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Apr 2011

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The Magazine Of American Beekeeping

Bee Kids Corner

The National Honey Board

Plus –

2010 Honey Production - 17
2-Day Queen Cells - 29
The Colony Queen - 40
EPA, Pesticides, Bees - 71

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Bee Culture

1 peach blossom + 1 honey bee = 1 delicious peach. Without only 1 – no peach, no peace.
photy by Cindy Hodges

Publisher – John Root
Editor – Kim Flottum, Ext. 3214, Kim@BeeCulture.com
Production Coordinator – Kathy Summers, Ext. 3215, Kathy@BeeCulture.com
Circulation & Advertising – Dawn Feagan, Ext. 3220, Dawn@BeeCulture.com
800.289.7668 • www.BeeCulture.com

Contributors
Clarence Collison • James E. Tew • Ann Harman • Kim Lehman
Steve Sheppard • Larry Connor • Connie Krochmal
Jennifer Berry • Ross Conrad • Audrey Sheridan

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Front Door Intro Author

I enjoyed seeing the recent article "Front Door Queen Introduction," authored by myself and Dr. John Hurst, in your February 2011 issue. However, I was disappointed to see that Dr. Hurst's name was left off as a co-author. This was, after all, a technique of queen introduction that he developed and has used for over 30 years. I would appreciate it if you would publish this letter in your Mailbox section to acknowledge his contribution to this article.

Michael P. Steinkampf
Mountain Brook, AL

AIA Speaks Up

I will be brief. Have we not learned anything in the last 25 years?

The futile attempts to control mite spread that bankrupted and caused untold hardship on many beekeepers, should have taught us that there are things way beyond our control. Africanized bees? Not nice, but they are here!

We can in no way stop their inevitable spread, fact. They have officially been in Texas 20 years and I must commend authorities there for accepting the fact and dealing with it by educating the public as to the importance of bees, and the importance of caution whenever bees are found. There has been very little hysteria, and in my opinion relatively few problems. People have been educated to the facts, and deal with the bees accordingly.

Since their appearance in the East all I hear are the "Chicken Little's." Wake up people, again they're here, learn to accept that fact and learn to live with them. The sky is not falling.

Chris Baldwin
Belvidere, SD

Fondant

The recipe for what is being called "fondant" on page 50 of the February issue is interesting.
1 cup sugar
1 cup 2:1 syrup
3/4 cup water

Once you look at the formula it's obvious that it's simply water and sugar . . . measured twice.

The above results in approximately:
1-2/3 cups sugar
1 cup water (1-1/12)

So you are starting with less than a 2:1 syrup . . .

I have recently made about seven batches of fondant using from two to eight pounds of sugar, all of which were made using **one ounce of corn syrup per pound of sugar**. I start with a 4:1 or 5:1 sugar mixture.

The following are links that show some of what I made:
www.beesource.com/forums/showpost.php?p=612787&postcount=13
www.beesource.com/forums/showpost.php?p=612867&postcount=17

The blocks of fondant used by bakeries contain corn syrup. The supplier near me sells "Karp" brand made by H.C. Brill in Georgia. "Dawn Foods" is another manufacture of sugar fondant.

The small amount of corn syrup limits crystal formation and allows the mixture to be kneaded or "creamed."

You might be interested in the following link: **www.stratford-upon-avon.freeserve.co.uk/PE-Notes/FondantSpecification.htm**

Joe Stafford

100,000 Beekeepers

Pennsylvania Apiculture Inc., and the National Honey Bee Day program is announcing a petition drive focused on bringing increased attention to the plight of the honey bee. A downloadable petition form, and additional details of the efforts can be found at www.national-honeybeeday.org

We must keep the focus on the continuing yearly massive bee loss all across the country. The petition drive hopes to collect a minimum of 100,000 signatures that will then be delivered to Washington calling attention to the plight of the honey bee. After nearly four years of "Colony Collapse Disorder" or CCD, there has not been one chemical banned from the market, one farming practice instituted calling for change, and no light at the end of the tunnel for beekeepers to cling too. And doing everything to keep the yearly massive colony deaths in the forefront of the public and the government's mind, is something we as beekeepers should strive to do.

Please download the petition form. Take it to your bee association, your farmers market, and to your neighborhood. Ask them to support the petition drive focused on bringing attention not just to the plight of the honey bee, but also bats, butterflies, frogs, other native pollinators, and the environment as a whole. The petition drive itself allows an opportunity to educate, promote beekeeping, garner support from the public, and call attention to the problems in beekeeping today. Together, we can make a difference.

We hope to present the petitions and a list of concerns later this Fall, and keep the plight of the honey bee in the minds of those in Washington. We hope you lend your support to the effort.

Thank you.

Mike Thomas
NHBD Coordinator

Encouragement Needed

I was in attendance yesterday evening at a presentation that you (Kim Flottum) made to the Northern Illinois Beekeeper Association in Crystal Lake, IL. I am writing to

thank you personally for keeping me in beekeeping another year.

It has been a tough year for all of us beekeepers I am sure. I have been keeping bees for five years and like so many others, I enjoyed great success at first, followed by great sorrow. From a personal high of six hives last Spring, I am down to a single hive as I write this.

Losing interest in bees and discouraged, I allowed my subscription to the other bee magazine to lapse. I did this for a simple reason: Most thought leaders in the beekeeping community continually hammer on how bleak everything is, how many challenges we face. The message we peons of beekeeping get is 'we face these 47 insurmountable problems and all the bees are going to die, but keep them anyway.' After reading this every month, I usually came away more discouraged and depressed than I was before the mail came that day. I kept my subscription to *Bee Culture*, mostly because I perceive a more positive message in its pages. Is everything great? No. Is everything even so-so? No. But are some things well with beekeeping? Indeed.

I don't want to be a dumb-and-smiling optimist. We face tremendous challenges. However, who ever got into beekeeping because somebody said "Try keeping bees, it's almost impossible to keep them alive!"? Great sales pitch.

Certain people in my club have done an amazing thing. Attendance at our meetings has more than tripled in the last three years. We have mothers with children, young adults single and married, teenagers and regular joes knocking down the club door to join. New beekeepers are excited about beekeeping. Getting new people to try beekeeping is no longer a problem; the 'old grey men' are outnumbered and people are fired up and ready to go. It is people like me that the fraternity of beekeepers needs to be more concerned about. I've been keeping five years. I've done most things right and bought way too many packages in that time. I'm tired, I'm burnt out, discouraged, and feeling bruised. I have a single colony, and before you spoke in Crystal Lake, I wasn't going to be buying any more bees; come what may.

People are spending too much time mulling over our difficulties and not enough talking advancements, behavior, telling good bee stories, things that one can do so one can, I don't know, ENJOY keeping bees again. For me, that was the central message of your speech and I thank you for it.

No pleasure in life is quite the same as sitting in your beeyard on a warm Summer day. How's that for a message?

Michael Marks
Northern IL Beekeepers Association

Quarantine!

I was interested reading the article about Vancouver Island's honey bees. I found it sad that our current Minister for Agriculture and Lands appears as misinformed and oblivious as his predecessor.

When the Ministry first lifted the 22-year-old restriction of honey bees coming onto Vancouver Island from the mainland and the rest of Canada last May, the decision was made without consultation or communication with the overwhelming majority of Vancouver Island and Gulf Island beekeepers.

As was well documented, last Winter, up to 95 per cent of the bees on Vancouver Island – Nanaimo south – mysteriously died.

When asked for help to figure out what had happened, ministry representatives declined to investigate, simply stating that it was 'bad beekeeping.' Interestingly, this was the same diagnosis given to the beekeeper in the U.S. who first raised the alarm of colony collapse disorder.

If poultry or cattle farmers had losses of this magnitude, would government not investigate, and would it diagnose the issue as 'bad farmers'?

Instead of looking for answers and protecting Island bees from the increased risk of exposure to pests and diseases not yet here, the ministry instead stripped away the restriction that served to protect all Island bees.

The minister has stated that re-instating the restriction would be inconsistent with federal standards and with other B.C. bee districts.

In fact, federal regulations state: "The importation into Canada of used beehives or bee equipment is prohibited under the Health of Animals Regulations, paragraph 57(a)," as per the Canada Food Inspection Agency website.

Several places in the world serve as precedents for the value of isolation in an age of colony collapse disorder, pests, diseases and bee deaths. It is common knowledge that there is a connection between the decline in honey bees and the concern for pollinators and therefore food production.

Several experts in the field share the concerns and stated in a letter to the Ministry of Agriculture and Lands, among others, that it would be inappropriate to consider opening the gates to yet more problems in beekeeping where they presently do not exist and that there is great risk of spreading pathogens and pests with the movement of comb and beekeeping equipment from one region to another.

After two meetings with ministry officials, no further communication has occurred, regardless of letters sent supporting our position.

In the end, the restriction for the movement of bees onto Vancouver and the Gulf Islands has been lifted since May 2010. This means that hives have been coming onto the Island in the hundreds, some overwintering, and each arriving with uncertain inspections.

The impact of this action will become clearer in the coming months as the bees come out of Winter.

The coalition continues to expect communication with the ministry in regards to this urgent issue. To not do so is tantamount to risking the future of the bees and our Island environment's food security.

Kathleen Silvey
Reprinted from NamioNewsBulletin
April 2011

More That's New For The Beekeeper –

Queen Of The Sun. What Are The Bees Telling Us? A Collective Eye, Inc. Production, Directed by Taggart Siegel, Produced by Jon Betz. 82 minutes. Coming soon to a theater near you. www.queenofthesun.com

Gunter Hauk, Michael Pollan, David Heaf, Scott Black from the Xerces Society, May Berenbaum, Carolo Petrine, President of Slow Food, Jeffery Smith author of Seeds of Deception, and Kirk Webster...to name a few of the personalities that appear in this film. And many of the others are from all over the world... Germany, New Zealand, France.

Of course there's the overwhelming presence of Rudolf Steiner, the biodynamic gardener and philosopher who predicted in the early 1920s that honey bees would collapse in 80 to 100 years. And 80 of the 82 minutes of this film have all these good people telling us why they are collapsing now, and what will happen when they do collapse, and, of course, now that they are collapsing why we should be concerned.

This film has won a multitude of awards. It is, as the critics say, entertaining, gorgeous and relevant. It is uplifting and alarming, replete with remarkable nature cinematography and eccentric characters. It is an argument for organic, sustainable, diverse agriculture in balance with nature. It condemns monocultures and agricultural chemicals. The people interviewed are passionate, dedicated, concerned, even spiritual.

But the other two minutes... well, that's all that's offered on how to actually pull this off. 300+ million people eat three meals a day in this country. Only one idea is offered on how to insure those meals continue. For a brief moment, one of the scientists suggests that there should be more food for bees, more better food for bees. Unfortunately, he doesn't offer how to make that happen. And that's too bad, because those answers exist, and could be used by the many people who aren't beekeepers that will view this film. This is a golden opportunity lost.

This is a pretty film that has fantastic music and will make you feel good. See if you have a chance. But don't expect answers.

Kim Flottum

Getting The Best From Your Bees. David MacFawn (US) and Chris Slade. (UK) Outskirts Press, Inc. Denver, CO. !SBN 978-1-4327-6646-7. 6" x 9", 141 pages, black and white, soft cover. $18.95 US, L12.23 (UK).

The authors pretty much lay out who this book is for – Advanced Beginner/ Lower Level Intermediate Honeybee Book. It is, they continue, for beekeeping year two and fully utilized by the Master Beekeeping level. They cover a variety of subjects, focusing on hive manipulation rather than Q & A. Topics include stock to use, swarming, IPM, equipment, marketing, seasonal management, moving bees, record keeping, beeyards, and more on equipment. I didn't find anything new in this book, but I was entertained, and being reminded of techniques forgotten but useful isn't a bad thing. That forgotten thing is important, because we tend to forget tried and true ways when newer ideas come along, and we all should be gounded once in awhile – just so we stay relevant. Plus, the mix of UK and US beekeeping offers some interesting insights not often available. A compare and contrast and what works best is good to have.

Kim Flottum

Small Hive Beetle Trap and Screened Bottom Board

Millerbees Manufacturing in Jackson, TN (www.beetlejail.com) has a new Screened bottom board with rear small hive beetle trap available. Beetles enter the hive from the front entrance, but have nowhere to hide. They go to the back, where the fine screened, stainless steel mesh gives way to a larger mesh screen the beetles can enter...but it enters into the oil-containing trap. Good bye beetles. The bottom board has a removable slide in sticky board to use for monitoring mites, and the domestic poplar wood is treated with a non-toxic preservative and primer. The unit should be painted. Because the oil reservoir is in three sections keeping the hive level isn't needed, a much appreciated upgrade.

Beekeeping made easy™
HIVE TRACKS

Beekepers Enter The Cloud

Web-based Online Record Keeping Empowers Beekeepers with Information for More Efficient and Effective Hive Management **www.Hivetracks.com**

Maintaining useful beekeeping records is a never ending struggle for beekeepers, including the founders of Hive Tracks. Immersed in the world of high technology and beekeeping, Hive Tracks founders Mark Henson and James Wilkes have created a powerful tool to assist the beekeeping community in the challenging area of record keeping. Designed according to real beekeeping experience, utilizing cloud computing technology, and adopting Google's business model for free tools, **www.hivetracks.com** offers an intuitive, accessible, secure, useful, and free record keeping system to beekeepers of all stripes. Internet access is all that is required to use the service.

Recordkeeping is an important aspect of effectively managing honey bee colonies, but most agree there is room for improvement.

From Mann Lake Ltd.

Creamed Honey Containers

All new pre-printed Creamed Honey Containers! These containers are attractive and easy to fill. Our Graphics Department has updated this classic container to give your product a unique look. The back panel says "Smooth & Creamy! Creamed Honey is an all natural wholesome alternative to other spreads. Store at room temperature. If necessary, warm to soften, cool to harden." The lid to the Creamed Honey Tub is translucent without any printing but it is the perfect size for the "Produced By" label.

4 lb Honey Pail

Our new four pound Local Honey Pail coordinates with the one pound Creamed Honey Tub to give your display a professional touch. A nutrition label is printed on the back panel of the tub and the lid offers liquefying instructions and a statement telling your customer not to refrigerate honey. There is room on the lid for the "Produced By" labels sold below.

MiteZapper®

www.mitezapper.com

Mite Zapper, LLC is pleased to announce its product, MiteZapper® is an extremely effective CHEMICAL FREE treatment for the varroa mites. In laboratory and field testing, over five years, the MiteZapper® killed 85-95% of *Varroa* Mites.

The MiteZapper® offers tremendous advantages over chemicals:

- Treatment is Quick and Cost Effective. Simply connect and let the MiteZapper® do the work, four to six minutes per colony; treatment is done every 23-25 days during the drone rearing season (approximately four times per year).
- Does not contaminate bee products with harmful chemical residues.
- Can be used under any temperature conditions.
- Ideal for Organic bee farms.
- As chemicals become less useful due to mite resistance, the MiteZapper® will remain effective year after year – through its patented heat technology.
- Can be used when the honey supers are in place.
- No special equipment is needed; NO gloves, NO safety glasses, NO MESS!
- The MiteZapper® does not interfere with bee keeping practices as the beekeeper does not have to disturb the colony.
- The MiteZapper® can be left in the colony year round.

The MiteZapper® is a device that combines mite biology with simple physics in order to treat. Resembling a heating element, the MiteZapper® is a Frame that is built as drone foundation and is installed into the super as easily as a regular frame. The beekeeper connects the frame wire harness to the control box, which is then connected to a 12 volt battery for four to six minutes. The electricity produces enough heat to kill both the pupae and mites. The bees then remove the dead mites within 24-36 hours. The MiteZapper® is then ready for the queen to lay eggs again. The zapping process should be done every 23-25 days during the drone rearing season.

INNER COVER

There's a letter in the Mailbox section this month that deserves comment. The writer notes that for the most part, the beekeeping community offers gloomy news, gloomy advice and no answers.

"We face these 47 insurmountable problems and all the bees are going to die, but keep them anyway", is one of the common messages he hears.

Or, "Try keeping bees. It's almost impossible to keep them alive. But Keep them anyway", is often heard also.

I'll add one more the author didn't mention. "We still don't have answers, and we need more money to get answers", which is often quickly followed by, "and those other researchers are wrong because their - Pick one: samples weren't big enough, statistics weren't robust enough, techniques aren't recognized by the scientific community, results are too vague, and etc, etc, etc.

After five years of this constant barrage of bad news, and five years of losing bees, the writer was tired, burned out, discouraged and feeling bruised. He wasn't going to be buying any more bees. Come what may. You'd think more businesses in the package and queen side of the industry would hear that as a call to arms, wouldn't you?

I don't blame the writer. Though he appreciates the somewhat more positive message he reads here, even we are sometimes guilty of offering only doom and gloom on occasion. It is tough out there, and beekeepers must know how tough it is because forewarned is forearmed. Of course telling it like it is is often telling more than one might want to hear. Or more likely, more than one can bear to hear.

With the grand exception of the continued improvement of the Russian Bee Program and the growing use of hygienic behavior, our esteemed scientists excelled in finding more and more and more things *wrong* with our bees *and* our beekeeping, but very few answers on how to fix the things they keep finding that are broken. Now I know you can't fix something until you know what it is you have to fix. And, if there were no problems there would be less money to solve them. But so far, it seems, the discovery process has done wonders to illustrate the problems, with few answers arising from that corner. So it goes.

What answers there are, and there are more than you probably realize, have come mostly from private industry (and even the Russians are being improved by the Russian Bee Breeders, a private group). Recent advances in nutrition management, mite control, and disease detection have all been accomplished by for-profit beekeeping businesses and motivated individuals, and lots of better beekeeping answers are coming from not-profit-motivated individuals who simply want bees to stay alive.

So some things are getting better, but most things aren't. But the good news is that they aren't getting worse, either. That's certainly better than more bad news. And the answers we have keep us going. There are better bees out there. There are ways to keep bees alive without fouling their nests. And there are bees that don't die far too soon. And they will win the day.

But don't you wish, just once, that something *official* would come out that said...It'll be OK, really. It has to be, because no pleasure in life is the same as standing in a beeyard on a warm sunny day.

•

Good News For A Change

We just can't help it. We couldn't wait to share our good news. And it is good news. The surge of beekeepers in the past few years has created a demand for beekeeping supplies, beekeeping information, beekeeping classes, beekeeping books, and beekeeping magazines. So last month we were happy to oblige, at least in a small way to start.

For several years this magazine has been available on the magazine and book racks of many Tractor Supply stores. Maybe you saw one in a store near you. That got the attention of others, and last month you may have noticed us on the magazine racks of many, but certainly not all, Barnes and Noble book stores, and on the racks of the Borders Book Stores that survived the belt tightening they recently went through (we'd like to think that with this additional tool in their reconstruction kit they'll solve all their financial problems, but that may be a bit optimistic).

It's difficult to find brand new beekeepers until they get into some system somewhere, and it's difficult for a new beekeeper to get into a system until they find the system. That's where we come in. We provide information for all levels of beekeepers, and, importantly, we offer the contacts they need to find more information, suppliers and associations. Newsstands in these outlets serve as the conduit for those wanting information and those wanting to share information.

We don't have a feel for this yet. It's brand new, and it may not be a fit in the long run. We'll see. But let me tell you, you can't beat the feeling you get when someone who wants to keep bees and doesn't have a clue where to start finds us on a shelf somewhere and gives us a call. That conversation is one of the best you'll ever have.

APRIL – REGIONAL HONEY PRICE REPORT

Where Do They Sell Their Honey?

Again this year we polled our reporters on where they sell their honey. We've been doing this for several years, and the pattern if fairly predictable. Our reporters are primarily sidleline or very small commercial beekeepers, with a few larger outfits represented that tend to be producer/packers.

If you are interested in expanding your honey (and other hive product) sales, look over this list of possible outlets. There are most likely some you are missing now and could investigate. Price is not the key to more sales so don't undersell your product. Rather, increase your exposure by increasing where your honey is sold.

Home sales continue to dominate the scene…both outside honey stand sales and inside sales. If you are just starting out, remember that if you are selling honey from home, your insurance may need tweaking since you are operating a business there. More businesses are requiring beekeepers to have some sort of liability insurance if they wish to sell honey at that outlet. Businesses don't want your problems to become their problems.

Home sales are interesting to watch. The per cent of reporters who sell honey from home remains roughly steady (about 74%), but the amount of honey they sell continues to creep up each year…from a third to over half. That makes sense if you think about it. Low to no overhead, a marketing device that cannot fail, and essentially no labor. Think about your home sales this season.

% of Reporters Selling at these locations							% of Their Honey Sales at these locations							Locations Honey Sold at
2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011	
78	69	65	76	82	81	71	35	33	46	44	40	43	51	Home (inside or roadside stand)
14	13	16	16	20	13	17	41	49	26	37	34	14	26	Local community - sponsored farm market (i.e. Sat. & Sun. sales)
21	30	37	16	26	23	19	14	17	32	32	26	27	31	Local Farm Market business that's seasonal (Fall only, for instance)
18	16	18	18	26	32	26	34	17	25	39	36	38	34	Local Farm Market business that's year-round
6	18	5	10	8	9	8	23	5	44	30	29	34	24	Flea Market
41	28	24	34	39	37	35	14	20	19	20	26	19	18	Health Food/Organic store
17	10	10	13	11	8	12	9	7	14	5	11	37	9	Gift Store
29	23	15	14	20	19	13	16	16	25	25	16	22	20	Bakeries/Food Establishments
11	5	4	9	15	13	17	23	5	21	19	15	13	13	Local High-End Retail Outlets (gourmet stores)
25	36	21	24	37	37	30	18	19	19	19	16	19	22	Local, Small 'Mom & Pop' Retail Outlets (grocery & gas)
25	10	9	11	16	13	14	31	12	32	48	30	26	32	Local Small Packer or Producer/Packer
10	5	5	6	3	0	5	68	45	60	54	63	0	42	Huge Packer, they pick up
6	3	3	6	8	9	13	29	40	47	33	42	30	38	Wholesale only to larger stores, you deliver to warehouse
10	10	6	10	13	11	14	3	15	5	7	6	3	4	Breweries/Beer or Mead makers
11	8	7	6	10	4	6	12	15	17	29	8	8	6	Internet, direct retail, mail order
11	25	18	26	22	17	29	6	28	33	23	15	11	20	Work, direct retail
6	8	5	6	8	8	8	33	17	18	7	8	25	8	Local/State Fair, with club

*Total percentage of sales does not come out to 100% because of multiple outlets.

