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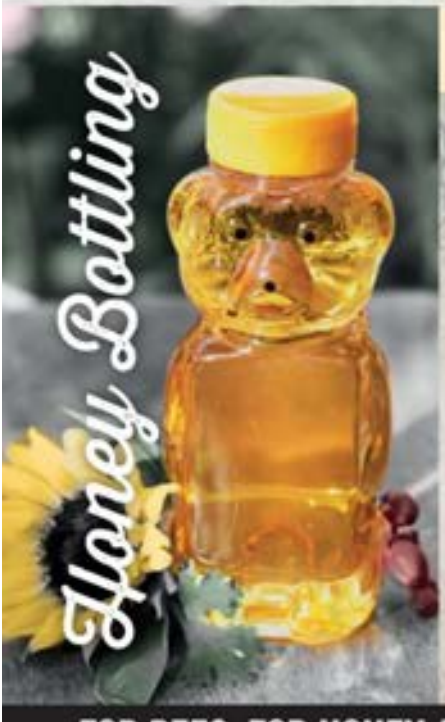

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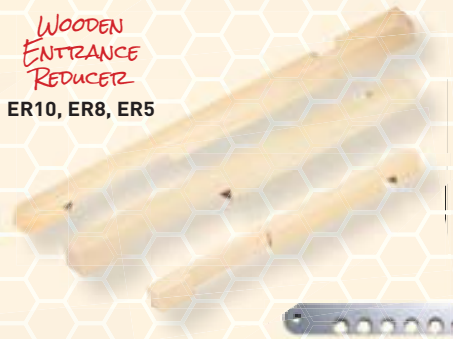

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The Other Side

It surprises me that there has been no response to the article that ran in Catch the Buzz on 9/2/20, (**https://www.beeculture.com/catch-the-buzz-we-are-inadvertently-damaging-honey-bees/**) from my beekeeper friends or scientists who have been investigating the neonicotinoid family of pesticides over the past decade. When I contacted Editor Jerry Hayes with my concerns he was gracious enough to offer me that opportunity.

While I am not a scientist, I have been a small scale commercial beekeeper for 45 years and I have paid close attention to the controversy over the effects of the neonics. Nearly every paragraph of the article is a misstatement of the evidence or an unsupported allegation of their safety. While I am not going to go tit for tat with the author on every point, let me address just a few.

Neonicotinoids do not target just a few pests that feed on the target crop. They are not safer than earlier pesticides. They do not boost crop yields except in a small percentage of their uses, serving more as expensive crop insurance. Their loss would not put farming operations at risk.

This is a complex controversy and instead of relying on what I may say, I encourage readers to take the time to read some of the basic research and form their own opinions. A good start would be the Linnaeus Lecture by Dr. Dave Goulson (**https://www.youtube.com/watch?v=WDkpVWzFnK0**). Next would be the work of Henk Tennekes of Holland and Francisco Sanches-Bayo, Delayed and time-cumulative toxicity of imidicloprid in bees, ants and termites (**https://www.nature.com/articles/srep05566?fst=0&l=ri&r=1**).

Finally I would direct readers attention to postings I have made on Tom's Corner (**https://www.bouldercountybeekeepers.org/toms-corner/**). Start with the article I wrote for *Bee Culture* in 2010, Do we have a Pesticide Blowout? (**http://www.bouldercountybeekeepers.org/wp-content/uploads/2010/07/PesticideBlowOut.pdf**), then scroll back through postings I have made over time which address the question of neonics.

And finally, let me throw out a challenge to the chemical companies and their apologists. I have made this challenge many times without response.

Using DDT as a reference point of 1, just what is the danger of neonics? In it's year of highest usage eighty million pounds of DDT were applied. Currently the EPA reports the annual usage of neonicotinoids at about four million pounds. That looks good, four million pounds against 80 million. Looks fairly good until you begin to understand the back story, what you aren't being told. These figures disregard seed treatment, which accounts for about 90% of the use, which brings us to an actual annual use of about 40 million pounds. Of that only about 10 percent or less goes into the plant while the remainder goes into the soils and groundwater. The work of Jean-Marc Bonmatin shows that the neonicotinoids are five to 10 thousand times more toxic to honey bees than DDT (**https://www.bouldercountybeekeepers.org/comparing-the-neonics-to-ddt/**). The math is simple.

The annual poisoning of the environment from the neonicotinoids is on the order of the toxic equivalent of 400 BILLION pounds of DDT, every year, year after year, on top of billions remaining from prior years. Are neonicotinoids safer for bees? To the contrary, they may represent the most massive poisoning of the environment we have ever experienced, for honey bees and a wide range of other life forms at the lower end of the food chain. The science clearly supports this. Don't be misled by industry propagandizing.

Tom Theobald
Colorado Beekeeper

Adopt A Bee

We all enjoy personal, fun mail, especially kids. And in these days of constrained socializing and pandemic cautions, kids of ALL ages love mail. A colorful letter really cheers up the senior citizen who only gets waves through a window, or a child, college student or military member who yearns for support and a bit of unique fun and cheer.

Just in time for the holidays, although this program extends throughout 2021, is a unique fundraiser: Adopt-A-Bee. Sponsored by the Michigan Beekeepers Association, each of your lucky recipients will receive an age-appropriate actual letter, a bee-autiful postcard of "their" bee – for the occasion you specify, like Christmas, birthday, anniversary or just because. The funds go to MSU Extension's programs to assist local bee clubs, provide even more online and hands-on education, and manage research and training apiaries throughout our great state. With three pricing tiers, you can adopt the right bees for your budget. Please consider this fun, important gift and adopt a bee (or a swarm of them!) at **https://www.michiganbees.org/adopt-a-bee/**. Thank you for showing special people in your life that they're very bee-loved, all while loving bees!
Adopt-A-Bee Committee, Michigan Beekeepers Association
adoptabeemba@gmail.com.

Charlotte Hubbard

PS: To learn more about MSU Extension's efforts or to make a contribution without adopting bees, please go to **https://givingto.msu.edu/crowdpower/beekeeping-education-support-fund**. To learn more about how the Michigan Beekeepers Association works on bee-half of pollinators, please check out **https://www.michiganbees.org**.

Zooming To A Bee Meeting

I have read Tina Sebastyen's article "Zooming to a Bee Meeting" and I have a comment.

You need to consider meeting security. People are out there who are looking for Zoom meetings to crash and disrupt. I have been to a meeting that was "Zoombombed"; let's just say it wasn't pretty.

Different sign-in information (meeting number and password) should be used for each meeting. The meeting sign-in information should be released to attendees as close as possible to the meeting time. The sign-in information should not be put on a public website/Facebook page, and invited attendees should not share the sign-in information with uninvited people.

If a moderator is used, he should have a list of the expected attendees, and not let in people who are not on the list.

May your Zoom meetings go smoothly.

Bill Miller
Dothan Alabama

More On Lawn Treatment

I'm a little behind on my reading and was just looking through the August issue of *Bee Culture*. One of the letters in 'From The Editor' asked about lawn treatments for mosquitos and ticks that are safe and non-toxic for honey bees.

I've been using concentrated garlic diluted in water and sprayed on my lawn, trees, shrubs, flowers, etc for several years. I used to have a pest control company spray it, but they inexplicably stopped offering it and went solely to pesticides. After trying other non-toxic treatments that didn't seem effective, I bought a backpack sprayer and found a source for the concentrated garlic and now spray it myself.

I don't know exactly how or why it works, but it definitely works. I live in a fairly swampy river-bottom area that is lousy with mosquitos. Without treatment of some sort, it's unbearable (not to mention unsafe - i.e., Zika, West Nike virus and such) to be outside in the summer. A treatment on my one-acre lot takes maybe an hour to apply and around $20-$25 worth of the garlic concentrate, which is a fraction of what I used to pay for professional application. A treatment lasts about a month, maybe longer if the weather is dry.

Eri Frobish
Illinois

Bigger Picture

It was with growing dismay that I read the recent article by Jessica Louque (Bigger Picture, *Bee Culture* August 2020). Why is a rebuttal to an email given full article status, especially a rebuttal that is strongly biased, emotional, and patronizing? The topic – considering potential conflicts of interest when digesting the science on a controversial topic (pesticides) is very worthy of an article, but this article falls short. I have been reading *Bee Culture* for a few years and generally greatly enjoy and learn much from your magazine. However, I request that the editorial board adopt a higher standard for full-length article authorship. The author described in great detail the need to consider conflicts of interest and bias, yet only partially revealed her conflict of interest buried in a later paragraph. She then defended her bias in a passive-aggressive style with descriptions of being "offended", "mad", and "purchased". She continued to defend "pesticide companies" and developed an argument against independent research. It's true that some universities might have fewer resources for experimental studies (and greater resources in other contexts), but there is great value in conducting those studies

because they can identify areas for additional research. I would argue that independent research is critical to safeguard public health, and responsible companies should strongly support it. Without independent research, we might still be using lead paint and pipes, breathing second-hand smoke, and failing to scrutinize Roundup. In all those cases, the industries responsible were involved in coverups and plenty of research bias.

Again, the topic is worthy of discussion and the email that was rebutted (I don't know which email because a link or reference was not provided) may very well deserve to be questioned. Unfortunately, the nature of the rebuttal distracted from a critical review of that email.

Scott Harris
Wren, Oregon

Editor's Response: *I appreciate your opinion. Just as I appreciate Jessica's and everyone else's.*

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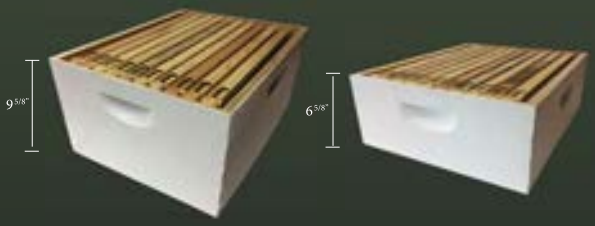

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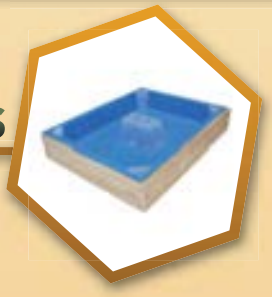

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Before *Varroa*, it was easier to be a Beekeeper in comparison to 2020. Back in the day we had AFB that antibiotics would control easily, maybe some EFB that would go away on its own many times and Nosema as a temporary issue for northern beekeepers. Severe pesticide exposure issues at times. Location availability on others property for decent forage was always a challenge.

Our world changed with *Varroa*. We had no idea all the honey bee health issues that would appear under the *Varroa* umbrella. There were lots of research funds given to explore *Varroa* control. The public has been engaged in honey bee health and the loss of this insect in the environment. But we are still talking about the same things as we were at the beginning of *Varroa* introduction in the U.S in 1987. Commercial beekeeping has not benefitted from the digital takeover of society that we all have been a part of. Yes we have mobile phones and computers but we have not seen or experienced the technology transition that Production Ag. has seen: Huge equipment, GPS capability, GMOs, Targeted pesticides/herbicides/fungicides, fertilizers, drip irrigation, and now remote sensing using drones. As an example read, "How Artificial Intelligence will Drive the Future of Agriculture", **https://www.growingproduce.com/farm-management/how-artificial-intelligence-will-drive-the-future-of-agriculture/?e=jerry@beeculture.com&utm_source=omail&utm_medium=newsletter&utm_campaign=afgenews09022020**

That is primarily because we have always been seen as an overhead to growers or an interloper looking for a free place to put colonies. Beekeepers with the help of honey bee biology regardless of pest, parasites and diseases always show up at the right time and get out of the way when told. But its getting harder and harder and we need the input of 21st Century technology coupled with better and more honey bee medical help.

Remote sensing: The buzz words. Several years ago I was involved in field research that used remote sensing for hive weight, temperature and humidity. It would identify, record and transmit what happened with hive weight and temperature but not why it was happening or when it was going to happen. It was not predictive. We still had to open the boxes and look and see. Beekeeping is a visual sport and you have to learn how to compare and contrast what you see. And those features of hive weight, temp. and humidity are not what we need to know primarily to maintain or restore colony health. Cost of similar technology now is very high when you think we have no consistency in honey bee genetics that if you test one hive it might be predictive of the others. It isn't 5,000 acres of one GMO corn hybrid. Or 1000 head of Black Angus cattle who all have the same Sire from artificial insemination. Others are looking at sound technology and camera technology that goes on hive entrances or inside the hive to see and use a laser to zap mites. It is a cobbled together product market currently. It will get better I am sure, but not soon. We have a ready market but a tough practical focus and user acquisition cost issues plus the learning curve – is there internet in the remote yard?

***Varroa* control:** USDA, University researchers and IR-4 are very involved in trying to identify chemical Varroacides that are more efficacious so that multiple treatments are reduced and collateral damage to the colony is minor. Killing a Little bug on a Big bug is tough, as you know, without hurting the Big Bug. Chronic collateral damage needs to be reduced. Acids such as Oxalic and Formic have taken center stage recently. They are low cost and delivery can be more efficient than other products. Control outcomes are variable because of these caustic acids sensitivity to temperature and humidity. Data show that multiple treatments damage honey bees especially the Queen who gets hit every time. The honey bees 'nose' is at the tip of its antenna. This can be damaged with multiple caustic acid treatments. One way Honey Bees communicate is with odors – pheromones. Damage their 'nose' and communication is disrupted and hive organization is compromised. Premature Queen supercedure is one result.

Breeding honey bees to become more resistant of *Varroa* is tough when you cannot control the other 50% of the genetics contributed from the 15-20 drones mating with the virgin queen in the DCA. Remote locations and artificial insemination are possible with a cost issue involved for bulk queen purchases.

What old, new and existing products we have currently available need to be part of an IPM strategy with Rotation, Rotation, Rotation as the mantra.

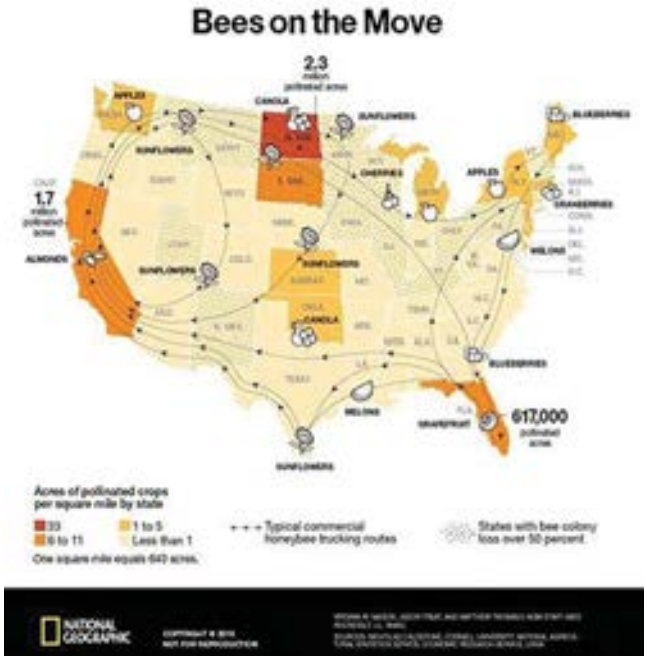
Nosema: Fumagillin is back but data show that for *Nosema ceranae*, which is dominating now, there is little or no control. Lots of essential oil, algae, probiotic products are available but little data other than anecdotal to confirm or deny efficacy. Buyer beware.

AFB/EFB/PMS: Antibiotics are under the control of the VFD (Veterinary Feed Directive) now. See; **https://www.fda.gov/animal-veterinary/development-approval-**

process/fact-sheet-veterinary-feed-directive-final-rule-and-next-steps. The reason for the VFD is resistance control as so many antibiotics were used prophylactically in the past when no infection was apparent hastening resistance.

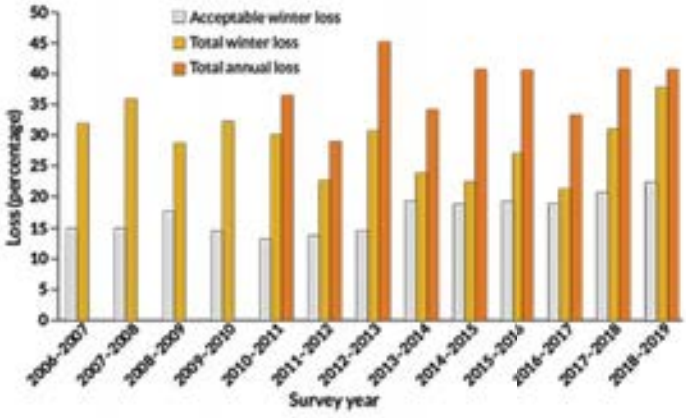
Natural/Biopesticide/Biorational: The definition of these is. **"**A pesticide or herbicide having relatively or no toxicity to non-targets and causing relatively little or no damage to the environment." These can be Botanicals, Microbial pesticides, minerals. Examples of these would be for us, Bt, Caustic Acids, Thymol, other Essential Oils, Nematodes, Pheromones, fungus, bacteria and bacteriophages . On the horizon we will most likely see more of these individually or part of a systems approach where these are included in a mix of active ingredients. The day of a long term silver bullet for honey bee health issues may be past.

One of the more interesting is the use of **Bacteriophages**. These are viruses that are everywhere that attack and feed on specific individual bacteria strains. They are specific and do the same thing antibiotics would do- they **disrupt bacterial cell walls**. Not the cells of our bodies, or animals or plants or Honey Bees. There was a startup company in the U.S. that identified a Bacteriophage that used AFB exclusively as its prey, if you will. They were trying to bring this to market but ran out of resources to get it through FDA. There was an article recently that highlighted work in New Zealand on the same bacteriophage and the success they were having within a research project. This use of 'phages therapy' has already expanded to address plants and humans, **https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5977211/#:~:text=Phages%20developed%20for%20the%20control,and%20on%20non%2Dtarget%20microorganisms**



Veterinarian Educational Outreach: There is a Honey Bee Veterinary Consortium, **https://www.hbvc.org/**, that is working with Veterinarians who already have honey bee interest and for training the next generation of Veterinarians. KSA (Knowledge, Skills and Ability) for individual Vets is in short supply but we need them long term if they can increase their Honey Bee IQ and simultaneously lower their costs.

Indoor Wintering: For many years some commercial beekeepers had access to unused potato cellars to over Winter honey bee colonies to moderate outdoor Winter weather effects. This concept has advanced and there are specially constructed above ground warehouses with a suite of indoor environmental controls in which to overwinter honey bee colonies. With the lack of consistent honey bee *Varroa* controls and the immune burden of viruses this seems to be a better method of reducing these temperature extreme stressors over some northern Winter conditions.

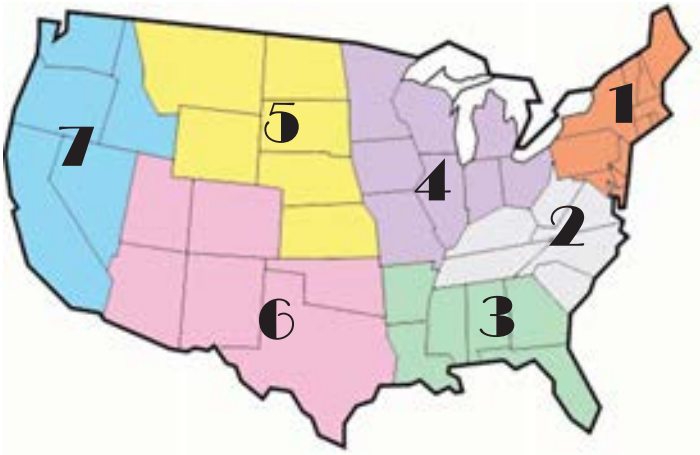


Indoor *Varroa* Control: The above indoor climate controlled warehouses are being tested and used to place colonies in during warmer months, stopping or slowing brood production, causing *Varroa* to become phoretic (exposed) and then applying treatments for better control. Ongoing research.

Grower Appreciation of Beekeepers: As mentioned, Beekeepers and the colonies they manage are considered a production input overhead no different than fertilizers, or pest control or irrigation. Beekeepers and their managed honey bees show up, they are used to create a crop and then they go away until next year when this cycle repeats itself, putting all the burden on the beekeeper to produce a significant income crop for someone else. There are some organizations such as the HBHC (Honey Bee Health Coalition) that have partnered with others to improve and understand the important and unique characteristics of commercial beekeeping

Opportunities for significant business power if managed by organized beekeepers. BC

NOVEMBER – REGIONAL HONEY PRICE REPORT



Spring, Summer, Fall Honey Crop

We took a look at the Spring, Summer and Fall honey crops this time across each region. Some, of course, don't have all three. We looked at average weather for each crop, what per cent of colonies actually produced honey, and what the major honey crops were.

Region One didn't have an outstanding year. They only harvested honey from 53% of colonies set up for production, and for most it was a worse year than last. Spring temps were mostly warmer than usual, but a few cold spots lingered. Moisture was dry to average. Crops included maple, dandelion, berries, locust, fruit trees and wild flowers. Summer was warmer and dryer than usual, and the main crops were Summer clovers, basswood and wild flowers. Fall was about the same, too warm and too dry, with goldenrod and asters the main crop.

Region Two harvested from right about 70 per cent of their producing colonies, producing about an average crop compared to last year. Spring temps were about average, but it was wetter than usual, and crops were lots of locust, clovers, basswood and wild flowers. Summer was warmer than usual, and mostly too wet, but some dry spots did OK. Fall temps were average to a bit high, and rainfall was less than usual. Crops included mostly goldenrod, aster and wingstem.

Region Three harvested from a healthy 80 percent of their colonies, and had a slightly warm, wet Spring, with tallow, wild flowers and fruit and berries the main crops. Summer was a bit warmer than usual with average moisture. Crops include loosestrife, cotton, soybeans, wildflowers, and the clovers, with some milkweed and sourwood thrown in. Fall had mostly average temperature, but a bit wetter than usual. Goldenrod, asters and wildflowers were the crop.

Region Four was mostly cooler than average and way wetter than average, with dandelions, locusts, berries and wild flowers the crops. Summer in this region was hot and dry, with clovers, soybeans, alfalfa, the major crops. Fall weather was about the same, warm and dry, with goldenrod, aster, alfalfa and sunflowers and some wildflowers the main crop. They harvested from right about 65 per cent of their production colonies for an average to slightly better year.

Region Five, often considered the bread basket for honey, harvested from just 60 percent of their colonies, but still had mostly an average to better season compared to last year. Spring was warmer and wetter than usual, dominated by clovers and dandelions. Summer hot and dry, with clovers, soybeans and alfalfa the crops. Fall was more of the same, with goldenrod, wildflowers and alfalfa the main crops.

Region Six, hot and dry all season this year, harvested from 80 per cent of the operating colonies, and considered it a better than average season. Spring was for mesquite, tallow, willows and wildflowers. Summer, along came more wildflowers, knapweed and alfalfa. Fall was all goldenrod, sunflowers and wild flowers the main crops.

Region Seven, with all the fire going on up north, had about average temperatures early on and was actually wetter than normal, with berries, deer brush, madrone, fireweed and some maple helping out. Summer was hot and dry, with some bamboo, clovers and alfalfa, more fireweed (gotta love the irony of that), and some Summer vegetable crops adding in. Fall was hotter and very dry, with mostly pollination crops filling the supers. Beekeepers harvested from almost 90 percent of their colonies but felt it was only an average to just below average year overall.

