opportunities for both traditional and alternative farm enterprises are covered for farmers, ranchers, gardeners, and landowners.

Exhibits range from animals to animal products (honey, wool, etc.) to farm supplies to tractors and other equipment.

The National Small Farm Trade Show & Conference™ is sponsored by Small Farm Today® and brought to you by Liar's Lake; USDA-CSREES Sustainable Agriculture Research and Education (SARE) program; MU College of Agriculture, Food & Natural Resources; Bishop & Associates; Sustainable Agriculture Farm Institute (SAFI); and The Jefferson Institute.

Show times are 9:00 a.m. to 5:00 p.m. Thursday, and 8:00 a.m. to 5:00 p.m. Friday and Saturday. Registration at the door is $8 for one day, $15 for two days or $20 for three days, allowing attendance of the trade show, seminars, demonstrations, exhibits, shows, meetings, and Farmer's Forum. Short courses are an additional $35 per person. Call Small Farm Today at 800.633.2535 or see www.smallfarmtoday.com for more information. Come see the Show and join the fun!

OXALIC APPROVED

After a lengthy review of the application submitted by the Canadian Honey Council, the Pest management Regulatory Agency has approved the use of Oxalic acid for the control of *Varroa* mites in honey bee colonies. For the new label and conditions, for use check the following website: www.honeycouncil.ca/users/folder.asp?FolderID=876&nID=512 Canadians have another effective tool to manage mites in honey bee colonies.

Where Are They Now?

African honey bees are still on the move in the southern U.S., and as a result maps showing their confirmed locations are only a snapshot of where they were when we gathered the data. And, when they first move into an area it takes some time before they are positively confirmed. Almost always it is a stinging incident that prompts someone to capture bees and send them off to be identified.

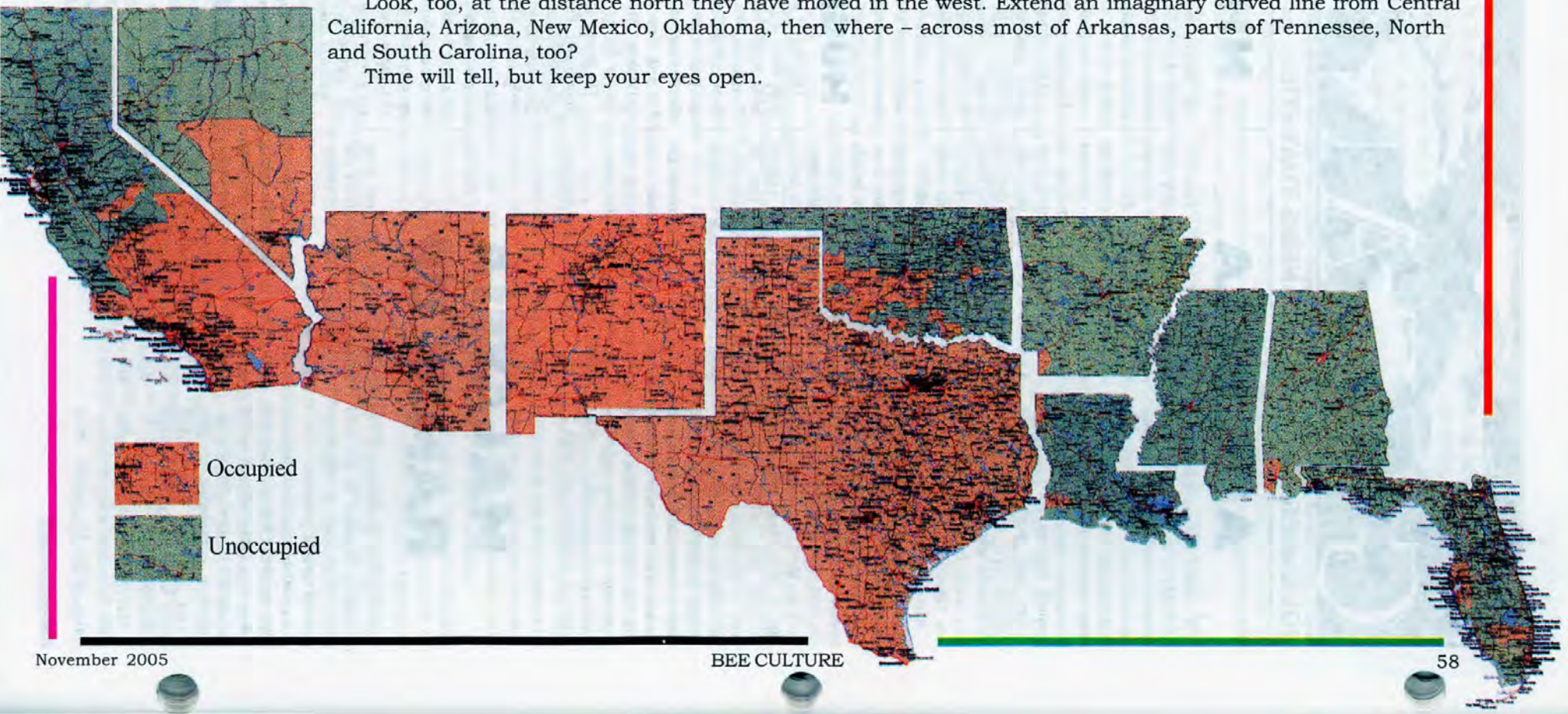
And even though we've had AHB in the U.S., officially, for 15 years, when they enter a state for the first time, or even a previously unrecorded location within an infested state, that stinging incident, and the eventual identification make the news. Not as much news as 15 or even 10 years ago, but nevertheless bees and usually beekeepers are on the 11:00 news, and usually not in the best light.