REPORTING REGIONS													SUMMARY		History	
	1	2	3	4	5	6	7	8	9	10	11	12	Range	Avg.	Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS																
55 Gal. Drum, Light	1.65	1.85	1.65	1.53	1.60	1.65	1.56	1.65	1.65	1.58	1.62	1.65	1.53-1.85	1.64	1.67	1.61
55 Gal. Drum, Ambr	1.56	1.75	1.56	1.47	1.50	1.49	1.58	1.65	1.56	1.56	1.53	1.52	1.47-1.75	1.56	1.57	1.47
60# Light (retail)	130.00	161.00	142.00	132.50	135.00	148.33	141.60	143.33	148.51	139.80	150.00	163.33	130.00-163.33	144.62	137.65	134.89
60# Amber (retail)	130.00	151.00	129.00	129.75	141.00	143.33	137.67	142.50	135.00	145.54	143.75	157.15	129.00-157.15	140.47	138.75	127.77
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS																
1/2# 24/case	55.20	79.65	49.08	55.90	68.19	53.75	44.60	68.19	68.19	56.00	55.30	87.67	44.60-87.67	61.81	59.30	57.18
1# 24/case	85.56	99.23	84.78	71.70	101.50	98.50	79.87	89.10	72.00	99.84	71.00	96.88	71.00-101.50	87.50	85.79	77.80
2# 12/case	84.90	81.85	77.01	74.33	108.00	76.32	71.74	81.00	63.00	81.00	73.33	88.08	63.00-108.00	80.05	73.18	68.71
12.oz. Plas. 24/cs	68.16	94.78	63.96	69.33	60.00	80.74	62.50	85.75	66.00	60.60	71.40	74.00	60.00-94.78	71.43	68.82	63.69
5# 6/case	102.81	93.98	92.55	72.63	80.00	92.25	80.45	91.50	70.00	75.60	62.08	96.67	62.08-102.81	84.21	84.13	79.53
Quarts 12/case	134.75	111.73	81.60	107.52	96.00	96.83	101.70	103.00	134.75	120.06	97.20	123.67	81.60-134.75	109.07	111.22	95.73
Pints 12/case	86.44	88.98	82.80	70.40	68.00	58.50	77.78	68.40	86.44	70.20	73.00	73.33	58.50-88.98	75.36	71.30	67.87
RETAIL SHELF PRICES																
1/2#	3.00	4.32	2.62	3.40	4.26	3.33	2.99	2.29	4.26	3.15	3.54	5.50	2.29-5.50	3.55	3.40	2.98
12 oz. Plastic	3.50	4.84	3.93	3.82	5.10	4.42	3.51	4.20	3.99	3.33	4.37	4.66	3.33-5.10	4.14	3.89	3.63
1# Glass/Plastic	4.38	5.79	4.51	4.87	5.83	5.43	4.46	5.72	4.99	5.31	5.44	6.44	4.38-6.44	5.26	5.30	4.70
2# Glass/Plastic	7.75	8.49	8.18	8.15	9.50	8.66	8.01	9.12	7.99	9.40	8.85	9.75	7.75-9.75	8.65	8.77	7.94
Pint	10.51	7.98	8.00	6.57	6.15	6.75	6.81	7.26	10.00	6.71	7.75	9.60	6.15-10.51	7.84	8.53	6.70
Quart	18.33	13.40	14.00	10.98	12.00	12.16	11.29	12.58	15.00	11.69	10.99	16.00	10.98-18.33	13.20	13.09	11.25
5# Glass/Plastic	18.50	18.36	19.68	18.30	22.13	20.89	17.08	19.25	21.00	16.46	19.64	23.00	16.46-23.00	19.52	19.22	17.76
1# Cream	6.51	7.98	7.15	5.89	6.51	5.13	5.66	5.84	6.51	5.96	7.15	6.63	5.13-7.98	6.41	5.99	5.77
1# Cut Comb	6.50	6.99	7.15	5.70	7.81	7.00	8.07	7.00	7.81	6.00	7.70	9.33	5.70-9.33	7.25	7.50	6.21
Ross Round	6.67	6.32	7.15	6.33	6.67	6.50	6.00	7.00	6.67	6.67	6.63	8.38	6.00-8.38	6.75	6.54	6.37
Wholesale Wax (Lt)	2.35	4.83	3.75	3.45	3.15	4.93	5.89	5.00	5.75	6.00	3.24	3.75	2.35-6.00	4.34	3.90	3.24
Wholesale Wax (Dk)	2.25	4.32	2.75	3.13	2.00	4.30	4.50	4.00	5.00	5.01	2.15	3.10	2.00-5.01	3.54	3.32	3.63
Pollination Fee/Col.	90.00	103.33	64.67	43.60	75.00	65.00	54.00	75.00	89.52	89.52	66.00	122.50	43.60-122.50	78.18	83.75	80.46

U.S. HONEY PRODUCTION – 2010

Honey production in 2010 from producers with five or more colonies totaled 176 million pounds, up 20 percent from 2009. There were 2.68 million colonies producing honey in 2010, up seven percent from 2009. Yield per colony averaged 65.5 pounds, up 12 percent from the 58.6 pounds in 2009. Colonies which produced honey in more than one State were counted in each State where the honey was produced. Therefore, at the United States level yield per colony may be understated, but total production would not be impacted. Colonies were not included if honey was not harvested. Producer honey stocks were 45.3 million pounds on December 15, 2010, up 21 percent from a year earlier. Stocks held by producers exclude those held under the commodity loan program, which totaled 4.1 million pounds when this report was released.

Honey prices increased to a record high during 2010 to 160.3 cents, up nine percent from 147.3 cents in 2009. U.S. and State level prices reflect the portions of honey sold through cooperatives, private channels, and retail.

Prices for each color class are derived by weighting the quantities sold for each marketing channel. Prices for the 2009 crop reflect honey sold in 2009 and 2010. Some 2009 crop honey was sold in 2010, which caused some revisions to the 2009 crop prices. You can read the entire report, that is from 2009 and 2010 at **http://usda.mannlib.cornell.edu/usda/current/Hone/Hone-02-25-2011.txt**.

This report, while revealing in many ways, is only one set of data contributing to our annual analysis of the U.S. Honey Market. We sort out for you 16 years of honey prices so you can see any possible trends, and we look indepth at the top 10 producing states each year, compared to the top ten for the previous six years, again so you can spot trends and make plans.

Overall, USDA's calculated honey prices continue to be encouraging. From their "All honey prices", that is basically bulk prices, prices increased from $1.473/lb in 2009 up to $1.603/lb in 2010, nearly a 14% increase in an at best flat year for most price increases. Bulk prices in *Bee Culture*'s monthly honey report increases were nearly identical rising from $1.415/lb to $1.605. USDA calculated retail prices were up also, going from $2.837/lb up to $3.054/lb, just over a 7.5% increase. *Bee Culture* calculates our retail figures differently, using unweighted averages. Our figures show a retail price last year of $3.263, rising to this year's $3.589, a 10% increase across the board for a pound of honey.

Total honey production in the U.S. was up 20% this year, rising to a modest 175.9 million pounds from last year's 144.1 million pounds. Be sure to look at where most of that increase came from. Of the 34.8 million pound increase, California contributed almost half by

Honey: Number of Colonies, Yield, Production, Stocks, Price, and Value by State and United States, 2010[1]

State	Honey Producing Colonies[2]	Yield per Colony	Production	Stocks Dec 15[3]	Average Price per Pound[4]	Value of Production[5]
	x1,000	Pounds	x1,000	Pounds	Cents	1,000 Dollars
AL	9	54	486	73	222	1,079
AZ	24	77	1,848	665	143	2,643
AR	25	60	1,500	360	147	2,205
CA	410	67	27,470	6,318	156	42,853
CO	34	56	1,904	533	150	2,856
FL	200	69	13,800	1,794	157	21,666
GA	55	46	2,530	152	167	4,225
HI	10	77	770	239	227	1,748
ID	98	27	2,646	1,191	150	3,969
IL	9	41	369	92	305	1,125
IN	10	43	430	151	226	972
IA	27	49	1,323	463	189	2,500
KS	9	52	468	103	229	1,072
KY	5	67	335	67	264	884
LA	21	80	1,680	269	148	2,486
ME	6	41	246	39	211	519
MI	70	58	4,060	1,502	164	6,658
MN	126	66	8,316	1,746	154	12,807
MS	16	98	1,568	78	147	2,305
MO	11	52	572	92	180	1,030
MT	157	74	11,618	2,905	155	18,008
NE	44	55	2,420	1,041	149	3,606
NJ	13	35	455	73	175	796
NM	7	66	462	157	158	730
NY	47	64	3,008	1,173	178	5,354
NC	13	46	598	138	273	1,633
ND	510	91	46,410	12,995	151	70,079
OH	17	62	1,054	327	223	2,350
OR	59	39	2,301	874	162	3,728
PA	30	37	1,110	377	205	2,276
SD	265	59	15,635	4,847	154	24,078
TN	8	63	504	106	245	1,235
TX	100	72	7,200	792	153	11,016
UT	26	30	780	195	152	1,186
VT	4	65	260	73	221	575
VA	5	37	185	37	331	612
WA	71	37	2,627	1,077	152	3,993
WV	5	38	190	38	239	454
WI	68	64	4,352	1,654	167	7,268
WY	34	36	1,224	282	160	1,958
Oth Sts[6,7]	26	46	1,190	219	256	3,046
US[7,8]	**2,684**	**65.5**	**175,904**	**45,307**	**160.3**	**281,974**

[1]For producers with five or more colonies. Colonies which produced honey in more than one State were counted in each State.
[2]Honey producing colonies are the maximum number of colonies from which honey was taken during the year. It is possible to take honey from colonies which did not survive the entire year.
[3]Stocks held by producers.
[4]Average price per pound based on expanded sales.
[5]Value of production is equal to production multiplied by average price per pound.
[6]AK, CT, DE, MD, MA, NV, NH, OK, RI, and SC not published separately to avoid disclosing data for individual operations.
[7]Due to rounding, total colonies multiplied by total yield may not exactly equal production.
[8]United States value of production will not equal summation of States.

Honey Prices 1995-2010

Cents/lb.	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
All Honey	68.5	87.8	75.7	65.5	60.1	59.7	70.4	132.7	138.7	108.5	90.4	104.2	103.2	141	144.5	160.3
Retail Shelf	100.0	117.3	125.7	114.7	126.6	130.4	142.2	152.5	188.5	188.7	183.3	191.0	196.1	197.6	278.4	305.4
%Difference	31%	25%	40%	34%	53%	54%	51%	13%	26%	42%	51%	46%	29%	28%	48%	48%

increasing their production by 15.8 million pounds. Add in North Dakota's increase of an additional 12 million pounds and Florida's 2 million pound increase and right there's the change in U.S. honey production for 2010. Interestingly, my home state of Ohio had a significant turn around last year, with colony counts going from 11 million to 17 million, over a 50% increase in one year, and production per colony rising from 50 to 62 pounds/colony. Check out your state's change on the report at the web page above. You may be as surprised as I was.

Snap Shot Of Colony & Honey Production

YEAR	COLONIES (x000)	PRODUCTION (000 lbs)
1989	3528	180.6
1990	3220	198.7
1991	3211	220.9
1992	3045	221.7
1993	2875	230.6
1994	2783	218.2
1995	2655	211.1
1996	2581	199.5
1997	2631	196.5
1998	2637	220.5
1999	2652	203.1
2000	2622	220.3
2001	2550	186.1
2002	2574	171.7
2003	2599	181.7
2004	2554	183.5
2005	2409	174.6
2006	2394	154.9
2007	2443	148.3
2008	2342	163.7
2009	2462	144.1
2010	2684	175.9

Per Capita Honey Consumption

One of the more revealing analyses we do each year is to calculate the per capita honey consumption in the U.S. This is an arbitrary figure in a way, because you and I know lots of people who never, ever eat a drop of honey. Can't afford it, don't like it, too messy . . . take your pick. Some folks just won't and don't eat the stuff. I even know beekeepers who don't eat honey . . . or don't eat enough to amount to a teaspoonful a year. I'm always amused when I meet one . . . but so it goes.

The per capita consumption figure does, however, provide a tool we can use year to year to see how things are moving along. The final figure has to do with U.S. production, imports, exports, stocks held over from last year, and honey still in warehouses this year, and the amount of honey beekeepers have taken out of the commerce stream and put under loan. Here are the figures:

Honey Income

Imports – 252 million lbs.
U.S. Production – 176 million lbs.
Stocks held over from 2009 – 37 million lbs.
Honey placed on loan (from 2009) – 5.0 million lbs.
TOTAL – 470 MILLION POUNDS

Honey OutGo

Exports – 30.4 million lbs.
Stocks held this year not yet sold – 45.3 million lbs.
Honey placed on loan (from 2010) – 4.1 million lbs.)
TOTAL – 79.8 MILLION POUNDS

To calculate honey consumption in the U.S. during 2010, subtract the amount of honey not consumed in the U.S., that is exports and honey still not sold (stocks), from all the honey that came into the country, that is imports, U.S. production, stocks held over, and honey under loan, and the total is 393.4 million pounds of honey were consumed last year. Now, divide that figure by the total U.S. population of 308.7 million people, and you get per capita consumption of 1.27 pounds per person . . . which comes to 20.4 ounces. This figure has remained relatively constant for years, rising ever so slowly from 16 ounces/person about 20 years ago to 20 ounces now. However, when you think about it, there are more and more people every year, and even FOUR ounces over 308 million people amount to 77 million pounds . . . 30% of what we import, or 44% of what we produce, so even that small amount adds up.

But wait, I hear from all corners, what about all those beekeepers with five or fewer colonies that don't get counted every year? What about all their honey, and all their colonies. This exact question came in when we sent this report out on our CATCH THE BUZZ ™ news release at the end of February (Yes, you could have had this report sent directly to your computer on Feb 27, 2010, and not had to wait an entire month to get it. Sign up at **http://www.beeculture.com/content/catch_buzz.cfm** so you don't miss any more important news). So, OK, what about those 120,000 or so folks who don't get counted (our estimate here is that about 20,000 of these are new this year, so honey production will be

Top Ten Producing States Each Year

2005			2006			2007			2008			2009			2010			
State	x1000 Col	x1000 Prod lbs	State	x1000 Col	x1000 Prod lbs	State	x1000 Col	x1000 Prod lbs	State	x1000 Col	x1000 Prod lbs	State	X1000 Col	X1000 Prod lbs	State	X1000 Col	Colony % change	X1000 Prod lbs
ND	370	33.7	ND	350	25.9	ND	420	31.1	ND	390	35.1	ND	450	34.7	ND	510	+13%	46.4
CA	400	30.0	CA	380	19.8	CA	340	13.6	SD	225	21.4	SD	270	17.8	CA	410	+15%	27.5
SD	220	17.4	FL	170	13.8	SD	255	13.3	CA	360	18.4	CA	355	11.7	SD	265	-2%	15.6
FL	160	13.8	SD	225	10.6	FL	160	11.4	FL	150	11.9	MT	146	10.2	FL	200	+33%	13.8
MN	120	8.9	MT	132	10.4	MT	135	9.2	MN	122	9.5	FL	150	10.2	MT	157	+8%	11.6
MT	130	8.7	MN	125	10.0	MN	130	8.8	MT	134	9.4	MN	122	7.9	MN	126	+3%	8.3
TX	84	6.0	WI	64	6.0	TX	105	8.6	MI	71	5.2	ID	103	4.7	TX	100	+35%	7.2
WI	64	5.3	TX	82	5.7	ID	92	3.8	TX	77	4.9	TX	74	4.7	WI	68	+8%	4.4
MI	65	4.4	ID	95	4.2	MI	72	4.6	WI	58	4.6	MI	66	4.0	MI	70	+6%	4.0
ID	95	3.5	MI	72	4.0	WI	60	5.0	GA	55	3.9	LA	37	3.8	NY	47	0%	3.0
Total	1708	131.7		1695	110.4		1769	109.7		1642	120.3		1773	109.7		1953		141.9
All Sts.	2410	175.0		2392	154.8		2442	148.5		2301	160.9		2462	144.1		2684		175.9
% of Tot.	71%	75.3%		71%	71.3		72.4%	73.8		71%	75%		72%	76.1%		73%		80.6%

minimal, if at all). But the remaining beekeepers out there? Well, let's see. If every one of them produced 100 pounds of honey . . . and you know beekeepers with five or fewer who do more, and a lot that do less, but for the sake of this computation, let's figure 100 pounds/beekeeper. That comes to an increase of *10 million pounds*. Divided by our population of 308 million, would increase per capita consumption by five ounces per person. That rounds it out 25.2 ounces, or 1.6 pounds per person. Certainly a more respectable figure, though perhaps a bit optimistic.

A final note on colony counts. The U.S. hasn't had as many colonies as it has this year since 1994. Contributing to this increase certainly in the spectre of colony collapse disorder hanging over all U.S. beekeepers, urging them to produce more colonies than necessary for the pollination King out west . . . the almighty almond crop. It is better to have 1500 colonies, and need 500, than to have only 500 and have half come up empty in January. And, of course, the continuing increase in honey prices has not detracted from beekeepers increasing their colony counts . . . just for the pocket change. BC

A Closer LOOK

DIVISION OF LABOR

Clarence **Collison**
Audrey **Sheridan**

The ability of colonies to adjust the division of labor among workers in response to changing environmental and colony conditions is both hormonally and genetically controlled

As worker honey bees age, after they emerge as adults, they are engaged in various activities that are correlated approximately with their age and physiological development. This has been referred to as "temporal division of labor" or "age polyethism." Younger workers tend to stay inside the hive during the first two to three weeks of adult life performing such tasks as brood care and food processing, and then become active in foraging outside the hive during the remaining two to three weeks of their life (Gary 1992). Division of labor may be defined as the variation in frequency at which individual bees are engaged in specific activities as a result of differences in age, er.vironment and genotype (Robinson 1995). Age polyethism in honey bee colonies has been analyzed from behavioral, genetic, endocrinological and neurobiological perspectives (Wagener-Hulme et al. 1999). Age-related division of labor is characterized by a high degree of flexibility (Schulz and Robinson 1999). Numerous studies have been completed to increase our understanding of the mechanisms that enable adult workers to show plasticity in age polyethism in response to changing environmental conditions; both external and within the colony.

Behavioral development in honey bees is thought to reflect changes in the responses of bees to stimuli that elicit the performance of each task. According to this hypothesis nurse bees are more responsive to stimuli that elicit the performance of brood care while foragers are more responsive to stimuli associated with foraging (Schulz and Robinson 1999). Chemical stimuli are believed to be of primary importance. Behaviorally related differences in response thresholds to chemical stimuli encountered in the beehive have been reported (Robinson 1987a, Page et al. 1998). Behavioral development in honey bees also is thought to reflect differences in learning and memory. Foraging is probably a more cognitively demanding task than other activities that are performed exclusively in the hive because it involves multimodal integration of information, efficient flower handling and symbolic communication via the "dance language" (Fahrbach and Robinson 1995).

A further division of labor is also common in a honey bee colony that involves specialization on different tasks by similarly aged workers. For example, middle-age bees, two to three weeks old, perform a variety of tasks such as building comb, receiving nectar from incoming foragers, guarding the nest entrance or removing corpses from the nest. Only a small percentage of a colony's workers act as guards (Moore et al. 1987) or undertakers (Visscher 1983; Trumbo et al. 1997); most bees apparently never perform these tasks. Variation in worker genotype influences the likelihood of specializing on certain tasks at a given age, such as guarding or corpse removal (Robinson and Page 1988).

Individual workers can accelerate, delay, or even reverse their aging process in response to changing colony needs (Robinson 1992). A surge in worker birth rates, due perhaps to favorable environmental conditions in late Spring, may soon result in a colony that has too few foragers to handle the food demands of all the new young larvae and adults. Under these circumstances some young bees shorten dramatically their tenure as hive bees, from three weeks to one week, and become precocious foragers (Robinson 1995).

Delayed development occurs in a new colony founded by a swarm. A

swarm initially contains adult workers of all ages, but it becomes dominated by older individuals soon after establishing itself in a new nest site. This is because there are no adult replacements temporarily – new adults do not emerge until three weeks after the queen lays the first eggs. As the adult worker population ages, some of its youngest workers continue to care for brood as "overage nurses" for the all important new generation (Robinson 1995).

Behavioral reversion, from foraging to nursing, is not as well understood under natural conditions. It can be induced experimentally by depleting a colony of all workers except foragers (Robinson 1995). Bees then become younger, both behaviorally and physiologically. Under normal conditions, the brood-food glands located in the worker's head produce food for larvae early in life, but then degenerate or shift to producing other substances with age. These glands are rejuvenated when reversion occurs, and they actually become capable once again of producing brood food. Reversion may occur in nature as colonies become inactive due to the onset of Winter or, in tropical and sub-tropical areas, the onset of the rainy season.

In the case of a young bee developing into a precocious forager, how can a young bee in a colony numbering 20-40,000 adults, with a dozen or more tasks being performed simultaneously, "know" that there is a shortage of foragers and change its occupation accordingly? It is inconceivable that each individual bee can monitor the state of its whole colony and then perform the tasks that are needed most (Robinson 1995). Girary and Robinson (1994) demonstrated that genetic variation for plasticity in age polyethism is not based on genetic variation for sensitivity to changing colony conditions. Rather, genotypes that have relatively fast rates of behavioral development under more typical conditions are more inclined to show precocious foraging in the absence of normal age foragers. Similarly, genotypes that have relatively slow rates of behavioral development under typical conditions are inclined towards over-age nursing in the absence of normal age nurses.

Huang and Robinson (1992) showed that not only does a transplant of foragers into a single-cohort colony inhibit precocious foraging, but the inhibition persists even if the transplanted foragers are themselves not allowed to forage. This means that the young resident bees are likely to be inhibited by the foragers directly, rather than stimulated to forage by some change in the hive environment such as decrease in food stores or a lack of freshly collected food. A similar conclusion can be drawn from experiments in which foragers are confined by artificial rain. In this case there is a delay in behavioral development even though again it is expected that forager confinement led to a decrease in food stores or a lack of freshly collected food (Huang and Robinson 1996).

Juvenile hormone (JH) influences rate of behavioral development, and environmentally induced changes in JH titers (a titer is a measurement of the amount or concentration of a substance found in a solution, in this case the bee's blood) are thought to underlie changes in age polyethism (Robinson and Huang 1998). Hemolymph titers of JH increase with age (Rutz et al. 1976, Huang et al. 1991, 1994), and treatment with JH (Jaycox 1976), JH mimic (Jaycox et al. 1974) and JH analog (Robinson 1987ab, Sasagawa et al. 1989) induces precocious foraging. Removal of the corpora allata (the glands that produce JH) delays, but does not prevent, bees from developing into foragers; the delay is eliminated with JH analog treatment (Sullivan et al. 1996).