	REPORTING REGIONS							SUMMARY			History	
	1	2	3	4	5	6	7				Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS								Range	Avg.	$/lb		
55 Gal. Drum, Light	2.25	2.28	2.23	2.06	2.38	2.05	2.50	1.65-3.00	2.17	2.17	2.18	2.21
55 Gal. Drum, Ambr	2.16	2.29	2.14	1.96	2.16	2.00	2.43	1.45-3.00	2.09	2.09	2.02	2.11
60# Light (retail)	224.14	200.00	215.00	198.54	157.50	200.00	205.00	150.00-325.00	210.77	3.51	206.28	195.93
60# Amber (retail)	221.86	201.25	203.33	178.55	221.86	190.00	197.40	150.00-325.00	206.21	3.44	200.40	194.88
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	100.80	81.07	97.20	77.40	61.20	94.44	94.44	60.00-144.00	86.89	7.24	91.76	89.54
1# 24/case	181.92	125.35	134.77	113.79	152.50	127.60	136.20	84.00-211.20	131.27	5.47	129.58	135.50
2# 12/case	173.76	118.00	118.85	102.10	96.60	114.00	123.00	72.00-192.00	116.61	4.86	111.50	126.65
12.oz. Plas. 24/cs	122.35	110.69	104.67	93.64	83.76	101.40	112.80	66.00-216.00	103.70	5.76	98.17	100.12
5# 6/case	204.00	116.45	190.50	112.14	113.16	105.00	146.48	71.50-240.00	137.21	4.57	134.07	140.76
Quarts 12/case	213.62	175.04	133.65	145.82	139.08	155.70	162.00	109.20-420.00	162.63	4.52	157.41	155.43
Pints 12/case	118.72	112.89	78.67	89.64	139.00	109.00	96.00	60.00-210.00	102.43	5.69	98.99	88.92
RETAIL SHELF PRICES												
1/2#	4.50	4.99	4.35	4.63	3.87	5.45	5.45	3.00-9.00	4.89	9.79	4.95	5.19
12 oz. Plastic	7.06	7.03	6.13	5.55	5.33	5.72	6.13	3.79-12.00	6.23	8.30	6.23	5.99
1# Glass/Plastic	8.00	7.97	8.78	7.04	7.73	7.30	7.67	4.79-14.00	8.05	8.05	7.89	8.06
2# Glass/Plastic	14.75	12.99	15.72	11.77	13.72	15.50	14.33	8.39-21.50	13.92	6.96	13.04	14.09
Pint	13.44	13.45	9.19	10.46	11.00	10.00	10.30	4.00-27.00	11.38	7.59	11.40	9.99
Quart	21.62	18.81	16.98	15.80	20.04	16.25	18.80	8.00-42.00	18.23	6.08	18.73	17.91
5# Glass/Plastic	34.50	27.58	41.00	26.28	18.67	20.99	30.14	13.55-50.00	28.50	5.70	27.17	28.99
1# Cream	10.00	8.25	10.55	9.90	7.72	10.55	12.50	6.00-16.00	10.10	10.10	9.66	9.90
1# Cut Comb	14.55	16.63	12.65	13.50	15.00	14.55	15.00	8.00-24.00	13.10	13.10	12.70	12.98
Ross Round	10.94	7.20	10.94	11.33	10.94	11.00	13.75	7.00-15.60	10.57	14.10	10.54	10.16
Wholesale Wax (Lt)	6.78	6.35	6.00	6.45	5.85	4.25	6.67	2.50-12.00	6.32	-	6.46	6.96
Wholesale Wax (Dk)	5.66	5.24	4.52	5.63	5.66	2.50	5.66	2.00-10.00	5.31	-	5.06	6.06
Pollination Fee/Col.	107.48	75.71	70.00	72.50	107.48	107.48	200.00	50.00-200.00	89.96	-	84.96	86.67

NEXT MONTH

Region One
- Feed Dry sugar if stores are low
- Feed Sugar Syrup if stores are low
- Insulate hives
- Provide top ventilation
- Don't disturb too much
- Too late for mite sampling or treatment
- Make sure electric fence works
- Read *Bee Culture*
- Add insulation to Nucs
- Sleep in

Region Two
- Feed thick syrup if needed
- Work on repairing damaged unused woodenware
- Kick up my feet
- Too late to treat for *Varroa*
- Keep eye on hive weight
- Order new woodenware
- Group Nucs together

Region Three
- Check honey stores
- Feed if needed
- Assemble new woodenware
- Feed probiotics
- Treat for SHB
- Repair equipment/order next year's supplies

Region Four
- Combine weak colonies if you already haven't
- Wrapped colonies
- Put up wind breaks/snow fence
- Feed if needed
- Hope you sampled and treated for mites four months ago
- Probiotics
- Install mouse guards
- Put on candy boards if needed

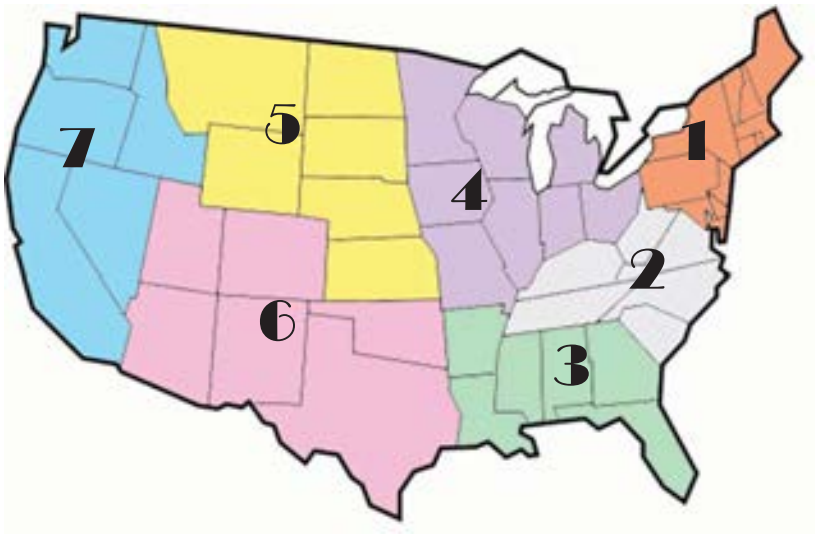
Region Five
- Build new boxes
- Check Food supply
- We Winter indoors so moving colonies now
- Insulate colonies
- Feed sugar syrup
- Will be done winterizing by time you read this
- Set up good windbreaks
- Too late to treat for mites

Region Six
- Feed
- Check for Dead Hives
- Inventory and bookwork for tax year
- Feed some more

Region 7
- Check beeyards
- Build equipment
- Nothing
- Melt wax capping's
- Feed As needed
- Ventilate to remove moisture
- Leave them ALONE!
- Feed to build up for Almonds

Honey Reporters Wanted

We are expanding our Honey Reporter population and need new reporters in EVERY region. We ask that you fill in most of the wholesale or retail or both sections, most months, and our short survey on the back. We give you a FREE subscription for your service. So if you are interested send an email to **Amanda@BeeCulture.com** and put REPORTER in the subject line. Include name, email, phone number and mailing address and we'll get you the next Honey Report form. Sign up today and be a part of the BEST Monthly Honey Price and Beekeeping Management Report in the industry.



It's Summers Time –

Somewhat Random Thoughts –

It's Fall and really beautiful here in Northeast Ohio. One of the nicest things about living in this area is the dramatic seasons we have. Each one makes it presence known in a huge way. Fall is a favorite time for me – the nights are cool, the days are usually fairly warm until November and the colors are amazing.

Kim and I have had lots of good help this Summer so we've gotten several projects done – mulching, trimming, planting a bunch of trees. Our journey into the land of raised beds was interesting. We were a little over zealous with the amount of plants we put in each one, so the peppers kind of got swallowed up by the tomatoes. We'll do better next year.

We're turning the plot that was the big garden into a small orchard. Several years ago I got a book at the Mother Earth News Fair called *Grow A Little Fruit Tree*, by Ann Ralph. I was intrigued by the concept of having lots of small fruit trees, in a small space – accomplished by pruning techniques. So now we're going to try it. No ladders – old people shouldn't climb ladders – and not 40 bushels of whatever fruit you're growing. We've started with four or five Persimmon trees that we got somewhere at some tree sale. I'm pretty sure I've never eaten a Persimmon. In the Spring we'll get cherry, apple, pear and peach to add to the mix.

If you noticed my page was missing from the October issue. I was pushing through to finish the newest edition of *ABC & XYZ*. I know it's hard to believe, because it has taken a very long time, but the book is near completion. By the time you are reading this it will be at the printer and our tentative plan is to have it on site in early to mid-December. It has been a journey – a somewhat painful journey at times – but we're finally there. You can see a few details on page 88 in this issue, but watch the December issue for more and also watch our Facebook page. Amanda will be posting on Facebook as soon as it is in the building.

I want to send a huge shout out and thank you to Brenda Bray for taking over for me on the layout of the October issue so that I could press on with this task. Brenda has been working with the *Bee Culture* team for several years now. Her main duty is putting together our quaterly magazine, *BEEKeeping, Your First Three Years*. But when she's not doing that she's always helping us out with other tasks. Thank you, Brenda!

The ducks and chickens are still one of our joys here on Spieth Road, although Kim has taken on much of the burden while I've been busily working on *ABC*. I've missed all of that and look forward to getting back out there. Some strange things have gone on this Summer.

We have six ducks – started with seven and lost one very early. So these six are a year old now and because of the type of breed it's hard to tell male and female. In the Spring they started being very aggressive, not just the normal mating activity. So I got out the book and started reading. It seems that if you have a disproportionate ratio of male to female you get this aggressiveness. We went through various separation groups and have landed on a group of two and a group of four. We still don't know which are male or female or maybe they are all male because we haven't seen any eggs from any of them. But at least they're not fighting any longer.

We're at 16 chickens. We just lost one this week. And as is very typical she seemed fine and then one day wasn't – sitting off in the corner by herself and then gone. She didn't seem to be in any pain, just sitting there. No one was picking on her. Then there was one last night that seemed to be on her almost last breath and we thought for sure she'd be gone this morning. But she greeted Kim and ran outside with the rest when he opened the door. The life of poultry!

As has happened too often this year Ohio lost two more friends of the beekeeping world. Don Downs lived just down the road from us and was very big in the Apitherapy world. Another friend, Barry Conrad passed away this past month. You may recognize Barry's name from our *Bee Culture* calendar. Every year he sent in winning photos.

We also want to send our thoughts to Keith Delaplane of the University of Georgia, on the loss of his wife Pilar, in September. Pilar had fought a long and hard battle with cancer.

This has by far been a hard year and as we head into Winter soon and the holiday season we don't really know what to expect. I love the holidays – Thanksgiving and Christmas and New Year's Day. We love having people over, going to Christmas Eve Service, doing all of the Winter activities that Medina offers. So I'm trying to be creative in how we do things differently this year. But it's hard. I miss all those hugs. I missed seeing lots of you at all of the bee meetings that had to be cancelled or zoomed. But I also have to be thankful that our family is healthy and I sincerely hope your's is too.

Whatever your Thanksgiving ends up looing like we hope it is a very happy day. Take care, stay safe and I hope to see a bunch of you real soon.

And Kim says hi to everyone. He's keeping busy even though retired. His new email address is **kim@growingplanetmedia.com**. He'd love to hear from you.

Hardy Summers

P.S. We want to apologize to Jennifer Berry for misspelling her last name in the October issue.

BEE TALK

Send us your questions, we'll find the answers. Our regulars and our guests will share what they know. Send your questions to Jerry@BeeCulture.com, with BEETALK in the subject line.

QUESTION – Over the Summer I started my first Observation Hive. A big four-frame deep one. I wanted to place it in our family room so selected a location right in front of a big window facing south, built a stand and drilled a 1½" hole in the wall for a tube entrance/exit. I had started a Nuc and let them build up and then transferred the frames, bees and marked Queen into the Observation Hive. I moved it into my prepared spot. It looked Great. The colony was full of bees and had all the things they needed. They have dwindled down from four-frames of bees to one. The Queen stopped laying and has shrunken to not much bigger than one of the workers still left. I don't see any disease. I did see a wax moth larvae. They have stored honey still in the comb. What is going on? What did I do wrong? Johnny Dixon

ANSWER – Well, it's a learning curve like everything else.

Not to be a pain, but where do honey bees live? They live inside a pretty dark cavity. The key word is 'dark.' None of the young workers, nurse bees likes to be out in the light. Only the sacrificial older foragers are designed and destined to maneuver in the sunlight. The Queen does not like to do her egg laying, nor do the Nurse bees like being outside in the light. But, an observation hive is certainly self-contained and secure but it is designed for you and I to look into it and that means light is needed so it has transparent glass panels that let light in easily. The Queen and the colony members are uncomfortable and stressed and feel the colony is in jeopardy so Queen shuts down. Researchers use observation hives all the time but these are not exposed to bright outside lights. They are in rooms that use Red Lights because we can see under Red Light illumination but Honey Bees cannot see Red so they think it is all dark and go about their business. I am not suggesting you put Red Lights in your Family room but why don't you simply cover the Observation hive with some type of cloth covering when it is not being looked at. Taking the cover off and watch for an hour or so a day is OK. Leave it covered the rest of the time especially in front of the nice bright window you have it in front of. Let me know how it works out. *Jerry*

I did what you said, it took a couple of weeks, but the Queen is full size again and laying and the colony has brood and looks like it is growing. Thank you so much.

QUESTION – I haven't seen or heard anything about the phorid fly threat to the honey bee for a while. What's the current status? Blaine Nay

ANSWER – That is because it wasn't a concern a few years ago as it was already recognized as a known minor parasite connection with honey bees and other insects. Researchers do this kind of thing from time to time hoping it is a slow news day and get attention and more funding. Not unlike the 'Murder Hornet' attention over the last few months as media and people wanted to escape from COVID-19 news.

QUESTION – I was helping a friend recently who bought six nucs this year. Four of the six look good and well behaved.

Two were queenless and one had already become laying workers by the time I saw them, so I gave her a mini nuc with a good new queen and merged them wi/ mean girls via the newspaper method – should know the outcome there shortly.

BUT, I had an extra Jackie Park Burris queen we introduced to the other mean one, she was accepted, saw brood etc. , but the bees were still like being under machine gun fire.

Also, the first time I went to install the queen, there was a swarm close by so I helped her catch her first swarm which was fun, but when I visited last time, they look good, nice brood, but ALSO very mean.

I've only been doing this 12 years, but have had about 40 hives past few years and have only encountered fussy bees when they were trying to requeen themselves a couple of times, but never to the level of these bees, and once the new queen emerged life was happy again for all of us so I was expecting once they had brood to care for etc., things would settle down.

Any thoughts or suggestions? Do you think the new workers emerging from new queen will settle this problem down? Looking for your expert insight if you have a minute.

Thanks for your help and doing a super job with the magazine!!!! Congrats!! Mary Raymond

ANSWER – An expert is anyone at least 200 miles from their home. Where are you located?

Jerry story – I bought six nucs and they were fantastic looking, wall to wall brood. Installed them at home and let the population build. As it did, they got nastier and nastier. Really bad. I had one swarm go under the stump of an old cut down tree in a cavity between the ground and the stump. Then it all made sense to me. Having experienced this years ago in Florida with AHB, African Bees. AHB has wall to wall brood because they want to reproduce by swarming multiple times a year. When the colony is small, like in a nuc, they can be fairly calm. When they build up, they become more and more defensive. When they swarm, they will

select cavities below ground like water meter boxes, and under houses and trees. I spent some more money and purchased queens from a local Queen Breeder that I had confidence in. Made the colonies Queenless for a couple days then left the queens in their cages and wedged them between frames for a couple more days. Released them and they all were accepted. But, remember that all those defensive workers were still there and having a new Queen doesn't change those genetics. Mine were still grumpy until the next cycle of brood from the new Queen emerged. As more emerged the nicer they got.

All that to say I think the original nucs and their Queens had some level of AHB genetics in them.

What do you think?

Thank you for the *BC* compliment. *Jerry*

QUESTION – I have two hummingbird feeders and I have about a dozen hummingbirds that visit every day. Two times this week I have had a big bunch of honey bees that have surrounded one feeder. Is there any way I can keep the honey bees away without harming them or the hummingbirds? Patricia

ANSWER – As you know the reason the honey bees are there is because you have offered them a free easy meal. The honey bees tongue is much shorter than the hummingbird's beak tongue combo so many people will put small mesh hardware cloth around where the birds and the bees are accessing the sugar water. The hummingbirds can still insert their beaks through the mesh and their tongues can access the sugar water. The honey bees can't. *Jerry*

Thank you so much for the information. Is there a way to provide sugar water for the honey bees, or is that not a good idea? Patricia

You could but the honey bees are super efficient so are simply looking for an easy meal rather than visiting flowers for nectar. I would rather they visit flowers and get natural nectar and pollinate the flowers in nature. My opinion. Jerry

Mite Biter Gene

Targeting A Single Gene Responsible For Grooming Behavior In The IN Mite-Biter Strain

Krispn **Given,** Greg **Hunt**

Honey bee researchers at Purdue university and the University Guelph School of Environmental Sciences have isolated a gene associated with grooming behavior! With virus vectoring *Varroa* mites in about 90% of U.S. honey bee colonies most beekeepers, especially commercial, rely on some form chemical compound or miticide like amitraz to eradicate them. The importance of keeping honey bee populations alive through selective breeding is significant because one-third of our food depends on them! Among the vast numbers of pollinators, the Western honey bee is the most important pollinator globally.

This recent publication demonstrates that IN mite-biting bees have decreased Winter mortality compared to some commercially available stocks many commercial and hobbyist rely on. The mite-biters colonies survived three times higher than the Italians in this study conducted at Purdue University. Beekeepers can help reduce the population of *Varroa* with the mite-biter bee that researchers are breeding to resist them. But even more significant was that *Nerexin-1* gene expression corelated with the proportion of mutilated mites from the mite-biting bees mandibles! Some say bee breeding is like breeding sheep to resist wolves but sheep cannot kill wolves – bees can certainly kill mites.

"The aim of this study was to assess the efficacy of selecting for increased mutilation of *V. destructor* mites as a tool to breed *V. destructor* resistant bees and the possible involvement of AmNrx-1 in mite biting behavior. We expanded the evaluation of the Indiana mite biter stock by comparing it with an Italian commercial genotype for *V. destructor* mutilations, mite population growth, and Winter survival. We also correlated mite population growth and the proportion of mutilated mites with the expression of AmNrx-1 in bees, to assess the value of this gene as a potential marker of *V. destructor* resistance." BC

Link to the Apidologie publication: **https://link.springer.com/content/pdf/10.1007/s13592-019-00710-y.pdf**

Krispn Given and Dr.Greg Hunt visiting a OH bee breeder with some of their IN Mite-biter bees. They started selecting for Varroa *mite-resistant traits over two decades ago at Purdue Universities honey bee laboratory.*

Eagle Scout Project

Thomas **Babcock**

Honey Bees At The Salisbury Zoo

I would like to tell you about an Eagle Scout project involving live bees and a native pollinator garden.

Robbie Senesi is the Scout and the son of a friend. He showed an interest in attaining a Merit Badge for insects and Honey Bees. I agreed to mentor him. Since the City of Salisbury, MD is a certified "Bee Friendly City" we came up with the idea for a native pollinator garden with working beehive. The president of our local bee club, Sam Gibson, had a contact at the Salisbury Zoo. The Zoo was on board and we now had our Eagle Scout Project. The City Zoo was thrilled to have the project. Robbie and his fellow Scouts cleared the space, planned out a native pollinator garden and planted with the help of Master Gardener Ginny Rosenkranz. Then with Robbie's help the bees were moved from my apiary into there new home. A yearlong planning project had come to the final placement of the last piece of the puzzle (The Bees). Along the way Robbie learned how to plan a project, maneuver through a government agency to allow Bees in public, organize and schedule fellow scouts to help work, raise funds, learn about native pollinator plants, and most important learning about bees and how to take care of them.

When the Zoo opened for the weekend I went in and sat down on a bench. As I was watching the bees come and go I saw a youngster walk up to the educational sign. He was so excited to show his Mom and Dad real honey bees. Come quick look at the Bees! I realized then that all the work was worth it. BC

FOUND IN TRANSLATION

Drones, The Other 50%

Jay **Evans**, USDA Beltsville Bee Lab

Given the need to battle mites and other disease threats, good beekeepers scrutinize the genetics of their queens and the genetic contributions they carry from long-dead mates. In doing so, they may wonder whether their individual efforts, from buying pricey selected queens to culling queens from poorly performing colonies, will actually make a difference. And what about holding back on disease treatments to select for more resistant stock? While it is true that improved genetics will serve this generation and those for years to come, life is complicated. As I lamented in this column in May, 2018, ("**Holding The Line On Trait Rot and Inbreeding"),** your designer queen will never be quite as valuable as the day you drove her off the lot. Also, artificial selection for desired traits, like its counterpart in nature, is often two steps forward and one step back. Still, there are ways beekeepers, and especially communities, can work to nurture positive genetic traits.

Outbreeding is the norm for honey bee queens. Queens mate a good distance from home to 15 or many more males selected not by a careful assessment of their genes but by an assessment of their abilities to fly fast enough to keep ahead of the pack. This by itself reflects good drone genetics in a way, since successful drones came from a colony strong enough to produce them and they were at least fit enough to fly up to two miles from home before their final sprint to copulation. Still, not every drone who lucks into an encounter with a fertile queen carries top-notch genetic traits.

Visits by drones and receptive queens to Drone Congregation Areas (DCAs) are sporadic but the greatest activity occurs in the afternoon, peaking at approximately 4 p.m when the weather is right. I asked my excellent USDA colleague, Dr. Mohamed Alburaki, how to estimate the crowds at these aerial hookup sites. He has successfully used the 'Williams' drone trap, a fabric kite holding an artificial queen (an absorbent lure soaked in queen pheromones). Once a promising site is identified, this kite is lifted aloft using a helium balloon or even with a mechanical unmanned aerial vehicle, the "drone-drone" trap. Males are lured into the folds of the kite where they will find not a queen but dozens of equally frustrated males. Dr. Alburaki is using these traps to identify the genetics and physical traits of drones lured into his research apiary, and is getting insights into how far they have travelled to get there. Maritza Reyes and colleagues in France measured individual drones in source colonies using specific tags ("Flight activity of honey bee (*Apis mellifera*) drones", 2019, *Apidologie,* 50:669-680, 10.1007/s13592-019-00677-w), showing that drones started with orientation flights at six to nine days of age, then paused to grow up more before carrying out most of their mating flights once they were 21 days old. True mating flights lasted approximately 30 minutes, and drones, assuming they did not actually mate, took several flights a day, coming home for honey in between. On average, drones spent 510 minutes aloft in colonies monitored in the Spring and 327 minutes in Summer colonies, again highlighting the need for drones to be relatively fit in order to be part of the mating swarm at DCAs.

Other than simply surviving up to the moment of mating, what do individual drones contribute to their queens? Jesús Yániz and colleagues in Spain reviewed studies of sperm quantity and quality for honey bee drones ("Sperm Quality Assessment in Honey Bee Drones", 2020, *Biology* 9:174; doi:10.3390/biology9070174). In raw numbers, drones contribute 2+ million sperm when they mate. Since queens only store 3-5% of the sperm from each

of their many mates, the sheer numbers of sperm picked up at the local DCA are generally not limiting. However, sperm quality is key and Yániz and co-authors described studies showing that up to half of the sperm produced by some males is not viable at the start, and presumably a greater proportion will fail over the lifetime of queens. Non-viable sperm often reflects stresses during male development, from chemicals to poor nutrition.

Those who wish to maintain great genetics, and especially those who are breeding queens, should attempt to find out the makeup of their local drone population. Whether you are raising queens for profit or simply doing backyard splits, your receptive queens are sampling drones from a wide area and consequently a large set of source colonies of unknown stock. Patsavee Utaipanon and colleagues have provided new estimates for just how widely drones travel to DCAs, critical data for those keen on helping their queens find quality sperm ("Estimating the density of honey bee (*Apis mellifera*) colonies using trapped drones: area sampled and drone mating flight distance", 2019, Apidologie 50:578–592, 10.1007/s13592-019-00671-2.). Based on their genetic measurements, drones flew up to 3.75 kilometers (2.3 miles) to their traps. This means a potential drone source area of 44 square kilometers or over 10,000 acres. The island of Manhattan, with 1.6 million residents and quite a few honey bees, is under 60,000 km^2 and bees in broad areas (e.g., Medina, Ohio, 30 km^2) can share a single DCA. In short, you will likely have a beekeeping neighbor, or many, near your mating yards unless you take great pains to push them away.