Note that Mississippi is AHB-less so far, and one can argue, perhaps successfully, that at least the original findings in Alabama and Florida were brought in at deep water ports, rather than eastward migration from Texas.

Georgia is the big missing state on this map, isn't it? The probability of AHB getting to Georgia from Florida seems pretty good, even with the certification program Florida's Department of Ag is putting into place. Natural swarming, migration, or hitching a ride on a non-bee-vehicle are likely, eventually

Look, too, at the distance north they have moved in the west. Extend an imaginary curved line from Central California, Arizona, New Mexico, Oklahoma, then where – across most of Arkansas, parts of Tennessee, North and South Carolina, too?

Time will tell, but keep your eyes open.



For Smaller Beekeepers In Louisville

ABF PLANS SPECIAL PROGRAM

Two days of extra programming tailored to the smaller beekeeper are planned for the annual convention of American Beekeeping Federation, which will be Jan. 11-14, 2006, at the Hyatt Regency hotel in Louisville, KY. Friday and Saturday a short course will be offered for hobbyist and sideliner beekeepers, concurrent with the regular ABF program.

"While most of the regular ABF program is of interest to all beekeepers, our non-commercial beekeepers have unique needs and opportunities," notes Danny Weaver, Vice President and program chairman. "Having the separate program for the non-commercial beekeepers, we are able to arrange topics and presentations that will benefit them in particular."

Experienced instructors will take the beekeepers through the full cycle of their year, from getting started in the Spring, through honey production, harvest and sale, to wintering and breaking out the following Spring.

The cost for the two days, including all handouts, coffee breaks, and admission to the ABF Trade Show and any of the regular program on Friday and Saturday is $95 with advance registration. Persons who register for the full four-day convention are welcome to attend any part of the short course.

The general convention begins on Wednesday morning and continues through Saturday evening. Wednesday afternoon the ABF Special Interest Sessions will allow Commercial Beekeepers, Package Bee and Queen Breeders, Honey Producer-Packers, and Hobbyist and Sideliner Beekeepers opportunities to focus on their segments of the industry.