Hormone analyses and exocrine gland measurements were made to probe for physiological correlates of division of labor among similarly aged adult workers (Huang et al. 1994). Middle-age bees (ca. two weeks old) performing different tasks showed significant differences in both juvenile hormone (JH) biosynthesis rates and hemolymph titers. Guards and undertakers had high JH, and wax producers and food storers, low JH. Guards and undertakers had similar hormone levels to foragers, even though they were 10 days younger than foragers.

Robinson (1995) and others have demonstrated that the bees alter hormone levels themselves in response to changing conditions. Precocious foraging has been induced by establishing colonies consisting initially of only very young bees. In checking juvenile hormone levels in blood, they found that one-week-old precocious foragers had levels that were higher than those of one-week-old nurse bees, but about the same as those of three-week-old foragers. Two weeks later they obtained over-age nurses from these colonies since they did not allow new adults to emerge. Hormonally, these old nurse bees resembled young nurses, rather than foragers.

Queen mandibular pheromone (QMP) has been shown to be involved in the control of age polyethism. Kaatz et al. (1992) showed that QMP inhibits the rate of worker JH biosynthesis. Bees from colonies treated with supplemental doses of QMP had lower JH titers and began to forage at older ages than bees from control colonies (Pankiw et al. 1998).

Results of experimental perturbations suggest that colonies cope with constant variation in age demography and resource availability via a process of developmental plasticity that involves ongoing adjustments in the proportions of individual workers engaged in various tasks (Robinson et al. 1989). The ability of colonies to adjust the division of labor among workers in response to changing environmental and colony conditions is both hormonally and genetically controlled (Robinson et al. 1989, Robinson 1995). Structural changes in two brain regions, the antennal lobes and the mushroom bodies, also have been detected in association with honey bee behavioral development.

Biogenic amines may play a role in the regulation of honey bee behavioral development. The biogenic amines dopamine, serotonin, and octopamine are known to influence the expression of many types of behavior, presumably by modulating the responsiveness of animals to various behaviorally relevant stimuli. Treatment studies of honey bees revealed effects of biogenic amines on olfactory sensitivity and performance in a laboratory learning assay (Mercer and Menzel 1982, Macmillan and Mercer 1987, Hammer 1993). Wagener-Hulme et al. (1999) demonstrated striking changes in brain levels of dopamine, serotonin, and octopamine during honey bee behavioral development. Older bees, notably foragers, had significantly higher levels of all three amines than did younger bees working in the hive. Octopamine levels were significantly lower in normal-age nurses versus precocious foragers, and over-age nurses versus normal-age foragers but not different in reverted nurses versus reversion colony foragers. Serotonin levels did not differ in any

of these comparisons.

Levels of the biogenic amines dopamine, serotonin, and octopamine were measured in different brain regions of adult worker honey bees as a function of age-related division of labor (Schulz and Robinson 1999). In the antennal lobes, foragers had higher levels of all three amines than nurses, regardless of age. Differences were larger for octopamine than serotonin or dopamine. In the mushroom bodies, older bees had higher levels of all three amines than younger bees, regardless of behavioral state. These correlative results suggest that increases in octopamine in the antennal lobes may be particularly important in the control of age-related division of labor in honey bees. BC

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Clarence Collison is an Emeritus Professor of Entomology and Department Head Emeritus of Entomology and Plant Pathology and Audrey Sheridan is a Research Technician at Mississippi State University, Mississippi State, MS.

Managed Pollinator CAP
Coordinated Agricultural Project
Genetic Toolkits For Bee Health

Jay **Evans**

Diagnostic Genetic Tools Are Available For Each Of The Major Honey Bee Pests And Pathogens

Beekeepers, inspectors, and researchers have a shared interest in checking bees and hives for clues related to bee health and disease. These checks take many forms, from lifting Fall supers prior to feeding decisions to carrying out sticky board or jar tests for estimating *Varroa* populations. Most decisions for managing beehives are, appropriately, made in the field using these and other traits presented by the bees themselves. Nevertheless, some tests are best carried out on hive samples that have been gathered and brought to a home or laboratory where different tools can be used. In the laboratory, genetic tools are becoming the norm for everything from disease diagnosis and research into bee behavior and nutrition to validation of promising bee stock.

Diagnostic genetic tools are available for each of the major honey bee pests and pathogens and these tools offer new avenues for screening bees and colonies to predict ailments and causes of colony declines. In addition, the sequencing of the honey bee genome (Honey Bee Genome Sequencing Consortium, 2006) and associated efforts to define the genetic and protein makeup of bees have generated informative genetic tags for bee proteins involved with development, immunity, physiology, and behavior. These resources for bees and their disease agents can be exploited in order to improve bee breeding schemes, manage diseases or bee nutrition, and regulate the movement of viruses, bacteria, fungi, and other infectious agents.

Interest in such 'forensic' tools has surged in the past several years, triggered by enigmatic colony losses that have defied typical explanations. Currently, molecular diagnostics are a routine part of national surveys (Genersch *et al.*, 2010) and research efforts (de Miranda, Fries, 2008; Johnson *et al.*, 2009; vanEngelsdorp *et al.*, 2009) aimed at understanding disease risk factors in the field.

Two recent national disease surveys provide a hint of the power of genetic tools for identifying the major honey bee pathogens and predicting their impacts on bees. Genersch and colleagues (2010) describe extensive methods and target sequences for a national survey carried out in Germany for several years. Their major findings (a connection between mite and virus levels and Winter losses), were consistent with a biological cause of colony losses. Similarly, vanEngelsdorp and colleagues (2009) used genetic markers to show higher microbial loads in collapsed colonies from a U.S. survey than in healthier controls. This survey exploited markers for a group of well known and newly recognized viruses (Evans, 2006; Cox-Foster et al., 2007).

Building A Better Toolkit

A useful toolkit for understanding bee health faces four major hurdles in order to become a lasting component for bee diagnostics or research:

1) **Tools must be robust and reproducible.** This stage weeds out many promising tools. Diagnostics that can not be reproduced, ideally via a new technique and by an independent team of researchers, will soon be forgotten. This is a sobering fact of science.
2) **Tools must have a purpose and predictive value.** Scientists, or companies, can develop a very precise and accurate diagnostic for a genetic trait or something like the exact degree of darkness on a bee's backside that in the end offers little insight into bee biology, breeding, or management. Research notebooks, including ours, are riddled with brilliant tests that have not yet found, and likely will never find, their niche as a useful genetic tool. Still, these tools are often made public in hopes that someone with more insight or experience will find them a niche. Few will actually fulfill that promise. On the plus

side, there is an abundance of new tools right now and chances are great that gems will emerge for understanding bee health or giving great fundamental insights into what it means to be a social insect, or an insect at all. These gems, and the toolkits built around them, are what keep scientists going.

3) **Tools must be adopted and further tested across the community.** Imitation is flattery, and new tools have a greater impact if they are tested and then adopted in many places, after being proven reliable in different parts of the world. Scientists, while we try to think independently on the bigger questions, are eager to adopt a technique that has worked elsewhere. This tendency, in fact, unites scientists and beekeepers. While it is useful to keep a critical mind, imitation can push some really useful behaviors into the community. Maybe 10% of a scientist's work (o.k. at least THIS scientist's work) actually gets imitated in this way.

4) **Diagnostic tests must be cost effective and 'portable' to different labs.** This last stage is one in which genetic techniques excel and will continue to do so. Many genetic toolkits revolve around the polymerase chain reaction (PCR), a decades-old technique (Nobel Prize already bagged) that imitates the cell's replicative machinery by making a measurable amount of DNA for a specific marker by 'priming' replication of that, and only that, region of the genome. As a tool, PCR is quick, cheap, sensitive, and specific, MOST of the time. It often fails for identifying novel or rogue targets like unstudied viruses, driving constant efforts to tag those targets by more tedious sequencing efforts (e.g., Cox-Foster et al., 2007). Nevertheless, most would-be targets of interest for bee health can be studied with robust and sensitive PCR assays. Since nearly every University, government lab, or small tech outfit has the machinery needed to enact PCR, this technique also leads the way currently in terms of portability. Victories are temporary in science and completely novel diagnostics are in the background, but PCR has some years left in it as a key part of any genetic toolkit.

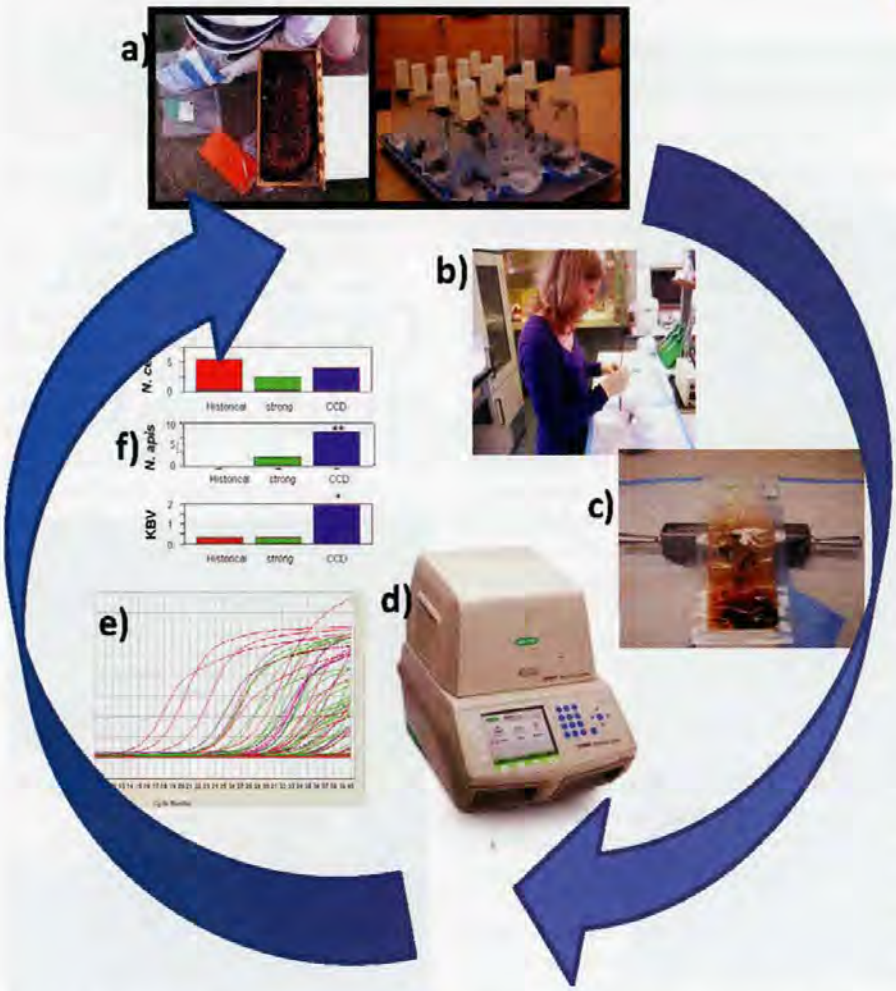


Figure 1 *– Flow chart showing honey bee diagnostics from field collections or experiments through RNA extraction, genetic diagnoses, analysis, and (hopefully) new insights.*

One Lab's Toolkit For Disease Diagnostics

With help from the CAP program and with insights from many colleagues and especially my coworkers Judy Chen and Dawn Lopez, I have pieced together a modest genetic toolkit for diagnosing honey bee disease and addressing some of the many bee health and regulatory issues. After much taxpayer support, all of the actual diagnostics we use have inched past stage '1' above, most have passed stage '2' and a few are knocking on the doors of stage '4'. The routine we use is illustrated in Figure 1 and in more detail at the Bee Health website (**www.extension.org/pages/Protocol_for_Honey_Bee_PCR_Diagnostics**). We stick more or less to the same script whether samples are generated in laboratory experiments (Evans et al., 2009), field experiments, or field crises. The hope is that a cycle of diagnostics will lead to new insights into a general health issue of bees or a local collapse of bee colonies.

Genetic markers have had great impacts on honey bee research and on the discovery of potential disease agents. It is hoped that these insights will now lead to more cost-effective screens that can be used to assess management and regulatory practices and speed the selection and maintenance of desired bee stock. All of the technical pieces are in place to do this in a big way, and in fact genetic insights into bee behaviors including the switch from nurse bees to foragers (Whitfield et al., 2006) and specific tendencies (Hunt et al., 2007)

are well established, as are indicators of honey bee immunity and stress (e.g., Johnson et al., 2007). On the pathogen side, genetic markers gave unique insights into the distinctiveness of *Nosema ceranae* from *Nosema apis*, and helped map the great recent spread of *N. ceranae* (Klee et al., 2007). Genetic sequences for *N. ceranae* also allowed for the first field diagnostic test for this species (Aronstein, 2010). Genetic signals are now known for each of the major honey bee pests, and diagnostics based on these signals are ready to complement other measures of honey bee health and disease. BC

Did you read the 2010 Honey Report on Page 17? You *could have* read it on February 27, instead of today. go to **www.beeculture.com/buzz**.

2 Day Queen Cells

A good way to promote raising local queens

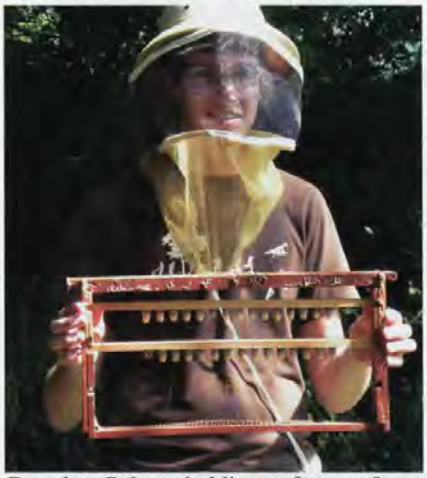
Joe **Latshaw**

Local queen rearing initiatives have taken many forms over the last several years. The primary objective of such efforts is to supply beekeepers with locally adapted and locally produced quality queens. Beekeepers are resourceful and have established queen rearing programs, offered classes and promoted the concept of sustainability to support their cause. In my opinion, queen rearing is perhaps the most enjoyable part of beekeeping. It requires a thorough understanding of honey bee biology and necessitates attention to detail by the beekeeper. These skills are required to ensure proper timing of needed actions to produce queen cells and ultimately, a new young queen. Producing GOOD quality queens requires significant time and resources. But what if a management practice could be employed that would distribute the time and resource demands of queen production to a larger number of beekeepers? Many years ago I read of one such practice employed by European beekeepers interested in promoting stock improvement and more recently read about the same practice in Dr. Larry Connor's writings. The concept of utilizing two-day cells captured my attention and offers beekeepers a relatively simple method to produce and distribute locally adapted stock.

As with virtually every other aspect of beekeeping, new management practices must stand the test of time and each beekeeper will determine the relative value for a new practice in his or her operation. From my involvement in local queen rearing efforts, it quickly became apparent that most beekeepers involved in queen rearing have day jobs. It just did not seem feasible that any one beekeeper could produce a large number of queens on their own. While I fully support the concept of beekeepers producing local queens, the reality was that a shortage of local queens will persist for some time. It was inevitable that the question of, "where do we purchase local queens" followed any presentation to promote local queen rearing. I had to stop and think. There are dedicated beekeepers producing relatively large numbers of queens in the north, but production levels are far below the high demand for good quality locally produced queens. To me, this is where innovation steps in and beekeepers have the opportunity to restructure their beekeeping practices.

What is the most time consuming and resource demanding part of queen rearing?

For me, it is the nucleus colonies or nucs, used to mate the new queens. It really does take a great deal of bees and equipment to establish the mating nucs. Then there is the issue of tending to the nucs and making sure they have enough food, are not too crowded, and most importantly that cells and queens are added or removed in a timely manner. This is no easy task, and just imagine raising queens on a large scale. It is no wonder we do not have more large queen producers in



Brendan Palmer holding a frame of two-day old cells that were just removed from the cell starter colony. Brendan had a 93% success rate on the grafting. (photo by Joe Latshaw)

A closer view of the two-day cells Brendan grafted. Plastic cell cups are nice because the beekeeper is able to see the royal jelly level through the side of the plastic cell cup. (photo by Joe Latshaw)

Brendan placing the two-day cells into the Styrofoam piece to prepare the cells for shipment. (photo by Joe Latshaw)

Once the cells were placed in the Styrofoam, a damp paper towel was placed over the cells to keep them moist during shipment. (photo by Joe Latshaw)

Once the cells were packaged and covered, they were placed inside a plastic bag to prevent desiccation. (photo by Brendan Palmer)

the Northern states. Our season is relatively short, but if we adapt our beekeeping practices to suit our needs, then there is plenty of time each season to produce queens.

The other challenge involves the production and evaluation of stock. When I was involved with the Ohio Queen Project, there were two primary objectives: teaching the skills to raise queens and develop a stock selection program. Learning the skills to raise quality queens is the first step, the second step is to place emphasis on the stock that is used to raise queens. It takes years to select and develop a strain of bees that is better adapted to its environment. The use of instrumental insemination greatly accelerates the selection process, but also adds to the cost of selection. The concept/model of cooperative selection programs allows beekeepers to pool their resources. When selecting and evaluating potential breeder queens beekeepers must screen a large number of potential queens every year. The more beekeepers that are involved, the more queens can be evaluated. Think of selection as a sorting process and you (the beekeeper) are in charge of this process. You are looking for the best of the best each year. The more queens "you" are able to look at, the more critical you may be with the selection pressure. The challenge then becomes distributing daughter queens from the selected breeder queens. Again, how many beekeepers are raising and producing a large number of queens for sale? Beekeepers or clubs can pool their colony resources to help with the evaluation and selection process. The majority of beekeepers can readily assess the quality of beehives. The next step is to efficiently and effectively distribute the genetic material contained in the exceptional queens.

Not all of the cells arrived safely to Roy Hendrickson's beeyard. Upon arrival, Roy examined the cells and noted that some of the larvae were not properly positioned in their pool of royal jelly. Some larvae were adhering to the side of the cell as shown in this picture, while some were completely displaced. (photo by Roy Hendrickson)

Distribution of improved genetics appears to be the weak link in the chain when it comes to propagating local queens from local stock.

Persuading all beekeepers to become proficient queen producers does not appear to be a viable option. But could the average backyard beekeeper be persuaded to become a "surrogate queen producer"? Dr. Connor hinted at the idea several times in his monthly articles about local beekeepers using two-day cells in place of fully mature queen cells or naturally mated queens. Intrigued by the idea of using two-day cells I began thinking of how this would work for local beekeepers and set out to conduct some preliminary testing.

Two-day queen cells are cells that are grafted and placed in a starter colony for two days (48 hours). A queenless colony will generally accept and start a higher percentage of cells than a regular queen right production colony. Therefore, starting cells requires the skills to graft and the resources to establish a queenless starter. Once the cells have been started for two days, any strong colony or nuc will readily accept them and finish them. This is the beauty of such a concept. A skilled grafter can graft cells from the best local colonies available (as identified by local beekeepers), start them, and then distribute them to local beekeepers so that their standard honey producing colonies or nucs may finish the cells and have them ready at maturity. The only requirement is that a beekeeper has a strong colony or nuc, queen right or queenless, where the cells may be completed. If it is a standard honey producing colony, the cells may be finished above a queen excluder to prevent the resident queen from destroying the cells.

In looking at this concept, I asked the question of what does "local" mean or more appropriately, how far can one travel with two-day cells and no attending bees? To help

answer these questions I asked a few local beekeepers for their assistance. Brendan Palmer, a local beekeeper and college student, assisted with the grafting and queen rearing. Barry Conrad assisted with transporting and finishing two-day cells, and Roy Hendrickson assisted with receiving and finishing shipped two-day cells. This arrangement allowed us to test a couple of possibilities. One, cells could be started at a central location and beekeepers could drive to pick up two-day cells and return home with them to finish in their bee yards. Barry Conrad graciously volunteered to help with this aspect of the project. Barry lives approximately 30 minutes from my house. Two days after cells were grafted, Barry came to pick up the cells. At this stage of development, desiccation or drying out of the young larvae is a greater concern than temperature. Barry brought along an empty nuc box with empty frames to transport the young cells. The started cells were removed from the cell starter colony. Bees were gently brushed off the cells and then the cell bar and cells were wrapped in a damp paper towel to keep them moist for the ride home. Again, there were no bees attending the cells as Barry drove them home. The empty nuc and frames were just a carrying case for the cells to keep them in the upright position. Barry installed the two-day cells into a cell finisher where he reported approximately 95% completion of the transported cells.

The second experiment consisted of shipping two-day cells. The concept of shipping cells is routinely practiced. David and Linda Miksa of Florida have shipped cells all over the country for many years and have perfected their technique. However, David and Linda ship mature queen cells, just ready to emerge. While rearing queen cells to maturity does not take a great deal of additional time or resources, it does require careful planning and timing to ensure the queen cells arrive at their destination right on time. Mature queen cells also need to stay warm, so David and Linda ship their cells in battery boxes with attending bees. Again, my interest in shipping two-day cells stems from the fact that temperature is not as critical and bees are not needed if the cells are shipped for a short period of time.

Roy Hendrickson graciously accepted my invitation to be the guinea pig for the second experiment, shipping two-day cells using overnight service. Roy lives approximately three hours drive from my house, but we were interested to see how shipped cells would survive. Brendan grafted the cells as before and on the second day, the cells were removed from the cell starter colony and packaged in a piece of Styrofoam with holes cut in it for the cells. The piece of Styrofoam holding the cells was then wrapped in a damp paper towel and placed inside a plastic bag. The cells were then placed in a box for shipment. My primary concern with shipping two-day cells was handling. Would the movement and jarring be detrimental? Roy received the cells the following morning. He photographed the box and its contents upon arrival to illustrate the condition of the shipped cells. As we suspected, the two-day cells did not fare as well when shipped. Larvae were displaced from their bed of royal jelly. This displacement may have been due to handling, or improper conditions for the larvae in the cells. We did not follow up on what caused the larvae to become displaced, but rather focused on the success rate of the shipped cells.

Twenty cells were shipped to Roy. Of the initial 20 cells that were shipped, eight appeared to be viable and were placed in a 3½ story five-frame nuc finisher colony. In the following days three of the eight cells were torn down. The final count was five completed queen cells. From a practical standpoint, a 25% success rate does not appear to be feasible. Shipping two-day cells does provide a potential method of transferring genetic material; however, there are far more effective methods of stock transfer.

Roy Hendrickson prepared the eight healthy looking cells on a cell bar to be placed into the cell finishing colony. (photo by Roy Hendrickson)

Roy Hendrickson used a 3½ story five-frame nuc cell finisher colony to complete the eight healthy cells. (photo by Roy Hendrickson)

The use of two-day cells has great merit for distributing genetic material to local beekeepers that are willing to provide the time and resources necessary to finish cells and mate queens in their beeyards. Most beekeepers would benefit greatly from having a spare nuc in their beeyard and two-day cells provide a great way to supply the desirable stock. Again, if local bee clubs or organizations pool their resources they will be able to more easily identify the best potential breeder queens and have a way of disseminating the desirable genetics.