Even with incursions by the drones of other beekeepers, there is great merit in maintaining the genetics you control (your queens) and there is a community benefit in selecting for, or purchasing, the best stock. Next month I will cover some success stories and role models for longterm, holistic efforts to improve the genetics of field-mating populations. As homework, you might read a freely available review by Jacques van Alphen and Bart Fernhout ("Natural selection, selective breeding, and the evolution of resistance of honeybees (*Apis mellifera*) against *Varroa*, 2020", *Zoological Letters*, 6:6, https://doi.org/10.1186/s40851-020-00158-4). These authors, and many others in research and the beekeeping industry, argue that fighting the rot is well worth it. BC

Photos by Dr. Mohamed Alburaki, USDA-ARS Bee Research Laboratory.

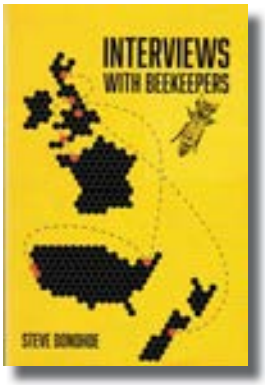
New Winter Reading –

Interviews With Beekeepers, by Steve Donohoe. Published by Zuntold Publishing. ISBN 978-1-9162042-5-6. 358 pgs., color throughout, softcover. $29.95 on Amazon.

An interesting book of interviews with an eclectic collection of commercial beekeepers from several very different locations. Each interview was recorded by the author, and then actually transcribed with each question and each answer reproduced pretty much as is. There are some sub-interviews also, those who work for, or with the person in mind, so you get a feel for the whole operation, which is uncommon, but both entertaining and insightful.

Another interesting twist is that he often asks each interviewee similar questions to determine differences in beekeepers, and differences in location. Some of these are about raising queens, good and bad years, getting started, mentors, for some of them a question on the issues surrounding neonics is looked at, the roles of hobby beekeepers and hive types and ventilation in particular.

The beekeepers interviewed were Murray McGregor, from Coupar Argus, Scotland; Mike Palmer, a well known commercial nuc and queen producer from Vermont; Peter Little from Exmoor in the UK, who talks in detail about instrumental insemination; Peter Bray, who used to be a commercial beekeeper but now is mostly a honey packer from Leeston, New Zealand; Richard Noel, from Brittany, France, who stresses the value of talking to as many people as possible about your business; and Randy Oliver and Ray Oliverez, two well known operations in Northern California in the U.S.; and finally David Kemp, from Nottinghamshire, UK., who was an assistant to Brother Adam.



All of these people have something unique about their operations, and the author finds ways to get them to share much about how they do business. This isn't a book for beginners, but each of these people talk about the problems they have that beginners will have. You can find more on all of this and more about these people on the author's web page **www.thewalrusandthehoneybee.com**. You can buy the book there too. – *Kim Flottum*

The Art Of The Bee: Shaping the environment from landscapes to societies. Robert E. Page, Jr. Published by Oxford University Press. ISBN 9780197504147. Hardcover, 256 pages, 6 1/8 x 9 ¼. $34.95.

"We aren't so different, bees and humans. The elements of our social structures, and how they come about, have many similarities. Our individual behavior has been shaped by selection on our social structures over thousands of millennia, shaping us to fit the structures that are optimal for the environments we are in. Our adaptive responses to changes in our environment are likewise similar. When resources are abundant, bees are very docile, but when they aren't colonies transform into militarized societies. The defenses go up. Immigration services tighten up the entrance, their border control, guard bees, increase in number, in their overzealous desire to keep out unwanted immigrants." This is paraphrased from the very last page of the epilogue of Page's latest book. The 210 pages, covering nine chapters, that precede this explains how he got to his conclusion in a very convincing, practical and yes, even an entertaining manner in nine very different, but very focused chapters.

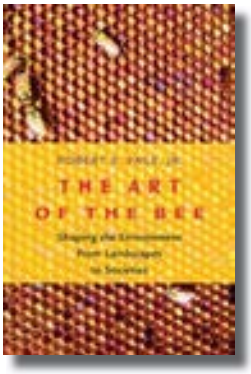
Environmental artists, he begins, of both bees and plants describes the ongoing coevolution of both to meet the needs of the other, and the evolution of behavior of both to meet the needs of both so both can adapt to ever-changing resources.

Then he looks at the role of bees as environmental engineers to construct the niches they live in, such as the nests they construct. And when looking at the social structure, or social order, he describes this group as having special guilds, and brings in the contributions of Aristotle, Huber, Darwin and Rousseau, all who made observations, about building, defending, fitness, developmental biology and perfect comb construction, without being taught or directed. Bees are shaped to a degree by what part of the nest they are born in, and where they spend their time patrolling, and when they stop patrolling and fly.

Then the Superorganism, cooperation, Darwin's theory, and the internal communication that is always ongoing. Not unlike, he compares, to our hormones, like organs and systems in humans. And then the requirements of a body, or a colony, to be considered a superorganism, comparing and contrasting, and more alike than not.

He was involved in an evolution experiment for 23 years, studying pollen storage amounts, artificially selecting for high and low pollen storage behaviors. From the action of a gene to the formation of complex social interactions. High pollen selections would store up to 20 times more pollen than the low pollen collectors. One difference noticed was the number of ovarioles between the two, and the different length of life.

And then the behavior and biology of drones. And mating with virgin queens. A colony, left to it's own devices and average health produces something like 20,000 in a season. Yet only 1 or 2/1000 will actually get to mate with a queen. Huge in comparison, and producing more sperm by far than a queen will need. Meanwhile, queens are built to insure diversity in a colony population by how sperm is mixed from multiple matings during a flight and what that first egg becomes. It, says Page, becomes a small part, the first cell, of something much larger and more complex, organized for reproduction, nutrition, protection with coordinated action of its many parts, capable of responding to its environment and of making decisions. A superorganism.



Mark Winston noted this work inspires us to ponder our own place in nature, and within our human societies. That is what you will do when you complete this task. – *Kim Flottum*

Minding Your Bees And Cues, Part 2

Bees On The Move

Becky **Masterman &** Bridget **Mendel**

Some colonies are just mean. Despite using a smoker and moving slowly and carefully, you might get a whiff of bananas and stings immediately upon opening up the colony (read Minding Your Bees and Cues Part 1: Interpreting Fruit Scents in October's *Bee Culture* issue).

It could be they have been bothered by intruders, like skunks, or have been consistently handled by a rough beekeeper, lowering their threshold for defensiveness. They also might be easily triggered because of a genetic basis for defensive behavior.

Recently we encountered such a mean colony. The Bee Squad beekeeper was stung 10 times within seconds. Clouds of defensive bees followed her back to the truck after the hive was closed back up, determined to sting. This quick-to-sting colony is part of our Bee Network program where we track trends (like mites, nutritional resources, and queen issues) and share what we learn with beekeepers. Because we manage bees in urban areas where there is plenty of foot traffic, we needed to do something quickly about this highly defensive colony.

One option for moving honey bees if colony weight is an issue is to separate the boxes for the transfer. Use ratchet straps to secure each brood box to a bottom board, inner and telescoping cover. Robbing screens provide great ventilation for moving bees. Use duct tape to secure the screen to the hive box. Also make sure to secure the openings with tape. (Masterman photo)

While honey bee colony defense is a complex response to threats (Breed et al. 2004), a beekeeper often needs a simple solution. Two common defensive-colony remedies are requeening, and moving the colony to a remote apiary. If you replace the current queen with one bred for gentleness, you need to be patient for her daughter's genes to change the colony temperament. If you can't wait for the population to turn over, or if it's late in the season when requeening isn't easy, moving your bees is a good option.

Moving bees can seem daunting to a new beekeeper, but it is not difficult. You just have to have the right tools and remember a few key things, such as making sure they have enough ventilation (you do not want to damage the heat-sensitive brood), and remembering that they must be moved far enough away from the original site so as to thoroughly confuse the foragers. Otherwise, those girls will go right back to their first home location.

Bee Squad's defensive colony was in two heavy deep brood boxes, and was at the height of their population in mid-August. Moving a large colony alone or with limited contact with others (thank you, Covid-19) posed a few safety challenges. We are sharing how we moved these mean bees to help you prepare for this situation, or any situation in which moving your bees becomes necessary. Some tips:

1. Get help! Beekeepers need mentors who can help with advice (and heavy lifting). Find this support by joining local and state beekeeping organizations.
2. Invest in robbing screens (see photo) and a little extra bee equipment.
3. Embrace ratchet straps. Ratchet straps are not just a fancy replacement for a brick weight, but they are essential for keeping equipment together when you move bees.
4. Need help lifting a heavy colony but lack friends? It is okay to split the colony up into two for the move and reassemble them at their new destination.
5. Move your bees on a rainy day, or very early or late in the day, so you don't lose your foragers.

We brought robbing screens, ratchet straps, an extra bottom board, inner and telescoping covers and a mild-mannered replacement colony. We lit the smoker, put on bee jackets, and duct-taped the holes in our veils. We moved the nice colony right next to the mean girls. In normal times when we could move colonies in pairs, we would have moved the intact two-deep colony directly to the

Bridget Mendel with a group of defensive bees encouraging her to stay away from their hive. If your bees send a 'not very welcoming party' to visitors in close proximity to their hive or follow you as you walk away from the hive, moving them to a remote location away from people and pets is a sound decision. (Masterman photo)

truck. Because of pandemic working conditions, we moved the top deep off of the colony to a new bottom board, attached a robbing screen, new inner and telescoping cover and secured them with a ratchet strap. We repeated this process with the bottom deep and then moved both sets of ventilated and secured bees to the truck. They were easy to move on and off the truck again; we relocated the defensive bees to a more remote apiary over three miles from the original location.

Moving bees can be daunting, but with safety precautions, it is not difficult to do. It's a good skill to have in your back pocket in case you or a beekeeper friend should need to get your bees out of dodge. BC

Acknowledgement

The authors would like to thank Dr. Marla Spivak for helpful edits and suggestions.

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Authors

Becky Masterman led the UMN Bee Squad from 2013-2019 and currently alternates between acting as an advisor and worker bee for the program. Bridget Mendel joined the Bee Squad in 2013 and has led the program since 2020. (Photo of Becky and Bridget from 2014).

Number 1 Tip of the Month – Observation Hive

Every beekeeper is occasionally asked to tell people about honey bees. It may be at the farmers market, agricultural meeting, civic celebrations, etc. an observation hive containing live honey bees will attract the attention of many people.

This observation hive is just the ticket to take with you. It is small, compact, lightweight, and portable. This makes it easier to store, load up and carry to and from your talk and set up for display. The hive can be used as a one or two frame hive. Since it is only one frame wide, both sides of the frame are always visible. This unit also contains a feeder bottle. If you desire to keep the hive for a longer period of time, remove the exit plug to allow the bees to fly freely.

To load up the observation hive, first shake some extra house bees from a frame into the lower hive body. Then take a frame with brood, eggs and bees and the queen from your hive and install in the lower unit. Next place a frame containing sealed and unsealed honey with bees in the upper unit. Latch the cover and the two hive bodies together. Mix a jar of sugar water to take with and you are ready to show off your bees to the public.

At the presentation, point out the capped honey and the uncapped cells containing nectar and pollen from the flowers. Point out the darker capped cells of brood. Then describe the eggs in the bottom of the many cells which hatch into the white larva. Point out the honey bee chewing the cell cap and then emerging from the cell as an adult bee.

If you brought the queen, let the children find her. Kids get great enjoyment from just spotting her on the frame. Don't forget to talk about the drones, bee stings and pollination.

When you get home, return the frames and bees to the original hive. If necessary, remove the glass to brush off the bees, then clean the hive and glass.

If you did not include the queen or if you remove her, set the observation hive on the porch and remove the plug under the feeder permitting the bees to fly freely. The queenless hive will shortly begin to build a queen cell while you watch. Take the hive with the queen cell to your next bee presentation.

You have already reviewed the pictures and the plan for the two frame observation hive. If you are not a Saturday morning carpenter, you may have a friend with the tools to help you. Purchase the material and let's begin.

1. All pieces are cut from ¾-inch lumber with your table saw. Groves for the glass and for the feeder cover can be made by multiple cuts from your saw blade.
2. Drill the holes for the feeding jar and the ventilation holes as shown.
3. Assemble with wood screws, not staples or nails, to make a secure unit and give it the professional look.
4. Finish the exposed exterior surfaces with a light colored polyurethane finish.
5. Cut insect screen to size and staple over ventilation holes from inside.
6. Attach the latches.
7. Cut 1/8" glass to suit openings and install.
8. Place a one-inch diameter plastic plug in the end of the feeder. This can be left open if you want to display the bees on your porch between meetings.

Bee Culture wants you to share your good ideas with our readers. Be precise and include a photo or sketch if possible, but that may not be necessary. If we use your idea you get a free one-year subscription. The best each month gets $100.

You need to make a couple more items.

1. Punch about eight or 10 small nail holes in the metal top of the pint glass jar to use for feeding the bees.
2. Also cut a piece of thin aluminum sheet 4" x 5" slide under the feeder top to close the hole while transporting the hive. If the feeder jar is left on the hive while moving it, the vibration will cause the liquid to drain from the jar.

Well, everybody at your presentation enjoyed looking at your bees and trying to find the queen. You were the hit of the day. Slip the aluminum closure plate under the feeder panel to keep the bees in your hive, and then remove the feeder bottle.

After the long drive home, just replace the two frames and b ees in your old hive and set your new temporary portable observation hive aside until your next outing. Oh, remember this can also used as a single frame unit. Just place the cover on the bottom body. Enjoy using your new Two-Frame Observation Hive. *Walt Dahlgren, PA*

As a beekeeper, I was curious to know how my bees are doing in the coldest months of the year, being December, January and February. I thought about how I could monitor my bees during the Winter months and then I came up with this solution in October of 2017. I found this on the internet, it is the LaCrosse 308-1412-3TX Wireless Weather Station. The unit has three remote sensors that can record temperature and humidity up to 300 feet. The weather station sells for around $43.00 today. This is the third winter of use and is still working fine, except for a new set of batteries on occasion.

Using this weather station, I can monitor up to three hives at once, whether for curiosity or for a major concern. I also use this in the Summer months, since the weather in the high desert of NW Colorado can be brutal. The temperatures here can vary from -30°F in Winter to above 100°F in Summer. If you use these in the Summer months, you may want to wrap the sensor with some plastic, otherwise the bees like to cover the unit with propolis. Wrapping the sensor will lose the accurate humidity reading but not the temperature.

Terry Smalec, Rangely, CO

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95% Efficacy
Apistan, lab study: 95.72% Varroa mortality *(Insects, 2018)*

84% Efficacy
Apistan, field study: 84% efficacy (Apiguard: 86%; Apivar: 79%; HopGuard: 64%), @ Mississippi State University *(Insects 2018)*

94% Efficacy
Apistan: 94.90% efficacy *(2019, Veterinary Bee Inspector, Spain)*

96% Efficacy
Apistan: 96.92% Efficacy *(2018, Veterinary Bee Inspector, Spain)*

97% Efficacy
Apistan + 50 g Apiguard: 97.97% Efficacy *(2018, Veterinary Bee Inspector, Spain)*

97% Efficacy
Apistan: 97% Efficacy *(2014, FNOSAD, France)*

93% Efficacy
Apistan: 93% Efficacy (2015, FNOSAD, France)

91% Efficacy
Apistan: 91% Efficacy (2016, FNOSAD, France)

95% Efficacy
Apistan: 95.22% (2017, FNOSAD, France)

Apistan should be used as part of an Integrated Pest Management Strategy
Pockets of resistance are possible, we recommend trialling Apistan on a couple of colonies before widespread use.

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Update From The North

Simon **Lalonde**

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We're finally through the main stress of our season up here, and can see the light at the end as we have one round of feed on everything and extracting will be finishing up by the weekend. For us, the season came in average for honey production and the bees are looking good going into Winter – still less than 1% mites on everything, we will test two more times into the end of September and treat if they go above 3%. The Winter wraps will be installed October 1 – October 15 and then walk away from the bees until mid-March. The end is nigh . . .

From the other Canadian beekeepers I've talked to, it sounds like Manitoba will be maybe 10% below average for production, Saskatchewan will be around 15% below production and Alberta will be about 20-25% below production. Most issues with the production seem to be weather related – too cool/wet or too dry. These 3 provinces produce over 80% of Canada's honey, so I expect Canadian honey production to be down by about 15% this year (expecting down about 12-13M lbs on an average of 85Mlbs). Our domestic price has been very strong, starting about 10 months ago and continues to be strong. Our current price into the U.S. market would need to be $1.71/lb US to put the same amount into our pocket for what we can sell domestically. It is interesting to see Canadian honey exports to the U.S. in the last three years:

- 2017 was 60,900,000lbs;
- 2018 was 62,000,000lbs;
- 2019 was 33,600,000lbs
- 2020 until end June was 7,900,000lbs.

Canadian beekeepers had major issues with getting Temporary Foreign Workers in to work, at the end most beekeepers had 50% - 70% of the TFW's the usually get for the season (most source from Mexico, Nicaragua and the Philippines). Because of travel restrictions and paperwork delays at the start of our season (March-May) due to COVID, many beekeepers were not sure if they would get a full work-force, so they took their winter loss and did not make replacement nucs, as many beekeepers did not know if they would have enough people to work those bees. Further, issues with package bees arriving from Australia and New Zealand and airlines shutting down travel routes resulted in about 50,000 packages not arriving in Canada. Therefore, Canadian hive numbers are expected to be down another 15% at least.

Most of our conventions have been cancelled until spring at least. Thankfully all beekeepers made it through the season, no known reported cases of COVID on any operations during the beekeeping season which was a big relief for producers. Now trying to get the workers home – Mexico and the Philippines are flights as usual, although there are significantly fewer flights to choose from, resulting in higher ticket costs and longer travel times. The Nicaragua government has indicated to us a negative COVID test on every worker is required 72 hours prior to arriving in Nicaragua, with results to be sent to government for approval 24 hours prior to flight. Canadian Honey Council has been instrumental in chartering a plane to get these workers home from across Canada. It has been a struggle to find labs who can do this work in the time frame required, it is somewhat frustrating that their own citizens are having such a difficult time returning home from one of the safest countries in the world. We will know how this first charter goes by October 2nd. Nothing like another curve ball for the season.

I hope everyone else had a good Summer, I know our timing is off and some of you are getting into another honey flow. Best of luck down south! Take care. BC

A Closer Look

NECTAR COLLECTION & HANDLING

Clarence **Collison**

Nectar Composition Can Vary Greatly

"Nectar, an aqueous solution of sugars, amino acids, organic acids, proteins, fats, vitamins, minerals and other minor components, is derived from the plant's phloem sap and is produced by a group of specialized cells, called nectaries. Its composition can vary greatly depending on plant species and environmental conditions (Gardener and Gillman 2001a). Sugar content ranges 5-80%, and in most cases sucrose is the main component, whereas in others sucrose, glucose and fructose are present in similar amounts (Davis et al. 1998). "A third nectar type is predominantly composed of fructose and glucose (Percival 1961)." Insects rely on nectar sugars for energetic expenditures, primarily flight. Amino acids are also found in the nectar but at low quantities (typically 0.0002-4.8% organic matter, Gardener and Gillman 2001b), and the biological significance of their presence is still being debated (Bertazzini et al. 2010)."

"Dual choice feeding tests were performed to determine a preference of forager honey bees for specific amino acids. Artificial nectar containing proline was preferred over those containing only sugars. Nectar containing alanine was preferred on the first day, but preference was no longer significant thereafter. On the contrary, a negative response was found for serine. When the bees were given the choice between two nectars enriched with different compounds, proline was preferred above both alanine and serine, and alanine above serine (Bertazzini et al. 2010)."

"Hendriksma et al. (2014) tested the preferences of free flying foragers between 20 amino acids at 0.1 % w/w in sucrose solutions in an artificial meadow. They found consistent preferences amongst amino acids, with essential amino acids preferred over nonessential amino acids. The preference of foragers correlated negatively with amino acid induced deviations in pH values, as compared to the control. Next, they quantified tradeoffs between attractive and deterrent amino acids at the expense of carbohydrates in nectar. Bees were attracted by phenylalanine, willing to give up 84 units sucrose for one unit amino acid. They were deterred by glycine, and adding 100 or more units of sucrose could resolve to offset one unit amino acid. In addition they tested physiological effects of amino acid nutrition on forager homing performance. In a no choice context, caged bees showed indifference to 0.1% proline, leucine, glycine or phenylanaline in sucrose solutions. Furthermore, flight tests gave no indication that amino acid nutrition affected flight capacity directly. In contrast, low carbohydrate nutrition reduced the performance of bees, with important methodological implications for homing studies that evaluate the effect of substances that may affect imbibition of sugar solution. In conclusion, low amino acids in nectar relative to pollen suggest a limited role in bee nutrition. Most of the 20 amino acids evoked a neutral to a mild deterrent response in bees, thus it seems unlikely that bees respond to amino acids in nectar as a cue to assess nutritional quality. Nonetheless, free choice behavior of foraging bees is influenced for instance by phenylalanine and glycine. Thus amino acids in nectar may affect plant-pollinator interactions and thereby exhibit a selective pressure on the flora in the honey bee habitat."

"Yeasts occur naturally in floral nectar and have been considered to be an influence on the foraging behavior of bees. When honey bees were presented with a choice of flowers of milkweed, *Asclepias syriaca*, which were contaminated with yeasts in the nectar vs yeast-free flowers, they showed no discrimination in visits or movements between the flower types. They moved to the closest flower (reward) regardless of the presence or absence of yeasts. The same results were obtained with the use of yeast-free and yeast-contaminated droplets of sugar syrup (Kevan et al. 1988)."

"The honey bee colony chooses among different nectar sources available in the field, selectively foraging from those which are most profitable (Camazine and Sneyd 1991)." "Seeley (1986) attempted to understand how a colony of honey bees keeps its forager force focused on rich sources of food, and analysis was made of how the individual foragers within a colony decide to abandon or continue working (and perhaps even recruit to) patches of flowers. A nectar forager grades her behavior toward a patch in response to both the nectar intake rate of her colony and the quality of her patch. This results in the threshold in patch quality for acceptance of a patch being

higher when the colonial intake rate of nectar is high than when it is low. Thus colonies can adjust their patch selectivity so that they focus on rich sources when forage is abundant, but spread their workers among a wider range of sources when forage is scarce. Foragers assess their colony's rate of nectar intake while in the nest, unloading nectar to receiver bees. The ease of unloading varies inversely with the colonial intake rate of nectar. Foragers assess patch quality while in the field, collecting nectar. By grading their behavior steeply in relation to such patch variables as distance from the nest and nectar sweetness, foragers give their colony high sensitivity to differences in profitability among patches. When a patch's quality declines, its foragers reduce their rate of visits to the patch. This diminishes the flow of nectar from the poor patch which in turn stimulates recruitment to rich patches. Thus a colony can swiftly redistribute its forager force following changes in the spatial distribution of rich food sources. The fundamental currency of nectar patch quality in not net rate of energy intake, (Gain-Cost)/Time), but may be net energy efficiency, (Gain-Cost)/Cost."

"The honey bee has a special chewing-lapping proboscis, which consists of a pair of galeae and a pair of labial palpi (Zaho et al. 2016)." "The bee's tongue or glossa (Figure 1) is a long flexible structure with an internal canal for aspirating nectar and water. The canal which runs the length of the back of the glossa opens just above the tip, by the spoon-shaped flabellum. This canal is closed posteriorly by a fringe of hairs. The tongue is protruded into the nectar of a flower. Its hairy surface collects nectar. This is then withdrawn into the feeding tube from where the suction of the pharyngeal muscles draws the liquid into the mouth. Considerable quantities of liquid can be picked up by the surface area of all of these hairs. The canal of the glossa opens just above the flabellum (Stell 2012)." "During nectar dipping, the galeae and labial palpi roll into a tube and form a channel to let the glossa protract and retract to transport nectar through it for nectar loading (Zaho et al. 2016)." "Wu et al. (2015) demonstrated that the honey bee's tongue has a dynamic surface structured by erectable glossal setae (stiff structures resembling hair or bristles) which erect rhythmically when drinking nectar."