The ABF Ladies Auxiliary has their annual breakfast meeting on Thursday. On Thursday evening, a reception will fete Kentucky author Tammy Horn, and she will speak about her book *Bees in America*. Friday evening, you will have an opportunity unique to Louisville, when we tour the Frazier Historical Arms Museum, where a bourbon tasting will be available for those so-inclined. For more on the Museum, see www.FrazierArmsMuseum.org.

The ABF Educational Workshops will be on Saturday morning, this year incorporating the smaller beekeepers short course. The annual ABF Business Meeting will be Saturday afternoon, followed by the annual banquet with awards and the crowning of the 2006 American Honey Queen.

For information, contact the ABF Office, P.O. Box 1337, Jesup, GA 31598, 912.427.4233, fax 912.427.8447, info@ABFnet.org, or visit www.ABFnet.org.

SULFA IN HONEY RECALL

The Canadian Food Inspection Agency reports two voluntary recalls of honey because of drug residues.

The agency said Highland Honey – Jim Smith sold honey in unmarked containers of variable weights from its farm gate in Fergus, Ontario, that may be contaminated with sulfathiazole, a sulfa drug residue.

The agency said there has been no reported illness associated with the consumption of the product that could cause a serious or life-threatening reaction in persons with sensitivities to sulfa drugs.

The agency also warned people with sensitivities to sulfa drugs not to consume Lyndhurst, Ontario-based Stonebridge Hiveworks honey because the product may contain the drug residue, sulfadoxine.

The affected products, liquid honey, creamed honey and combed honey were sold in 375 gram plastic bear, 500 gram glass jar, 500 gram plastic squeezable and one kilogram glass jar. Products affected by this recall do not bear lot code information.

The products were distributed from Lyndhurst and Gananoque, Ontario, through farm gate sales and retail stores.

OBITUARY

Lois Elsa Park, age 83, of Palo Cedro, California died Tuesday, September 6, 2005 of natural causes at Northern California Rehab Center in Redding.

Lois was born on July 26, 1922 in Escalon, CA. She moved from Escalon in 1929. She was the co-owner of a bee raising business called Homer Park Queen Bees.

As a Shasta County Pioneer Bee Businesswoman, she was a strong community minded person. She belonged and was active in many clubs and associations. Her memberships included Millville Grange, 69 years, Master of Millville Grange 1993, 1994, 1995, Millville Rebekah Lodge, 60 years. Noble Grand 1953-1954, District Deputy President 1965-1966, Shasta Pomona Grange, Shasta Beekeepers Association. California State Beekeepers Association Lifetime, American Beekeepers Association, American Honey Producers Association, Alberta Beekeepers Association Lifetime, Grand Marshall of the Palo Cedro Christmas Parade plus many more organizations and clubs too numerous to mention.

Lois was preceded in death by her husband, Homer Park, and brother, Elbert Stone.

Survivors include children Mary (Cecil) Reimer of McKague, Saskatchewan; Cleta (Fred) Dieken of Two Hills, Alberta; Steve (Sharon) Park of Palo Cedro, CA; Glenda (Shannon) Wooten of Palo Cedro, CA, and Fay Park, daughter-in-law of Redding, CA.

CANADA CROP DOWN

BeeMaid Honey chief executive Gordon Marks said the Manitoba honey crop was down 25% of the five year average while the harvest was down between 10% and 15% in Alberta and Saskatchewan.

BeeMaid, the marketing arm of the Manitoba and Alberta Honey Producers Cooperatives, is North America's largest single source marketer of packaged honey.

Marks blamed extensive Spring flooding for much of the downturn because many fields went unseeded.

Three-quarters of Canadian honey comes from the Prairie provinces but the drop in production has not resulted in a significant increase in prices because of a flood of Australian and Argentine exports.

"Canada will historically produce 75 million pounds of honey and we consume 60 million pounds," Marks told locked-out employees of the Canadian Broadcasting Corp. "In the past year we probably saw 20 million pounds of imported honey come into the country and it's displacing Canadian honey. It's coming in because it's cheaper and it's posing a competitive problem."