I wish to thank Brendan Palmer, Barry Conrad, and Roy Hendrickson for their assistance with this project. BC

Joe Latshaw runs Latshaw Apiaries where he produces II Breeder queens, Latshaw's vitamin and mineral supplement for bees, and II equipment. Find out more at ***www.LatshawApiaries.com****.*

To Bee – Or Not To Bee – A Bee

What Makes Bees, Bees

Roger **Hoopingarner**

This article is the first of several that will show those features and structures that make a honey bee both a dynamic pollinator as well as a superb social insect. Along with the description of these features, we'll examine how each of the structures or organ works.

The world of insects is large, and to many, extremely fascinating. In that world the honey bee has evolved many characters and structures that make it a bee. We're going to examine the parts of a bee that allow it to function both as an individual and as a part of a colony. While most of these structures are common to all insects, the honey bee has modified them by adding, subtracting or changing the parts to fit the functioning life of a bee, and the colony she (or he) lives with. In essence the structures that make a bee, a bee.

Part 1. The bees belong to the sub-set of insects with complete metamorphosis. That is, they have three stages in their development up to an adult insect – egg, larva, and pupa. Sometimes it will be important to look at the larval (or feeding) stage as certain structures, or lack thereof, become important. The transitional stage (pupa) will be ignored, for the most part, as it is difficult to compare and examine even for the experts in insect morphology. For beekeepers the pupae (capped or sealed) stage is the easiest to keep track of when doing colony measurements. The pupa is also the stage where the *Varroa* mite feeds and reproduces.

The outside of any bee, or for that matter insect consists of an exoskeleton, that is, its skeleton is on the outside. This tough shell is also its skin, and as such has some of the features of our skin, like sensory hairs. The exoskeleton is much more impervious to water than our skin, for in most insects water loss is very critical. However, in the honey bee it is not such a critical problem since often they are carrying excess water in the form of nectar. The outside form of a honey bee worker is shown in Figure 1.

In all of the insects the body is divided into three parts – head, thorax and abdomen. However, in the aculate Hymenoptera (the group that includes the bees, wasps and ants), there is a slight variation. The middle region (the thorax) actually has the first segment of the abdomen attached to it. The thoracic segments are labeled 1-3, in the figure, and the abdominal segments I-VII. Thus, what appears to be a constriction between the thorax and abdomen is actually a constriction between the first and second segments of the abdomen. Though in practice almost everyone refers to the middle region as the thorax.

Honey bees, like most insects have three pair of legs, though only one side is shown in Figure 1. There are also two pair of wings, one pair, each, on the last two segments of the thorax. We'll look at wings and legs in a future article. The head contains the primary sensory structures of the antennae and the eyes, both the simple ocelli and the large compound eyes. The head also contains the main brood-food gland. The thorax has the means of locomotion – wings and legs. The interior of the thorax is therefore almost entirely muscles. The abdomen contains, mainly, the digestive and reproductive systems. All of these structures and organs will be covered later.

If you were to compare the diagram of the honey bee in Figure 1 with a diagram of a typical wasp, the only differences would be in the mouthparts and slight differences in the wings. So what is it that distinguishes the

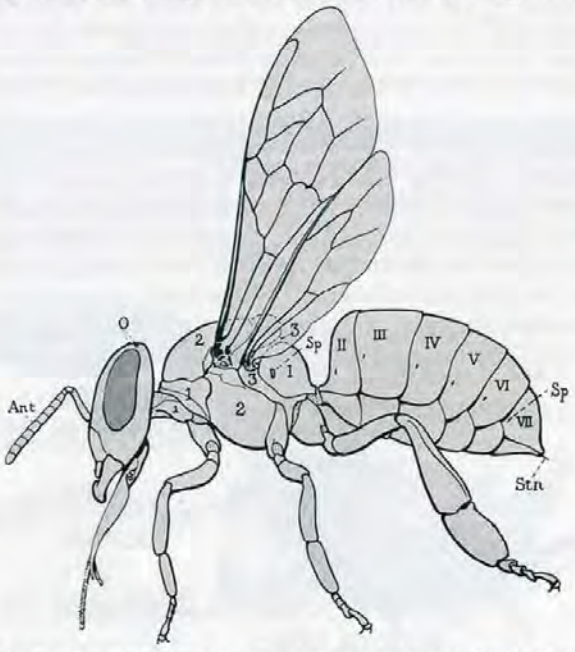


Figure 1 *– Side view diagram of a honey bee with its three body regions, plus legs, wings and antennae. The proboscis (tongue) is extended.*

Figure 2 *– A honey bee visiting a garlic chives flower. the setae on the thorax are very noticeable.*

Figure 3 *– A bumble bee on globe thistle. Her setae are very noticeable both on the thorax and the abdomen.*

bees from the wasps? It is in the number and structure of the setae (hairs) on the body of the bees, as seen in the photos of the honey bee and bumble bee. (Figures 2 & 3)) Whereas all insects have setae on their exoskeleton, the setae on the bees are branched which traps pollen grains. The worker bee then combs its body with a special apparatus on the inside of the basal tarsus of the hind leg. Then by rubbing the two hind legs together they push the pollen into the pollen basket. The foraging bee does this rubbing action while in flight from flower to flower.

The branched setae with trapped pollen are shown in Figure 4, which is a scanning electron microscope picture of these setae, thus the setae and pollen grains are highly magnified. These setae are so effective in trapping pollen that a worker bee often still has 4-5,000 pollen grains on her body when she leaves the hive to return to her foraging. It is this fact that makes the honey bee such an effective pollinator of self-incompatible crops such as almonds and apples. The foraging bee picks up pollen from other foragers that visited a different variety of apple, or almond, and because of static charges within the hive the pollen is transferred from bee to bee. Thus, when a forager returns to visit the same tree it is carrying compatible pollen.

There is another feature that is seen on Figure 1 that should be noted. Almost all of the segments of insects have openings to the respiratory system. These openings are the spiracles (**Sp** on the drawing). The openings lead to the branced and re-branched breathing tubes known as treachae. In most insects this is a passive, diffusion system of getting oxygen to the cells of the body. In the

Figure 5 *– Diagram of the posterior tip of the abdomen showing the location of the wax glands. nasanov bland and the sting.*

Figure 4 *– A scanning electron micrograph of the setae from a bee foraging on apples. The branched setae have four pollen grains trapped within them. The pollen grain in the upper left is from dandelion, which blooms at the same time as apples.*

honey bee it is not so passive as the bee forces air into the anterior tracacha and out the posterior spiracle via a pumping motion of the abdomen. You can see this pumping action if you watch a bee that has just landed from a foraging flight. (I will describe the interior structure of the respiratory/tracheal system in a future article.)

Associated with the external exoskeleton are a couple

Figure 6 *– Bee with its Nasanov bland exposed. The photo was taken after a swarm had been dumped in front of a hive. The arrow points to the exposed gland.*

of glands that are important in the life of the bee colony. A diagram of these are shown in Figure 5. These are the Nasanov gland and the wax glands. The Nasanov, or scent, gland is located between the 6th and 7th dorsal plates. This gland is used in a couple of noteworthy times in the life of the colony. The first one is when the colony swarms. This gland is opened (see Figure 6) and the pheromone (odor) is used as an aggregation signal. The bee bends down the 7th segment and this exposes the gland and then by fanning their wings disperses the odor. The photo of the Nasanov gland opened was taken after a swarm was dumped in front of a new hive and the bees were beginning to move into the new home. It is a very powerful aggregation signal.

Another time when a beekeeper will see the Nasanov gland opened and the pheromone dispersed is when the colony has a virgin queen, especially when she goes on a mating flight. When this is occurring if you open the cover of the hive you can smell the pheromone. It is a signal to the young queen so that she might find the right colony when she flies home from a mating flight. There is also an increase in noise within the colony as there are many bees fanning their wings to dispese the pheromone. It is another signal that a beekeeper can pick up when the hive cover is opened. (This sound will also be heard if the colony is queenless.)

There are eight (four pair) of wax glands on the ventral abdomen. When the colony needs more beeswax cells made, many young worker bees eat honey and cluster together and raise the temperature to over 100°F. The honey and the temperature stimulate the bees to secrete beeswax and then mold it into comb for storage of honey or pollen or for brood cells. Worker bees pick newly emerged and just hardened wax scales from between the segments using a sharp appendage on their hind leg. They transfer these wax scales (many are dropped when comb building is hectic, that can be found on the bottom board), from hind leg to fore leg mandibles where it is shaped into the hexagonal cells. (See Figure 7) BC

Roger Hoopingarner is retired Extension Apiculturist, Michigan State University, East Lansing.

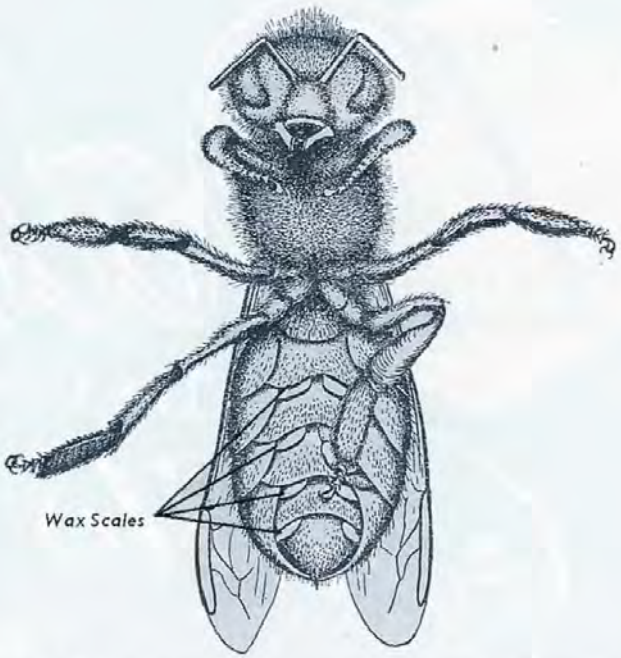


Figure 7 – *Diagram of a bee (ventral view) removing a wax scale from its abdomen.* (Diagram from USDA Circ. 161, Oct. 1912.)

North American Pollinator Protection Conference

Making A Difference One Pollinator At A Time

Tammy **Horn**

The North American Pollinator Protection Campaign 10th Anniversary conference, held in Washington DC 2010, is the last place I saw myself being invited to a couple of years ago. Unemployed and changing careers, I withdrew from conventional academe to work bees on surface mine sites in Kentucky, which are not conventional places to define new careers.

The sheer canyonesque scale of the United States Department of Agriculture (USDA) complex stopped me cold. The Whitten Building takes an entire city block. It is surrounded by other buildings that occupy entire city blocks. Since its formation in 1862, the USDA has become "The Church of Information and Technology (with its own missionaries) for millions of modernizing farmers," according to agricultural historian Steven Stoll. Another building across the street extends the USDA campus. The North American Pollinator Protection Campaign met in both buildings.

Washington, DC is a long way from my favorite mine site, Thunder Ridge, on whose spoil I planted wildflowers, American Chestnuts, and other native Appalachian pollinator habitats. Ironically, it is that habitat, which I helped sow by hand, that led Florida Assistant Chief of Apiary Inspection Jerry Hayes to submit my name for consideration for 2010 NAPPC Pollinator Advocate Award. Or for a more accurate chain of events, it is those wildflowers that led to the KY Pollinator Habitat Law 2010 that led to an invitation to attend the North American Pollinator Partnership Campaign.

And what a conference it was! NAPPC recapped the accomplishments of the past ten years, starting with its beginning in 1999, when concerned entomologists, academics, private industries, and researchers decided to coordinate their efforts. Compared to other projects, NAPPC focused around a central issue, i.e., the health of pollinators. Even if some of the individual entities had conflicts of interest, everyone contributed a small part toward the progress. "Perhaps an industry would say, we can only contribute five percent toward this effort," explains Executive Director Laurie Davies Adams, "we took that five percent and combined it with another group's effort. We created amazing products that were *used* by people (emphasis Adams) and, more importantly, we weren't fighting each other."

Ironically, the biggest accomplishment, according to Adams, may seem like a small thing to most people. "It was making the word "pollinator" an universally-recognized term," she said in a presentation to the group. Initially, NAPPC was advised, "No one will know what you mean if you use "pollinator" in a name." However, Adams says proudly, we created "a steady drumbeat and a multi-faceted extension program, so that now most people know that pollinators are invaluable. It was *everyone* working together, every NAPPC partner, who made that happen."

Not just a steady and vocal drumbeat, but high profile visibility has been the NAPPC banner. The NAPPC has single-handedly educated a vast continent by providing high-quality, easily available books and websites as well as policy education to bring awareness of pollinator declines. With a decade of educational outreach, scientific research, and political collaboration under its collective and collaborative belt, Adams is optimistic that equally extensive strides can be made in Canada and Mexico. "Ideally, we will have a coordinator in both Mexico and Canada," she predicts. If this could happen, NAPPC could project a sustainable vision for the entire North American continent,

Alcee Hastings

Pollinator Advocacy

In 2010, the Pollinator Advocacy awards went to Representative Alcee Hastings, who made pollinator-specific provisions in the 2008 U.S. Farm Bill; the Musee de l'abeille, which houses pollinator exhibits for thousands of visitors (Canada); Sabrina Malach for coordinating the first Pollinator Week in Toronto, Canada; Humberto Berlanga, who coordinates avian conservation efforts in Mexico.

Tammy Horn, who authored HB 175, the Pollinator Habitat Bill in KY for surface mine sites.

a place environmental writer Tim Flannery called *The Eternal Frontier*. Unlike other continents, Flannery enthused, "North America was created differently: It resulted from a victory of the forces of union."

Millions of years ago, long before there were human-constructed political boundaries, North America was divided into two biological "islands," the eastern "island" linked the Appalachians from Newfoundland to Mexico and was semi-tropical. America's western "island" had been joined to Asia via the Beringian land bridge for hundreds of millions of years. So, the fauna and flora were largely shared with Asia. In between the islands was the Bearpaw Sea. In the Oligocene, as Australia was breaking from the Antarctic, the Rockies were being affected by volcanic activity in Nevada, Idaho, and Oregon. The changes in climate meant that figs and magnolias gave way to maples, oaks and beeches.

Yet, even as climate change was affecting plants millions of years ago, North America was united by its timber lines. Three mountainous forest regions (the Eastern Appalachians, the Western Rockies and the timber regions spreading across Canada and Mexico) formed natural corridors for birds, bats, bees, moths, and other pollinators to migrate.

NAPPC celebrates the diversity of specimens from this remarkable union of forces as well as the industrial potential associated with pollination more noticeably than other industrialized continents. Currently, the United States alone supports a trillion-dollar agricultural system. Mexico and Canada contribute another two billion. For all the vastness of North American ecosystems, though, its pollinators are *not* eternal. Fossil remains of a honey bee from the Miocene are a clear example of prior species being wiped out. Similarly, honey bees are dying in the 21st century. NAPPC encourages participants to think about these questions and the equally alarming die-offs of bumble bees, bats, and butterflies. NAPPC goes one step further by making awards to protect pollinator health in four types of classes: Pollinator Advocate Awards, the Farmer-Rancher Award, the Wildlife Habitat Council Award for corporations, and the Paul Growald Media Award.

People who attend the NAPPC conference find themselves working toward similar goals, not just for one week, but all year. The NAPPC conference has been able to shape public dialogue and perceptions by bringing together diverse communities – bat experts, forestry professionals, natural gas industry representatives, commercial beekeepers, hummingbird scholars, wildlife specialists and philanthropists--to engage in task forces. There is a list of accomplishments that range from cultural visibility projects (i.e., postage stamps and children's projects) to political accomplishments (2008 Farm Bill) to scientific research projects. The NAPPC organizers coordinate task forces to develop brochures, design posters for educational activities, coordinate web sites, etc. The participants develop a timeline to work on projects.

When asked what a target goal is for 2020, Adams paused reflectively and then said simply, "trying to engage citizen scientists." NAPPC is already making pollinator conservation ubiquitous throughout the States in reaching out to public land managers and agricultural industries, and being at the table when major land use conversations happen. For instance, NAPPC will meet with state Fish and Wildlife officials to coordinate efforts to include pollinator habitat in State Action Plans and seed mixes. But there's no way to do the types of monitoring for pollinators without everyday citizen scientists. So the NAPPC Steering Committee's next goal, i.e., to encourage ordinary people to observe, record, and monitor local pollinators and habitat, begins with us.

"We need to enjoy what we do," emphasized Adams. So food was the vehicle for unity. Small "microclimates" of creativity flourished in the Witten Patio area. Children's artwork depicting farms, animals and food added more delightful surprises. The NAPPC organizers decorated the Jefferson auditorium entrance with floral posters, postcards, informational handouts, etc. The receptions resembled "culinary gardens" of food dependent on pollinators. NAPPC created "bouquets" of information. The generosity of NAPPC organizers was matched only by the generosity of the pollinators we were there to celebrate and protect. In this conference among these people, the unity of North America seemed indeed, for a moment, eternal. BC

Tammy Horn is actively involved in restoring strip mine land in her home state of Kentucky.

The Farmer-Rancher Award. Singing Frogs Farm is a certified Bee Friendly Farming™ (BFF) operation, signifying that the operation meets or exceeds minimum criteria for providing adequate habitat for bees and other pollinators and using bee-beneficial practices.

THE COLONY QUEEN – AN OVERVIEW

James E. **Tew**

Her mystique, her biology and her job description.

The best in the hive

If you had to be a bee, I bet you would want to be the queen. She's perceived as being the hive's boss. Compared to workers and drones, she lives a long life. All her whims are catered, she's defended, and she's indispensable to the hive's well being. For all of that, I still feel that she is frequently over-rated. She is only one of many factors that determine whether or not a colony thrives. Yet she is so visible – so characteristic of a productive hive that most (actually "all") beekeepers fixate on her.

Growing the best in the hive

At any given time, something is "hot" in beekeeping. It may be a particular topic (neonicotinoids). It may be an alternative equipment style (eight-frame or Top Bar Hives), or use of a popular mite control procedure (drone brood removal). To a degree, topics like these wax and wane, but interest in queens and their performance has been a popular topic for more than a hundred years. But even with this precedent, current interest in queens and their production is presently a white-hot topic. I don't think I have ever seen anything like it. Various U.S. states have been awarded funding to offer queen production classes. Fledgling queen production industries based on small scale producers are sluggishly trying to become established. Seemingly, a few selected beekeepers in most states are trying their hands at *"growing queens."* Local queens are generally seen as being superior to queens shipped from remote production sites. What is with all this interest? I see two primary reasons: (1) good queens are expensive and are in short supply and (2) increasingly, the historic queen producing area is becoming populated with Africanized bees. It becomes easy to believe that we can produce a queen product that is better, cheaper than those that we buy and safer to distribute. Nothing wrong with that idea.

Some biology of the young adult queen

The developing queen requires about 16 days to pass through all of the developmental stages. As a young adult, the queen's first official instinctual function is to kill her rival sisters before they kill her – hardly a family bonding behavior. Her sterile worker sisters seemingly take no interest in the rivalry. The stakes are high. Either she lives or dies. The driving force behind this unique bonding behavior is that the colony ultimately has only one queen.

Since fighting for her life is a tiresome process, the victorious queen takes a short break of about a week before she begins the second phase of her existence – mating. The short version of the long colorful story is that the queen takes multiple nuptial flights. To be able to conceive sexually sterile workers, the queen must unionize with at least one drone; however, typically a queen will copulate with as many as 12 to 18 drones. While multiple flights are typically required, she only goes through this process once in her entire life. These flights are a dangerous part of the queen's life. She must predict weather and not become lost. She will probably be required to fly several miles from her hive and she must be able to dodge birds, moving cars and bad weather.

Drone Congregation Areas (DCAs)

The way queens have developed to find unrelated drones would seem to be the stuff of *Tall Tales*. Most people who have any inkling of honey bee queen mating biology envision the nubile queen hastily departing from the colony with a cone-shaped entourage of sex starved drones in hot pursuit. The "fittest" drone supposedly catches the queen and copulation ensues. Wrong, wrong, wrong. If that were the case, queens would consistently mate with males with which they were too closely related. Too many harmful genetic characteristics would be expressed in this hypothetical bee population. Ultimately, it would just genetically "go away" – die out or at least become much weakened. To prevent such genetic back-crossing from occurring, colonies from a community contribute drones to an aerial mixing pot called drone congregation areas (DCAs). Drones from a host of colonies go to those areas from about 10:00 a.m. until 3:00 p.m. and congregate about 35 feet from the ground, waiting for the rare queen to fly by. DCAs' size and population varies according to the season of the year and the number of colonies in the area. In most areas, in late Summer there are many DCAs and the drone population in each would probably number in the thousands. Queens taking flights in early Spring would probably have to take more flights than a queen would have to take in late Summer. Queens seem to find the DCAs by smell, but science has not conclusively shown

that. No doubt, many identifying factors are involved.

It's a riotous event when a queen enters the DCA. Drones, which have no other responsibility other than mating, begin to act like miniature fighter pilots – darting around – chasing everything – birds, dragonflies, even each other. It's a rambunctious moment. Multiple matings can occur quickly with drones mounting the queen in quick succession. The procedure requires the death of each drone that successfully copulates. Finally, the queen either drops too near the ground or she flies out of the DCA and returns to the hive. Frequently, the genitalia of the last drone with which she mated will still be attached to the queen and is called the "mating sign." At some point, the queen decides enough is enough and this short phase in her life passes – never to occur again.

Drone and worker eggs

The newly mated queen produces offspring – thousands of offspring, but the hive provides her with a brigade of nurse bees to care for the needs of all the infant bees. Seemingly, the queen has the ability to determine how many new female bees (workers) to produce and how many male bees (drones) to produce. She makes it look so easy, yet scientists are still not sure of all the procedural details. Essentially, she provides about one half of the genetic characteristics for the soon-to-be new worker bee. The other half of the genetic requirements for the new bee comes from the male's semen that the queen has stored in a special internal pouch – the spermathacea. Combine the halves and an egg is developed that produces a worker that has some characteristics of the queen and some of the drone that provided the semen. Drones, on the other hand, are an entomological quirk of nature. As the queen produces the egg internally, she does not give the soon-to-be drone any semen from the spermathacea. This unfertilized egg produces a drone bee (a male) that only has characteristics of the queen. Drones have only half a genetic component and are said to be haploid while workers have the full genetic complement and are said to be diploid. Drones are little more than flying sexual gametes (sperm). Therefore, drones have no father, but do have a grandfather.