"Zhu et al. (2016) investigated how honey bee workers remove floral nectar from flowers they are visiting. A honey bee drives its segmented tongue (glossa) covered by dense hairs reciprocatingly to load nectar. A high-speed camera system ameliorated by a microscope revealed morphological changes in glossal surfaces during live honey bees' nectar dipping and surface configurations through the stretching of postmortem honey bee's glossae. Both the in vivo and postmortem observations reveal that shortening and lengthening of the glossal segments perform high concordance with the erection of glossal hairs, which aids in developing deformable gaps between rows of glossal hairs during nectar trapping."

"A honey bee uses its brush-like tongue (glossa) to dip nectar and the setae densely distributed on it can increase the amount of trapped nectar observably. The glossa is often simplified as a cylinder covered by uniformly distributed and vertically erected setae during the drinking process (Zhao et al. 2016). Using the scanning electron microscope and a specially-designed high-speed camera system, they measured the dimensions of glossal setae and captured the dynamics of the hairy glossa in nectar feeding. They proved that the erection angle of glossal setae varies along the tongue axis. Compared with the hypothetical uniform distribution mode of glossal setae proposed by former researchers, they obtained a 16% increase in energy saving from the actual erection pattern."

"Forager bees that return from nectar sources transfer the gathered liquid to receiver hive mates through mouth-to-mouth contacts (trophallaxis). After returning from a nectar source, several trophallactic events of different lengths usually occur between the incoming forager and hive mates. No unified criterion exists so far on the minimum time required for an effective food transfer to actually occur. By means of non-invasive thermographic recordings it was possible to observe that the warm nectar regurgitated by the returning donor forager heated up abruptly the proboscis of the recipient. By using this methodology, they analyzed the increase in the receiver's proboscis temperature as an indicator of effective food transfer between arriving donor foragers and receiver hive mates. Results show that under the present experimental conditions, all contacts lasting more than three seconds were effective food transfers, while most contacts lasting two to three seconds (87.5%) also showed liquid food transference. Moreover, even during contacts lasting one or two seconds it was possible for receiver bees to obtain samples of food via trophallaxis. Present results help define more accurately the minimum time required for an oral contact to allow effective food transfer (Farina and Wainselboim 2001)."

"During trophallaxis, the speed at which the liquid is transferred (unloading rate) from forager to recipient hivemates is related to the profitability offered by the recently visited food source. Two of the main characteristics that define food source profitability are the flow of solution delivered by the feeder and the time invested by the forager feeding at the source (feeding

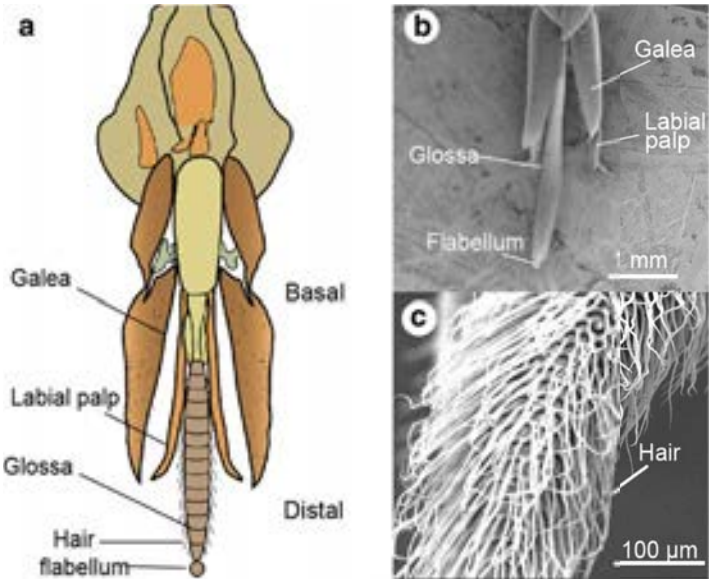

Figure 1. *The honey bees' mouthparts. A) Schematic diagram of the mouthpart of a honey bee (not to scale). The mouthpart appendages of the honey bee consists of a pair of galeae, a pair of labial palpi and a glossa. B) SEM image of a honey bee's mouthpart. C) SEM image of a honey bee's glossa and its multiarticulate appearance.* (Zhu et al. 2016)

time). To investigate which of these two variables is related to unloading rate, Wainselboim et al. (2002) individually trained donor foragers to a regulated-flow feeder that presented changes in the delivered flow of solution within a single foraging bout, while feeding time remained constant. With the range of flows used, bees attained maximum crop loads in all experiments. During the subsequent trophallactic encounter with an unfed recipient hivemate, unloading rate was differentially affected by the changes in flow of solution presented during the previous foraging trip at the source, depending on whether there had been an increase or a decrease of flow rate within that visit. Foragers unloaded at lower rates when they experienced a decrease in flow rate, but did not increase the unloading rate when presented with an increase at the food source. Thus, forager honey bees seem to be able to detect variations in the delivered flow of solution, since they modulate unloading rate in relation to these changes, although decreases in food value seem to be perceptually weighted in relation to increases, independently of the time invested in the food-gathering process."

"Flight patterns of honey bees were quantified as the bees foraged among artificial 'flowers' for sugar solution ('nectar'). Bees exhibited considerable directionality on successive flights which minimized repeat visits to flowers and they usually made short flights to nearby flowers, thus minimizing flight time. The change in direction on successive flights between flowers were independent of the number of immediately preceding consecutive rewarding visits but decreased as the number of non-rewarding visits increased. Flight distances were short after visits to rewarding flowers but increased as the number of immediately preceding non-rewarding visits increased. The bees' rate of caloric intake (calories/time) was highest at the floral arrays having the highest density, and it was greater at arrays with clumped nectar-distributions than at those with randomly distributed nectar (Waddington 1980)." "Records of the temporal pattern and nature of nectar-collecting visits to individual flowers by honey bees, shows that bees can avoid revisiting, landing on, or probing recently-probed flowers (Corbet et al. 1984)."

"Food quality is a relevant characteristic to be transferred within eusocial insect colonies because its evaluation improves the collective foraging efficiency. In honey bees, colony mates could directly acquire this resource characteristic during trophallactic encounters with nectar foragers. Martinez and Farina (2008) focused on the gustatory responsiveness of bees that have unloaded food from incoming foragers. The sugar sensitivity of receiver bees was assessed in the laboratory by using the proboscis extension response paradigm. After unloading, hive bees were captured either from a colony that foraged freely in the environmental surroundings or from a colony that foraged at an artificial feeder with a known sucrose solution. In the first situation, the sugar sensitivity of the hive bees negatively correlated with the sugar concentration of the nectar crops brought back by forager mates. Similarly, in the controlled situation, the highest sucrose concentration the receivers accepted during trophallaxis corresponded to the highest thresholds to sucrose. The results indicate that first-order receivers modify their sugar sensitivity according to the quality of the food previously transferred through trophallaxis by the incoming foragers. In addition, trophallaxis is a mechanism capable of transferring gustatory information in honey bees."

"While feeding, a honey bee worker uses a rapid back-and-forth motion with its brush-like mouthparts to probe pools and films of nectar. Because of the physical forces experienced by the mouthparts during the feeding process, Wu et al. (2019) hypothesized that the mouthparts acquire wear or damage over time, which is paradoxical, because it is the older worker bees that are tasked with foraging for nectar and pollen. They showed that the average length of the setae (brush-like structures) on the glossa decreases with honey bee age, particularly when feeding on high viscosity sucrose solutions. The nectar intake rate, however, remains nearly constant regardless of age or setae length (0.39 ± 0.03μg/second for honey bees fed a 45% sucrose solution and 0.48 ±

0.05 µg/second for those fed a 35% sucrose solution). Observations of the feeding process with high-speed video recording revealed that the older honey bees with shorter setae dip nectar at a higher frequency. They proposed a liquid transport model to calculate the nectar intake rate, energy intake rate and the power to overcome viscous drag. Theoretical analysis indicated that honey bees with shorter glossal setae can compensate both nectar and energy intake rates by increasing dipping frequency. The altered feeding behavior provides insight into how honey bees can maintain a consistent fluid uptake rate, despite having damaged mouthparts." BC

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Supporting Solitary Bees

Kim **Lippke**

When you think of bees, your mind probably goes to honey, hives, and stingers. But, what if I told you that 90% of the world's 20,000 bee species are solitary bees? Solitary bees, as you might guess, live on their own, not in colonies with a queen and workers like honey bees and bumblebees. It could be said that each solitary bee is her own queen! She builds her own nest, collects her own pollen and nectar, and lays her own eggs without any help from other bees.

While our solitary species don't give us honey or wax, they are expert pollinators – pollinating more flowers than any other species of insect. The reason they are such great pollinators is that they carry dry, loose pollen on their hairy bodies rather than in saddlebags on their hind legs (like the honey bee). Dry, loose pollen falls off easily at every flower visited with a clumsy but effective belly flop right where the flower needs pollination.

Solitary bees are also extremely important to food production and ecosystem health. Agriculture has become more dependent on the services of bees because the proportion of crops that require insect pollination has increased in recent years. A recent study found that in more than 40 important crops grown worldwide, wild pollinators improved pollination efficiency, increasing fruit set (the process in which a flower becomes a fruit) by twice that facilitated by honey bees. It makes sense that our native bee species would be good at pollination as many co-evolved with our fruits and vegetables, making them specialist pollinators.

One of the major families of these specialist bees is the Megachilidae, which includes leafcutter bees and mason bees. Unlike the majority of solitary bees which nest below ground (75%), leafcutter and mason bees nest in above ground holes, such as hollow plant stems and wood cavities. The females lay eggs in a series of cells and block the entrance with materials such as mud (mason bee) or leaves (leafcutter bee).

The benefits of these hole-nesting bees are their gentle behavior (rarely sting!), their perseverance through cold and rainy weather, and the ease at which they can be managed and moved around from crop to crop. Mason bees are one of the first bees out in large numbers in the spring, making them especially important to early-season crops such as almonds and blueberries. Leafcutter bees, once thought of as strictly a pollinator for alfalfa, are active in the warm Summer months and are perfect for pollinating squash, melons, cucumbers, and other Summer fruits and vegetables. As we become more aware of the connection between bee diversity and enhanced global crop yields, the integrated management of both honey bees and native solitary bees is becoming more common among home gardeners (urban and rural) and large and small-scale agricultural farms.

Unfortunately, like our honey bee populations, many of our native bee populations are also declining. The increased use of chemicals in farming and lawn care, our preference for manicured lawns without bare spots, and the loss of native food sources and nesting habitats are all contributors to the decline in our native bee species. The good news is that it is easy to provide food sources and nesting habitat in your farm or garden to help solitary bees and increase pollination! By adding more native plants to your garden, keeping around a little bare earth or mud banks for nesting bees, going pesticide-free when possible, and installing native bee-houses you can help protect our native bee populations. While beekeeping, hive or solitary, can be a little intimidating for first-timers, there are lots of resources out there to help you get started!

One great resource is Crown Bees, a small mission-based company with the vision of returning to a society in balance with nature, where more plants and food are produced through natural pollination by solitary bees. Based in Woodinville, Washington, Crown Bees provides healthy hole-nesting bees and bee raising supplies along with year-round quality support and educational programs to help ensure the success of solitary beekeepers. Of particular importance to Crown Bees is that the health of the bees comes first! For example, Crown Bees carefully inspects each mason bee cocoon for mold and parasites before sorting them by geographic location. The sorting is done to avoid mixing populations from different ecoregions that may be sensitive to a specific temperature or moisture cues, giving the bees a better chance at survival when they emerge in the spring. To learn more about the importance of solitary bees or to get started as a native beekeeper, visit **crownbees.com**! BC

CROWNBEES

COMMERCIAL BEEKEEPING

What Is The Actual Cost:

Chris **Hiatt**

I wrote this as a response to many news outlets reporting the national total number of beehives is stable and slightly increasing with honey bees being just fine with this problem being overblown. Those numbers are true. They failed to report the truth about the high mortality level of over 40% the last two years.

Looking at the numbers, yes hive levels are stable are slightly increasing. Quoting Dr. Jaime Ellis analysis from the University of Florida, the national hive total since 1948 to 1988 have had a .9% gain per year. From 1988 to 2007, .43% per year gain and finally from 2007 to now 1.2% gain. These gains have increased even during the record high loss numbers every year. The main reason why beekeepers have made back all these dead hives and increased is simple, almonds. Almond pollination price has increased from $40 dollars per hive in the early 2000s to $200 in 2019. We are approaching 80% of the nation's hives trucked to California to pollinate almonds in February and March. With this year's almonds crop expected to come in at three billion pounds, which has gone up in just five years from 1.8 billion, it shows the success of almond growers and their dependence on hives for pollinating these record crops year after year. With more acres coming into production, the almond industry will be needing several hundred thousand hives more each year.

Honey prices paid to beekeepers has not kept pace with the rise at the retail level, and two years ago for the first time the National Agricultural Statistics Services reported that pollination passed honey for beekeeper income.

So the stable hive numbers reinforces how resourceful beekeepers are at making back dead hives to stay in business. But let me show you the true costs that the media doesn't understand and is not reporting.

My family's company keep our hive numbers up by making nucs after almonds in California and again after apples in Washington. Usually around 7 to 8000. Supplemented by buying around 1500 packages and occasionally buying 1000 parent colonies or nucs from other beekeepers depending on the year. Packages and buying hives can be very expensive. Packages are running $80 to $100 for commercial beekeepers and $200 to $250 a hive, respectively. I'm willing to share our expenses from 2008 and compare it to 2019 to show the increase cost of doing business with the high loss levels.

	2008	2019
Pollen Supplement- (Feed)	$0	$170,142
Queens-	$217,411	$457,068
Drugs- (Mite treatment, antibiotics)	$58,380	$102,598
Labor-	$183,837	$465,321

First, the feed increases shows – by us constantly dividing hives to keep hive numbers up, the hives are weaker and need more pollen and syrup because wildflowers in the spring aren't enough. Besides the amount of wildflowers in California and Washington has gone way down due to clean farming, habitat loss, etc. I can remember never having to feed our nucs we made up in California in the spring to have them strong and ready for honey production in North Dakota. But about seven or eight years ago all are needing feed, more as the years go by. Look at the Pollen supplements or pollen patties category. You see it is a big ZERO in 2008! We never had to supplement pollen to the hives back then. They would overwinter fairly well with the fall pollen and honey we left. We found out fairly fast we had thousands of more hives good enough to rent to almonds by feeding pollen.

Second, queens do not live as long as they used to. The *Varroa*/virus complex, mite treatments, nosema, are all very hard on the queens. We replace close to 80% every year.

Third, mite treatments. From the 90s to the late 2000's one mite treatment in the Fall is all you needed to keep your mites under control. Those days are long gone. We are treating five or six times per year, rotating

between three or four different treatments.

Fourth, labor has increased the most. That is a lot of trips to our beeyards putting on mite treatments, pollen patties, syrup, putting queens in, pulling off deadouts, etc. The old saying was one guy could run 1,000 hives by himself. For sure that number has to be down nowadays. Also the adverse effect wage rate has increased every year since 2008 for most of the states we run in. Many commercial beekeepers have H2A visa workers to help during harvest as we can't find enough willing American workers.

I think the American beekeeper quietly just keeps plodding along with all the rising expenses and high losses to pollinate every third bite of food we eat without much recognition on the business-side of things. Many beekeepers I know are struggling and work crazy physical long hours to be able to stay in this worth-while business they love. Along with the nomadic lifestyle, I usually am away from my family three months of the year. If soybean, corn and wheat farmers showed a 100 to 200% increase of costs to grow crops, you would be hearing about it on the TV every night and the Farm bill would compensate them for it. We should be applauded for providing all the pollination services to this great country of ours. I have always said to Senators and Congressman I meet in Washington D.C. that to keep American beekeepers in business is a National Food Security issue. We don't want to import our fruit, vegetables, seeds and nuts.

So the next time you hear or talk to someone that tells you our country's beehive numbers are stable and fine and honey bees aren't threatened – please take time to educate them. BC

2021 Almond Pollination Outlook

Brittney **Goodrich,** Jennie **Durant**

Economic And Other Factors

2020 has certainly been an interesting year on many accounts. It started off well for beekeepers and almond growers with near-perfect pollination weather in February, promising a large almond crop. Things changed quickly following almond bloom as the world shut down due to COVID-19. As we near the end of 2020, we hope things improve going into the new year. In this article we provide information that we believe will be useful as beekeepers begin to settle their agreements for the 2021 almond pollination season.

Almond Industry Update

Currently, almond prices are hovering around $1.50-$2.00/lb depending on variety, which is roughly 30% below their five-year average $2.90/lb. Due to the increasing demand for almond pollination services over the past two decades, pollination costs now represent a substantial share of annual operating expenses for almond growers, rivaling both harvest and irrigation costs (Champetier, Lee and Sumner, 2019). Tight profit margins mean almond operations will closely scrutinize any production expenses, and consequently will likely look closely into their pollination expenses as they establish contracts in the coming months.

There has been a lot of interest in recent years in planting self-compatible almond varieties (Independence and Shasta) as a way to decrease pollination and other production expenses. In 2020, an estimated 7% of bearing almond acreage in California was in self-compatible varieties, but in 2019, self-compatible varieties represented 21% of new plantings. Recently, an article published in *Nature* found the Independence variety showed an increase in yield by 20% from allowing bee visitation (Sáez et al. 2020). This study eliminates any claims that these self-compatible varieties do not require honey bee colonies for commercial production.

Colony Demand and Shipments into California

Figure 1 plots the estimated demand for colonies based on bearing almond acreage each year, compared with total colony shipments into California. Estimated demand is calculated using two colonies per acre for traditional varieties and one colony per acre for self-compatible varieties. There is consistently a gap between estimated demand and colony shipments, which is filled by colonies that remain in California year-round.

For the 2020 almond bloom, roughly 1.2 million almond acres required an estimated 2.4 million honey bee colonies for pollination. According to apiary shipment data provided by the California Department of Food and Agriculture, 1.9 million honey bee colonies were shipped into California from other states for the 2020 bloom; this was down 3% from 2019. For those who remember, 2019 likely required more colonies due to the rainy, cold weather compared with the 2020 bloom's warm and sunny weather. In February 2021, an estimated 2.5 million colonies will be required for almond pollination. This amounts to approximately 88% of the total colonies in the U.S. on January 1, 2020.

Weather Impacts on Colony Supply

2020 has seen a number of weather incidents that have the potential to impact colony populations and overall colony health. By mid-September, over 3.4 million acres had burned due to wildfires in California, while over 1.5 million acres had burned across Oregon, Washington and Idaho. During July-September 2019, up to one million colonies were located in these states, roughly half of what is required for almond pollination. It is unclear how many of these colonies have been (or will be) impacted by the wildfires, but the wildfires have the potential to severely impact beekeeping operations in these areas, as well as the 2021 supply of colonies for almond pollination.

Another natural disaster, Hurricane Laura, devastated parts of Louisiana and Texas in August. These states supplied at least 6% of the colonies for almond pollination in 2020. Hurricane Sally was not as strong as Hurricane Laura, but still caused extensive damage in parts of Alabama and Florida in September. These states supplied at least 10% of colonies for almond pollination in 2020. The impact of these hurricanes on colony supplies may be minimized because they occurred at times when many colonies were likely still in the Northern Plains for honey production.

However, the Northern Plains may not have been its usual haven for honey bee colonies over the Summer months. Figure 2 shows the percentage of area in the

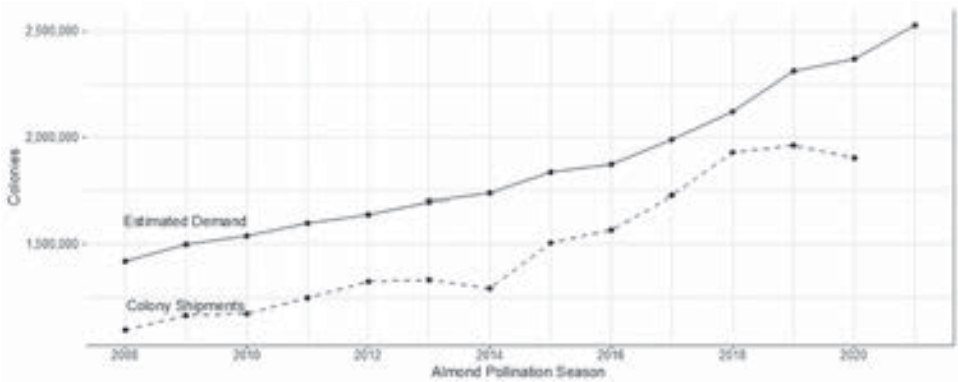

Figure 1. *Estimated Demand and Colony Shipments, 2008-2021*

Sources: 2008-2019 Almond Acreage Reports, USDA NASS and CDFA; Apiary Shipments through California Border Protection Stations, CDFA Plant health and Pest Prevention Services

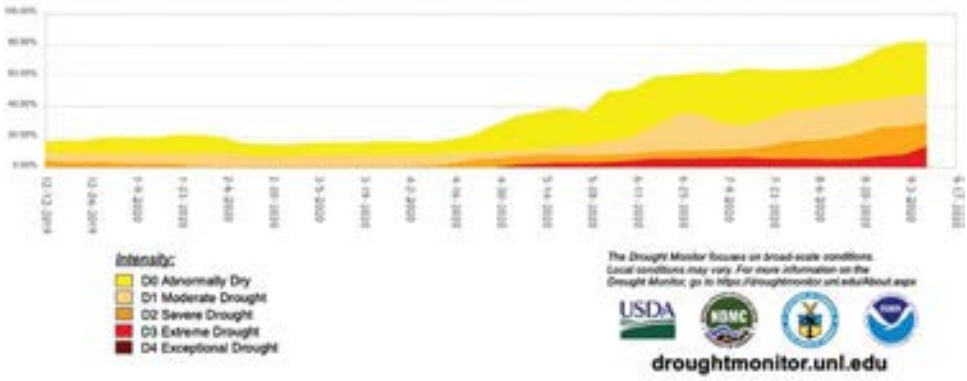

Figure 2. *Percentage of Northern Plains Area in Drought Monitor Categories*

Note: USDA Climate Hub Region of Northern Plains includes: (Montana, Wyoming, Colorado, Nebraska, South Dakota, and North Dakota)

Northern Plains (Montana, Wyoming, Colorado, Nebraska, South Dakota, and North Dakota) that was abnormally dry or in worse drought conditions. At the beginning of June, 36% of the Northern Plains was at least abnormally dry. By the beginning of July this number had increased to 62%, with 12% of the total area in a severe drought. It is possible honey flow in this area was affected, which ultimately may impact the health of colonies going into 2021.

Almond Pollination Fees

We wrote this article early enough that the 2020 California State Beekeeper's Association (CSBA) pollination survey was not yet available, so we cannot report fees from the 2020 almond pollination market (which would have included projections for 2021). However, we can report on what is likely the largest survey of pollination fees to date. In December 2019-February 2020, researchers at UC Davis and Duke University conducted an online survey of over 300 almond growers to better understand pollination decisions. The sample represented roughly 14% of almond acreage in 2019.

75% of growers who rented colonies in 2019 provided the minimum colony strength requirement associated with their largest almond pollination contract. Table 1 shows the average almond pollination fee by the minimum average frame count requirement for growers' largest pollination contracts in 2015 and 2019. 2015 pollination fees were converted to 2019 dollars to adjust for inflation. The 2015 data come from a survey conducted at the 2015 Almond Conference (Goodrich, 2019). The 2015 survey has a smaller sample size than the more recent survey, however, paired together these surveys provide the first documentation of how fees have changed across colony strength categories over time.

Across both surveys, the eight-frame minimum average frame count was the most frequently used colony strength requirement. In the 2019 survey, nearly a quarter of respondents who used colony strength requirements used a six-frame minimum average, compared to only 7% in the 2015 survey. This increase could signal an increase in popularity of six-frame requirement over time, or may be due to the small sample size of the 2015 survey.