Marks said he was concerned what effect the imports have on consumers.

"There certainly is a different flavor profile to Canadian honey," he said. "When consumers buy this other honey, do they taste it and say, 'I don't like honey any more?' I mean, it's not a must-have product. Maybe they won't buy it again."

BeeMaid is launching a campaign targeted at young, health-conscious shoppers promoting its products as 100% Canadian. It includes new labels and packaging.

OOPS!

Six people ended up in hospital after bees attacked bystanders and then bystanders attacked the beekeepers during a honey-making workshop in the Dutch city of Breda.

When things calmed down police asked the beekeeper to leave. He did, taking his hives with him.

Police said the bees had become aggressive when the beekeeper was removing honey from the hives. Those at the workshop had protective clothing but the bees turned on onlookers and neighbors. Witnesses estimate 30 to 90 people were stung including a number of police officers.

(freeze dried) royal jelly also available. GloryBee Foods, Inc., P.O. Box 2744, Eugene, OR 97402. Call toll free 800.456.7923, Fax 541 762.7173 or sales@GloryBeeFoods.com. Order online at www.GloryBeeFoods.com

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ANSWERS ... Cont. From Page 56

mune responses of bees to *Paenbacillus larvae larvae*, the causative pathogen of American foulbrood, researchers have found that exposing young larvae to nonpathogenic bacteria, normally foreign to bees, are capable of inducing an equally strong immune response when ingested. These results suggest that the honey bee immune response is fairly nonspecific and that these nonpathogenic bacteria might possibly be used as a potential surrogate for screening different lineages of bees. The nonpathogenic bacteria may also be used as a probiotic to enhance honey bee immunity.

21. **False** The expression of the genes encoding the four immunity-related enzymes (Phenol Oxidase, Lysozyme, Glucose Oxidase, Glucose Dehydrogenase) share a common regulatory path in newly emerged adults. The gene expression of these four enzymes, however, was differently correlated to the expression of the antimicrobial peptides (abaecin, apidaecin, hymenoptaecin and defensin).
22. **False** In insects there are two main immune signaling pathways, the Imd and Toll pathways, that are activated upon detection of microbes. These pathways are in the control of expression of genes encoding antimicrobial peptides for humoral response. The Toll pathway is responsible for defense against fungal and Gram-positive bacterial infections, whereas the Imd pathway is primarily involved in defense against Gram-negative bacteria.
23. B) 53 hours

There were 13 points in each level this month. Check below to see how you did. If you scored less than 6 points, do not be discouraged.