Pheromone production

The second major responsibility assigned to the queen is produce specific pheromones that are critical to the colony's function. Essentially this is a "chemical" newsletter that is circulated throughout the colony. This chemical information, passed from bee to bee, informs all the other hive members of the queen's health, vigor and appropriateness to serve as the hive's monarch. When the chemical news becomes bad, the queen loses her job. Since there's no retirement or medical program for old queens, she dies. But not before beginning the process of developing new queens and the whole procedure starts over again with new queens growing, fighting, mating, producing young bees and then ultimately – dying.

I have suggested that the queen's reputation may be overrated. Surprisingly, the court of young nurse bees may be the driving force of the colony. They clean and prepare cells in which the queen puts either worker or drone eggs. They feed the queen depending on the population needs that they, the young nurse bees, determine. They cut back on the queen's rations when autumn approaches. To a large extent, the nurse/house bee populations control what the foragers bring back. If the hive's too hot, they solicit water. If they need protein, they solicit pollen and, if they need carbohydrates, they anxiously take nectar from returning foragers. Importantly, nurse bees select the larva that will become the future rival queens. Any fertilized egg (female) can become a queen if it is kept on a hormonal diet of royal jelly throughout the development cycle – ergo – any worker could have been a queen if certain critical changes had been made – by nurse bees – while she was a youngster (three days old or less). Though the queen is obviously not the entire engine in the hive, she is unquestionably the genetic sparkplug. She determines the genetic characteristics of the hive but she needs help to do it.

Homemade Queen Quality

Honey bee workers will initiate queen production when confronted with three stimuli: (1) supersedure – the resident queen can no longer fulfill her regal requirements, (2) swarming – the hive will need a replacement queen since the reigning queen will leave with the swarm, and (3) an emergency – something goes catastrophically wrong with the queen in the hive. Such accidents usually involve the good-intentioned beekeeper.

With witnesses present, I planned to make up an observation hive for a farm show many years ago. The queen was marked with a red dot of paint on her thorax that I had put there previously. The plan was simple. Open the hive. Remove a frame of young developing bees (bee brood) along with a few hundred workers. If the queen was not on the selected frame, I would find her and put her on the frame. Finally, the brood, the bees and the queen would all be put in a single frame observation hive. I searched and searched for the queen, but she was not to be found. It was puzzlement for she had been seen only hours earlier. With heavy heart, I looked on the bottom of my shoes. There she was, compressed to the thickness of a sheet of newspaper.

Had it not been for the bright red dot, her remains would have totally unrecognizable.

All that to say this: Thanks to my bungling, that hive had a queen emergency. One minute it had a functional queen and the next minute it didn't. The hive had to replace its queen under the influence of the emergency stimulus. This stimulus is the one most often used by beekeepers to coerce a hive into producing extra queens.

As outlandish as the biology of the honey bee queen appears to be, producing honey bee queens is not extremely difficult. Entire books have been written on the subject. Indeed, quite a number of beekeepers make a full-time living producing honey bee queens for beekeepers like you. The question must then be addressed, "if you can buy good queens at affordable prices, why try to raise them on your own?" To my thinking, the answer is direct, *"for the beekeeping fulfillment of it."* Why do I enjoy woodworking? Everything I build, I could purchase much cheaper. Why go hunting? Why do I plant a vegetable garden? Why bake a cake? We can usually buy anything cheaper than we can produce it ourselves. Growing our own honey bee queens is no exception. We can probably buy them cheaper than we can produce them, but if you know what you are doing, you can produce the very best queens for the hives in your backyard. It is beekeepingly rewarding – both for you and your hives. Raising queens is the jewel of beekeeping. When the time is right in your beekeeping life, give it a try.

This is a test. This is a test. This is a test.

At my OSU lab web site, I have posted a Power Point program (15 minutes long) entitled: ***An Overview of Queens and Simple Queen Production*** that I hope will supplement this article. This is a prototype for me and is not an elaborate production. Other titles will be posted as time allows and expertise develops.

To access the program:

1. Open your browser and enter **www.honeybeelab.com**
2. Scan my posts for ***An Overview of Queens and Simple Queen Production***.
3. Look for the link to this Power Point title in the body of the message. (If necessary, select "older posts.")
4. Select the link and the Power Point program should open with an arrow in the screen center.
5. Click on the arrow.
6. The presentation will run automatically and can be paused and restarted at will. The slide titles are listed on the left hand side of the screen and can be used to navigate the presentation. Note: The presentation cannot be downloaded.
7. For those of you reading *Bee Culture* electronically, the direct URL address is: **http://presenter.cfaes.ohio-state.edu/Tew.1/Honey_Bee_Queens_-_Flash_%28Large%29_-_20110222_07.01.33PM.html**

Individual computers vary widely and my experience is limited. I freely admit that, I too, am learning this technology. Thanks for experimenting with this project. BC

Dr. James E. Tew, State Specialist, Beekeeping, The Ohio State University, Wooster, OH 44691, Tew.1@osu.edu ***http://beelab.osu.edu/; http://www.facebook.com/beelab***

A (RE)INTRODUCTION TO THE NATIONAL HONEY BOARD

Bruce **Boynton**

Advertising, promotions, public relations, consumer information, both beekeeping and honey product research, and social media marketing on less than $4 million a year.

Having been associated with the National Honey Board (NHB) for more than 20 years, I've grown to assume that most people in the honey and beekeeping industry know all about the NHB. That's an incorrect assumption. There are plenty of newcomers to the industry, and even folks who've been around beekeeping for a while, who may not know what the National Honey Board really is or what we do (or cannot do). So, from all of us at the NHB, I'd like to introduce, or reintroduce, you to our organization.

The NHB has 10 board members who are nominated by industry groups, with final appointments made by the U.S. Secretary of Agriculture. Board members represent various segments of the industry such as packers or first handlers, importers, beekeepers, and a marketing cooperative. Board members do not represent the company they work for or their own self interests; they represent the entire industry from the unique perspective of the group they were appointed to represent. The Board has been meeting twice a year since 2008. Board meetings are open to the public and announced on our website (**www.honey.com**).

The NHB has a staff to implement the policies, strategies and programs approved by the Board. Staff (who are not federal employees) manage and assist with marketing, research and industry information efforts. They contract with and manage various agencies and vendors. NHB marketing staff exhibit and promote honey at various trade shows and events, visit with magazine editors to provide honey information, recipes and photography to generate media coverage and answer questions from consumers and the media. Staff also develops and maintains our websites, including the popular **www.honeylocator.com**, which gives honey suppliers a great place to be seen by potential buyers.

The NHB is considered a federal research and promotion board under USDA oversight. A representative of USDA's Agricultural Marketing Service attends each Board meeting. Our duties and limitations are spelled out in a federal Order, and USDA must review and approve our budget, programs and activities, promotional materials and press releases, as well as operational policies and procedures. They give careful attention to any health or nutritional messages. One of the limitations is that we are prohibited from using our funds to undertake any action for the purpose of influencing legislation or governmental action or policy, by local, state, national and foreign governments, other than recommending to the Secretary amendments to the Order. Unlike many industry or trade associations, we cannot lobby. Also, we do not have the authority to set quality standards or act as a regulatory agency. Our goal is to increase demand for honey and honey products. But more than that, we want to increase *use* and *consumption*.

We do not collect membership fees or dues like an industry trade association, but are funded by the honey industry (not the government). The source of our funding is a one cent per pound assessment on imported honey and honey produced in the United States. The U.S. packers, or first handlers, pay the assessment monthly on the U.S. honey they handle. U.S. Customs collects the assessment on imported honey and wires us money each month. All of the information we receive from packers and from U.S. Customs is kept confidential. Only a few staff members required to track the data have access to it.

Bruce Boynton, CEO of The National Honey Board.

Through this industry funding we collected a little more than 3.7 million dollars in calendar year 2010. I've often received comments from experienced public relations agencies that say we get a lot done with the money we have. I believe that's true. Although we do niche advertising, such as in baking trade publications, a lot of our messaging is done through public relations efforts (i.e., pitching stories, photos and information about honey to the media to generate media coverage without having to pay for expensive advertising). Since we communicate with different target audiences, we work with different public relations agencies that specialize in those markets. The primary markets we try to reach include general consumers (the largest group), Hispanic consumers, bakers and food manufacturers, the foodservice industry (restaurants, universities, institutions, etc.), culinary professionals, and fitness and health professionals.

In recent years we've conducted promotions with top chefs and culinary organizations, sports and fitness professionals, nutritionists and dieticians and Minor League Baseball, among many others. These groups help us to strengthen our key messages: Honey as an all-natural ingredient and sweetener in cooking and baking, a natural energy booster, a natural cough suppressant and as a skin moisturizer.

An important part of public relations is being prepared to handle a crisis. Our own staff, as well as our public relations agencies, monitor daily news and events for negative stories or misinformation about honey, and respond when appropriate to help protect the image of honey and the honey industry. Our general consumer public relations agency has experienced media personnel to assist us with crisis management, and NHB staff goes through media training to help prepare us for those challenging situations.

We also develop fulfillment materials such as various brochures for consumer information and education, some of which are available for *free* to beekeepers, honey industry members and associations. One of the free brochures, *A Sweet Story: The Making of honey*, was developed for children in 2010 to tell them how honey is made and to let them know that honey is pure and natural. Interested beekeepers or associations should check out the NHB Supply Catalog on our website (go to **www.honey.com**, and click on the Honey Industry tab) or call our office for more information.

A portion of our budget also goes to research. Five percent of our anticipated assessment revenue must be budgeted for "production research," which means research that is related to the natural production of honey prior to packing. In recent years that money has been used to fund research focused on maintaining the health of honey bees. A listing of past NHB-funded Bee Health Research can be found on our website by clicking on the Honey Industry tab. When research results become available, we share that information on the website. We also helped fund such studies as *The Value of Honey Bees to U.S. Agriculture.*

Our research budget also can be used for the development of tests that can identify a product as pure honey, and can help differentiate it from honey pretenders that impact the image and marketability of pure honey. Much of last year was spent surveying the research community, and then soliciting proposals from numerous laboratories here and in Germany. The goal is to have a simple, cost-effective test that can be widely used by the honey industry, honey users and consumers to advance the image and marketability of honey. Proposals were reviewed in December 2010. This is a very high priority project, and we are now working with two different laboratories to move forward as quickly as possible with this much-needed work.

We also fund research into the properties and benefits of honey, and to find new uses for honey. About every two years we conduct *market research* to determine how consumers are using honey and how their attitude toward it may be changing. The market research, along with key food, beauty and fitness trends, is used to guide our marketing and honey promotion messages.

Last year we introduced social and online media to our marketing efforts. We can be found doling out honey recipes, tips and information on Facebook, YouTube, Twitter and our various ingredient websites (**BakingWithHoney.com**, **SnackingWithHoney.com**, **CandyWithHoney.com** and **DairyWithHoney.com**). We also have a blog, *Straight from the Hive*, which can be found on the homepage of our website. I encourage you to join in on those conversations and communications to help spread the word about honey.

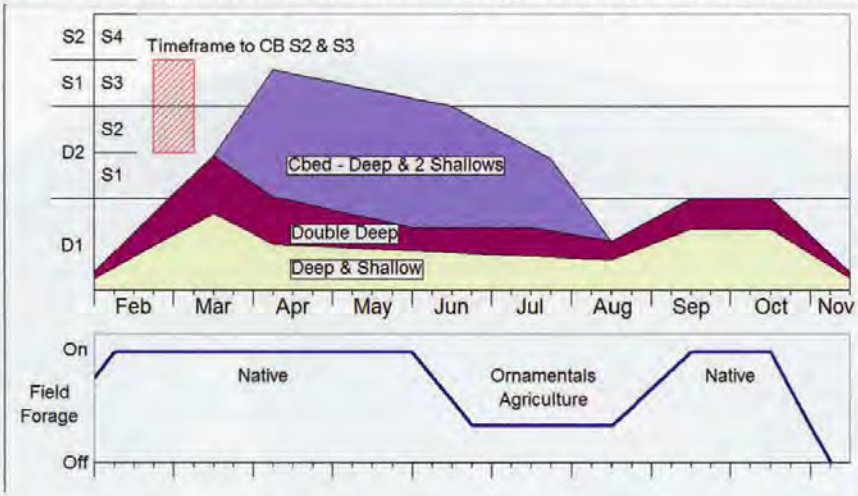
The National Honey Board continually strives to serve the industry in a positive and productive manner. Our Board members, staff and agencies look for new avenues to promote honey and honey products and contribute to the honey industry through our research, promotions and consumer education programs. More specific information about NHB operations can be found in the federal Order or the Bylaws, which can be accessed through the *About Us* section of our website. For more information, please visit **www.honey.com** or call (303) 776-2337. BC

Manage Your Brood Right For More Honey

Walt **Wright**

The large brood volumes fostered by expanding the broodnest by my 'checkerboarding' technique makes a larger difference in honey production than 'normal' swarm prevention.

The first test of checkerboarding (CB) was expected to produce slightly more honey if it reduced swarming incidence. A colony that did not lose bees to the swarm would have more population to exploit the flow. Anticipating maybe a 20% increase in average production of surplus, the results were surprising. One colony in that outyard produced seven supers of surplus. Wintering at that time in a double deep with shallow feed box at the top, the most surplus we had seen was about four supers. Seven would be a 75% increase. One sample, for sure, but an attention getter. The seven-super producer had queen problems in the preceding fall. Working around the problem of requeening, that colony went into winter with a single deep and three shallows overhead. Thinking that extra production might not be coincidental, we started our shift to a single deep and shallows for wintering configuration. After several years of observation of the advantages, we now recommend the single deep as easier and more reliable, at least in our location.



Note that the 2½ deep wintering configuration is not included on the chart. Hives were in a constant state of change with respect to wintering configuration in that period. It took two years to get all-up in a different configuration and was not fully all-up at 2½ when we elected to go to a deep and two shallows. The result of the "every-which-way" configurations is that we didn't acquire an average brood volume for the 2½ configuration, but I can report that the brood volume was typically somewhat more than the double deep.

Supering optimistically for production, during the calendar period of maximum brood volume, means the stack is building height and that height discourages access to the brood chamber(s) to actually see the brood volume. It took another couple of seasons to learn why the production took a leap forward with CB. It was quite obvious when lower levels were examined that brood volumes were much larger than earlier configurations. Conclusion: Increased brood volume, and the resultant increased population is the key to the increased honey production – and the increase is much more than you *could expect from swarm prevention alone*. Note that most swarm prevention techniques actually weaken colonies.

The reader has already seen the Figure 1 Seasonal Brood Volumes, and is way ahead of me, but we will wade through it, anyway. The plots are from memory of the first few years of my learning. After two false starts, where colonies didn't survive, about 1990 we were underway and growing colony count. My ignorance of beekeeping knew no limits – didn't know about clubs or literature support. Guessing about what to do next, hives were not standardized and almost no two were the same in the first couple years. Finding and visiting other beekeepers in the area, settled on wintering in a deep and shallow. That's normally plenty for our mild and short Winters, which you must keep in mind if you try this. In that same time frame, bought some double deeps from beekeepers who couldn't cope with parasitic mites. In the following years we increased and decreased wintering configurations in accordance with observed results. All this to say we saw the effects of several wintering configurations. That info is contained in the chart and reflects multi-year averages of effects. Some years more – some years less.

Field Forage: The plot on the flows is not what you are accustomed to seeing. A plot from a scale hive has sharp peaks and valleys. My take on field forage avail-

ability is somewhat different. If there is enough forage out there for all the colonies in a given location to send all the foragers that are available, the peaks and valleys don't mean much. In this area, when it's out there, it is a smorgasbord of sources. The on/off transition plot is what the colonies key on for internal operations. Keep that in mind, too, for your location.

Calendar Months: Although the progression of time should be self explanatory, it is important that the reader understand that the timing of colony operations charted is for the AL/TN state line. Other areas will need to adjust the timing to coincide with their forage development, amount and kind.

Vertical scale for brood volume: The scale is deliberately ambiguous to permit us to overlay different wintering configurations with different size boxes used for brood chambers. You will see how it works as we describe the configurations.

Deep and Shallow

In my area of good build up forage availability, generally, minimal honey (often none) is opened in the shallow at the top. The overhead shallow of honey is saved as the reserve when field forage and flying weather support colony feeding requirements. The result is that brood nest expansion and swarm preparation nest size reduction are accomplished in the single deep brood chamber. Further reduction of brood volume in the buildup is due to the space taken up by stores using four frames in the deep as honey at the outside and pollen adjacent to the brood. The colony can easily meet swarm requirements in the restricted space. An early swarm is generated with minimum effort. Do you suppose that might be why nest scouts select a cavity of about a bushel volume when other cavity sizes are available above and below that volume?

Back to the subject: The colony that reduces brood nest size in swarm preparation by backfilling does not typically increase brood volume for the rest of the Spring season. Instead, brood nest size continues to shrink. In spite of brood volume decrease, the population has a safety margin built into the numbers to insure resupply of the wintering honey. That safety margin produces some surplus. Is it any wonder that southeastern production is limited to the 50 to 70 pound range? The smaller the overwintering colony hive volume, the less surplus is produced.

Double Deeps

Honey production is slightly increased by wintering in the double deep configuration. A hundred pound average is considered excellent by most local beekeepers. Higher colony populations are generated by increasing brood volume into about half the upper deep. The other half of the top box is dedicated to maintaining the capped honey reserve through the swarm preparation period. Expansion and contraction of the brood nest takes place primarily in the upper deep.

Single Deep & Two Shallows – Checkerboarded

There is still some mystery in why CBing causes the colony to continue brood nest expansion until reproductive cutoff. Not understanding why does not limit our appreciation for this gift. Huge populations are generated by almost an extra brood cycle of nest expansion. If standard management creates populations of 60 thousand bees, we no doubt get populations in excess of 100k often. We don't count bees, but a colony with concentrated bees seven feet high prior to main flow is impressive. More bees make more honey.

The increase in production comes in two phases. The CBed colony also improves honey production by storing nectar overhead before the "main flow." Brood volume upward expansion is accelerated through the thinned honey by virtue of less honey to consume. Their penchant for filling cells within the cluster generates a couple supers of nectar during the swarm preparation period. That nectar jump-starts honey surplus – it's located above the wintering configuration because of earlier, extended brood nest expansion. That nectar is stored raw and starts curing by brood nest heat rise. The established colony does not have wax-making capability until the start of "main flow." At that time cells of built up nectar are extended, topped off with pre-dried honey and capped. This honey is a bonus of checkerboarding.

The key to storing nectar overhead prior to "main flow" is enfolding empty comb within the concentrated bees of the cluster – we are still in the frosty morning period of late Winter through early April.

The CBed colony, in broodnest expansion, starts storing in the interspersed empty comb overhead promptly after CBing. As soon as the cluster volume covers empty comb, filling the lower edge becomes a priority activity. The colony does not "want" empty cells within the cluster. Storing nectar upward continues with brood nest expansion.

The fully-established colony typically has a three–week period prior to "main flow" when very little nectar is stored at the top. Old literature sometimes refers to that period as the "dearth before the flow." Locally, that period is the peak of native forage availability – hardwood green-up, with associated early tree bloom.

It is possible, however, to encourage overhead nectar storage prior to the three-week lull by beekeeper manipulation. In the case of double deep early-season reversal, where brood is raised to the top, adding a super of empty comb is often effective, if done on the same hive opening. The colony "wants" liquid feed immediately above brood. The problem with this trick is that it may be done too late. Reversal, if done when there is apparent "crowding," may follow the start of swarm preparation and therefore is too late to be effective.

The major asset to increased production when CBed is the large work force generated by nearly doubling the brood volume prior to "main flow." For efficient dispersal of that large work force, have plenty of supers on hand. To get maximum efficiency, they need room to work and can be working in several supers at the same time. In our short flow, dispersal of the work force is a major advantage to honey production efficiency.

Let's get into the chart comparison of brood volumes for the active season, as seen at my location. A few general notes will be provided first:

In the Fall the colony adjusts the population of the cluster to be proportional to cavity size and accumulated stores. Cluster size allows for normal attrition of older bees in early Winter and consumption of honey for room

to start brood rearing in Winter. When they get it right (difficult with current problems) they have the wherewithal to build up to swarm potential in a timely manner, with food reserves for the swarm prep period.

Mid-Winter brood rearing sustains cluster size pending advent of late Winter forage availability. At forage availability in late Winter, build up to swarm strength gets underway in earnest.

The colony in build up can double brood volume in a worker brood cycle. No effort has been made on the chart to incorporate the doubling effect on growth rates. Average highs and lows are straight-lined for my convenience.

The colony is motivated during the "main flow" by space at the top needing filling. Brood nest reduction is slowed by that perception. The flip side is that the colony accelerates brood nest reduction when the cavity is approaching filled. They need to *anticipate* filling the cavity to offset the slow process of reducing population. They do not wait until the hive is filled to start reducing brood nest size. Rethink supering "as needed" (last super 70% filled.) You need to 'stay ahead' of the bees. Depending on your supering schedule and the strength of the hive, you should add one to two supers of drawn comb per week *as soon as the bees are working in the top box.* We speak in terms of motivation versus "complacency." The colony that can meet survival requirements in a walk, does so. That's complacency. The colony that perceives that they are not meeting survival requirements can rev it up a notch and do more. That's motivation.

With these notes in mind, we can walk through the local season by the months for the three wintering configurations. For all three, empty comb was maintained at the top for continuous colony motivation. You will notice that the deep and shallow tracks the double deep quite well at a slightly lower level.

February: Locally, forage is normally available. Increasing periods of flying weather between cold fronts gets build up started.

March: Brood nest volume tops out and the backfilling of swarm preparation starts. Some stronger colonies will commit to swarm by starting swarm cells before the end of the month with no beekeeper intervention.

When CBed, the effects of checkerboarding kick in, and brood volume continues to grow for those colonies. No brood nest reduction in March.

April: Colonies that did not "top out" and start brood nest reduction in March change direction in early April. CBed colonies also start brood nest reduction at reproductive cut off, but they have gained substantial brood nest size by expanding into April.

April through early June: The brood nest size on all colonies drifts lower through the flow. When they sense flow trail off in June, brood nest reduction is accelerated. That's critical to protection of accumulated honey stores – reduce "consumer bees."

Late June through early August: Maintain a minimum brood nest for replacement bees and bees of all ages for the various duties by age.

If honey is harvested in July, the bees need to adjust to the revised overall cavity size. That often results in a speed-up in brood nest reduction. Note on the chart that at harvest in July, the double deep brood volume has been reduced to the bottom deep. Honey fills the upper. At that point the CBed colony sometimes has the equivalent of two deeps of brood (1½ shown). This is an added bonus in mid season population and is a result of the taller stack and the colony tailoring population in consonance with cavity size/stores. Who knows what kind of difference that would make in production for northern areas where there is less time between the Spring and Fall flows. Locally, it is reflected in sometimes filling supers during the Summer doldrums. We don't get that with standard management.