It is clear across both surveys that pollination fees increase as the colony strength requirement increases. In 2019, the average premium associated with strong colonies (>eight-frame average) compared to eight-frame colonies was 6.2%, six-frame colonies were discounted on average by 1.7% compared to eight-frame colonies, and weak colonies (<6-frame average) were discounted on average 3.1% compared to eight-frame colonies.

Across all colony strength requirements, inflation-adjusted pollination fees increased by 5% between 2015 and 2019. This varied by category: the highest colony strength requirement of a minimum average above eight frames increased by 9.4% on average, while the smallest colony strength requirement of less than six frames increased by 4.2%. The premiums associated with the highest colony strength category went from 2.3% to 6.2% above the eight-frame minimum average. This increase in premium could reflect either increased input costs associated with supplying high strength colonies, and/or an increase in the demand for high strength colonies relative to eight-frame colonies.

Table 1 Average almond pollination fees by average colony strength requirement, Seasons 2015 and 2019

	2015 Survey (N=74)			2019 Survey (N=205)			
AverageColony Strength Requirement	Percentage of Responses	Average Pollination Fee (2019 Dollars)	Premium/Discount compared to 8-frame	Percentage of Responses	Average Pollination Fee	Premium/Discount compared to 8-frame	Percentage Change in Real Pollination Fees 2015-2019
<6-frame	5%	$179.73	-1.9%	10%	$187.25	-3.1%	4.2%
6-frame	7%	$177.05	-3.4%	24%	$189.96	-1.7%	7.3%
7-frame	7%	$178.12	-2.8%	8%	$191.41	-1.0%	7.5%
8-frame	61%	$183.27	-	48%	$193.30	-	5.5%
>8-frame	20%	$187.57	2.3%	10%	$205.28	6.2%	9.4%
Total		$183.17			$192.78		5.2%

Note: 2015 fees adjusted to 2019 dollars using U.S. Bureau of Economic Analysis GDP Implicit Price Deflator
Sources: 2015 Almond Pollination Contract Survey, B. Goodrich and R. Goodhue (2015)
Survey on Bee-Friendly Practices in Almond Orchards, J. Durant and E. McNamara (2020)

The 2019 CSBA survey included projections for 2020 almond pollination fees. On average, the projected 2020 fee was $200 per colony. Despite the slight increase in demand for colonies, we don't anticipate much difference between the 2020 and 2021 pollination fees, largely due to growers feeling the pressure of low almond prices. So assuming the average fee for an eight-frame colony is $200 in 2021, based on the premiums in Table 1, larger than eight-frame colonies will rent for approximately $212 per colony, six-frame colonies will rent for $195 per colony and less than six-frame colonies will rent for $189 per colony. Those are rough estimates based on a lot of assumptions, so take them with a grain of salt. Additionally, if any of the supply issues discussed in the previous section materialize into significant colony losses, fees could increase substantially from 2020 levels.

For more discussion of the survey findings, see Goodrich and Durant (2020).

Evaluating Pollination Contracts

Given the tight profit margins of almond production going into 2021, we think it is a good time for beekeepers to take a close look at the net profitability of their pollination agreements. Specifically, this means evaluating the costs of meeting different colony strength requirements, and comparing those costs with the associated differences in pollination fees. For example, on average, what are your per-colony input costs of providing six-frame average colonies compared to eight-frame average colonies? Is that input cost less than 1.7% of the expected eight-frame pollination fee? If not, it may make more sense for you to find a six-frame contract, or talk to your grower/pollination broker about lowering colony strength requirements (and receiving a lower fee, of course).

Example Scenario: In 2019, the average difference between an eight-frame contract and a six-frame contract was $3.34 per colony. Assuming the difference between supplying six-frame and eight-frame average colonies requires one extra pollen patty at $1.25/lb and an extra half gallon of syrup at $3.81/gallon (Topitzhofer et al. 2020), that requires spending an additional of $3.16 per colony on average just in food supplements. This allows you only $0.18 per colony for any other additional costs between the six-frame and eight-frame colonies. If you ship colonies into California immediately prior to almond bloom, shipping six-frame colonies will likely cost you less than shipping eight-frame colonies (less weight/colony means more colonies/truck). Additionally, you will likely spend more in labor grading colonies to make an eight-frame average than a six-frame average. In this scenario, it begins to look like you might be better off contracting for the lower colony strength. In other scenarios, a higher strength contract may be more profitable.

It may not be as easy as we make it sound to switch from a high colony strength contract to a lower colony strength contract (or vice versa), especially if you have been contracting with the same grower for many years. However, this year especially growers will likely be trying to decrease the per-colony fee they pay. Given that many growers are currently contracting for two eight-frame colonies per acre, switching to two six-frame colonies

Figure 3. *California Border Protection Station Locations*

Table 2 Highest Shipping Days on Average for 2019 and 2020 Almond Pollination Seasons by California Border Station

Station	Date	Average 2019-2020 Apiary Shipments	Average 2019-2020 Colonies Shipped
Benton (US 6)	October 21	25	10,510
	October 27	19	8,029
	October 28	19	8,347
Blythe (I-10)	February 2	28	12,335
	February 6	21	9,204
	January 31	21	10,360
Dorris (US 97)	January 15	12	5,217
	January 17	11	4,347
	January 6	11	3,792
Hornbrook (I-5)	January 21	16	6,062
	January 30	12	3,489
	January 29	11	3,647
Needles (I-40)	February 3	32	14,239
	January 27	32	16,955
	January 30	31	13,665
Truckee (I-80)	January 24	46	20,391
	January 28	42	17,663
	January 29	40	16,933
Vidal (SR 62)	February 5	16	6,432
	February 8	16	7,134
	February 7	14	5,748

Source: Apiary Shipments through California Border Protection Stations, CDFA Plant Health and Pest Prevention Services

Table 3 Highest Apiary Shipment Day for 2020 Almond Pollination by California Border Station

Station	Date	Apiary Shipments	Colonies Shipped
Benton (US 6)	10/23/19	24	10,232
Blythe (I-10)	2/2/20	28	12,248
Dorris (US 97)	1/6/20	13	4,446
Hornbrook (I-5)	2/4/20	16	4,189
Needles (I-40)	1/30/20	36	16,346
Truckee (I-80)	1/24/20	45	20,494
Vidal (SR 62)	2/8/20	17	7,516

Source: Apiary Shipments through California Border Protection Stations, CDFA Plant Health and Pest Prevention Services

per acre may be a mutually beneficial suggestion in some instances. It's worth knowing that the almond crop insurance standards state that a grower must use a "minimum of two six-frame colonies per acre or its equivalent (for example 1.5 eight frame colonies)…" (USDA, 2018). Growers also have the option to use less than the recommended two six-frame colonies per acre (or its equivalent) as long as they have used that lower colony strength/hive density combination for at least one year without a crop insurance claim.

Border Station Inspections

Any beekeeper that has participated in almond pollination before is well aware that every shipment of bees entering the state of California has to be inspected for invasive species at one of California's border stations prior to being allowed entry (see Figure 3). Delays at California's border inspection stations can be detrimental to colony shipments entering California (especially those entering in southern California where temperatures may be warm even in January/February). Beekeepers can prevent delays by avoiding busy shipment times (if possible) and ensuring their shipments are clean and free of soil and other debris before leaving for California.

Table 2 displays the average three busiest days for apiary shipments for the top seven entry points in California over 2019 and 2020 almond pollination seasons. Table 3 shows the busiest day for the 2020 pollination season for each of these stations. Needles, Truckee and Blythe are the most frequented stations for apiary shipments and these tend to be busiest right before almond bloom-the end of January and early February. The Benton border station is busiest in late October, presumably as beekeepers bring colonies into California after honey flow in the Northern Plains. If possible, avoiding these shipment days at each location may lead to a quicker trip through the inspection station.

Conclusions

In 2021, low almond prices will likely have growers wanting colonies at a cheap price. For the business savvy beekeeper, this can provide opportunities. Can you negotiate a more profitable contract for yourself that is mutually beneficial? Are there any benefits you can request to provide your grower with a discount per colony? One thing that comes to mind is asking for a portion of the payment up front in exchange for a lower per-colony fee. This can provide some working capital to use to pay the transportation, treatment, or feeding costs required before almond bloom, in addition to providing additional security in your pollination agreement. BC

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Listen to Brittney on Bee Culture *sponsored podcast at* ***www.beekeepingtodaypodcast.com.***

The Fight Against Covid-19

Propolis Potential

The potential of propolis in the fight against Covid-19

As I sit down to write this article some 900,000 people have died world-wide as a result of Covid-19. The disease is associated with the development of pneumonia, serious breathing problems as the lungs fill with fluid, and heart failure.

The United States leads the rest of the globe in Caronavirus related deaths, with the American death toll at over 200,000 and climbing. We have less than five percent of the world's population but have experienced over 20 percent of the world's Covid-19 deaths despite being the country with the most expensive and supposedly best health care system in the world.

In the midst of this dire situation comes a review of the healing properties of propolis and its potential use in treating Covid-19 that appears in the November issue of *Biomedicine and Pharmacotherapy*. We already know that propolis ramps up the immune response of honey bees when they are exposed to pathogens, but now it appears increasingly likely that propolis may be able to do something similar for us humans.

In the paper, *Propolis and its potential against SARS-CoV-2 infection mechanisms and Covid-19 disease, Running Title: Propolis against SARS-CoV-2 infection and Covid-19*, the authors, Andresa Berretta, Marcelo Silveira, Jose Capcha, and David De Jong, point out that controlling Covid-19 has been a challenge. Tests that determine if people are infectious or were previously infected are not widely available, expensive, and often do not provide timely and accurate results. Shelter at home and other isolation measures do not provide effective protection for essential workers, especially health care personnel, who have contracted the disease and are dying at alarming rates. Quarantine measures have limited usefulness due to economic and other necessities especially among people with modest incomes. Thus, any options that can help reduce the impact of this pandemic and its consequences, even a little, would be useful.

Benefits of natural remedies

Medical researchers have identified the SARS-CoV-2 virus as the cause of Covid-19. Among the options to deal with this virus are adjuvant treatments. Adjuvants are typically natural remedies that are inexpensive, readily available and rarely have undesirable side effects. The advantage of using natural remedies is that folks with additional health problems, or flu-related symptoms, who are unable to get to often overcrowded medical facilities can take simple and inexpensive measures to help reduce the effects of SARS-CoV-2 infection until they are able to access additional medical care.

One potential adjuvant that shows great potential is the propolis that is being produced in your beehives. Propolis has already been used successfully and an adjuvant in vaccines for cattle and mice. The review paper identifies numerous reasons to be optimistic about the potential for propolis to help us deal with the current human pandemic. For example, studies have shown that extracts of propolis and some of its components are able to prevent the ability of the virus to enter cells in the body.

Propolis and Covid-19 complicating conditions

People with hypertension and diabetes have a greater chance of requiring intensive medical care should they come down with Covid-19 symptoms. The data also indicates that people with cardiovascular disease, including hypertension and diabetes are more likely to die from Covid-19. The good news is that studies have shown that propolis can alleviate diabetes, hypertension and cardiovascular disease in animals, and this provides considerable evidence that these benefits might carry over to humans.

Criticisms and cautions

The lack of human studies is only one of the criticisms that have limited the widespread use of propolis as a health promoting supplement in human medicine. Another issue preventing the acceptance of propolis for therapeutic use is the lack of standardization and the wide variance in the components and biological activity of most propolis products on the market. Unlike beeswax, royal jelly, and honey bee venom which are produced within the body of the bee and whose characteristics are fairly consistent where ever honey bees are found in the world, propolis is made from the resins of trees and other plants. Thus, the characteristics of propolis and its efficacy in treating illness will vary depending on the types of vegetation found in the vicinity of the colony. It is simply not possible to have identical batches when working with natural products like propolis; therefore, standardization is needed in order to validate safety and efficacy studies and guarantee useful characteristics and consistent results when a product is introduced to the market. Thankfully standardized propolis products have been developed that by World Health Organization standards are safe and

without risk of drug interaction. This may help to fill the need during the pandemic for products whose bioactive components are confirmed and effectiveness consistent.

So far theoretical computer models have identified a number of components in propolis as potential allies in the battle against Covid-19. Lab studies in test tubes and culture dishes will be needed to evaluate this potential and identify the most promising compounds before human trials can begin.

Immune stimulation

Some research indicates that propolis can act to stimulate the immune system generally improving immune response in people that are challenged by diseases and infectious organisms. This could be especially helpful since the caronavirus disrupts the immune response in the initial phases of infection which helps to facilitate replication of the virus. The benefits of propolis are also theorized to potentially reduce the severe inflammatory response which can damage the lungs and other organs in the later stages of the disease.

One of the lines of research being utilized by pharmaceutical companies working to develop a vaccine for Covid-19 is to target the inflammatory compounds produced in the blood of patients with severe Covid-19 compared to those with mild symptoms. Since the molecular mechanisms involved in the immune process targeting these inflammatory compounds are stimulated by propolis, there is reason to be optimistic about the potential of propolis to minimize symptoms and the harmful effects of Covid-19 infection.

While propolis is used as a building material by bees, they also self medicate with it when they are challenged by disease – something we beekeepers might want to pay extra attention to.

Propolis has a long and well established history of use for its antibacterial, antifungal, and antiviral properties. Since bacterial infection is a common complication in Covid-19 the use of propolis is expected to be helpful when used in conjunction with any conventional treatments that are applied.

Our modern medicines typically have a single or sometimes a few active components. Propolis on the other hand has hundreds of components, many of which can help treat diseases and associated complications. The strong healing potential of propolis has inspired a clinical trial of Brazilian green propolis extract (EPP-AF) for the treatment of Covid-19 patients. Propolis is relatively easy to obtain, is low cost, is relatively risk-free, has minimal interaction with pharmaceutical drugs, enjoys a long history of therapeutic use, does not require a prescription, and has known biological activities. While more research is needed to uncover the specific benefits propolis may provide to people suffering from the SARS-CoV-2 virus, some are suggesting that except in the rare cases where people may develop an allergy to it. Propolis may be useful during the current pandemic as a prophylactic treatment, especially for high risk groups. While most studies have used daily dosages of 500 mg/day (the equivalent of about 30 drops of tincture three to four times a day) safely, one study testing propolis on dengue fever prescribed 1200 mg/day (400 mg three times a day) for a period of one week with no harmful effects suggesting that dosages of more than 500 mg/day could be useful in severe cases of Covid-19.

According to projections from the influential Institute for Health Metrics and Evaluation the U.S. death toll from Covid-19 could more than double the current rate reaching 410,000 deaths by January 2021. The institute projects the daily death toll to grow to about 3,000 per day by December 2020. Of course trying to predict the future is extremely difficult since many unexpected things can happen between now and then. For example, the institute projects that 120,000 lives could be saved if 95 percent of the country regularly wore face masks. Given the politicalization of such simple solutions, knowing about a safe, inexpensive, and easy to obtain product such as propolis might just mean the difference between life and death. BC

Propolis can be used raw right out of the hive, although it is typically available in capsule and tincture form.

Ross Conrad is the author or *Natural Beekeeping* and *The Land of Milk and Honey: A history of beekeeping in Vermont.*

BEE VET

Human-Bee Bond?

Dr. Tracy **Farone**

Mutually beneficial relationships have existed between humans and animals for thousands of years, but in the1990s the recognition and importance of the **human-animal bond** began to permeate veterinary medicine and our society in general. As dogs and cats moved from the backyard or the barn to the house, our animal's status changed from pets to family members. Many pet "parents" today find it perfectly normal to share much of their beds with their beloved canine, feline and/or other furry creatures.

While attending veterinary school at Ohio State University in the mid to late 90s, I was one of the founding student officers in our Human Animal Bond Club. At that time, we did not fully understand the meaning of our club's purpose, we just liked bringing animals around to visit folks in nursing homes. Since then, I have watched the human-animal bond relationship evolve from a near front row seat. Volumes have been written on the subject in the past 30 years. Laws have changed. How we handle animals in scientific research, in veterinary medicine, and in agriculture has changed. How we acknowledge and treat animal pain has changed. How we value animals in society has changed. The human-animal bond has become its own subject of study (just check Google scholar), and has meaningful, beneficial, and economical applications for both humans and our animals.

During one of the first bee vet medicine disease courses I took, another veterinarian asked if bees recognize their keeper. "No . . . (with a laugh)", was the response from the instructor. However, over time, my research and observations with honey bees and beekeepers are leading me to another conclusion.

I am not saying that your bees are going to love you like a devoted, slobbering Labrador Retriever. They will not. But let us consider what the science, both biological and social tells us. I will also throw in some anecdotal evidence that I believe most keepers can relate to.

Behavioral and Physiological Science:

There are many reasons for aggressive or defensive behavior in bees: genetic predisposition, extreme weather, queenlessness/pheromone imbalance, underlying diseases, and lack of reserves/hunger. Notice these reasons are not unlike the major causes of defensive action in all animals. One factor that induces defensive behavior that you can control every time you interact with your hive is your behavior. Honey bees, like most animals, recognize and communicate threats and non-threats. They will change their behavior toward you based on their assessment. Anecdotally, after shadowing dozens of beekeepers, I have observed that "rougher" beekeepers tend to have "crankier" bees.

Honey bees' brains have incredible capacity for memory, and they are capable of passing this memory on to the hive collectively. Honey bees have keen visual, mechanical, and chemical senses. If you visit them on a regular basis, it is likely they know what you look like, smell like, and whether you and your behavior are perceived as a threat or not.

Social interactions:

Many backyard beekeepers may view their hives like pets. One's hives may even make your Christmas card picture along with your kids, your dog, your cat, and your spouse! However, the human-animal bond does not just apply to pet owners.

*The **human-animal bond** is a mutually beneficial and dynamic relationship between people and animals that is influenced by behaviors essential to the health and wellbeing of both. This includes, among other things, emotional, psychological, and physical interactions of people, **animals**, and the environment.* – The American Veterinary Medical Association (AVMA) definition of the Human Animal Bond

Anyone who has spent some time with a family farmer knows that most love and care for their animals. Growing up in dairy farm land and in my early vet days, I can remember watching dairymen calling in their cows from the field for milking. A cow's ear tag may have said #49, but to the dairymen, she was "Susie". He would call her by name, she knew his voice, and he helped direct her to her stall. To me, they looked like a bunch of black and white Holsteins, but to the farmer these animals were his life and livelihood. Granted the dairyman knew if Susie's production dropped, she would have to "go down the road", but he still stewarded an empathy for her life's contribution to his family. In commercial bee yards, I have observed a similarity amongst beekeepers with bees much like a dairyman caring for his cows. I have heard these bee farmers lament and struggle with the choice of moving their bees and disturbing their peaceful "porch sitting" evening. Many bee farmers worry about their bees' health and stress, understanding the relationship that their bees' wellbeing has on their own.

Other Bond Benefits:

Included in the definition of the human-animal bond are the mutual benefits of the bond between the animal and human, including emotional, psychological, and physical aspects. The environment also plays a role in the interaction of this relationship.

On the bee's side, a good keeper will provide proper shelter, nutrition, health and preventative

care. Unfortunately, without a knowledgeable, involved keeper intervention many *Apis mellifera* colonies will perish within a few years due to pests, disease, exposure and/or poor nutrition.

On the human-side consider everything bees do for us! Like many agricultural animals, we may feed them but ultimately, they feed us. Bees provide honey, wax and other hive products, **and** pollinate a substantial number of crops that human and other animals eat. Beekeeping itself also provides a means of physical activity. Our benefits from the bees go much further than just the physical benefits. Beekeeping is acknowledged as an activity that can improve mental and emotional health, one of the biggest public health issues we face. Many beekeepers have expressed how their hives gave them something positive and "safe" to do during COVID-19 lock downs.

Ways to Improve Your Bond

Know your bees. Keep records. Learn how to do regular, gentle inspections. Move smoothly, at "bee speed". Try not to crush too many bees or bang on the hive. If you are afraid to inspect your bees on a regular basis for whatever reason, get some help. Your developing knowledge and technique will keep them healthier and both of you "happier".

Try less smoke. Imagine if every time you met someone; they thought their house was burning down. Yes, there are times and places for smoke. I am not saying throw your smoker away. Certainly, commercial settings or dealing with Africanized bees are a different story. But a smoker is essentially what we call in veterinary medicine, a restraint device.

A restraint device is a tool or technique that veterinary professionals use to control an animal's movements for the safety of the animal, the animal owner, and the veterinary professional. However, if too little or too much restraint is used, specific to the situation, control and safety may be lost. An example of a restraint device would be a dog muzzle or a cat bag. Most veterinary professionals will start with the "less is more" approach, especially with felines. Most of the time this is the best approach with most cats. However, a few cats may still end up jumping to the ceiling, no matter what you have tried. I have found *European* honey bees to be somewhat like cats, in that less smoke is more for most hives, on many days. Keep your smoker lit, but use it judiciously, only when needed.

Drones don't snuggle.

Food for thought

I am writing this in August in Western Pennsylvania, where we are experiencing an extended dearth, exacerbated by severe drought conditions which we have not experienced for years. One recent evening while sitting on the back deck with my husband, I had bees hovering and crawling all over me, but not my husband. "They know you," he said with a smile. I think he is probably right. I have been in so many hives I probably "smell" like a queen pheromone cocktail mixed with sugar syrup. Every evening my bees are following me around like a puppy, as I water my plants, hoping to get a sip of precious water. They just want fed, right?... But is this not a major way we form bonds with most animals? We feed them. Nothing wins over a cat like their favorite treat. My horses come running into the barn after I call them, yes ...**and** after I dump grain in their buckets. The very first human relationships with canines developed thousands of years ago around our campfires where food scraps were easier to come by than typical prey. Are our bees really that different?

The human-bee bond. A bond with of tens of thousands of stinging insects? I believe we and our bees absolutely meet the definition of this important relationship... but these babies are still staying outside in the yard for me. BC

Gifts from the hive.

Photos by Deidra Ressler

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The Human-Animal Bond Research Institute: **https://habri.org/**

AVMA's definition of the human animal bond. **https://www.avma.org/one-health/human-animal-bond**

I found one master's thesis on the subject of the human-animal bond and bees: **https://aquila.usm.edu/cgi/viewcontent.cgi?article=1213&context=masters_theses**

Enhancing Africanized Bee Removals In Trinidad & Tobago

Gladstone **Solomon**

The arrival of Africanised honey bees in Trinidad, the most southerly island in the Caribbean, is undoubtedly the biggest game changer in the island's beekeeping history. The first established colony was found in July 1979 in county St. Patrick, south-western Trinidad. Annual reports from the Ministry of Agriculture indicate that a succession of swarms arrived from South America (seven miles away) and irreversibly changed beekeeping as it was previously known.

To date, the honey bees on Tobago, Trinidad's counterpart in the twin island Republic, are of the same variety introduced by European colonists. This is on account of the *de facto* prohibition on the movement of bees from Trinidad to Tobago since the arrival of Africanised bees in the former, Tobago's location 35 kilometres up-wind of Trinidad, and the nature of passenger and cargo traffic between both islands, which limit the possibility of undetected transportation of honey bee colonies.