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

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STATEMENT OF OWNERSHIP MANAGEMENT AND CIRCULATION (Act of August 12, 1970). Section 3685. Title 39, United States Code. 1.Title of publication: BEE CULTURE MAGAZINE. 2.Publication Number: 9243-80. 3.Date of Filing: October 1, 2005. 4.Frequency of Issue: Monthly: 5.Issues #12.; 6.Price $21.50. 7. and 8.Location of known office of publication, headquarters or general business offices of the publisher: PO Box 706, Medina, OH 44256-0706. 9.Names and addresses of publisher and editor are: Publisher, John Root, PO Box 706, Medina, OH 44258-0706 and Kim Flottum, Medina OH. 10.Owner: The A.I. Root, Co., Medina, OH; Stockholders: John Root, Medina, OH; Stuart Root, Wadsworth, OH; Elizabeth Judkins, Silver Bay, MN; Brad Root, Medina, OH; Robert Root, Medina, OH; 11.The known bondholders, mortgagees, and the security holders owing or holding one percent of more of total amounts of bonds, mortgages or other securities are: None. 12.For completion by non-profit organization authorized to mail at special rates (Sec. 132-122, Postal Manual); Not applicable. 13.Publication Title: BEE CULTURE MAGAZINE. 14.Issue date for circulation data below: October 1, 2005. 15A.Total number of copies printed (net press run); Average number copies each issue during preceding 12 months, 12,784. Actual number of copies of single issue published nearest to filing date, 13,650. 15B.Paid/requested outside-county mail subscriptions slated on form 3541: 1. Average number copies each issue during preceding 12 months, 11,035. Actual number of copies of single issue published nearest to filing date, 11,797. 2.Paid in-county subscriptions stated on form 3541: Average number copies each issue during preceding 12 months, None. Actual number of copies of single issue published nearest to filing date, None. 3.Sales through dealers and carriers, street vendors, counter sales, and other non-USPS paid distribution: Average number of copies each issue during preceding 12 months, 188. Actual number of copies of single issue published nearest to filing date, 188. 4.Other classes mailed through the USPS: Average number of copies each issue during preceding 12 months, None. Actual number of copies of single issue published nearest to filing date, None. 15C.Total paid and/or requested circulation: Average number of copies of each issue during preceding 12 months, 11,223. Actual number of copies of single issue published nearest to filing date, 11,985. 15D. Free distribution by mail (samples, complimentary, and other free). 1. Outside-county as stated on form 3541: Average number of copies of each issue during preceding 12 months, None. Actual number of copies of single issue published nearest to filing date, None. 2.In-county as stated on form 3541: Average number of copies of each issue during preceding 12 months, None. Actual number of copies of single issue published nearest to filing date, None. 3. Other classes mailed through the USPS: Average number of copies of each issue during preceding 12 months, 71.Actual number of copies of single issue published nearest to filing date, 71. 15E.Free distribution outside the mail: Average number of copies of each issue during preceding 12 months, 117. Actual number of copies of single issue published nearest to filing date, 117. 15F.Total free distribution: Average number of copies of each issue during preceding 12 months, 188. Actual number of copies of single issue published nearest to filing date, 188. 15G. Total distribution: Average number of copies of each issue during preceding 12 months, 11,411. Actual number of copies of singles issue published nearest to filing date, 12,173. 15H.Copies not distributed: Average number of copies of each issue during preceding 12 months, 1,375. Actual number of copies of single issue published nearest to filing date, 1,477. 15I Total (sum of 15g and h): Average number copies of each issue during preceding 12 months, 12,784. Actual number of copies of single issue published nearest to filing date, 13,650. 15J. Percent paid and/or requested circulation: Average number of copies of each issue during preceding 12 months, 98%. Actual number of copies of single issue published nearest to filing date, 98%. 16.Publication of statement of ownership will be printed in the November 2005 issue of this publication. 17.I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanction (including fines and imprisonment) and/or civil sanctions (including civil penalties). Signed Kim Flottum, Editor.

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I'm not sure what the stork was thinking 11 years ago when he dropped a little pink bundle down the chimney of a farmhouse across town. He should have dropped it down ours. I guess I should have paid more attention in 11th grade health class.

Emily, that little pink bundle, has borrowed every bee book in the county library system, but they are either too hard to read or they are written for little kids. She called me and asked if I could recommend any. No one has ever written a basic bee book for 11 year olds.

"Why don't you come over and I'll teach you what I know," I suggested. That should just about fill up an average child's 10 minute attention span.

I heard silence on the other end of the phone. Then, "Oh...Mr Sieling! That would...I mean...I can't thank you enough! That is such a generous offer...Thank you! Would you be free today?"

I had just transferred a batch of grafted queen cells into nuc hives the week before. By now they were hatched and ready to inspect. That afternoon Emily's mother brought her over. She jumped out of the van and ran to where I was lighting my smoker.

"Thank you for letting me come, Mr. Sieling."

"You're quite welcome, Miss Gardner."

"I don't cry when I get stung anymore."

"If you do get stung and feel like crying, it's okay. This thing I'm lighting is a smoker. We use it to calm the bees. Stand back!" I touched the burning torch tip to the secret ingredients tamped into the combustion chamber. A six foot flame flared out, scorching my eyebrows. It's amazing what you can do with a little fertilizer and recipes off the internet.