August: The Fall build up to rear young bees for wintering starts in early August. They have barely managed to get the brood nest reduced and it's time to change direction again. The CBed colony, harvested in July, is now the same overall hive volume as the double deep. Two shallows are almost exactly the same amount of honey as a deep. The two brood volumes converge and overlay for the Fall season.

The honey in the tanks at harvest is almost double. Some years more – some years less. One year that stands out in my memory was a season with a weak "main flow." Some local beekeepers didn't even bother to harvest/extract. The CBed colonies produced about 80 pounds average. In the weak flow, those strong colonies managed to complete the supers of nectar accumulated in the build up. Only two of 20 required a super to maintain empty space at the top during the flow, but the harvest was more than our normal yield with standard management.

In a more normal season, we expect about six or seven supers average of honey with CBed colonies. They seldom disappoint me. Compare that to three or four with the best of standard management.

We regret, and apologize for, the scattershot comments interspersed through this submittal. We have tried to limit them to notes that affect the subject of brood volume and honey production. Some are unduly brief in the interest of article length. Details of colony internal operations were reported in this magazine in a series of articles in '03 and can be downloaded from **http://www.beesource.com/point-of-view/walt-wright/**.

In summary, the large brood volumes fostered by checkerboarding make a larger difference in honey production than could be expected by just swarm prevention. Of course, you can continue to make partial honey crops as long as you choose to do so. But if honey production is important, you might consider investing in checkerboarding. It's more than an alternative swarm prevention gimmick. Seems like I have written words to that effect somewhere before. BC

Splits For Different Reasons

Jennifer **Berry**

What do you want from your splits?

Since moving to Georgia, April has become my favorite month by far. The temperatures aren't too cold and definitely not too hot. It's the perfect weather for playing in your yard, hiking about, planting your garden, camping and, of course, working bees (that is if the rains hold off). The dull browns and grays of the Winter have been replaced with lime greens, pinks, whites, reds, yellows, and blues. The cold Winter smells have melted away, and the sweet warm aroma of Springtime has returned. Yes, I love April in Georgia. I imagine that, in the northern tiers of the country, your thaw is almost complete, and you too are shaking off the Winter chill and soaking up the Spring sun with a smile.

Yet, for the beekeeper here in the south, the month of April, along with its picture perfect days, can also bring about some serious headaches. The degree of which depends partly on us, partly on the nectar flow and mostly on the weather. Here in central Georgia and to our north, April is the peak swarming month, but there are no absolutes when it comes to bees. Swarms can occur as early as February or as late as September. Granted, those are the outliers of the season and they typically don't have a chance in . . . (you know where) for survival, but, why would we ever just sit back and let them hit the trees?

To maximize our honey, we should always take advantage of each bee's potential. We must harness her energy, and guide it in the right direction. (Do I sound like an infomercial?). As long as the colony has been managed properly in the Fall and overwintered with plenty of healthy Winter bees, it should now be strong and ready for the challenge.

As proper Fall management and overwintering yield strong and ready bees, proper funding yields strong and ready University Bee Labs. Unfortunately, like I've said before and probably will say again, this lab runs hand to mouth. We receive a pittance from the State, which only covers a minimal percentage of our monthly needs. The rest (supplies, repairs, gas, wages, bees, sugar, etc.) is funneled from grant money. And, for those out there who still believe that our lab receives money from large chemical companies . . . well, guess what? You're wrong! Anyway, I digress. Back to the point, our budget, just like the rest of the nation, is tight; tighter than tight, and looks like it's going to get even tighter. Hence, we need to watch every penny, and every bee lost to the trees, whether here at the Lab or in my private operation, is critical money down the drain. In the Georgia Spring-time, we need every bee we can keep our hands on. So, what do we do? We make splits or "artificial swarms." It's so easy; all you need is an additional hive (nuc box or standard eight or 10 frame), frames, sugar syrup, and about 15 minutes!

Now, before going into the apiary, you need to decide what purpose you have in mind for these new splits. Are they for swarm prevention? Will they go into honey or queen production? Are they to be sold off? Or, are they just more pets to look after? There are slight differences when making up the splits for each of the above cases. Also, the strength of the original colony will play a role as well. They may not be strong enough to make splits yet, or so strong as to be able to make more than one.

Let's start off with the basic split for swarm control. For you in the far North, the first of April may be a bit too early temperature wise, to make a split; however, you can at least begin to plan your attack so that you'll be ready when the time comes. To begin a split for swarm control, open the colony, locate the queen and set her aside. What we prefer to do here at the Lab is to take frames covered in bees, including most of the capped brood frames, a frame of pollen, and a frame of honey, as well as last year's queen and transfer them into a five-frame nuc box. This equates to a total of four frames with bees and brood from the parent colony (given that it has the resources to do so) and an

When you've made the split move one to a new location.

empty frame. Arrange the frames in the nuc box (and the parent colony) as follows:

Honey (H)– Empty frame (preferably drawn) (E)– Brood (B)– Brood (B)– Pollen (P)

If you are using a standard eight or 10 frame box, just add empty frames to the outside positions. As the temperatures warm, you can move those empty frames next to the brood frames to provide extra room for the queen to lay eggs. However, just be careful not to separate the brood from the pollen or honey too early, as April can still be very unpredictable, with drastic changes from high to low temperatures being common, even here in the South. This arrangement can be dangerous if cold temperatures are still in the forecast because the bees will not leave the brood. They can be a mere inch from the honey and starve. Think of the amount of energy it takes to fuel their bodies in order to create enough heat to keep not only the brood but themselves warm. As their internal energy supply dwindles, they lose their ability to generate heat, and the cluster becomes colder and colder. Once the bees are chilled, they're too cold to traverse the frames to reach the honey and will stand in place and starve. Hence, you may want to either put a few frames of honey in a super directly above the brood nest or bring the lateral honey frames closer if temperatures are predicted to drop.

Now, let's go back to the parent colony. Make sure to leave behind plenty of nurse bees, a frame of eggs or very young larvae, honey and pollen; this colony is now queenless and will need to raise its own queen. If there are swarm cells, leave those behind. Or better yet, if you've thought ahead, and ordered a queen she can be introduced immediately by placing the cage into the parent colony, thus saving precious brood-rearing time.

Finding the queen in a big colony can be a challenge.

After the swarm control split is made, screen the entrance, load it in the truck and take it to a different location. This will reduce the tendency of adult foragers to return to the original hive. It's a good idea to feed these girls to reduce stress since they've been moved to a different location and don't know their way around the new neighborhood just yet. Also, keep in mind that this new split will soon bust out of that five-frame nuc box, so you will need to anticipate transferring it into a bigger box shortly. Now, not only have you kept your colony from swarming (hopefully), you have another colony that you can keep, give away or sell.

If your goal is to make more honey, especially cut comb, a slightly different arrangement is warranted, and timing is of the essence. In this scenario, the split needs to be done just prior to the nectar flow. Take the queen, all the open brood, most of the honey and pollen and transfer them into a nuc or standard hive box. Again, take this new colony to a different location so that the remaining foragers don't fly back into the nuc where the queen is located. Leave behind most of the foraging force, the capped brood, a frame of eggs, and some honey for the bees to survive on. With little to no open brood for the bees to attend to, it frees them up to forage mostly for honey. For cut comb, you need these boxes full of bees, basically on the verge of swarming during the entirety of the nectar flow. But, don't forget to check for a laying queen in about four weeks. Plus, you will want to arrange the split and parent colony exactly like before with honey and pollen frames on the outer edges with brood in the center.

If you want to expand your operation, there is yet another route you can take, especially if you were on the ball last year and ordered early queens. This works great for sourwood honey production or any other mid Summer nectar flow. Making splits now gives your new, robust queens time to populate the hives with plenty of foragers eager to bring in that nectar this Summer. Basically, you are just splitting the colony in half. Take half the brood, bees, honey and pollen and put them into a new box leaving the remaining half in the parent hive. Place the honey and pollen frames on opposite ends of the box with empty frames next to the brood.

E-H-E-E-B-B-B-E-E-P-E

Again, keep an eye on those future temperatures and, as the threat of chilly weather subsides, move those empty frames even closer to the brood so the queen has more cells available to her.

Splits not only help keep your colonies from swarming or provide you with additional colonies and honey, but they are also a natural method of *Varroa* control. Each time the queen's egg laying is interrupted, there are breaks in the honey bee brood cycle; hence, there are corresponding breaks in the foundress mites' reproduction cycle. The resulting delay in mite population growth reduces the stress on the colony. The splits that you've made without the original queen will take days (if introducing a mated queen immediately) to weeks (if they must rear their own) before egg laying will resume. There's even more time before the larvae are old enough for the mite's migration into the cell for her egg laying to commence. So if you time this right (when there is little to no capped brood), and dust the colony with powder sugar, you may be able to remove a good majority of mites from that colony since the mites are outside the cells feeding on the adult bees or hunting for a suitable larvae, and not under the protective wax capping.

If I've learned anything from my years in beekeeping, it's this: When I think that I still have time to do something in the beeyard, it's usually already too late. Beekeepers always need to think weeks in advance, to keep one step ahead of the bees, especially this time of year! And one other thing I've learned; if I goofed off this Winter and didn't do my rainy day chores (building frames and hive bodies), then I'm out of time come April. So, don't waste time. Get that equipment ready today for what you will need tomorrow to harness the energy of your bees and guide them in the direction of high productivity and long-term survival. Have fun and enjoy the season.

See Ya! BC

WIPE OUT!

Larry Connor

The Big Island In Crisis

Walking in an 18-acre avocado field with trees planted in the lava rock and managed by Rob Huelskamp of Keaau, HI (southwest of Hilo, on the western side of the Big Island of Hawai'i), I was struck by the absence of honey bees on the flowers. In a large open area there are empty hive stands and stacked metal corrugated metal sheeting that many Island beekeepers use as protection from the tropical rains. There is a sole colony of honey bees that has survived the massive attack, and it does not look that strong. Next to the decimated apiary site is fire pit of smoldering hive and frame ash where 79 colonies were burned. The ground crunched as I walked down slope past the fire, still smoking from the day's last sacrifice to the beetle gods; I had stepped on a thick layer of solidified beeswax that had been melted by the fire and poured into the lava and thin topsoil. In places the wax was several inches thick.

Huelskamp is understandably depressed that the colonies that have for 30 years pollinated his tropical fruit trees have been killed and slimed by the small hive beetles. He saw his first beetles just last Summer, and he took this nearly complete loss in just a few months. At the time the beetles first appeared he was busy picking and selling his avocado crop – he packs tons of fruit to ship to Honolulu for market within the state. He may ship three tons at a time of the ten varieties of these large green and black beauties, working with only his wife and two sons. Like many farmers on the Island, they

A mac nut grower who walks the trees every day looking for pollinators keeps five colonies of hives. She combines oil traps, beetle barns and open space above the hive for worker bees to patrol. There are screened vent holes on the side (which were completely propolized shut) and an upper entrance. She finds geckos in the top of the hive and sees them eating small hive beetles.

A oil based stew of beetles and beetle larvae.

Mixture of beetle adults, larvae and bees captured in a plastic tray filled with oil.

live simply and somewhat remotely in the southwest corner of Hawai'i. He is not too far from the area where a lava flow cut off the road around the lower part of the island and still flows into the Pacific Ocean. He has a modern honey house where he previously extracted tropical honey from his hives, bottling and selling it locally. People sought his unique tropical sources of honey – now there is nothing to extract.

I was there in late February, and the impressive, 30-year-old avocado trees were in bloom. There were newly pollinated avocados on the early blooming flowers, giving Rob some hope that there will be at least a partial crop to sell in 2011. I saw green bottle flies, and a few Lepidoptera – the most noticeable were some sphinx moths (hawk moths) that were flying about the trees at twilight. Unique Island spiders, crab-like garden spiders, build enormous webs between trees to catch pollinators as they fly tree to tree. Heulskamp picked up a six foot stick to carry in front of him like a light saber, catching the abundant webbing as we moved around the trees. The spiders only appear at blooming time, he said.

Pollination research on avocado pollination has been done in California and Florida but not much in Hawaii, perhaps because of the abundant supply of managed and feral honey bee colonies, an abundance of large black carpenter bees (*Xylocopa*), yellow jacket wasps, pollinating bird species like hummingbirds, and generally small field sizes. A review of the pollination needs of avocado flowers (in S.E. McGregor's *Insect Pollination of Cultivated Crop Plants*) reveals that the flowers go through two phases. The first phase is when the stigma is exposed and receptive and the second phase is when the stigma is non-receptive but the anthers are releasing pollen. This makes it impossible for the flower to self-pollinate. Because the flowers have an open structure they are easy for pollinators to visit. In pollination cage studies, the cages without honey bees (and without other pollinators I assume), produced just four or five fruit, but when honey bees were in the cage, between 120 and 284 fruit were produced. Pollination is necessary, therefore, but just which animals are pollinating the flowers in Heulskamp's field is unclear.

The beetles have also killed feral colonies, estimated by old-time Hawaiian beekeepers at 800,000 before the attacks. Indeed, the abundant and unmanaged feral colonies may have been a huge source of the massive numbers of beetles. But small hive beetles are highly reproductive, and the colonies killed in Rob Huelskamp apiary may have produced millions of beetles to fly miles to other colonies. Clusters of hundreds of the eggs can be seen in the corners and cracks of the hives, and the larvae develop very quickly in the tropics.

With 18 acres, Huelskamp has a larger field than many of the small fields and orchards owned and operated independent growers, often small family farming operations run by those who selected the Island as a place to be away from many social pressures. Some are living off the grid, no electricity, phone or other modern attachments. Some of these farms are owned by beekeepers, or where beekeepers keep their hives. With a seasonal temperature range of 60s at night and high 70s and low 80s during the day, most of the people I have met on a quickly arranged 12 day visit to the Big Island are folks who live with their bees, walk the trees to count the pollinators, and understand the role of bees in the pollination of the crops they produce. They are old Hippies, folks escaping to a remote Paradise, and some who have been successful in another business who have voluntarily picked the good life in Hawaii.

On the Big Island of Hawaii, 55% of the colonies are dead, 34% of the beekeepers have lost all their bee colonies

Perhaps Huelskamp is an extreme case, but certainly not alone with his colony losses. In the Big Island Beekeeping Association (BIBA) and the Honey Bee Education Project Survey of 2010 Colony Losses on Hawaii Island, (Revised February 27, 2011), "Respondents reported losing 2,535 honey bee colonies or 55 percent of the total number of colonies reported at the beginning of the year . . . Altogether 90 percent of the respondents reported losing at least one colony in 2010. Thirty-four percent of the respondents reported no colonies at the end of 2010. (These beekeepers were wiped out.). The majority of survey respondents attributed their colony losses to Small Hive Beetle (80 percent) or a combination of varroa and Small Hive Beetle (29 percent)."

One beekeeper described the situation as a "Perfect Storm" where small hive beetles, *Varroa*, Nosema and perhaps drought (on the leeward side of the Island) have combined to

kill so many bees. It is unclear if the survey included numbers from any of the Island's major queen producers, who are friendly but not sharing a lot of data. They are all private operations. Next month I will discuss visits to two of the queen producers and to two honey producers while during my visit. The many beekeepers who have lost colonies have been those who kept bees in a mite-, beetle- and disease-free environment older Mainland beekeepers recall from the 1960s and 1970s. For many colony management consisted of making increase colonies, letting the bees raise their own queen, supering the hives and harvesting the honey. There is no Winter losses to contend with in this lush tropical environment, and many beekeepers harvested honey 10 months out of the year; some removed an average of 40 pounds a month during significant nectar flows. The beekeepers sold honey at local farm markets and online. They got a premium price for their honey.

That is now changed. Many beekeepers are using one or more types of beetle traps to reduce the level of beetles in the colonies. In early February the beekeepers in Hawaii received news that the Mitaway Quick Strips (MAQS) were able to ship from Canada after the U.S. government gave Hawaiian beekeepers permission to use the chemical for *Varroa* control. A few of the beekeepers are checking their bees for Nosema levels. One of the duties that the new State Apiary Specialist will be offering soon is training programs for Nosema monitoring. One of the local macadamia (called mac nuts by the natives) nut growers has offered laboratory space, a compound microscope and accessibility for beekeepers to come in and check their bee samples for the midgut parasite. For the well informed, proactive beekeepers on the Island the tools seem to be available for the control of these three pests, but most of the beekeepers I met have not reached that level of intensity of activity. A few are still waiting to see what the government will do for them.

New State Apiarist

This puts enormous pressure on newly hired State Specialist in Apiculture for Hawaii, Danielle Downey. She has been on the job since December 1, 2010, after a long delay in hiring. In February she addressed the Hawaii Board of Agriculture with an update on the honey bee situation. It was an open meeting I attended. She presented an overview of beekeeping history in Hawaii. According to Downey, honey bees were first introduced from California in 1857. The industry grew, and by the 1890s the large cattle industry needed honey bees for the pollination of kiawe, a mesquite relative that requires bees for pollination and is a valuable nectar source. Importation of various bee stocks was allowed until 1909. Since then the border has been closed to importation, with the exception of bee semen. There is widespread speculation about how the *Varroa* mites and small hive beetles arrived on the Islands, including some conspiracy theories, but the reality of regulation of every tourist who flocks there is a daunting task for Hawaiian officials.

Ron Hansen and Danielle Downey at a beach in Hilo, HI (it was the closest I got to the ocean during my trip).

Downey reported that from 1918 to 1941 over a million pounds of honey were produced each year, but in the 1930s American foulbrood spread throughout the islands. The spore-forming bacillus requires that beekeepers burn infected equipment. In 1952 there were 11,900 beehives in the state with 25 commercial beekeepers. There is no registration or colony census at present, but some estimate that there are about 500 beekeepers on the islands.

In April of 2009 the *Varroa* mite (*Varroa destructor*) was found on the island of Oahu. This mite has been in the United States since 1985. It kills colonies and is associated with various viruses, including the deformed wing virus, which renders the worker bee useless to the colony. "The colony will just throw her out of the hive," Downey said. *Varroa* was found in April of 2010 on the Big Island, is now widespread on both islands.

The small hive beetle was first found near Hilo in April 2010 and then in Oahu in November of 2010. A relative of the sap beetles, the beetle is elusive and may not be seen by the beekeeper until larvae are present and the colony is close to being slimed. These wet combs are repellant to bees, who leave the colony. While in other areas the SMH is considered a secondary pest, in Hawaii it a lot more destructive, and may be a primary pest. The beetles live in feral hives and are suspected of feeding on Hawaiian fruit. They carry a yeast the causes honey to ferment and produce the slime, making the equipment unusable. For most beekeepers this means that the hive bodies and frames must be burned. Beekeepers with plastic frames scrape the frames, power wash the plastic, and recoat with new wax. Some include a bleach bath before recoating. Unfortunately, the plastic frames are made in such a way as to harbor beetles when the frames are in the hive and many beekeepers are abandoning them for wood frames where there are fewer places for beetles to hide.

We really don't know when the

Macadamia nuts bloom several times a year, so there are large green nuts and flowers on the trees at the same time. I observed many 7 to 10 nut racemes in older nuts, but only one or two in recently pollinated nuts, suggesting that something (rain, lack of pollinators) interfered with successful pollinations.

midgut parasite *Nosema ceranae* first appeared according Danielle Downey, who worked last in Utah. She has been hired on a one-year contract. She has found spore counts in foragers of 15 million, but the colonies continue to live. There are high mite numbers too, four and five thousand per colony, yet they continue to live, says Dr. Ethel Villalobos, Associate Researcher and Coordinator for the Honeybee *Varroa* Project of the Dept. of Plant and Environmental Protection Sciences at the University of Hawai'i at Manoa. This greatly exceeds the mite levels found on the Mainland for non-systematic colonies.

Invitation to visit

Last November Pahoa beekeeper Ron Hansen attended the Southern New England Beekeepers Assembly in Hamden, Connecticut. He heard the three speakers – David Miksa of Groveland, Florida, Medhat Nasr of Alberta, Canada, and myself give lectures. A few weeks after that I was invited to visit the Big Island. I agreed to visit in February, hosted by Hansen and the Big Island Beekeepers Association (BIBA). Cary Dizon, a small scale beekeeper who had four hives but now only has one, is BIBA president, and there was a lot of 'discussion' on how various aspects of the visit would be structured. When I agreed to wave any fee it meant that I got a working vacation in Paradise. Ron made sure he got his money's worth.

Hansen has lost about one hundred colonies, having somewhere between and 40 and 50 alive colonies when I visited. Beekeeping is a sort of retirement business for Hansen, one where he works nearly full time. In his and other beekeepers hives I saw a lot of beetles, adults in the hives, larvae on the combs and even more in traps designed to trap and kill both forms. Hansen and others use screened bottom boards furnished with screen covered oil traps. Cooking oil is put into the traps (level the colony hive stand first). The bees are aggressive toward the beetles, and seem to drive them out of the combs and into the traps when they have the chance. Especially in the Hilo-Pahoa area where rainfall is measured at 200 to 300 inches per year and the vegetation is extremely tropical, there were more beetles and *Varroa* mites in the oil traps at enormous numbers. Stories of buckets of beetles come from this, as the beekeepers empty the polluted oil in beetle filled traps into buckets and then refill the traps with fresh oil. If not checked the level in the trap gets so full that the beetles can crawl out and back into the brood nest.

There is a debate about the ability of a the small hive beetles to be able to kill a colony if it has a large population. Some recent Island visitors like Jerry Hayes say no, that the beetles are only secondary to the varroa and Nosema infections. But Drs Ethel Villalobos and Lilia de Guzman (USDA, ARS, Baton Rouge Bee Lab) state "things are different in Hawaii."

Certainly any strong hive that undergoes swarming or a queen change will get an enormous beetle invasion. The absence of a strong queen is one of the triggers that appears to be at work with beetle invasions. Ray Olivarez (Olivarez Honey Bees, Inc) told me that he has taken a queen out of a strong colony that contained no beetles and returned the next day to find many beetles filling the colony. When he placed a queen back in the hive, "the beetles went away."

This frustrates Hansen, who tries to keep colonies strong, but then has them swarm and the beetles move in the colony and do enormous damage, even killing the hive if not monitored twice a week.

The oil trays on screened bottom boards on many hives I saw impressed me. They were a way of trapping adult beetles and also a predictive tool for the beekeeper to see which colonies that were about to die from the beetles. There are lots of *Varroa* mites floating on and in the oil too, so both pests may be monitored proactively. Many colonies had a thin coating of freshly secreted beeswax flakes floating on the oil that caught the mites. Others fell through, as did the adult beetles and the beetle larvae.