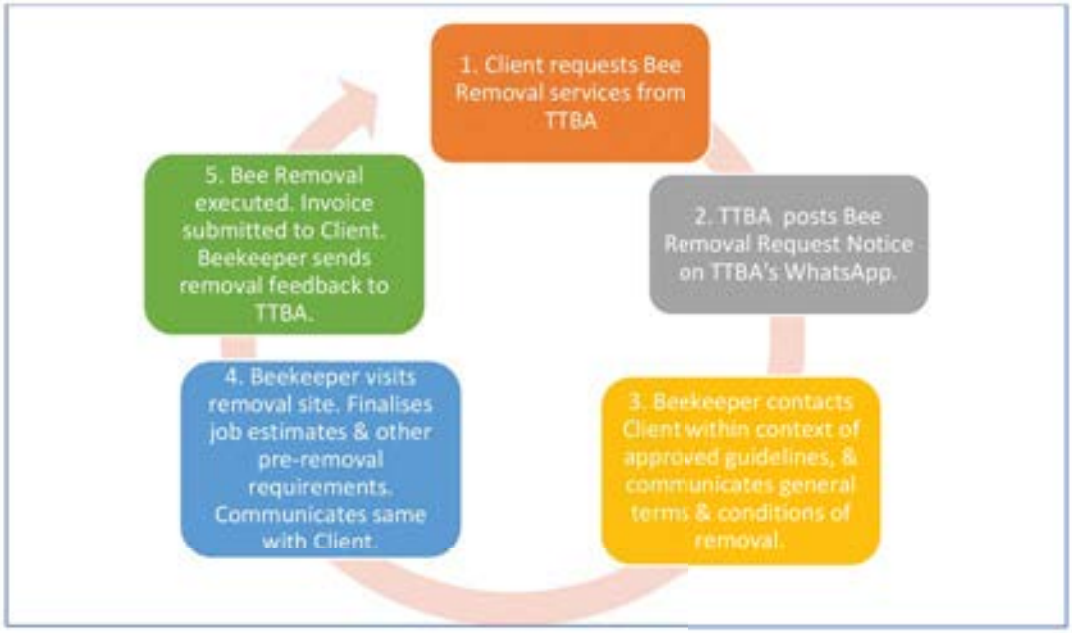
Africanized honey bees pose a heightened challenge to public safety, particularly in urban areas, given their higher propensity to swarm and abscond, and to be defensive, compared to their European counterpart. Their arrival precipitated a decline in Trinidad's beekeeping sector and marked the end of the parallel development of beekeeping on both islands. There were significant reductions in both the number of colonies and beekeepers in the aftermath of the bee's arrival. More than half of the practicing beekeepers in 1978 had given up beekeeping by 1984 because of the bee's high swarm frequency and extreme defensive nature.

Over 28,000 established feral colonies were destroyed or collected by the Ministry of Agriculture's Bee Abatement Programme, and at least 5,300 persons and 800 plus animals had been stung by honey bees during the period 1979 to August 1992. By December 2005, 16 persons in Trinidad died because of stings from Africanised bees.

The emergence of a new generation of beekeepers around the turn of the century with no prior exposure to the easier-to-manage European honey bees, and no option but to work with the available stock of Africanized honey bees, heralded the start of the resuscitation of beekeeping on the island. Hayden Sinanan, Inspector of Apiaries, estimates that currently there 400 active beekeepers, managing approximately 9000 colonies in Trinidad, roughly the same number of beekeepers and almost 2,000 more colonies than was reported in 1978.

The removal of honey bee colonies from locations other than managed apiaries, has always been integral to beekeeping. Bee removals were provided by the Ministry of Agriculture as a 'public service' prior to, and more so since the arrival of Africanised honey bees. As beekeepers gained confidence in managing Africanised bees, their

Chart 1: Process Flow Diagram



Enhancing Africanised Bee Removals in Trinidad and Tobago, by Gladstone Solomon. **Page 3 of 4**

involvement in bee removals and the commercialisation of the activity accelerated. In fact, bee removal has emerged as a specialised economic activity within the sector, with several beekeepers investing in bee vac's, scaffolding, ladders, and the like. This development has been facilitated in part by constraints in the delivery of bee removal services by the Ministry's Bee Abatement Unit.

Reports of misconceptions in clients' expectations regarding bee removal services are on the increase. Some clients are of the view that they are entitled to the honey removed as part of the process. Petra Rattan, a home-schooling mother from north-east Trinidad with over five-year's beekeeping experience, remedied the situation by including a statement in her removal estimate form that clients are required to sign, which reads, *"A successful colony requires bees, comb, honey, and pollen, as such all of the aforementioned are considered part of the removal process."*

Other clients believe they are doing the beekeeper a favour by allowing him/her to remove bees from their property and, as such, they should not be required to pay a removal fee. Kern Cyrus from Chaguanas in central Trinidad has encountered several clients over the past four years who he believed were genuinely not able to pay removal fees. Kern informed that in such instances he removed the bees anyway, sometimes at a reduced rate, and explained that doing so "puts me in a position to help persons who often are under siege or feel threatened by a swarm of bees, it's my way of contributing to the wider community in my capacity as a beekeeper".

An average of 220 removal calls are received per month by the Bee Abatement Unit, with a data variance skewed towards more calls in the rain season (June to November). Bee removal calls were also received by the three beekeeping associations in Trinidad, pest removal companies, the Trinidad and Tobago Electricity Commission (T&TEC), and individual beekeepers. Taken together, an estimated 3,600 bee removal calls were received from all sources over the past year.

In endorsing the estimated number of removal calls received, the Inspector of Apiaries, referenced a 2005 study by the Ministry of Agriculture which quantified annual bee removal requests at approximately 1,000. He attributed increases in the estimated number of removal calls to improved methods of communication, urbanisation, and overall increases in the number of managed and feral honey bee colonies on the island.

Aditya Ramlochan, a beekeeper from Manzanilla on Trinidad's east coast estimates that he removed over 1,000 colonies since he started bee removals in 2001. Aditya recalled that in 2019 he removed 120 colonies, and about 100 the previous year. Referred to by his peers as the "bee whisperer" because of his deft bee-handling and bee removal skills, Aditya anticipates removing over 100 colonies this year.

Recognizing the need to improve service delivery and customer education, a Team from the Trinidad and Tobago Beekeepers Association drafted proposals to enhance the Association's bee removal portfolio, inclusive of the following recommendations:

1. Amend the bee removal Process Flow to comply with the 5-Steps at Chart 1.
2. Communication and consumer education regarding bee removals, via programmes on social media, television, radio and newspapers.
3. Form an exclusive Bee Removers WhatsApp Group, administered by the TTBA. Conditions for inclusion and retention in the Group are as follows:
   - Financial membership in the TTBA.
   - Practical skill and knowledge levels established by the TTBA.
   - Agreement to abide by a Code of Conduct and other requirements approved by the TTBA.
4. Adopt the professionally drafted Bee Removal Contract

Agreement ((attached) as the authorised agreement document between Beekeepers and Clients.

5. Follow-up on discussions initiated by the Team with T&TEC and pests removal companies regarding establishing strategic alliances to treat with bee removals.
6. Implement the following Bee Removal Fee Structure. BC

The Structure provides pre-determined fees for Assessment Scores ranging from 3 to 12 points.

A pre-determine fee is fixed for an assessment point, e.g. $xx. An Assessment Score of 3 = $3xx.

Fees for Total Assessment Scores above 12 are determined by the Beekeeper.

Fees are for a removal process involving one Remover.

Bee Removal Fee Structure						
CATEGORIES (Assess the removal & circle one numerical value in each category)						ASSESSMENT SCORE
REMOVAL	TIME	RISK		SKILL LEVEL		
Less than 1 hour	1	Low	1	Basic	1	
1 to 2 hours	2	Medium	2	Moderate	2	
2 to 3 hours	3	High	3	Mildly Complex	3	
3 to 4 hours	4	Very High	4	Complex	4	
More than 4 hours		Extremely High		Very Complex		
TOTAL ASSESSMENT SCORE						

Saving Money, Part II

John **Miller**

Last month we examined how beekeepers can save money by wintering hives indoors.

The science supporting indoor wintering is not in question.

The economics of indoor wintering, done right – is not in question.

Indoor wintering reminds me of the old C. P. Dadant quote – loosely:

"Beekeeping requires the relentless attention to detail." [Indoor wintering requires a lot of attention to detail.] "Hence, beekeepers are, generally speaking, grumpy." Indoor wintering requires attention to details. 170 years after the apt quote, beekeepers have access to widely available monitoring devices – services and information available through the web, our phones, and alarms. So, Why are we still grumpy?

For readers: Last month's arithmetic revealed one of my education short coming[s].

A 6,000' building, at $120/psf is not [Sorry, Michigan Beekeepers] $72,000.00. What's a zero?

For those embarking on indoor wintering: Develop the Financing Plan long before turning a shovel of earth. Several financing routes are available. Banks. Farm Credit Associations.

Internally Saved. Federal Programs.

I want to zero in on one program.

For nearly five years, I worked on inserting five words into a USDA program. "Temporary refrigerated storage of beehives."

www.usda.gov/farmstoredfacilityloanprogram describes a program supporting loans available for a wide variety of commodities, including the 60 USDA-recognized floral sources of honey.

Additionally, grains, oilseeds, peanuts, pulse crops, hay – fruits and vegetables, floriculture, hops, maple syrup, milk, cheese, yogurt, butter, eggs, poultry and aquaculture. Eligible facilities – for cold storage. The full Application is CCC-0185. In 2015 the first FSFL application in the nation was made for temporary refrigerated storage of beehives. Three prior years financial disclosures/tax returns were submitted. The application was denied because 'temporary refrigerated storage of beehives' was not an allowed use of the program. The FSFL program is not available for the storage of beehives; but it Should Be Available for indoor storage facilities.

*The September, 2020 CCC lending rates are:

.125% for FSFL with a 3 year loan term.

.250% for FSFL with a 5 year loan term.

.500% for FSFL with a 7 year loan term.

.625% for FSFL with a 10 year loan term.

.750% for FSFL with a 12 year loan term.

In 2016 I urged ND Congressmen to include language in the 2018 Farm Bill to make 'temporary refrigerated storage of beehives' an eligible use of the FSFLP. After the 2018 Farm Bill passed, in the Joint Explanatory Statement we read: "The Managers encourage FSA to add 'temporary refrigerated beehive storage facility' to the list of eligible uses for the FSFLP, in order to help beekeepers more effectively fight mites and CCD."

In 2018 I inquired about insertion of the five words. In 2019 I inquired about insertion of the five words. In 2020 I wrote the Secretary of Agriculture. On July 30, 2020 I received the following from William L. Beam, Deputy Administrator for Farm Programs:

". . . Your comments and recommendations are appreciated. However, Congress must provide statutory authorization for FSA to allow beehive storage to be eligible under FSFLs. Currently, the FSFL Regulations at 7 CFR part 1436 and the Commodity Credit Corporation Charter Act do not allow for beehive storage under the FSFL program."

Where are the bees?

From the Congressional side, the recommendation to include beehive storage is in the Joint Explanatory Statement, courtesy of Senator John Hoeven's office.

From USDA – "I will keep your concerns in mind should Congress revisit the scope of the FSFL program."

William L. Beam.
USDA – Farm Service Agency
1400 Independence Ave. SW
Stop 0501
Washington, D.C. 20250-0510

Commercial beekeepers, sideliners, clubs, co-ops, and national organizations: Focus attention on the above interest rates and compare those rates to any other available financing source.

Our Farm Credit loan rate is 4.15%. The interest payments on the loan are over $18,000 annually. The loan term was for seven years, three years remaining. For beekeepers in Rio Linda: seven years at $18,000 = $126,000.

I shared with the Farm Service Agency Deputy Administrator the Joint Explanatory Statement from the 2018 Farm Bill Managers. I asked for further explanation of the claim that Congressional Statute is necessary to enable beekeepers use the FSFL program. I await his response.

It is a USDA disservice to be tone-deaf to rapidly changing agricultural conditions.

Change is constant. Dozens of refrigerated fruits, nuts and vegetables – pollinated by honey bees – are program eligible.

For those embarking on indoor wintering: Develop the Financial Plan long before turning a shovel of earth. Save $100,000 with the right lender. BC

Beekeeping In Cuba

David **Donathan**

I traveled in early November with a small group of American beekeepers (ranging from hobbyists to commercial producers) to learn about Cuban beekeeping practices by visiting the Center for the Study of Apiculture (CIAPI) in Havana and several apiaries/queen breeding centers in eastern and central Cuba. As with any group of beekeepers, there were many questions and lots of cross-conversation, so this article is only as accurate as the notes I took at the various sites.

This article is not a comparison between American and Cuban apicultural practices per se. The climates are not similar enough to make straight comparisons and the legal environments are completely different. This makes it difficult, if not impossible, to cite pros and cons between American beekeeping and Cuban beekeeping.

This is especially relevant when one considers the climates. Cuba is essentially a tropical climate with a wide variety of bee friendly plants blooming throughout the year. While U.S. beekeepers operate under different regional plant seasons, only the southernmost states are conducive to year-round active beekeeping. The rest of the U.S. beekeepers experience more weather-limited active seasons and have to over-winter hives. Generally, the U.S. honey production is from about May – September. In contrast, the Cuban beekeepers we visited in Central and western Cuba, reported their honey dearth was from July-August with some of the highest honey production occurring during November-December.

CIAPI is actively studying the effects of climate change on the sea level and how these changes will affect beekeepers in the future. Since the locations and numbers of hives are regulated, CIAPI knows the location of all the apiaries in Cuba and has already begun planning how rising sea levels will require their relocation.

While the basic apicultural practices are very similar to what we do in the U.S., there are several key differences between Cuban and American beekeeping. The primary difference is that all Cuban beekeepers are full time professionals who operate under the auspices of a national organization – Empresa Apicola Cubana (Cuban Beekeeping Company). Better known simply as Apicuba, it is the central government agency in charge of apiculture and honey production in Cuba. They provide training, research and resources to 1532 Cuban beekeepers, all of whom are registered with Apicuba. While the apiaries are privately owned and operated as part of cooperatives, there are no hobbyist beekeepers in Cuba and the number of hives, location, etc. are regulated.

Another important difference is the prohibition on the use of any chemicals in the hives. Control of *Varroa* mites (first found in Cuba in about 1996) is done by genetics and hive maintenance practices such as re-queening hives with high mite counts and frequent use of drone frames. No specifics were given on how mite counts are conducted or on how high mite loads were determined, but the primary means of controlling *Varroa* were segregating and re-queening (brood break) infested hives in separate areas of the apiary. Some apiaries also appeared to use drone breeding hives to assist in mite control. It should be noted that all queens are raised in certified centers and sold to beekeepers at a cost of about $3. The beekeepers we visited all said they re-queen every one to two years and will routinely re-queen a low producing hive or mite infested hive.

A major goal of CIAPI is to protect "Cuban bees." The importation of bees is strictly prohibited and sanitary zones around port areas ensure that the Cuban bee population is not contaminated by foreign bees. This prohibition is strictly enforced and, as a result, there are not only NO Africanized bees in Cuba, but the Cuban hives are populated by distinctly "Cuban bees." Between 2015-2018, CIAPI certified 295 maternal and 261 paternal genetic bee lineages in eight Cuban provinces. Intensive genetic research, queen breeding center "breeding stock" certifications, successfully creating barriers to foreign bees, and ensuring only Cuban-certified queens are provided to apiaries, CIAPI has successfully created a "Cuban" bee which is very gentle and less aggressive.

In addition to uniquely Cuban bee populations in honey producing hives, two of the apiaries visited have created unique methods for raising stingless, in-ground dwelling Melipona bees for a limited harvest of their specialized honey. At the El Servi apiary in Caonao, they house a single hive in a glass dome which is kept covered by a light-proof hood, while at Finca Coincedencia Apiary special hive boxes for raising and producing the stingless bees have been developed. The boxes are about 10" square and four inches deep.

El Servi Apiary's Melipons bubble hive.

There are no frames or foundation. The bees build honey "pots" out of wax inside the empty boxes and fill them with honey. At both apiaries, the honey is harvested for use as a homeopathic remedy for eye ailments (the honey is dropped into the affected eye, not ingested).

Honey production goals are set by Apicuba for each of the 1532 registered beekeepers. The average honey production per hive is estimated at 45-70 kg of honey per year, with production goals for beekeepers being set in tons. Honey production rates vary according to the time of year, but all of the beekeepers we visited were at or above production targets and consider July – August to be the honey dearth period and November-December their higher producing time frame. In 2017, Cuban beekeepers produced over 900 tons of honey which was primarily exported and produced over $20 million in revenue. In 2018, the 20,000+ hives produced about 47kg of honey per hive, but due to unfavorable weather, the 2019 honey production is expected to be somewhat less.

The honey is sold to Apicuba (some beekeepers keep a small amount to sell privately) which has two plants where the honey is filtered and then sent to the central Planta de Envasado (packaging plant) in Havana. It is sold and packaged primarily for export under the government Apisun label. BC

Apisun products are sold to tourists in a retail store in Old Havana City. Products include seasonal dark and light honeys, Vino de Miel (honey mead) and candies such as Polen Cubierto de Chocolate (chocolate covered pollen).

In this CIAPI certified queen breeding center of about 400 breeding nucs, over 450 queens a month are provided to beekeepers in Cienfuegos Province. In addition to queen rearing, they also breed drones in special hives and have already produced 556T of honey toward their 700T target.

Finca Coincedencia Apiary has developed special hive boxes for raising and producing stingless Melipona bees whose honey is usually sold for medical purposes. The boxes are about 10" square and 4 inches deep. There are no frames or foundation. The bees build honey "pots" out of wax inside the empty boxes and fill them with honey (the holes in the tops were caused when the outer cover was removed and the wax caps of the honey pots pulled off).

Anton Diaz's queen breeding center in Santa Clara has 500 nucs for raising queens for Santa Clara Province. He maintains an 88%-90% success rate and produces 4,000-4,500 CIAPI certified queens per year.

Late Summer / Fall Blooming Bee Plants – Northwest

Connie **Krochmal**

Bees in the Northwest can find a good number of forage plants blooming during late Summer and Fall. Among these are the following.

Yellow cleome (*Cleome lutea),* which is a relative of the cultivated spider flower and the native Rocky Mountain bee plant, bloom throughout the growing season until frost. Bees love these flowers, which bring nectar and pollen. This can yield a somewhat strong tasting, dark colored honey.

Borage (*Borago officinalis)* is a fast growing annual herb that bears blossoms from June until frost, depending on planting time. Several successive sowings are possible during the growing season. The plant can also self sow.

The March 2020 issue of *Bee Culture* featured "Found in Translation" by Dr. Jay Evans, which critiqued a study highlighting the top six bee plants with borage being one of those. These gorgeous, small, blue, nodding blooms are a favorite among the bees.

The plants provide pollen and nectar. The great tasting honey can vary widely in color from whitish to very dark.

Beggar ticks (*Bidens spp.)* are also called Spanish needles. Most common in coastal areas, these plants typically bloom from August through October. All species are known to be good bee plants that bring nectar and pollen. The amount of honey can vary by region and species.

Chicory (*Cichorium intybus)* is a common naturalized plant from the midwest to the Pacific Coast. The flowers are eagerly sought by bees for they bloom over a long period. The blossoms provide white pollen along with much nectar in both dry and rainy periods.

The yellow honey can have a greenish tinge when it granulates. This has a characteristic, chicory-like flavor.

Yellow star thistle (*Centaurea solstitialis)* has also naturalized in this area. Also called yellow thistle, it occurs mostly as an annual.

Flowering from July until October or frost, this is a good honey plant in the West. Each blossom can provide a steady supply of nectar with .123 mg per flower daily.

The plants typically bring about fifty pounds of honey per colony. Often granulating, this very sweet, premium quality, heavy bodied honey has a great flavor. It varies in color from nearly white or extra light to amber, yellow or green—with or without yellow tinges.

Giant knotweed (*Polygonum sachalinense)* is a naturalized perennial in the Northwest. The plant looks very much like the common knotweed. Flowering from July until October, it is much loved by bees. Some knotweeds can bring a pleasant tasting amber honey. However, there is typically not enough of the plants in most locations to yield honey.

The **mints** (*Mentha spp.)* are grown commercially in the Northwest. Peppermint bears blossoms from mid Summer until Fall. The three foot tall perennial is a wonderful honey plant. The flavor of the honey, which is mint-like initially, mellows with time. This is amber to deep amber.

Pumpkins (*Cucurbita spp.)* and the other vine crops are excellent bee plants. Pumpkin is a great source of large grained pollen along with large quantities of nectar.

These vines can provide a surplus honey crop of sixty-five to over a hundred pounds per colony. Granulating rather quickly, the very heavy bodied honey is premium quality. The color ranges from straw colored or amber to yellow.

Because **fireweeds** (*Chamerion spp.)* are such important bee plants in parts of the Northwest, they deserve to be discussed here even though one early blooming species was included in a Spring article for this region. The fast growing perennials tend to spread easily. Fireweed blossoms typically emerge from June through September, depending on the species.

All fireweed species are considered great honey plants with the average surplus honey crop being fifty to over a hundred pounds per colony.

Typically mild flavored, the premium quality honey can sometimes taste a little spicy. This is the lightest colored honey of all from water white to pale straw colored. It can sometimes have a greenish tinge when the purplish-green pollen is present.

Cleome

Borage

Beggar ticks

Chicory

Asters are reliable late blooming plants in this area. They bring a yellow pollen along with nectar, which can result in good honey crops.

English ivy (*Hedera helix)* is among the latest blooming bee plants, and can produce flowers through November or so. This species has naturalized in some areas of the Northwest.

The vine is a rich source of nectar along with pollen. Bees are crazy about these flowers. The plant can provide a small surplus of around twenty pounds of honey per colony. Granulating quickly, the thick bodied, green honey has a pleasant taste.

Several herbs are known to flower late in this area. **Pennyroyal** (*Mentha pulegium)* bears blossoms during the Summer and Fall. The semi-evergreen to evergreen perennial bears lilac, blue, or mauve blossoms in compact whorls from Spring until late Summer. A good source of nectar, this can yield surplus honey, which is rather thin bodied and pale colored.

Additional Late Blooming Bee Plants for the Northwest

The following species are ones that haven't appeared in previous articles, while those above have.

Seven-Son Flower (*Heptacodium miconioides)*

A member of the honeysuckle family, this tree is native to an area of China that is at two thousand feet elevation or more. Also called seven son flower of Zhejiang and Chinese heptacodium, seven-son flower was first introduced to the U.S. in 1907 by E. H. Wilson.

Somehow, the plants were subsequently lost only to be reintroduced again in 1980 to the Arnold Arboretum by the Sino-American Botanical Expedition, which brought back seeds from China.

Description of Seven-Son Flower

This vigorous, upright, small tree or deciduous shrub is relatively fast growing. It has an upright to fountain-like growth habit. Seven-son flower generally is 10 to 15 feet in height, although it has been known to reach 20 feet occasionally. The tree has a six to 10 foot spread.

Seven-son flower is particularly striking in Winter when the pale, thin, outer bark peels to reveal the lovely, deep brown inner bark.

The bold, shiny, deep green leaves, up to four inches long, are opposite. These feature large, prominent longitudinal veins. With wavy margins, the foliage ranges from elliptical to narrowly heart shaped. Becoming purple tinged during the Fall, they remain on the plant until early Winter.

Blooming at a young age, this tree bears small, scented, creamy white blossoms, 1¼" wide. These are borne terminally in whorls, heads, or clusters, up to six inches in length. Usually beginning in late August or so, the flowers start emerging, and continue to do so until frost.

The common name refers to the number of individual blossoms in each flower cluster or head. As the flowers fade, the sepals enlarge and become brightly colored, mostly dark pink to red, but sometimes purple. Continuing to provide color for a couple months if the weather is favorable, they remain in place throughout the Fall.

Seven-son flower is highly recommended for bee gardens since it produces quite a lot of pollen and nectar. Bees eagerly seek out the blossoms.

The small, rather dry fruits develop during Autumn. Ripening to tan, these are ½ to ¾ inch in length.

For the most part, this tree is presently grown mostly in the Northeast, and isn't very common in most other regions. However, it is a very suitable bee plant for the Northwest.

Growing Seven-Son Flower

Bringing beauty throughout the year, this can be

grown as a specimen, in mixed borders, and as an understory plant under taller trees. Some sources report this is best suited to zones five through nine, while others recommend it for zones six through nine with marginal hardiness in zone five. The plant thrives in the Middle and Lower South.

Seven-son flower requires a well drained soil and acid conditions. It is tolerant of salt and drought. For best results, choose a sheltered spot for this species.

Easy to grow, seven-son-flower thrives in full sun to light shade. It seldom experiences insect or disease issues. Propagation is by seeds and cuttings as well as basal suckers.

To keep the plant dense and full, the shoots can be thinned as needed. If the base of the plant becomes crowded with twiggy growth, remove some of the smaller stems. Seven-son flower can be trained as a single trunk tree or a multi-stemmed shrub. The plants are available from Rockbridge, Kelly, and Forestfarm.