"Cool!" exclaimed Emily.

"The secret to keeping your smoker lit is a hot firebox. You know you're in business when the metal glows cherry red."

"It must be about 1400°F or 750°C."

"How'd you know that?"

"I'm home schooled."

Outside the electric fence, I stopped to relight the smoker. Emily put on my personal veil. "Does that fit okay?" I asked.

"Oh, is it yours? I'm so sorry. I'll take it right off."

"No, they both fit me." I picked up the smaller felt hat. "This one was the first hat I ever used. I got it when I was 11 or 12. It used to be covered with stingers." I squeezed it on, hoping the old alarm pheromones had evaporated by now.

Emily noticed she was wearing the only pair of gloves. The gauntlets reached her shoulders and the hands drooped to her knees. "I took your gloves, too, didn't I, Mr. Sieling?"

"No, I don't wear gloves. I brought them for you."

"Are you sure?"

"Yes." I turned off the electric fence and unlatched the gate. I handed her the smoker. "Here, puff the bellows on this." We opened the first nuc. Emily aimed the smoker at the colony, ready to fire at the first sign of attack. "Beekeepers work slowly and smoothly. Here's a comb of honey with pollen in the center That means the next frame I pull out will have eggs and brood or baby bees."

Emily lowered the smoker. "How did you learn all this stuff?" she asked.

"Thirty years among the bees."

Empty queen cell, no queen, no eggs. Calm workers. I knelt by the second nuc – same thing. Virgin queens aren't much larger than workers, but in a nuc hive they are still easy to spot. She could be right in front of my nose, she could have been lunch for a predator, or my new queens could be out cavorting with drones right now.

We opened the third hive. "There she is." I pointed down into the hive with the tool.

"Cool!"

"She's little – probably a virgin or freshly mated. She'll get bigger once she starts to lay. We won't try to take the frame out. Virgins are nervous and flighty. I don't want her taking off and getting lost."

"Cool!"

I pulled out the next frame. "Look, here are some new little bees." At the bottom of the frame several bees were gnawing out of their cells.

"Oh! Aren't they cute! Need some more smoke?"

"No, we use as little as possible when we are looking for queens. Smoke makes them run. You can hardly make these bees sting."

I knelt and opened the next nuc. By now Emily had forgotten bee stings. She'd lost her gloves. I felt a little hand on my back as she peered over my shoulder.

"Hey, there's the queen!" She pointed. "What's that on her?"

The queen ran across the comb, with mating sign hanging out the back. A couple workers scurried behind her, trying to get a grip and pull it out.

"There's something a lot of beekeepers never see. That's the mating si...yi...yi... ah ..." I cleared my throat. What do kids know these days and when do they know it? I stalled, trying to work out the math. They're five in kindergarten, six in first grade... That makes 11-year-olds in sixth grade. When do they cover this stuff? When I was in school you saw the childbirth movie when you were 18. My own kids saw it in ninth grade – the same one – with the same 60s hairdo. I'm not certified to teach Health in New York. What about her parents? "Oh, why, it's, ah..."

"Hey, does that mean the queen mated?"

"Well, err, yes. She's been out with the drones this afternoon getting...err...married."

"I read the drones die during mating – they just explode!"

"Something like that."

"Cool! Have you ever seen that?"

"No."

"It must be like fireworks in the daytime. I bet it rains drone parts. I once had a piece of firework land on me on the Fourth of July. It had Chinese writing on it. Are you hot? Your face is really red."

We finished checking the colonies, found the rest of the queens and refilled the feeders before Emily's mother returned to take her to track practice. She ran to her mother. "Mom, we saw something even beekeepers almost never see!"

I tried to explain what we did in the beeyard. "We checked the new queens and ah, I...err, they were um..."

"Don't even try explaining to Mom." Emily interrupted. "She won't get it anyway."

Her mother laughed. "Emily's probably right."

Peter Sieling

For Emily

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