Some colonies had traps containing hundreds of the dark beetles and there were some with thousands. But the larvae, from those ready to crawl out of the hive to the soil for pupation to the tiny ones that just hatched from the flood of eggs deposited by beetles in the cracks and burr comb of the hives were also in the oil. For the Island beekeepers the appearance of adult beetles was a desired result of the oil traps, but the presence of a large number of larvae predicted the rapid sacrifice by fire of the hives to the beetle gods before the beetles were able to complete their lifecycle and infest other colonies.

It is well known that the small hive beetle is very adaptive in its ability to hide inside the hive. When I worked hives with Hansen, I noticed that the plastic frames provided an ideal place for the beetles to hide from the worker bees. The adult beetle's objective is to mate and lay eggs in these places inside the hive where bees do not have bee space. The bees jump on the beetles and chase them – it is fun to watch in a perverse sort of way, cheering on the attacking bee but knowing the beetles will outnumber them with their larvae. But the real challenge is to develop hives that have no areas where the bees cannot move. Now beekeepers move side frames away from the side of the hive, and position the division board feeder so bees access both sides. Hansen is adamant that there cannot be any place for the beetles to hide. He spaces his feeders and frames so the bees are able to reach every space. He is looking at changing the cover/inner cover design so

the bees have full access to the tops of the hives and no cracks at the tops of the frames. Bottoms boards with screens and oil trays collect the beetles as they enter the hive. He was getting loss of adult bees in the oil in his home-made traps, and was planning modifications.

We visited one macadamia (mac nut) grower near the lava flow and saw how important the bee space is to keeping beetles out of healthy hives. The farmer, Sandy, and her husband have given hives a four inch space at the top of the hives to allow the bees to patrol over the inner cover (these must be carefully watched during the nectar flow or the bees will fill them with burr comb). Sandy also feels that the open space allows local and abundant geckos to occupy the space where they feed on the beetles. A number of other animals occupy the space as well, adding to my vision of 'hive ecology.'

This tiny beetle larva is on a slimed comb of honey. This comb has been removed and will be left out in the rain by the beekeeper.

Importance of Queens from Hawaii

Queen bee production is a critical part of North American colony management and pollination of important crops. Hawaii was one of the last places in the world to get the *Varroa* mite. Due to the climate, Hawaiian queen producers supply queens to many parts of the world in both early and late season when other queen producers cannot. Demand exceeds supply. One producer said that they could produce ten times the number of queens and still not fill the need. Since the producing firms are privately owned, we can only guess about production numbers, but it seems clear that the numbers are a million queens per year or more – perhaps much more. It seems possible that individual firms are doing that number.

There is a 30 plus year history of production of early and late season queens from the Big Island of Hawai'i. Most of the queen rearing is done in an area overlooking the bay where Captain Cook had his fatal encounter with the Island's natives. Located near Kona, the center of coffee production, the queen producers are sandwiched into an area where it is quite likely that you have another beekeeper's colonies close by, but due to the thick tropical vegetation and narrow roads up and down the volcanic rock, you may never know they are there unless someone tells you.

This may be a pretty good way to insure an adequate drone supply for queens as they leave mating nucs – my math suggests that this area needs to produce hundreds of millions of sexually competitive drones each year to mate with queens. The queen producers are acutely aware of the need to produce abundant drones, and keep detailed records to trace back any reports of poor mating. As Ray Olivarez (Olivarez Honey Bees, Inc) said to me, "the last thing we want is for our beekeeper customers to have drone layers from the queens we ship them. I keep extensive production data so we can trace back any performance issues."

Queen rearing can be successful all twelve months of the year, but most of the operators set up in January and February for the new season using a variety of nucleus sizes. These colonies require a lot of bees, shaken into large boxes and then dipped to make up nuclei with a spam can or a slightly larger container, depending on the size of the nucleus. In the tropical environment queens are often mated and laying in 10 to 12 days, filling the global demand for early and late season queens. In North America there are many beekeepers who purchase early season Hawaiian queens for use in nuclei assembly in Southern states from February on. More northerly beekeepers do the same thing, later in the season, but by April, and before they can produce queens of their own with any level of success. Canadians, like the Alberta beekeepers I visited last June, rely on tens of thousands of Hawaiian queens for expansion of their successful honey production and pollination services. Under the

Ron lets his chickens pick over plastic combs filled with beetles. They like the larvae.

Coffee benefits from bee pollination by resulting in larger and earlier ripening cherries, which contain the beans. Volcano side coffee produces the best quality coffee.

leadership and encouragement of Dr. Medhat Nasr, Alberta has dramatically expanded colony numbers in less than a decade. The use of Hawaiian queens has been key in making this possible.

No single group of beekeepers is more dependant on these queens than a enormous range of beekeepers who move bees to California for almond pollination. I am not sure anyone fully comprehends the number of colonies that are made up in the Fall for the move to the almond orchards. And again about March 1st, when the almonds are loosing their petals, there are a huge number of beekeepers who split the hives moved out of almonds for increase. Yes, there are queen cell producers like Dave and Linda Miksa of Groveland Florida who help with this demand, but these are not mated queens. I used nuclei made with Hawaiian queens while living in Connecticut. The queens allowed the beekeepers to make early season splits as described in my book *Increase Essentials.*

What would happen if Hawaii lost its queen production for even one season? At this time I doubt anyone fully comprehends this level of impact. But here are considerations one must include in making statements about the economic impact of these queens:

1. Commercial honey producers would need to make up colonies later in the season and may not have late season queens for Fall splits going to almonds;
2. Pollination interests for almonds and other crops would have a shortage;
3. Canadian pollination and honey production would suffer from a shortage of queens;
4. The pollination services to U.S. and Canada almonds, canola (oil seed rape), fruit trees, and other crops would be at risk.

When we add crop values, we include billions of dollars of food, oil and fiber production dependant (sometimes indirectly) on a few Hawaiian queen producers and the health of their colonies.

Next month I'll complete this story with visits to two larger queen producers and two honey producers, and report how they are dealing with this "Perfect Storm." BC

Having seen enough dead beehives in Hawaii, I returned to find many of my hives dead in late February, the cost of being chemical free during a severe winter. So April will be a month of rebuilding and perhaps changing directions with my small scale beekeeping operation in Michigan. That will be useful for a return visit to the Big Island for the Western Apicultural Society meeting in September where I am scheduled to conduct a workshop on 'Rebuilding the apiary after losses.' It will be fresh material to share with WAS participants. Read or reread Increase Essentials *available at* **www.wicwas.com**.

Perfect Package Installation

Kim **Flottum**

1. *Your package most likely originated in the southeast part of the U.S., or from the west coast. If from the west coast, beekeepers take a box full of bees and place it over a box with a queen excluder on the bottom. They smoke or chase the bees down through the excluder into a large holding cage below. This way they don't have to look for the queen. When the cage below is full, with perhaps 10 or 15 pounds of bees, the bees are poured into awaiting cages sitting on a scale. The can is added to keep them in and the package is returned to the farm*

2. *In the southeast a common technique is to have crew go to a beeyard and disassemble colonies in search of the queen. Once found, frames are shaken over a large funnel so the bees fall directly into a package, which is sitting on a scale. When full, a dummy feed can is added to keep the bees in and the package is returned to the farm.*

3. *Back at the farm a queen is added to the package. Many types of queen cages are used to suspend the cage in the package. Some are easy to use when you want to put the cage in your package, others are a bit difficult. Be aware of what technique you will have to use before you begin installing your package.*

4. *Workers quickly suspend the queen in the cage, then insert the feeder can full of high fructose corn syrup to feed the bees on their journey to your hive. A cover is placed over the can, the packages are fastened together and the bees are on their way.*

5. *Medina County beekeeper Tom Jefferies used to take his van and a trailer south to pick up a load of packages for our club members. This is a common way to obtain packages, and it's generally easier on the bees because they are in the package a much shorter time than if in the mail. People who do this on a routine basis all have a story or two to tell about their trips...some of which can be real adventures.*

6. *Even before you get your package home, get the receiving hive ready, your tools handy and have everything in place. You'll need a misting bottle with a 1:1 sugar syrup in it, a pliers and screwdriver, a hivetool and your feeder...jar, pail, top feeder. Bring some duct tape or masking tape and several rubber bands large enough to go around a frame top to bottom. Get frames in your hive...if you have some from previous hive with drawn foundation, great. If not make sure your frames are ready with wired foundation or plastic foundation.*

7. *When ready, remove 4 or 5 frames from the center of the box, pry off the cover from the package exposing the feeder can below and the tab that holds the queen cage.*

8. *Fairly solidly, thump the cage down on the hive stand, dislodging all the bees from the feeder can inside onto the floor of the cage. Spray them with sugar syrup immediately so they have something to do down there and don't come back up in a hurry. Pry up the feeder can using your hive tool or perhaps the screwdriver. Lift it gently until almost out. Grasp the tab holding the queen cage so it doesn't fall inside, lift the feeder can all the way out, remove the queen and place the cover you already removed over the hole.*

9. *Place the queen in your pocket so she does not become chilled while you finish the job.*

10. *Spray the bees again with sugar syrup to settle them down. Remove the cover from the package and gently dump the bees in the space provided by the frames you removed. Like shelled corn, says Jim Tew, into the hole. Gently roll and tip the box so as many bees as possible get into your hive. Spray them a couple of times right away, then give them a few minutes to settle down and start moving off the floor and onto the frames. Gently replace the frames you remove...all but one...set them in place and as the bees move out of the way below, the frame will settle into place. Don't be in a hurry. Watch the process, it's fascinating.*

11. 12. 13. *Place the queen cage in the colony off center so food won't leak on her. If you have drawn comb you can wedge the cage into the wax, near the top of the frame, with the screen exposed and the cork up. Put masking or duct tape over the cork so the queen is not released quickly. If you don't have drawn comb "maybe" the queen cage has a string, wire or some other means of suspending the cage from between the top bars. Often they do not, and you have to jury rig something...like the rubber band. Bring some with you. Generally, package bees are convenient for the package bee producer, not the final customer. Here's one good example. Make sure the queen cage is secure, then replace all but one of the frames, leaving space for bees to get to the queen cage.*

14. *When the queen cage is secure, and the frames have settled into place, replace the inner cover and add the feeder...pail, jars or top feeder and close up the colony.*

15. *After three days, check the food and replenish if nearly empty (half full or less). Remove the feeder, the inner cover and check the queen cage. Gently remove the cage and remove the tape from the candy plug so the bees can now release her. It will take another three or four days for this to occur. Be patient...you've taken the first step as a beekeeper.*

All The Buzzz in...

Dear Bee Lovers,

We are making prizes for other bee buddies using your artwork, poems and stories. Share your wonderful creativity with us!

Bee B. Queen

Bee B. Queen Challenge

Send us a poem!

Lillian Hanson, 6, MN

Ruth Kress
11, NY

Victoria Leavitt, 6, UT

Tanya Plett, MB, Canada

Angie Shah, 8, AZ

Up in Smoke

Tools

People use tools. A carpenter uses a saw and hammer. A chef uses pots and knives. Even you, as a student, use tools like pencils and calculators.

Are there tools for beekeepers?

Yes. There is a smoker, hive tool, extractor, hot knife, wax melters, and bee vacuums to name a few.

Let's take a look at the smoker. The smoker is a metal container with a bellows used to calm bees by using – you guessed it – smoke.

What does a smoker do?

The main job of the smoker is to blow smoke on the hive to calm the bees down so it is easier to work with them. The smoke works in ways. First, some people believe when the bees smell the smoke they think it may be a forest fire so they have to find a new home. Before they leave, they pack their bags. They fill their honey tanks with honey so they will have food and energy to build a new place to live. Once they are full, it is harder for the bees to sting. When they are very busy "filling up" they don't fly around much.

Another thing the smoke does is disguise smells. The bees release an alarm pheromone when they think the hive is threatened. The smoke masks that smell so the other bees don't know that something is wrong. Remember you are invading their home. They do not know that you will not hurt them. They just want to protect their hive.

How do you use a smoker?

First you have to build a fire. Where there is fire there is smoke.

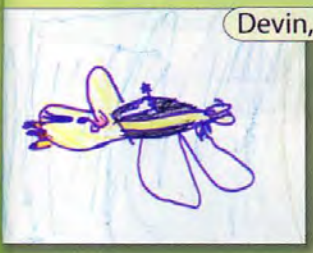
I get it. That's why they call it a smoker.

You're quick.

A fire needs two things. It needs fuel and oxygen. And of course a match to get it started. You can start the fire using newspaper, dried grass or leaves. Then you need to add fuel that will burn longer like wood chips or burlap. The bellows on a smoker pump air (oxygen) into the enclosed metal fire area. That air helps the fire build up and stay burning. It's like when you build a campfire and you blow on the embers to get the fire going. Same thing. Then you puff a little smoke in the hive at the entrance and as you open the top cover.

Bee kid's corner

Produced by Kim Lehman -www.kim.lehman.com
www.beeculture.com
April 2011



Devin, 5, MO

Leslie Howe, 10, ON, Canada

Recent swarms have no honey stores or home to defend so smoke usually is not needed.

It is very important not to burn anything toxic in the smoker that could hurt the bees like plastic, chemicals, or paint.

Most people credit Moses Quinby as the inventor of the first modern day smoker in 1875. T. F. Bingham improved on the design about twenty years later.

Paul Jackson Collection

Smoker Mania

Some people collect rocks. Other people collect dolls. How about collecting smokers? That is exactly what Paul Jackson has been doing for over 35 years. He has around 170 smokers! Many of them are very old. Some are unusual. Others have a story behind them. Jackson, the chief apiary inspector at Texas A&M University, even wrote a book about smokers.

Smoke Screen Scramble

The names of smoker fuel have been split into segments. The letters in each segment are in order but the segments themselves are all scrambled up. Can you put the segments together in each group to discover different fuels for a smoker?

1. le es av _____
2. e tw in _____
3. bu ap rl _____
4. ng st ri _____
5. aw tr s _____
6. a rk b _____

(The following are two words.)

7. ton cot ric fab _____
8. ne ne ed pi les _____
9. rse tti ho es pa _____
10. co co bs rn _____
11. nes ne co pi _____
12. ps od wo chi _____
13. pe el sh ut ls an _____
14. wo tt od en ro _____
15. at rug dbo ed cor car ard _____

(The last one is three words)

16. per pa rto g ca ns eg _____

Beecome a Bee Buddy

Send two self addressed stamped envelopes and the following information to: Bee Buddies, PO Box 2743, Austin, TX 78768. We will send you a membership card, a prize and a birthday surprise!

Name: _____

Address: _____

City, State, Zip Code _____

Age: _____ Birthday: _____

E-mail (optional)

Send all questions, photos and artwork to: beebuddies@hotmail.com or mail to the above address.

1. leaves, 2. twine, 3. burlap, 4. string, 5. straw, 6. bark, 7. cotton fabric, 8. pine needles, 9. horse patties, 10. corn cobs, 11. pine cones, 12. wood chips, 13. peanut shells, 14. rotten wood, 15. corrugated cardboard, 16 paper egg carto

Feed Your Bees Because . . .

Ann **Harman**

"Feed your bees!"

"Why? It's the middle of_____." You fill in the month.

All living things need a balanced diet, the right ingredients in that diet, the right amount of those ingredients and at the right time. Humans are constantly being bombarded with information on what, when and how we should buy, prepare and consume food. Do we give that same thought to our bees needs?

Left completely on their own, bees will forage for pollen (protein, fats, vitamins), nectar (carbohydrates), and water (yes they do consume some water). Will all the colonies living out there on their own survive? No.

No, for several reasons. Weather can be a huge reason. Too much rain, too little rain, too hot, too cold, all at the wrong time. Bees don't live with a calendar. Beekeepers do have calendars but calendars do not tell you just what weather conditions are or will be on a certain day. Another reason for non-survival is the changing environment the bees are living in. A flower-filled meadow can become a suburb. A field of clover can become a field of wheat. Still another reason can be pests or diseases. And if the bees chose to live in a tree it could blow down in a storm.

You have decided to be a beekeeper. That means you will have to provide for your bees the things they need: a dry, ventilated cavity to live in – a hive; protection from pests – perhaps a bear fence; a means for them to cope with parasites and diseases – various treatments. And, since these bees are in your care, you may need to provide adequate food.

You are aware of the climate that you live in. We'll consider climate and weather as two separate things. Climate, for our purposes, means the type of weather conditions characteristic of the part of the country you are living in. What a variety the U.S. has – the hot, dry desert of the southwest; the cool and damp of the Pacific northwest; the Midwest with its wind, scorching-hot Summers, bitter-cold Winters; the almost semi-tropical Gulf states; the hurricane-prone East Coast.

Weather, for our purposes, means what is really happening: day, week, and month. It means temperature during day flight time, and at night; sun or cloudy; wind or calm; snow and most definitely rain.

We tend to notice weather as it directly affects us. Today – do I need umbrella, heavy jacket, sunscreen, hat? Yesterday is forgotten. Tomorrow isn't here yet. Weather today does directly affect the bees, but also weather yesterday, last week, and last month. Weather tomorrow will also have effects but only you will know about that because you heard or saw a weather report.

Bees are totally dependent on plants for their food. And those plants are totally dependent on the weather for growth and flowering. And bees are totally dependent on the weather to access their food. So every beekeeper needs to be a weather watcher and a plant watcher, as well as a bee watcher.

Sugar syrup in a pail feeder.

It's April now. Would it be necessary to feed your bees? Feeding would depend on several things: what is happening with weather, plants and bees in your area. In a large part of the U.S. April is one of those unpredictable months. Today you have shorts and a T-shirt on; tomorrow you will be reaching for your winter jacket. Bees are flying and collecting today; tomorrow they will be confined to the hive.

For those of you who keep records, go back and look at April last year – and years before that if you have the information. Is this April anything like last year? Did you need to feed your bees then – or did you give that any thought at all?

Stop and think about the activities inside the hive. You should be doing this throughout the year. So what are these bees doing now that it is April? No matter where you live April is an important month for the bees to raise more bees. Food is critically important.

Think of all the reasons you want more bees in your hives. You may wish a big field force for gathering nectar in late Spring and early Summer. Your honey crop for the year may be made during that time. You need more bees in your colonies to make some splits to replace Winter losses. You have decided to sell nucs this year and are preparing to fill orders for those. And most important – a strong colony is a healthy colony.

Now we need to consider another situation that requires feeding: a new beekeeper with a new hive and a three-pound package of bees with queen. The package may arrive early April. New beekeepers are usually told to "feed the bees." That statement is just not enough information. Let us

Pollen provides protein.

hope that the new beekeeper has a mentor who will provide information and guidance.

So often I hear a new beekeeper comment that flowers are blooming so feeding should not be necessary. If you are a new beekeeper reading this you need to give that colony all the feeding help it needs even if it means feeding for months. As long as you are supplying the bees with new foundation to be built into comb their need for nectar or your sugar syrup must continue until all comb needed for your entire hive is completely drawn. Only then does your colony have the room to expand and room to store food for the Winter that will come. No, feeding does not make lazy bees.

Some new beekeepers will purchase a nuc. The feeding requirements will be just about the same as a package of bees. The few frames in a nuc still have to create the comb for a full colony. A nuc may draw out the comb more quickly than a package, but the work still has to be done.

Which sugar syrup to feed in the Spring? The basic recipe is very easy: to stimulate brood rearing one part sugar to two parts water; for basic Spring feeding one part sugar to one part water. By volume or weight? It does not matter.

New beekeepers – and mentors – take note! Sugar syrup, converted and stored in comb by the bees, is not honey. Do not remove it, extract it, give it or sell it. It may well have been mixed with nectar from flowers, but that does not make it honey.

Is there a perfect feeder? No. Each type has its advantages and disadvantages. And each beekeeper is adamant about personal preference of feeder style. What to use? You can certainly start by asking a number of beekeepers, perhaps in your local beekeeping association, what style and the reasons for that choice. You will receive more confusing information than you suspected. However, every opinion is something for you to think about for use in your situation.

Since every beekeeper should have a library of equipment supplier catalogs, the styles and prices of feeders are readily available. Why do I suggest having the actual catalog when you can see them on the Internet? Because you can open a number of catalogs, all over your kitchen table, at one time and compare styles and prices. Although the Internet is wonderful, your kitchen table makes it easier to investigate many sources and takes less time.

Since pollen is part of food for bees, some thought should be given to augmenting the protein needed. The quantity of pollen needed is not as great as that for nectar. Only you can know the plants in your area that provide pollen. Although you may know the blooming time, you still have to consider the weather, particularly changeable Spring weather.

On a fine April day, with bees flying, stop and look at the incoming bees at the hive entrance. Brightly colored pollen is easy to see. Then inspect a frame of brood. Look carefully at the rim of pollen. If you see a variety of colors you know that the bees are receiving a varied diet. If, however your hives are in or near a monoculture, and the pollen is all the same, your bees may be malnourished. Not every plant's pollen contains all the amino acids necessary for good nutrition.

What sort of protein to feed? The answer is not as simple as for syrup. Remember these terms: a pollen supplement contains pollen; a pollen substitute does not. The other substances in pollen patties are considered nutritional for bees. Many commercial protein products are on the market, produced by national supply companies as well as by local beekeepers.

If you are considering making your own pollen patties, keep in mind that using incorrect ingredients and incorrect proportions may be harmful instead of beneficial. If you trap pollen to be fed later, the freshly trapped pollen must either be dried or frozen immediately. Fresh pollen can very quickly get moldy.

When feeding bees syrup think in gallons. When feeding pollen substitutes/supplements consider your actual pollen sources and weather. If small hive beetles are a problem in your area, monitor the bees' consumption carefully. Ignored patty remnants may increase small hive beetle numbers. Since small hive beetles may be attracted to stored patties you may not wish to store them in quantity unless they are kept in a freezer.

Let your bees – in conjunction with the weather – be your guide in feeding. When fresh nectar and fresh pollen are available, as the weather allows flight, the bees will ignore your delicious offerings.

So now you can answer your own question: "When should I feed my bees?" Remember, there is only one answer: "When they need food." BC

Ann Harman makes sure her bees are well fed and taken care of at her home in Flint Hill, Virginia.

GUEST EDITORIAL

The EPA, Pesticides, And Bees

Graham **White**

This Spring, American farmers will plant 92 million acres of corn – the largest acreage since 1944, almost all of it treated with the neonicotinoid pesticide Clothianidin; they will use this pesticide, despite the fact that the EPA has never fully tested and licensed this product according to the law set down by Congress.

Why are the neonicotinoids so revolutionary? First-off, 'neonics' are systemic – they are *inside* plants. They are not sprayed onto the outside but are present inside the plant, in: sap, leaves, pollen, nectar and fruit. Washing or peeling your fruit will not get rid of these pesticides – they are part of your food, and part of the bees' food too. The 'old pesticides' like DDT were only a danger to bees for a few days; but neonics remain active inside the plant for the entire growing season.