Japanese Angelica Tree (*Aralia elata)*

Belonging to the aralia family, this woody plant is a relative of the native Hercules club. Japanese angelica tree was introduced to America around 1830 or so. It is native to northeast Asia, Korea, and Manchuria. This exotic is related to English ivy and ginseng.

Japanese angelica tree has escaped cultivation in some states. These include Washington, Oregon, Illinois, Wisconsin, Michigan, Ohio, Pennsylvania, Delaware, New Jersey, New Hampshire, and New York.

Description of Japanese Angelica Tree

This broad headed, erect, stout, flowering tree or shrub with a spreading growth habit has a wide spreading, umbrella-like crown. It is generally described as bold or tropical looking.

So far as size is concerned, this typically grows to about thirty feet in height. Under ideal conditions, it can be somewhat taller. Depending on how it is trained, Japanese angelica tree can be a somewhat sparsely branched, rather spindly looking tree or a shrub with just a few trunks or stems. The trunks are only a couple inches in diameter.

The plant is probably best known for its prickles. The main branches bear sharp, triangular thorns. The stems also have short prickles at irregular intervals.

Spines are also borne on the petioles and leaves as well. However, the cultivars with variegated foliage tend to be much less prickly than the species.

Japanese angelica tree leafs out late in the Spring. The large, deep green, alternate leaves are compound. They can be over three feet long.

Normally, these tend to form a crown about ten feet wide at the top of the plant. The foliage is doubly pinnate and rather coarse looking. The leaflets are 2½ inches long, and can become yellow, orange-red, or slightly red during Autumn.

Flowering occurs from late Summer into Fall. The very small flowers appear terminally in very large clusters on the crowded, pyramidal flower spikes, which are up to 1½ feet wide.

Japanese aralia tree serves as an excellent source of pollen and is an almost equally good source of nectar. The flowers contain so much nectar that it can be seen by the naked eye. Bees are attracted to the blossoms as soon as they open.

Japanese angelica tree bears small, berry-like fruits that ripen to black in the Autumn. These are enjoyed by birds.

Growing Hercules Club

Although Japanese aralia tree is a good pollinator plant, I recommend it for bee gardens only if its potential spread is monitored to prevent this exotic from becoming an invasive species in the future.

As an alternative, I offer its native counterpart, which looks quite similar and is an equally good pollinator plant. Hercules club (*Aralia spinosa)* is a woody species that is also known as angelica tree and the devil's walking stick. It is easy to grow from seed.

Native to the Southeast, Hercules club generally reaches six to 15 feet in height with a four to 10 foot spread. Some people have developed dermatitis from touching the roots or bark of this species. The entire plant is quite prickly.

This can be trained as a shrub or a tree. Hardy to zones four through nine, Hercules club prefers wet to moist, rich soil.

Its typical habitats are low or rich woods, riverbanks, and bluffs. The plant is native to Texas, Oklahoma, Missouri, Arkansas, Louisiana, throughout the Southeast and the Mid-Atlantic, northward to Rhode Island, Massachusetts, Connecticut, Maine, and New York.

When this native plant blooms from July through September, bees are all over these flowers. As the blossoms begin to age, the pedicels turn bright pink to purple. Birds are fond of the ripe berries.

Hercules club can sometimes provide surplus honey. This pleasant tasting honey is light colored with a pleasing body. BC

Connie Krochmal is a plant expert and beekeeper in Kentucky.

I Retired At 47!

Chad **Gilliland**

If you would have mentioned 20 years ago that beekeeping would be the center of my life, I would have laughed and shook my head in disbelief. At the time, I managed the pesticide division for one of Kansas City's largest lawn, landscape, and tree service companies. As an arborist, I built pesticide programs, researched chemicals, sold lawn and landscape healthcare programs, managed spray technicians, and sprayed countless chemicals myself. I learned during the first half of my professional career, the industry standard means to operate a fully functional farm and orchard using conventional insecticides, fungicides, and herbicides. Fast forward 20 years; I now operate a pesticide-free farm and a 125-tree fruit orchard. I completely see the irony in my professional pursuits.

My path as a beekeeper and my passion for beekeeping began six years ago when my wife and I purchased our forever home on 10 acres in northeast Kansas. Within weeks, I promptly went to work and planted a hobby orchard with 15 assorted fruit trees and hand-sowed six acres for a native wildflower patch for my wife and I to enjoy for years to come. As the fruit trees matured, I wanted to increase our crop yield by adding honey bees. Immediately I started to do my homework and found the Northeast Kansas Beekeepers Association (NEKBA) online and went to my first Monday night meeting. It was perfect timing; for the next two months I signed up for the beginner beekeeping class, purchased equipment, and ordered two packages of bees to start our colonies. From there, it was like a moth to a flame--I was hooked immediately and by my second year managed six hives. My wife and I focused on learning about the health benefits of beeswax, essential oils, and how to create all-natural salves and creams using the full spectrum of natural elements from the hive. Soon, our products included natural beeswax lotion bars, therapeutic salves and creams, and lip balms. We took a specific interest in how to develop artisanal flavors of honey and created recipes for using honey in food preparation.

Since I am a glutton for punishment, I setup at my first farmers market in a nearby city. All I can say is that it was a perfect fit for me. I was able to pair working outdoors, my love for horticulture, and being a salesman. For the next two years, I continued to do farmers markets and any festival or outdoor event that would allow me to set up and sell our products. I absorbed all I could about anything and everything beekeeping. In my third year of beekeeping, I started to realize I could make this hobby into a full-time business. I spent the next year, while still working full time, growing my hobby into a business. We landed on the name Next to Nature Farm and based our business plan on a pesticide-free farm focusing on sustainable farming practices and offering all our products in their most natural form.

In November of 2018, after much thought and prayer, I made a life-changing decision to retire at the age of 47 and take the plunge into running my business full time. At the time, my wife thought I was nuts. I just felt it was necessary and had faith I could chase down my dream of owning and operating a small business. Over the

Next to Nature's new store, located on their farm, is a fun destination for visitors to shop for local, handmade items including soaps, jams and jellies, pickles, home décor items and more.

Next to Nature specilizes in local, raw honey. They also feature a large selection of infused honeys and creamed honeys.

Chad Gilliland, owner and operator of Next to Nature Farm, catches swarms in the Spring to develop new hive colonies.

next year, we formulated an in-depth business plan and developed the concept of an agritourism education and retail center. We focus on the critical importance of honey bees and native pollinators to agriculture in Kansas, the Midwest, and throughout the world. For the next 10 months, I attended every workshop and conference on building and growing a small business and working toward the concept of a destination location business.

Construction on our new farm store started in November of 2019 and so began the long, slow, frustrating dance with contractors. Highlights of our agritourism facility include a seven-foot tall indoor observation hive designed and constructed by a fellow NEKBA member. In addition, we have the only honey tasting bar in Kansas offering visitors the opportunity to taste over 50 different natural flavor creations of artisanal infused honey, creamed honey, and varietal honey sourced from throughout the United States and the world. Our retail center has all our products, honey bee and native pollinator themed merchandise, and handmade products

Next to Nature Farm believes in preserving old-fashioned methods including canning foods. Their line of old-fashioned pickles and homemade jams and jellies are a fan favorite.

Next to Nature Farm built a commercial kitchen in their new farm store. They rent their commercial kitchen and extraction equipment to smaller beekeepers to use to learn the process of harvesting honey as well as having a clean, sanitary environment in which to do so.

from an additional dozen vendors that produce high-quality local products. In addition, as a certified Dadant dealer, we carry beekeeping equipment and supplies. This year, we were also a retail outlet for nucs. Along with our retail and educational components, we have built and outfitted a commercial kitchen at our facility that acts as a business incubator for individuals requiring a commercial kitchen to prepare products for resale and bakers/chefs a location to prepare specialty items.

We have plans for expansion including the construction of an 800-square-foot indoor butterfly house that will have native pollinator gardens. We hope to have this feature open in summer of 2021. Plans for a greenhouse are in the works for 2022 which will allow for us to offer a nice variety of native pollinator plants.

From an educational standpoint, we have workshops, classes, and events offering year-round opportunities to visit the farm. Follow us on Facebook or Instagram or visit **www.nexttonaturefarm.com**. BC

NATIVE PLANTS FOR BEES AND OTHER POLLINATORS

Christine **Bertz**

We like bees. (This seems a safe claim to make.) But our appreciation for the honey bee often extends to other insect pollinators, as well. In fact, the honey bee has become an ambassador for worldwide pollinator health, since many of the factors that threaten honey bees also threaten other insect pollinators. To protect the honey bee is to preserve an unseen host of other valuable insects, most of which are much more difficult to monitor. Yet research suggests that under certain circumstances, honey bees – an introduced species in most parts of the world – may compete for resources with native bees and other pollinators. The status of the honey bee as a symbol for insect conservation makes the idea that they might also endanger this cause a particularly unsettling thought.

Pollinator decline is a complex problem, but there is one simple action we can take to support native pollinators. Happily, it is a measure that also supports the honey bee: By choosing native plants for the landscapes we manage, we support the native pollinators that depend upon them and improve the health of the ecosystems on which all pollinators rely. This is true whether that ecosystem is an agricultural matrix or an urban neighborhood. Adding native plants to our surroundings provides resources for both native pollinators and honey bees, increases connectivity among pollinator habitats, and mitigates some of the stressors that threaten both native species and honey bees alike.

The honey bee is a talented generalist, but for many pollinators, not just any plant will do. Some native insects are specialists that will only visit the flowers of particular plants or plant families. Even some native bees with a broader diet still prefer the flowers of native plants. And, critically, some native insects require particular plants to host their larvae, and cannot reproduce without them. By choosing native plants, we can help reduce these limitations on native pollinator success without disrupting the less selective honey bee's diet.

Choosing native plants can also benefit both honey bees and beekeepers. For example, plants native to a particular region are more likely to be adapted to local weather conditions, and may require significantly less care than non-native species in order to thrive. Regions that receive little rainfall already embrace xeriscaping to maintain an attractive yard with little or no water use. Drought-tolerant native plants like those used in xeriscape can also provide rich sources of nectar for honey bees at times of the year when imported varieties wither. In areas prone to flooding, native wetland plants like swamp milkweed can produce copious Fall nectar while also hosting the larvae of the monarch butterfly. Similarly, pussy willow provides some of the first nectar available to honey bees each spring, and also hosts the larvae of many native butterflies and moths.

Admittedly, the larvae of beneficial pollinators are not always a gardener's friend, particularly when they take the form of a hungry caterpillar. The hawkmoth is a specialist pollinator for many rare plants, but its larval stage – the hornworm – isn't winning any popularity contests. Hornworms and other caterpillars are an important source of protein for bird hatchlings. And other insect pollinators are pest control agents in their own rights, preying upon damaging insects and

Honey bee on a passionflower.

A Parasitized Hornworm.

helping to keep their numbers low. The braconid wasps are a hair-raising example of this type of biocontrol, with larvae that parasitize crop pests including aphids, cabbage worms – and, yes, hornworms.

This all matters to the honey bee because providing native host plants for beneficial insects can reduce the need for pesticides that are harmful to honey bee health. For instance, many North American ladybugs feed on aphids as adults, while their larvae consume mites, whiteflies, and scale insects. The recommended chemical treatment for scale insect infestations is a neonicotinoid pesticide. Since a growing body of research links neonics to health declines in both honey bees and native bees, ladybug larvae are a welcome predator. But native ladybugs are difficult to rear commercially, and may transmit pathogens if they are wild-caught and transported. So the best way to enjoy the benefits of ladybugs – and many other native pollinators – is to plant the native species that attract and nurture them.

Lady beetle larva

"Save the bees!" has become a rallying cry for pollinator health, and despite its non-native status, the honey bee is a powerful ambassador for this important movement. However, concerns about the impacts of honey bees on sensitive native pollinator populations are also valid. As beekeepers, we can take steps to minimize these risks: For example, see the Xerces Society's publication outlining factors to consider when locating new apiaries. And as land managers, no matter the size of the area we tend, we can support pollinator health by planting native species. In doing so, we foster more diverse, resilient ecosystems that can reduce pesticide use, supply host plants for vulnerable native pollinators, connect fragmented pollinator habitats, and provide high-quality food sources for our favorite pollinating insects – all of them. BC

All About The Queen

Tina **Sebestyen**

Last month we were discussing optimal development for queens, and how a queen who was well fed from the moment her egg hatched grows big and fat, lives longer, and lays more eggs over her lifetime. So what about the tiny queens beekeepers sometimes see, whether home-grown or commercial purchased? Ed Colby and I recently spotted a new queen in one of my mating nucs who was so small she was almost indistinguishable from the workers. She was one I raised, so I am still watching her. She has grown to almost normal size, and is laying well for a queen in a mini-mating nuc. It is my theory that I had too many queen cells in my cell-building colony, so she didn't get the amazing abundance of royal jelly that she should have had, rather, she had to share with all of her sisters. This may be a by-product of raising queens during a dearth in July. Feeding was just not enough.

Another cause of small queens is when the larva is not intended to be a queen, and is fed the mixed diet of the regular worker bee, and then the nurses change their minds and decide to raise a queen, as in an emergency situation. They switch back to feeding only royal jelly, but can't turn back the clock to the first few days when the larva should have been receiving more abundant royal jelly and nothing else. This is the cause of what is called an intercaste queen. She will develop into a queen, and will usually be able to fly, mate, store sperm and lay eggs, but will never be as big or as robust as if her caste had been decided right from the start. I speculate that this is why emergency queens are not considered to be of the same quality as a swarm or supercedure queen whose fate is known from the moment her egg hatches. An emergency queen is not an intercaste queen, but maybe wasn't quite as well fed as she could have been.

The queens we order and receive in the mail are often long and skinny, and rarely even close to the fat beauties we can grow on our own. This is because they just haven't had the chance to lay many eggs yet, so their ovaries are not completely developed. As they really get up to speed in egg-laying, they'll attain most of the girth we are used to seeing in our good queens. Abundant egg-laying equals fat queens, reduced egg-laying equals skinny queens. This also helps us understand why it is so hard to find the queen in a colony that is preparing to swarm. Not only are there 60,000 bees in the colony, but the queen is being forced to reduce her egg-laying rate by crowding of the brood chamber, and she is being chased and bitten by the bees who are trying to get her in shape to fly. She loses weight, fairly dramatically. So, while we might judge a queen by her length and girth, it is wise to give her a chance to prove herself.

We also judge our queens by the pattern of their capped brood. Understanding how the queen puts the eggs in cells, and why the pattern might be either solid or spotty can help us make a more informed decision. This is one cool thing I've learned from watching my observation hive. The queen does not lay eggs in a patch of cells; bing, bing, bing. She lays one egg in a cell, then walks around in a big circle checking other nearby cells. After checking several, she lays another egg, usually a couple of inches from the last one. Then she does the same thing again, big circle … another egg, big circle … another egg. It is amazing that the pattern ever gets solid.

Can you find the two queens in this photo? (hint: It helps to look for the shiny thorax of the queens.)
(Beth Conrey photo

In late Winter, the queen takes over 30 seconds to lay an egg, then spends a good amount of time sauntering around, since she is only laying a few eggs per day, and the pattern may look a bit more random. This is the same for a young queen. In Spring and Summer, the queen is working harder and faster to get all of those 1200-2000 eggs per day laid, so she gets the pattern tighter. So, just the queen's age, experience level, and time of year can affect brood pattern.

There are other variables that affect the brood pattern. One of them is weather. If it is very hot, there will be more spaces left in the pattern to avoid over-heating of the brood. The bees may even bring water into empty cells in the brood chamber, to cool it. In cold weather, the adult bees crawl into the empty cells between pupating bees, to warm the cells around them. So, there will be more empty spaces in either hot or cold weather. Also, a dearth of either nectar or pollen may make the nurse bees decide that they can't afford to feed all of the brood, so they cannibalize some of the eggs. Or, if the queen mated with some of her brothers, the nurses cannibalize those resulting eggs. If there is a brood disease, or a very heavy mite infestation, hygienic or *Varroa* Sensitive bees remove that larvae. All of these are reasons for the pattern to be spotty that have nothing to do with the queen, since it means that the nurse bees are doing their jobs. Our first reaction to spotty brood should not be to replace the queen. First, we need to look at the health of the brood. Second, we need to monitor for mites, even if you think your last count (which should not have been more than one month prior) was within acceptable parameters. If the beekeeper begins to see diseased larvae, or perforated or shrunken cell cappings, they know the colony needs help in the form of a brood break and a new queen, along with feeding, and maybe a mite treatment.

An old queen can be the reason for a spotty brood pattern. A queen who has run out of sperm will lay eggs and can't fertilize all of them. Some of the unfertilized larvae might be cannibalized, resulting in the spotty brood pattern of a failing queen, but eventually, there will be a lot of drone larvae in worker cells. The drone laying queen needs to be replaced by the beekeeper.

One good reason to replace a queen is if the colony is unable to keep their mite numbers low. Just treating repeatedly is not the complete answer to the mite issue; filling the air with drones from mite resistant colonies, which requires mite resistant queens, is part of the complete answer. Better genetics is one of the best reasons to replace queens. Another reason to replace the queen might be her age. An older queen (one who has been through one Spring build-up) has weaker pheromones, and combined with the high population of Spring, this makes a swarm almost inevitable. Younger queens are much more reluctant to swarm. Queens that have been through two or more Spring build-ups are less likely to survive the Winter; or if they do survive, to come out strong in Spring. Older queens raise fewer fat Winter bees than do younger ones. Most backyard beekeepers do not replace their queens, no matter how old they get. In fact, since many backyard beekeepers do not mark their queens, they don't know how old they are. They rely on the bees' ability to supercede a failing queen, without any other real plan. Very often in my own colonies, I see a real need for a new queen, such as a spotty brood and the attendant declining population, but the bees just don't do it. The queen finally fails completely, laying no eggs, though she may still be alive, and the colony cannot raise a new queen with no eggs to start from.

One of the toughest conundrums of beekeeping is getting a new queen accepted into a colony. In a colony in which everything is optimal, things can go fairly easily. Optimal conditions are – good nectar and pollen availability, good brood pheromones from open and capped brood, low mite load, no disease or stress from predation

like wasps or skunks, and the queen is purposely removed one day before the new queen is introduced, or she is recently missing. The biggest of these issues is the brood pheromone. Brood pheromone and queen pheromone together create a happy and functioning colony. If there is no brood pheromone, it will be very difficult to get the colony to accept a new queen. This doesn't make sense to us humans, because, since the bees need a new queen very badly, it seems to us like they would be happy to accept a new one. Think of it more like this: the bees know that the brood is the responsibility of the queen. A new queen is introduced, and her pheromone is different, so she is already distrusted as a stranger, and then her pheromone can't be passed efficiently because she is in a cage, so she seems weak, thus the brood problems must be the queen's fault. This is why keeping only one colony of bees spells DOOM. Often beekeepers only notice that there is a problem after there is already reduced or completely missing brood. With no other colony to donate brood to the queenless colony, there is no way to introduce brood pheromone, and it will be extremely difficul to get a new queen accepted.

Under optimal conditions, the queen cage can be inserted into the middle of the brood chamber where the bees will care for and feed her, and they will eat through the candy plug and release her. Unfortunately, the bees often release the queen in only two days, not long enough for everyone to have decided not to kill her. I almost never allow the bees the release the queen, even under optimal conditions. It is just too risky.

Under less than optimal conditions – no brood, no nectar flow, queen missing a long time, or hot and dry or rainy weather – I employ the long release method. This means that I don't give the bees access to the candy plug. If there is no cork covering it, use duct tape (not Gorilla tape). Give the colony brood from another source if necessary, at least one day before installing the queen. Ensure that there is no other queen, queen cell, or virgin in the colony. Place the queen cage in the brood area, or on the brood frame you just inserted, with the screen accessible so that the bees can feed the queen. Always remove the attendants from the queen cage, as they will greatly increase the time it takes the bees to stop being aggressive to the new queen. The nurse bees *will* feed her. After three days, thoroughly check every single frame in the colony for queen cells and cut every one out. In order to check thoroughly, you must blow or shake the bees off of each frame so that you can see the very small queen cells that may have been started in inconspicuous places.

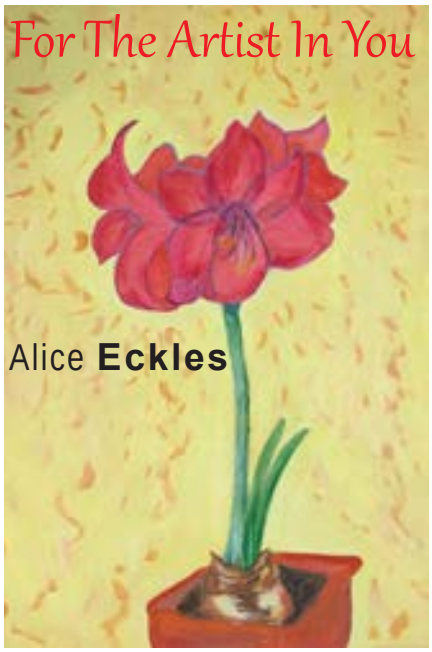
A few queen cups are normal, but lots and lots of them signal the bees' serious intention to get ready to swarm.

Will (white, years ending in 1 or 6
You (Yellow, years ending in 2 or 7)
Raise (Red, years ending in 3 or 8)
Good (Green, years ending in 4 or 9)
Bees (Blue, years ending in 5 or 0)

This queen from 2018 will be replaced this Fall, for insurance that the colony will survive the Winter.

Watch the bees on the queen cage. If they are very numerous, and packed tightly on the cage, be cautious about releasing her, though it might be all right. Run your finger down the face of the cage. If the bees move out of the way easily, then come back and stick their tongues through the cage, they are probably ready. If *any* of them are in the least bit resistant to moving, it is because they are biting the cage. Even one bee biting the cage means death to your queen. Their abdomens should be relaxed and flat. If they are curved in the sting position, it means death to your queen. If they are not ready, put the queen cage back for another three days, then test their disposition to her again. Once they are ready, it is time to let her out. The three-hole Benton cage is nice, because you can peel the screen back and let the queen walk out. Be forewarned, queens that have not been laying are quite capable of flying. Let her walk out onto a frame that is hanging in the hive, with ample space in front for you to look in and see what happens. If the queen dashes out, or runs and acts afraid, she knows that it isn't time yet. Get her back and put her back in the cage for a while. If conditions are right, she will normally walk out and get a big drink of honey from a cell. An entourage will form around her with the bees touching and licking her. This is all happy. If they are not ready, a huge ball of loud, angry bees will surround her. They are trying to cook her to death. This is called "balling the queen". Bees balling the queen usually do not sting her, so very often the queen can be rescued unharmed from the ball of bees. Calmly move the bees by touching them until you see the queen. Pick her up by her wings and pull the rest of the bees off of her and put her back in the cage. It is much better to take the time to get the queen accepted than it is to rush the job and have to buy another queen. As always in beekeeping, calm decision-making wins the day.

Next month we'll talk about what to do if the queen flies away, the cure for a laying worker colony, and what to do with old queens (no pinching required). BC



Amaryllis, 18" x 24" oil and cold wax on panel by Alice Eckles.

What is cold wax? I wondered while staring into a small abstract landscape in Edgewater Gallery of Middlebury, VT. I liked the thick materiality of the colors laid on and peeking out. As an artist I look closely at paintings, read the labels, and think about how they're made. These paintings by Steven P. Goodman, were oil and cold wax. Of course I'm familiar with oil painting, but what exactly was cold wax? Seeing the mysterious surfaces of these paintings and concreteness of color slabs I knew I had to learn more and get started with cold wax. Beeswax in art is something I consider with high interest as a beekeeper, artist, and nature lover.