Secondly, 'neonics' are fantastically poisonous; Imidacloprid, another famous neonic, is 6000 times more toxic than DDT, and Clothianidin is even more lethal than that. Just three to five parts per *billion* of Clothianidin in solution will kill any bee. What does that mean? If you dissolved one dessert-spoon of Clothianidin in a thousand tons of water – an average swimming pool volume – that dilution – five parts per billion – would kill any bee. But, that is only the acute dose – which kills on contact. French research by Bonmatin revealed that the 'chronic' dose, which impairs complex behaviours but does not kill outright, is less than one fiftieth of the acute dose; around 0.1 parts per billion. These are such minute amounts of poison that even sophisticated government labs cannot detect this level of contamination.

Finally nicotinoids are nerve-toxins; they block nerve receptors in the brains of bees and other insects so nerve-signals cannot travel. Bees poisoned by nicotinoids look like they have Parkinson's disease – they shake and tremble; they lose control of complex behaviors like co-ordinated flight, navigation and the waggle-dance. Mating-flights become impossible; poisoned foragers do not find their way home.

These revolutionary poisons are also highly persistent in the soil and water of the fields where they are used: Imidacloprid has a 'half-life' of up to two years in soil, while Clothianidin's half-life is much longer; even after 19 years, half of the Clothianidin that first went into the soil is still present to be taken up by new crops.

Neonics dissolve readily water, so these insecticides can travel a long way from the field where they were first used, to be absorbed again and again by wildflowers on field margins or stream-banks. Thus, the nectar and pollen of wildflowers can also become lethal to bees, butterflies, bumblebees and other insects.

As Tom Theobald wrote in an earlier article, the EPA registered Clothianidin in 2003, granting it a 'conditional' license despite the warnings of their own scientists:

> *"Clothianidin has the potential for toxic chronic exposure to honey bees, as well as other non-target pollinators, through Clothianidin residues in nectar and pollen..In honey bees, the effects of this toxic chronic exposure may include lethal and/or sub-lethal effects in the larvae and reproductive effects in the queen."*

James Frazier, Professor of Entomology at Penn State, wrote:

> *"Among the neonicotinoids, Clothianidin is among those most toxic for honey bees . .our research indicates that systemic pesticides occur in pollen and nectar in much greater quantities than previously thought, and that interactions among pesticides occurs often and should be of wide concern."*

Bayer promised to carry out an additional 'lifetime, or chronic exposure, study' in 2003 – but only submitted this after four growing seasons in 2007. Now, I am not a professional researcher, but, in the immortal words of Raymond Chandler, *"I can spot a tarantula on a slice of Angel food cake when I see one"*; see if you can spot the deliberate mistake here. Bayer went up to Canada and placed just four beehives in a two and a half acre plot of canola, treated with Clothianidin, surrounded by a vast prairie of untreated wild flowers. Now – the foraging radius of a bee colony is – conservatively – about 1.5 miles, this makes for about 3,000 acres. So, in comparison to 3,000 acres of pesticide-free forage, 2.5 acres of pesticide-laced canola, represents about 0.0008 of the total area – less than a 15th of one percent.

Not surprisingly, the bees showed few signs of contamination by Clothianidin, because they were spending very little time on the pesticide-treated canola. Would *you* design an experiment like that? More to the point, if you were the professional policy makers of the EPA, would you ever conceivably accept such a study as 'valid science'?

Well, the EPA's own scientists didn't accept this study and threw it out the window, but the policy managers brought it back inside, dusted it off and said: *'that's just dandy, we'll grant this pesticide a full registration!'*. As they say in the movies: 'you couldn't make it up'! If any beekeeper colluded in such an

obvious scam, he would be heartily ashamed. But, from this evidence, I doubt the EPA management would be embarrassed if they were caught drunk as skunks, dancing bare-ass naked in front of the Lincoln Memorial, swinging a chicken around their heads and whistling Dixie. These people see themselves as 'untouchable.'

In 1972, Congress charged the EPA with protecting the American people and their environment. People saw the agency as their vigilant watchdog; sharp in tooth and claw – fiercely defending while they slept. But, the price of freedom is eternal vigilance – and while we slumbered, something happened to the watchdog; its teeth fell out, its eyes clouded with cataracts; it became deaf and it appears to have been castrated. If the EPA was ever the 'people's watchdog' it arguably became the *'pesticide industry's pooch'* when George W Bush made Linda Fisher, a Monsanto lobbyist, number two at the agency in 1992; the EPA's track record since is not reassuring.

In 1991 a train was derailed at Dunsmuir above Lake Shasta, spilling 19,000 gallons of a pesticide called Metam Sodium into California's Sacramento river; this exterminated all life for 42 miles downstream. It killed a million trout, along with millions of other fish, insects, frogs and water birds. It poisoned most of the trees on both banks – and put 600 people in the hospital. Congresswoman Barbara Boxer later asked Don Clay, an EPA official, why metam sodium, was not on the EPA's register of 'hazardous' chemicals if it could kill people as well as fish? Clay replied: *"The number of fish killed or the number of people killed is not the criterion we use in labelling something 'hazardous'"*. Boxer was livid with anger, but the EPA still refused to list metam sodium as 'hazardous' and 25,000 tons are used annually in America today.

Linda Fisher, EPA Assistant Administrator of pesticides and former lobbyist for Monsanto admitted that the EPA had studies from 1987 linking metam sodium to birth defects in lab rats, but she said. *"birth defects were not enough to warrant a 'hazardous chemical' designation by the EPA."* One wonders what the EPA regards as 'hazardous'? Plutonium maybe?

In December 2010, on petition by the NRDC, a federal Judge in New York invalidated EPA's approval of Bayer's pesticide **spirotetramat ('Movento')** because it kills beebrood, and ordered the agency to re-evaluate the chemical in compliance with the law.

The EPA's own review found that residues of Movento brought to the hive by forager bees caused *"significant mortality"* and *"massive perturbation"* to larval honey bees. But the EPA licensed it anyway.

NRDC Senior Attorney Aaron Colangelo said.

> *"EPA admitted to approving the pesticide illegally, but argued that its violations of the law should have no consequences. The Court ordered the pesticide to be taken off the market until it has been properly evaluated. Bayer should not be permitted to run what amounts to an uncontrolled experiment on bees across the country without full consideration of the consequences."*

Apparently the EPA will not refuse registration of a pesticide even when it is 'highly toxic to bees'? Jennifer Sass of the NRDC wrote that – of the 94 pesticides licensed by the EPA since 1997 – 70% were granted a 'conditional' license, without completed safety studies. If the EPA granted licenses to Imidacloprid, Clothianidin and Spirotetremat – all of which have been independently confirmed as being 'highly toxic to honey bees' would they ever refuse a license to any bee-poison ?

The EPA gobbled up $10 billion of taxpayer's money in 2010. Well, on the basis of how they protect bees and beekeepers from dangerous pesticides, I have an idea on how to save some money. Why not fire the entire pesticides department? Just pay the janitor to sit at a table with a rubber stamp – and give a conditional license to everything that comes through the door. The result would arguably be exactly the same as it is currently – everything gets approved, nothing is rejected; and think of the money you would save!

According to the EPA database, American farmers used over 1 billion pounds of crop pesticides in 2007 (500,000 tons – that's just over three pounds per person, for *every* person in the U.S.); of these 99 million pounds (50,000 tons) were insecticides. Maryann Frazier's work at Penn State found up to 37 pesticides in any one load of pollen brought home by bee-foragers, and an average of four pesticides per pollen load. Beekeepers are sending bees out into a landscape that is saturated with a lethal cocktail of dozens of different bee-poisons.

It appears that bees are 'expendable' or are mere 'collateral damage' in the undeclared, all out, 'War Against Nature' which is being waged by pesticide companies, in collusion with the EPA.

I'm not sure what beekeepers can do about any of this – but arguing the science is not going to save the bees; the EPA threw the science out of the window when they licensed Clothianidin against the advice of their own experts. The so-called 'science' is nothing but camouflage to prop up a billion dollar poisons industry, for which the EPA serves more as sock-puppet than watchdog.

I suspect that political action (French style), and the loss of millions more bee colonies, leading to crop failures, will be the only things that will finally bring the EPA back to reality. Billions more bees, butterflies and bumblebees will surely die in the coming season, and nobody knows what the implications are for drinking water and human health.

An agency that consumes $10 billion of taxpayers money each year must surely be ethical, transparent, scientifically scrupulous and accountable, in its enforcement of the Law. Why should the citizens of the U.S. have to raise more money to drag the EPA kicking and screaming into the courts, to force it to uphold the very environmental laws it was responsible for policing in the first place? BC

GLEANINGS

APRIL, 2011 • ALL THE NEWS THAT FITS

SHB IN ONTARIO

The Ontario chief veterinarian has put some bee colonies in the southwest of the Canadian province under quarantine after it was found small hive beetle (Aethina tumida) has crossed the border from the United States.

Ontario provincial apiarist Paul Kozak tells the Canadian Broadcasting Corp. 50 bee keepers and several hundred colonies have been affected by the infestation.

There had previously been confirmed findings in southern Quebec and western Canada.

The Southwestern Ontario Beekeepers' Association says the quarantine prohibits beekeepers near Windsor, Ont., and Chatham, Ont., from moving colonies out of the yard where they're kept.

The area is across the border from Detroit.

Association president Mike Dodok tells the CBC the small hive beetle is a "serious pest" potentially affecting crop pollination.

"If they're a large commercial bee keeper they will not be able to bring their hives, let's say, into the southern part of Kent County where there's fruit pollination required," he says.

"That could be a problem."

Ontario officials say the beetle has previously been found in Michigan, New York state, and other bordering communities.

Beekeepers knew it was only a matter of time before it crossed the border.

Kozak says the first sighting in Ontario happened last September when the beetle was found by an Essex County commercial bee keeper, near Windsor.

"Before that we had no sighting of this beetle in the province," he says. "It's been in the United States for about 10 years previously."

Since the Essex County find bee inspectors have checked out all the colonies in Essex County and Chatham-Kent.

Quarantines were placed on 16 beekeeping yards and one processing facility in Essex County under the Animal Health Act

In January, small hive beetle was added under the regulations of the Ontario Bees Act as a named pest. The establishment of a quarantine area under the Bees Act complements these measures to further control the risk of spread to other areas of the province.

"In the grand scheme of things it is a smaller proportion of the colonies that we do have in the province but we're still taking it very seriously," Kozak says.

The official announcement says the quarantine has been established under the Bees Act to prevent the spread of small hive beetle to other areas of the province and to protect the integrity of Ontario's beekeeping industry.

"Establishing a quarantine area at this time, prior to the start of the beekeeping season provides the best opportunity to control movement of bees and prevent the inadvertent spread of small hive beetle from any yard where it might be present but not yet detected," the announcement says.

Under the quarantine, beekeepers must not move their bee colonies or equipment within or out of the quarantine area without the prior written approval of the provincial apiarist; report any previously unreported findings of small hive beetle to the Ontario Ministry of Agriculture; participate in surveillance and treatment as directed by the provincial apiarist; and follow biosecurity measures listed in the declaration.

The Ontario government says the ministry is working with the beekeeping industry and other stakeholders to manage the new pest.

Alan Harman

WORRIED ABOUT HOBBY BEEKEEPERS

A New Zealand commercial operator is unhappy with the growing number of hobbyist beekeepers in the country, saying the result could be an increase in diseased and unregistered hives.

Russell Berry operates 20,000 hives at his 67-year-old Arataki Honey Ltd. apiary in the North Island's Hawke's Bay region.

Its website says it is a family-owned, integrated beekeeping enterprise and the largest in the Southern Hemisphere.

Berry says some hobbyists have purchased hives hoping for high returns from Active Manuka Honey.

But the National Beekeepers' Association member says many will be disheartened after realizing only a small percentage of honey is active and potentially leave hives unattended and this could lead to disease.

"It's a wonderful hobby, but I'd recommend people think seriously about it as just that, good for your garden but don't think about it as making money," he tells the Waikato Times newspaper.

Berry says beekeeping increases with high unemployment rates and some hobbyists, including one who had purchased almost 50 hives without industry knowledge, could spread the *Varroa* mite and leave hives unattended.

New Zealand law requires hives undergo annual disease checks.

Hobbyists usually have less than 10 hives. They now account for 73% of the country's 3,188 registered beekeepers, the highest number since 2000 before *Varroa* devastated the industry. *–Alan Harman*

MI KNAPWEED TO BE ELIMINATED

Michigan beekeepers are facing an eventual 54% honey hit because federal law requires the state to remove non native invasive plants, in this case spotted knapweed, also known as purple star thistle.

The MI Department of Natural Resources and Environment's (DNRE) Wildlife Division completed a statewide invasive plant strategy in 2010 and one of the major priorities identified was the control of knapweed.

The DNRE is in the process of implementing the introduction of the two new species with a grant to Doug Landis, a landscape ecologist at MI State University's Department of Entomology.

He has selected five test sites in Schoolcraft, Missaukee, Crawford, Montcalm and Jackson counties that form a cross-section of the state from the Upper Peninsula to southern Michigan.

He is releasing and monitoring Larinus minutus, a knapweed flower weevil, and Cyphocleonus achates, a knapweed root weevil.

Both have shown to be effective in controlling knapweed in Minnesota, Wisconsin and Ohio.

The aim is to reduce the stands of spotted knapweed as it is an introduced, invasive weed and managers of natural areas want its removal. Since the biocontrol insects have already been released in surrounding states, their arrival in MI was only a matter of time. Landis is speeding up the process.

MI Depart of Agriculture figures show state producers gathered four million pounds of honey in 2010, ranking Michigan ninth in the U.S. in honey production with a value of $6.7 million.

Beekeepers estimate the value of honey raised off knapweed at over $4 million a year.

Landis recognizes the importance of knapweed to MI beekeepers and has selected several native, pollen and nectar producing species that will be over-planted on the sites where the knapweed biocontrol program is being tested. These native plant species flower in midsummer and are known to attract bees.

There is general acknowledgement this remedial step may not fully replace the $4-million value of knapweed when it comes to honey production.

Many beekeepers, particularly those in the northern areas of the state, rely on the plant as a major source of honey.

The MI Farm Bureau is on record as opposing any effort to eradicate spotted knapweed.

But MI Beekeepers' Association President Roger Hoopingarner says while release of biocontrol agents in MI may speed the process of elimination of knapweed as a major honey source, its fate is predetermined by the release in other nearby states.

"The plan of planting native plant species to replace the knapweed is a good, even if unproven, idea," he says. "I believe this makes the MI introduction plan a better one, and their inclusion in the plan recognizes . . . that honey bees and MI beekeepers are important."

"It was thought that if there were fewer seeds natural attrition would reduce the stands of spotted knapweed," he says. "While the flies were successfully established, their presence has not had much effect on reducing knapweed.

Hoopingarner says when he started beekeeping more than 60 years ago spotted knapweed was almost unknown.

Now it has spread throughout Michigan and is found mostly in poor, sandy or gravelly soils that have been disturbed. In wet or heavy soils other plants crowd it out.

In the poor soils that knapweed prefers it wins because it is alleopathic, that is it produces a chemical in its roots that prevents other plants from growing.

As knapweed spread throughout MI beekeepers soon learned of its nectar producing potential and began to place apiaries nearby. Today it is one, if not the most important, single nectar producing species for MI beekeepers.

A major problem for MI beekeepers is that knapweed flowers at an important time in the production cycle.

It is in bloom at the end of July and in early August and acts as a bridge when clover is waning and before goldenrod flowers.

"We have to find native plants to fill that window," Hoopingarner says.

"What is not known is how successful the over-planting will be, and what plant species will succeed in growing and producing nectar in these sites."

"From the late 1800s to about 1940 by far the major crop of honey came from sweet clover that was planted for dairy cow pastures. The sweet clovers were completely eliminated from pastures in the early 1940s and thus this crop was lost."

Alan Harman

OBITUARY

Jerry L. Shaw, 74, passed away in Mishawaka, IN February 3. Jerry was October 2, 1936 in Grant County, IN to Leon and Eunice Shaw. He was preceded in death by parents, his brothers and sisters, Maxine, Martin, Robert Shaw, Aldeene McFarren and Howard Jayce Shaw. Surviving are his wife of over 55 years, Carol, daughter, Beth (Kevin) Danley of Mishawaka, son, Scott (Terri) Shaw of Wyoming, MI, six grandchildren and one great-grandchild.

Jerry stated his teaching career in Wabash County and Grant County prior to going to Mishawaka. He was an Industrial Arts Teacher at Mishawaka High School for a total of 34 years before retiring in 1992. He was a farmer and a beekeeper. Jerry was a member of Michiana Beekeepers Association, former president of Indiana State Beekeepers and a member of the American Beekeeping Federation and a member of Mishawaka Education Association. He was also a member of Indiana Farm Bureau.

Jerry graduated from Ball State with a BS and MA. He coached tennis, track and basketball at Mishawaka High.

He was a member of the First United Methodist Church.

NEW HONEY REGS

Nebraska lawmakers give second-round approval to legislation to establish a formal definition for pure honey.

The bill introduced by state Sen. Annette Dubas is meant to ensure there would be a way to resolve disputes over whether a product being sold as pure honey is truly pure.

The legislation would direct the state department of agriculture to develop rules and regulations for a honey standard consistent with that set by the UN Food and Agriculture Organization and the World Health Organization.

Products failing to meet such a standard could not be labeled as honey.

Those who suffer damages resulting from the improper labeling of products as honey would be allowed to sue violators for actual damages or $1,000.

Dubas said the bill was introduced at the request of the Nebraska Beekeepers Association. With no state definition of honey, she said, honey producers have no civil recourse against producers of adulterated honey, as evidenced by an unsuccessful Michigan case.

Meantime in Utah, Rep. Stephen Sandstrom has proposed legislation to differentiate between raw honey and pure honey.

Sandstrom said raw honey has not been heated above 118 degrees, which means it tastes better and is healthier. Pure honey, he said, has been heated to improve the consistency.

He wants honey clearly labeled so consumers in Utah, where the honey bee, Apis mellifera, became the official state insect in 1983, know what they are getting.

The state has labeling rules, but they are primarily to prevent honey being mixed with cane, corn or other inexpensive sugars and then sold as pure.

Sandstrom's bill requires that honey produced, packed, repacked, distributed, or sold in the state may only be labeled as raw honey if it meets the definition of raw honey described in this bill.

It covers honey produced, packed, repacked, distributed, or sold in the state.

It defines raw honey as it exists in the beehive or as obtained by extraction, settling or straining, that has not been heated above 118 °Ft during production or storage and has not been pasteurized.

Alan Harman

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I don't know how it is where you live, but here in western Colorado, honey bees are the biggest thing since hula hoops. Everybody's ga-ga over the little darlings, what with them being endangered and all. You just mention that you own bees, and people want to buy your honey and be your friend.

There is also an explosion of interest in beekeeping from backyarders and sideliners. A handful of the latter operate around here, and there has even been some elbowing and jockeying for beeyard locations.

A couple of springs ago, one of my apiary landowners called to report that he'd gotten a call from someone who wanted to place bees on his property – where I keep my bees! Hopefully this was merely a misunderstanding on the part of my fellow beekeeper, because this is not the beekeeper way!

I live 55 miles from Aspen, and I work fulltime on the Aspen Mountain ski patrol. Summers I'm a part-time Aspen Mountain "ranger," meaning that mainly I hand out Band-Aids and advice to the gondola riders.

Aspen Mountain tops out at over 11,000 feet, and I've seen presumably feral bees as far up the hill as 10,500 feet. In town at 8,000 feet at the base of the mountain, you can find bees wherever you find flowers. I have no idea where they live.

I know some old-timers who kept bees around Aspen, and last Summer while exploring an abandoned dump on the ski hill, I found eight homemade but perfectly serviceable brood supers. All they need is a coat of paint. Aspen has always attracted not only the rich, but the eccentric. Who's more eccentric than a beekeeper?

Aspen Mountain has intriguing flora. Milk vetch thrives at all elevations, although it rarely blooms high up. As soon as you leave the ski area, you no longer find it. My guess is that it was planted long ago for erosion control. No one can remember. Alfalfa blankets some of the lower slopes. Dandelions start blooming in mid-May, and bees follow them up the hill as Summer progresses. There are wild strawberries and raspberries, and a host of native wildflowers.

The mountain manager likes me and buys my honey. He once told me, in a lighthearted way, that maybe I ought to try bees on the ski hill. Last Summer when I made a serious proposal, he practically leaped at the prospect. The Aspen Skiing Company is a "green" company, and Peter thought our very own ski area bees would dovetail with the company's image as a caretaker of the environment.

He made some thought-provoking suggestions about marketing Aspen Mountain honey, and we even talked about ways to turn my apiary into a tourist attraction. The liability angle didn't seem to bother him in the slightest. Ski areas are used to running with risk.

But talk is cheap, and I had reservations.

There are a few logistical hurdles to bees on Aspen Mountain. Let me draw you a picture. This narrow 600-acre hill goes straight up. A couple of old mining roads zig and zag to the summit. The ski trails dead-end in town. In the Winter, you can literally ski down the street, if you can get there before the sand truck.

But choosing a location proved difficult. For starters, I wanted one as far down the hill as possible. Higher elevation means cooler temperatures, and this is not the tropics. I've seen snow on the Fourth of July in Aspen. I wanted the little darlings to know it's Summer.

I needed a flat spot accessible by truck, yet the lower elevations are in general the steepest part of the mountain.

Next, I needed a location that's not on a hiker thoroughfare. Aspen Mountain is thick with Summer hikers. And I needed a site well away from the chair lifts. The chairs don't run in the Summer, but the lift crew guys need to be able to do their maintenance work without any bees in their bonnets.

And I wanted no surprises. I wanted a location where hikers could see the hives from a distance and not climb up over a rise and suddenly find themselves looking right at a bear fence.

Ah, yes, the bears. They're everywhere around Aspen. In lean wild berry years, they cruise the downtown alleys sniffing for leftover caviar and steak. They walk into people's homes. They pop open car doors. Would a solar-powered electric fence keep them out of a bee yard?

I combed the hill looking for the perfect spot, and of course I never found it. I did find a couple of locations that met most of my criteria. One was at 9,500 feet, the other above 10,000.

An otherwise perfect, flat bench just above the bottom of the hill seemed too close to a well-used footpath. Maybe if I put up some signs, folks would give the bees a wide berth. Maybe not.

So I was intrigued but undecided going into the Winter. It's late February as I write this. Yesterday the mountain manager pulled me aside. "Hey, Ed," he said. "You still interested in putting bees on the hill? Because another guy called me with the same idea. I told him I'd check with you first."

Suddenly I had no doubts. Somebody else put bees on my mountain? I don't think so!

"Peter," I said, "We'll iron out the details later, but this is a go!"

I like putting decisions behind me, and new adventures. This one is going to be fun.

Ed **Colby**

Put Somebody Else's Bees On My Mountain!?! I Don't Think So!