The first part of my research was to confirm my instinctive knowledge that cold wax is made with beeswax and that I could make this art material myself. I've found that the most cost effective way to learn about something is to buy and read the best book on the subject you can find. To quote from *Cold Wax Medium, Techniques, Concepts, & Conversations* by Rebecca Crowell & Jerry McLaughlin, "despite the development of many synthetic alternatives beeswax remains the wax of choice for most artists using both hot and cold (wax) processes." Of course! Beeswax is natural, renewable, tough, flexible, and has lasting adherent quality and color stability over time. And yes, you can make your own cold wax medium with your own beeswax. Other art supplies made with beeswax include: crayons, modeling wax, encaustic paint, and sealing wax, not to mention the numerous ways bulk beeswax is used in art.

Making the medium

As I discovered, one can make cold wax medium at home, and it's more economical to do so, yet after reading the how-to in the aforementioned book, I decided that just because one can doesn't mean one should. The directions say it's easy and if done with appropriate precautions – safe. However the idea of heating up mineral spirits and beeswax, with the inherent danger and noxious fumes, didn't appeal to me. I wanted to focus on painting.

Then I found the simplest most accessible recipe for cold wax from *Cold Wax Medium, Techniques, Concepts, & Conversations* and gave it a try. This recipe doesn't require heat. Instead the wax is dissolved over time in turpentine.

One part filtered beeswax, pastilles or grated and one to six parts turpentine depending on consistency desired.

Put in a glass or stainless steel container with tight fitting lid. Let the mixture sit for two to four days at room temperature. Turn the container over to mix several times a day.

"It is either easy or impossible." Salvador Dali.

I take this quote from the famous surrealist to mean you have to make things easy before you can do them. Or as I would say, art has to fit into your life. Hence I offer these tips:

• You can skip ruining your cheese grater by wrapping a beeswax ingot in cloth and hitting it with a hammer on a hard surface.

• If you need to melt beeswax for art you can use a Crockpot, as it safely keeps the temperature low.

• I tried the recipe above, substituting the turpentine with the Gamsol odorless mineral spirits I normally use in oil painting with great results. Unlike the turpentine version which smells terrible and looks brownish, cold wax medium made with Gamsol is lemon yellow (I used yellow cappings wax for both versions) and smells okay. In any case use cold wax medium only in a well ventilated area. I was very pleased with the Gamsol/beeswax cold wax medium. The yellow color didn't detract from the colors I was mixing in for my painting and it had a nice texture. The turpentine version I probably wouldn't make again, but since I had, I found myself using it as a thinning agent because the texture of it tended toward slimy. Mostly I used palette knives to paint, but when I wanted to use a brush I'd dip it into the slicker turpentine/beeswax and stir it around on my palette of oil colors mixed with the Gamsol/beeswax medium to get a more paintable consistency.

Art Supplies as a beekeeping based hobby or business

Beekeeper-entrepreneurs may want to consider art supplies as a new niche for value added products

Dissolving beeswax in solvent. On the right is beeswax dissolving in Gamsol, and on the left is beeswax dissolving in turpentine. It will fully dissolve in a couple of days."

Finished cold wax medium. On the left is the turpentine version, which you can see has a different color and consistency than the Gamsol version. To be fair I did add more beeswax to the Gamsol version because it was my favorite."

Here you can see my improvised outdoor set up, for good ventilation."

from the hive. Beekeeper-artists might want to make their own art supplies. When I think of beeswax art supplies I think of German brands like Stockmar and Faber Castell. But why not American made beeswax art supplies? The field is wide open. Beeswax is naturally high in quality, and there are many art supplies that are beeswax based.

Before making my own cold wax I bought a tin of Dorland's cold wax medium from my usual supplier. Cold wax is basically a mixture of beeswax and solvent. Sometimes there are other ingredients added such as resins, other waxes, and oils. Different brands have different recipes. The differences in brands is thoroughly covered in *Cold Wax Medium* for the artist trying to decide which brand is best for them. Unlike encaustic painting, which involves heating pigmented beeswax, cold wax as the name implies requires no heat. You can fuse layers of paint, adhere collage elements, and scrape back for texture and color reveal - all without the need to melt the wax. This adds a wonderful level of ease and safety to using cold wax. I started by incorporating the cold wax medium into my paintings by using a palette knife and blending the crisco-like wax with oil color on my palette. The wax makes the oil paint go farther, without lessening the vibrancy of the color. This is a potential money saver for the artist, especially those that elect to make their own cold wax. The color seems to remain opaque – yet translucent. The cold wax medium also gives body, texture, and thickness to the paint, good for impasto and raised highlights. I'm enjoying discovering how differently cold wax paint handles and how to intuitively weave its special qualities into my work. Someday, I'd like to use the wax as one of the abstract elements in my painting, almost sculptural without being three dimensional, in a way influenced by a painting like Helen Shulman's, Meadow Song.

Many of the cold wax paintings I've seen recently are abstract. The medium lends itself to that, but it's certainly not limited to abstract painting and some artists create realist and representational work in cold wax.

Cold wax medium is used by a variety of artists in a variety of ways. Many of these artists teach their techniques in online classes. To learn more I took one of these classes on Skillshare.com and plan to take another soon from Anne Hebebrand.

How to make a cold wax painting:

Prepare a space to work, and have your supplies ready.

Supplies should include:

Cold wax medium
Palette knife
Paint brush
Odorless mineral spirits
Oil paints
Stiff substrate, not too big, such as a panel or board

I like to prime the board with gesso mixed with a little red or orange acrylic paint allowing the color to show through any unfinished areas.

Options for applying paint may include: old brushes with character, new brushes too, spatulas, brayers, squeegees, scrapers, or whatever mark makers inspire you.

The materiality of cold wax lends itself to being process driven. Playing around with the materials is a good way to start, or if you're familiar with oil painting and have a paint process that works for you perhaps adding cold wax medium to your oil paints will lead you to something new. Though what follows is a basic way to get started with cold wax, there aren't any rules.

Sketching in a drawing, or composition, and doing some under painting is a good first step. Keep this thin, and start with lighter colors. A good paint to wax ratio for painting a first layer is 80% paint and 20% wax. Let this dry for a day or two. Apply new layers, getting thicker and more intense with color as you layer up. Using different tools see what kind of marks you can make, remember to keep changing it up. Different kinds of marks and different variations on a color will make your art more interesting for the viewer. Art should be easy on the eyes, like a garden that always gives you a place to go. Let harmony develop between the elements in your painting. It's good if you're not in a hurry. The artistic process can be healing, especially during the stress of this pandemic. Once you've layered up your painting, you might try painting on some of the odorless mineral spirit and rubbing off paint in certain places to reveal what's behind. Or try mixing about 40% wax with 60% paint for more transparency, adding a thin veil of color where you like. You'll find that your paint brushes don't work quite the same with cold wax as they do with regular paints. Instead try a brayer, squeegee, or palette knife for large waxy areas. Add, subtract as much wax and oil paint as you please. The medium is very forgiving. But who knows really what you will find. Different artists discover different things.

Arthur Dove, in the 1930's, painted in cold wax medium that he made by melting beeswax in turpentine and linseed oil. That's the first documented use of cold wax medium. I wonder how he applied his cold wax paint. His 1943 painting, Sun, looks like it's thinned down. He sometimes added egg yoke and resins. As I try to imagine the process he might have used, it inspires me. The same way the honey bees themselves inspire me as creative beings forming their sculptural wax homes, making their bee bread, gluing things together with propolis. It doesn't surprise me that the creative collaboration between humans and bees has been going for seven or eight thousand years.

Learning to make beeswax art supplies sometimes takes a bit of detective work. The companies making these products don't often divulge their secrets or their ingredients. I've made my own beeswax modeling clay, tempera paints, sealing wax, and encaustic paint. Though artists have been making their own supplies since the beginning, this art has become somewhat lost between the ease and convenience of store bought supplies and historical writings about it being few and hard to find. *The Artists Handbook of Materials and Techniques* by Ralph Mayer is a good place to start, and of course there's the internet. I recently learned that a commercially available tempera paint has honey as an ingredient that helps it stay moist. I'm on it. My next honey bee powered art quest is going to be honey infused tempera paint! Bon voyage! BC

Alice Eckles is the author of The Literature Preferred by Wild Boar*, a novel. While she sometimes assists in beekeeping, she mostly handles the value added parts of the beekeeping business she shares with Ross at Dancing Bee Gardens and has fun exploring the intersection of beekeeping and art via her artist business* ***AliceEcklesStudio.com****.*

Dr. Tom Seeley's Findings

David **MacFawn**

In recent years we have seen a tremendous loss in honey bee colonies. We have been able to stay abreast of the losses due to the tremendous reproductive capability of honey bees. Beekeepers can split existing colonies two to three ways each year and stay ahead of the losses.

Dr. Tom Seeley, professor emeritus of Cornell University, studied honey bees surviving in the wild and has made 14 suggestions to improve colony performance based on what he has found with wild colonies[1] (see the final chapter in his book *The Lives of Bees*). These suggestions are currently being implemented in the Columbia, SC, area but we have found trade-offs need to be made. This article discusses our progress to date and trade-offs made. Trade-offs are required for honey production with a lesser extent depending on migratory pollination or stationary pollination. We are experimenting and implementing these recommendations without tradeoffs in honey bee colonies at Camp Discovery, 208 Claude Bundrick Road, Blythewood, SC 29016; **www.campdiscoverysc.org**.

Implementing 11 of the 14 Suggestions for an Environment of Evolutionary Adaptedness (EEA)

1. Space the colonies as widely as possible; the average number of colonies in the wild is 2.5 per square mile
2. Use small hives consisting of one deep and one shallow box; colonies will produce less honey but will be healthier
3. Use rough-cut lumber on the inside to encourage an increase in propolis coating
4. Target diverse pollen sources for the location as much as possible
5. Maintain 10- to 20-percent drone comb
6. Obtain and keep bees adapted to your location
7. Keep the nest structure intact; keep the original frame location in the hive and the original frame orientation; do not reverse boxes
8. Use two-inch-wide bottom opening; no top entrances
9. Allow condensation in hives during the Winter; it is the Winter water source for the bees

Do not disturb the colonies in the Winter – no feeding syrup or pollen

Refrain from treating for *Varroa*; if the level gets greater than 15 mites per 300 bees, euthanize the colony of bees with warm soapy water; eliminate nonresistant colonies and avoid mite bombs

Camp Discoery beekeepers with David MacFawn.
(photo courtesy of Camp Discovery)

Camp Discovery Hives

Camp Discovery is a learning and teaching organization for young people in the Columbia, SC, area. The mission of Camp Discovery is to engage and inspire through discovery in nature. Camp Discovery has a newly transformed pollinator garden that is the perfect destination to learn and explore seeing pollinators in action.

There was one colony at Camp Discovery that survived about three years without human intervention. This colony's frames were moved to a one-inch rough-cut dimension eight-frame hive with an insulated top cover in September 2020. The hive is composed of an eight-frame dimension deep brood box (9-5/8 inches tall) and two medium eight-frame supers/boxes (6-5/8 inches tall). All the frames are beeswax coated full plastic. The brood pattern was "OK" and did not look stressed due to *Varroa* mites. However, there was very little brood and only about four frames total of bees. We need to do a *Varroa* mite count but am concerned about the low bee count. It should be noted that all the colonies I have inspected as of this date in the Columbia, SC, area had very little brood and fewer bees than in years past. It had a medium super of honey which should be enough for it to survive until next April's Spring flow. The autumn flow is typically weak in this area.

We are going to experiment and leave this colony alone without human intervention or treatment for *Varroa* mites going forward. This colony will be allowed to swarm naturally with the resulting natural brood break without removing any stored honey.

My Hives (I need to make the bees pay for themselves)

We have found there is a trade-off between survivability and honey production. I need to make the bees pay for themselves. Hence, I need to produce honey. Once you prevent swarming and give the bees room to store honey, then *Varroa* mites will overwhelm them without treating or if you have bees with excellent *Varroa* resistance.

So, rather them letting them swarm due to reduced hive size (eight-frames deep [9-5/8" brood chamber] plus one medium food chamber or super), I propose to add honey supers (boxes above the brood chamber for honey storage) during the Spring nectar flow when they

normally swarm. The Spring nectar flow in Columbia, SC, is from approximately the first of April to the first of June. Approximately three quarters of the way through nectar flow I will pull and extract the honey, treat for Varroa mites to prevent the colony from collapsing, then walk-away split hive back to one eight-frame deep plus one eight-frame medium food chambers. Splitting will give me a brood break.

A walk-away split is where a colony is split in half or thirds and the split raises a new queen from a fertilized egg. This allows the split to inherit half their genetics from the local area. A brood break (break in young worker bees emerging) results since it takes about three weeks for a fertilized egg to develop into a queen, the queen mates with the local male bees, and she starts laying new worker bees. This break is important to help control *Varroa* mites.

I am doing the following to support Dr. Seeley's recommendations:

- Space the hives 50' to100' apart but put five to eight colonies per yard maximum to improve the financials.
- Rough-cut 1"-dimension hives
  - for thermal insulation
  - to promote propolis coating for microbial and antiseptic
- Top covers: avantec 23/32" board, sheet insulation in middle, then another 23/32" avantec board
  - for thermal insulation at top to get moisture condensing on sides of hives and not top so bees can reuse the water in the Winter
- Small opening into the hive
  - use entrance reducer to make the opening approximately 1 inch
- Color/paint designs on front of hives to reduce bee drifting from hive to hive
- Use eight frames in the boxes/equipment for smaller size hives
  - deep (9-5/8" tall box) plus one medium super (6-5/8" tall box) easier to lift
  - eight frames are a tradeoff between 10-frame and five-frame equipment.
  - bees in wild typically have five to eight natural combs
- Allow natural 17% average drone (male bee) comb
  - use a 5" piece of wired beeswax foundation in 9-1/4" deep frame (get from Dadant). This makes sure bees will build comb the lengthwise of the frame with the desired 17% drone/male bees in addition to worker bees.

Camp Discovery Malcolm Gordge in bee suit with David MacFawn. (Camp Discovery photo)

- Allow to split/swarm
- Add supers during nectar flow to collect honey crop. Pull honey, treat for *Varroa* mites, and then split in beginning of June for brood break.
- Reduce the hive size after pulling honey to one eight-frame deep and medium, treating will keep the colony from collapsing, and splitting will produce a brood break

I believe it is the combination of things that will help my colonies survive. The major difference between Dr. Seeley's recommendations and what I am doing is adding honey supers, inhibiting swarming, treating for *Varroa* toward the end of the flow, and manually splitting the colonies in June. The major underpinning of Dr. Seeley's findings is letting the colony swarm naturally to provide a brood break to reduce *Varroa* numbers. Once you prevent swarming and give the bees room to store honey, *Varroa* will overwhelm them without treatment. BC

1 *The Lives of Bees: The Untold Story of the Honey Bee in the Wild*, Thomas D. Seeley, 2019 Princeton University Press, ISBN 978-0-691-16676-6

David MacFawn is an Eastern Apiculture Society Master Beekeeper and a North Carolina Master Craftsman beekeeper living in the Columbia, South Carolina, area. He is the author of two books, **https://outskirtspress.com/**

BIGGER PICTURE

Jessica **Louque**

Change Of Plans

I'm pretty sure that 2020 hasn't went the way anyone anticipated or expected. There have constantly been changes in plans, cancellations, and for the most part, lots of disappointment. We live so far out that for the most part, the majority of violence, protests, illness, and general unrest hasn't reached us. Coronavirus is almost a myth out here, but a lot of people weren't affected at all due to the fact that a lot of people here are self employed or work in agriculture. We have been fortunate in the short term because we do honey bee research, which doesn't require a lot of human interaction, urban visitation, or indoor time. We will probably have issues in a year or two, because all of the Chinese factories that produce a couple of the irreplaceable components of pesticides were shut down for a long time. That break in the supply chain hasn't hit us yet, but I'm sure it will. In the meantime, we've been mostly the same as normal, with slightly more isolation than usual.

Our community is mostly early settler lines that have been here forever, with a few new older families moving in during their early stages of retirement. We don't get a lot of new young families or new children, and it can definitely be a hard place to live if you crave socialization or a typical job. It's easy enough already to not see your neighbors for months at a time, so the community decided a few years ago to start doing a small festival in addition to our Winter Ladies' Auxiliary Bazaar. Farmfest started a couple years ago, and this would have been our third year. It's the only time I see a lot of the local people because I'm not normally a social person anyway and we're always busy with bees and kids. It's something that everyone looks forward to and a lot of people put a lot of effort into the organizing and running of the event. This year, it was off the table. Everyone kept hoping things would settle down and we'd be able to continue mostly as normal, but by the time July rolled around, we realized it wasn't going to happen.

As alternatives were being discussed, the idea came up to do a Sunflower Trail. It would break the continuity of Farmfest, but it was clear that nothing drawing that many people could take place. We had a handful of people that offer products and services that could set up their own places, so the community organizer group wouldn't have to be responsible for individuals, safety, or insurance. We didn't have a lot of people that had both something to attract visitors and were willing to let people come to their places, but we had enough to make a map. The most important thing was being able to offer something to do for all ages that brought the community together without being dangerous or making it uncomfortable for people who wanted social distancing.

Usually, we sell honey at the bazaar or at a booth at Farmfest, but this year we thought we could go a little extra. I wanted sunflowers this year in the "front yard" (which is maybe 10 acres) to try a trial run. We planted about four acres through the front fields, which I was hoping would be done in time for dove season. Instead, it ran a little longer with the crazy weather and was in decent shape for the trail. Unfortunately, we had a lot of rain come in from the rampant hurricane season and they were a little beat up, but overall stayed upright at least. I was not only able to do a senior photo shoot for my best friend's daughter, but we could do cut sunflowers and let people take pictures in the fields as part of our stop. It fit the theme pretty well, and we put flags down the property line and banners on the stable. George painted a canvas (with some help from Maggie) and painted a sunflower

Group shot in front of the stable.

Bobby with a bouquet.

on a hay bale for my godparents. Henry helped bush hog the front field so people in larger vehicles could drive to the sunflowers, and Charlie drove some people in mom's Polaris who didn't want to walk or drive. It left a lot of options for people who didn't want to get out of their car, elderly people who didn't want to or couldn't walk, or people who didn't wear good field shoes. We also had a bunch of pumpkins that we could sell that were a new Japanese variety that were dark green with streaks of yellow pixelated into the green.

There were a few beekeepers stopping by because they saw bees and wanted to talk about what research we had going on or what we were doing with our bees. I may have gotten roped into a few more speaking engagements (which are all weird this year because they are through Zoom) on how we do pesticide research. Recently, we had someone poop at our hives that are at a site near the road. We know it was a person because there was also some sort of napkins or toilet paper stuck with it. I can't imagine why anyone would choose to poop near bees and have that part exposed, but it did clearly happen. There was a guy who worked on light poles and was asking about the bees we had at that location. They were working on the lines down that road, so I had to ask him if he was the one who did it. I'm sure he was caught off guard, so I told him I'd speak for the county if he contacted me later. Since I put him on the spot so bad, I'll probably even answer his messages.

You could tell that a lot of people came out just to have something to do, but were still cautious. We did a drive-by service to make sure if you stopped, someone came to your car. A lot of people still chose to park, and I think some just wanted to get out and socialize even if it was at a distance. It was a little cold for us and a little windy, but not unbearable and it was still pretty pleasant by noon. We all had to stay at our place because honestly it took all of us to take care of visitors and we didn't get to go to anyone else's site. My aunt tried to go get us apple turnovers from one of the sites. I had been trying to send everyone there because they were so good and I knew she would sell out. True enough, by the time my aunt went, there was only pound cake and peanut butter delight (which were still good but I really wanted apple). We also just had a brewery open, and it was a great way for them to introduce themselves to the community and get some advertising.

The family.

One of the other stops was Kordick Family farm. They run an organic apple orchard and a few other smaller endeavors, like Brittany's goats and rabbits. I really wanted one of her apple slushees even though it was probably too cold for that. We pollinate her apples so we've been over there a lot this year, and I think a lot of the Sunflower Trail was from her push. Since they are running it as a business, it's much more important for them to have local exposure. We had pumpkins leftover from an untreated plot, sunflowers just for fun, and we weren't really looking to turn a profit. We donated a quarter of our profit to the fire department. For her, it's a lot more important because everything they sell, it affects their business for the next year and how much they can expand. I've been trying for a couple years to get her to add Magnum Bonum apples, which is an NC native from the 1800's but is hard to grow because it is susceptible to cedar apple rust. It's really ugly but it is by far my favorite apple. I really need Brittany to grow her farm big enough to add those and Summer Banana apples so I don't have to go to Virginia to buy them.

George and Texie with the sunflower hay bale.

In the short term, being able to produce something that adds to your community's value and purpose is a great benefit of having bees. We are able to contribute to bringing more people as a group, because it's easier to bring in people when there are more options. In the long term, we may be able to start a farmer's market or produce stand and combine with others like Brittany to be able to add something locally and create some new farming opportunities in the area. I also am a huge apple fan and having a local place not only gives us a place to put our bees, but has the potential to bring a lot of heirloom varieties back to our area. I'm sure 2020 hasn't helped their marketing out very much, but hopefully it hasn't been too bad. Her place is really interesting, which is why I will be interviewing her for the December issue of *Bee Culture*.

A quick change here, but I wanted to take a second to recognize the best dog ever, Atlantis. I've had her since she was a puppy, and she passed away after 13 years of being an awesome dog. We are currently looking for a new dog because Pickle is clearly having some depression and separation anxiety without Atlantis around, and I'd like to encourage everyone to adopt from shelters and spay and neuter their pets. All the animals deserve a home and to be loved. BC

California First Master Beekeeper

Kathy Keatley **Garvey**

She "bee" the first.

Despite COVID-19 pandemic precautions and constraints, the California Master Beekeeper Program (CAMBP), headquartered at the University of California, Davis, has certified its first-ever Master Beekeeper: Amy Hustead of Grass Valley, a veteran beekeeper who also happens to be the first and only beekeeper in her family.

Hustead, president of the Nevada County Beekeepers Association and a veterinary technician, recently passed the Master-level beekeeper certification process.

CAMBP, founded and co-directed by Extension apiculturist Elina Lastro Niño of the UC Davis Department of Entomology and Nematology, uses science-based information to educate stewards and ambassadors for honey bees and beekeeping. It offers three levels of certification (Apprentice, Journey and Master). Niño launched the first Apprentice class in 2016.

Hustead's passion is education and outreach, said Niño and CAMBP manager Wendy Mather.

Hustead's Master Capstone project involved teaching two, three-hour online CAMBP classes ("Planning Ahead for Your First Hives," and "Working Your Colonies.") She designed, developed and successfully delivered "Intermediate Backyard Beekeeping," an in-depth, online, four-hour course on science-based beekeeping for the hobbyist and sideliner. Topics included winter and Spring preparation, swarm prevention, active swarming, splits and nucs (nucs, or nucleus colonies, are small colonies created from larger colonies), diseases, nutrition, maximizing honey production, and harvesting honey, wax, propolis and pollen.

Amy Hustead, a wife, mother of nine-year-old twin boys, and a seven-year beekeeper, said she really enjoys CAMBP. "It has allowed me to meet some really excellent beekeepers. I plan to continue to teach classes and help educate people on the biology of bees."

Highly praised for her work, she has drawn such comments as "the class exceeded my expectations"; her "lecture style is professional, yet warm, which is needed in the context of Zoom classes"; and she "keeps an open mind about other beekeepers' goals." Wrote another: "Amy is very informed and easy to follow, and shares her information with the right amount of applicable detail for the intermediate."

What fascinates Hustead about bees? "When I was in college I studied sociobiology, which is a field of biology that explains social behavior in terms of evolution," she said. "I have always been fascinated by the cross section of evolution and behavior. Bees are the epitome of social insects. Everything they do is for the good of the whole."

"I dabbled in homesteading when I first moved to the foothills, and like a lot of people, started out keeping chickens. I think I wanted to get goats but my husband was not on board, so I decided to get bees instead."

As a veterinary technician, she works in low-cost spay and neuter programs. "I also volunteer with an organization that provides veterinary care to pets of homeless and low-income people in the Sacramento area."

Bees keep her occupied at several locations. "I have between 15-20 personal colonies at three different locations," Hustead related. "I also manage a few colonies for other people."

As it turns out, this year is not a good year for bees. "Mostly my bees aren't doing well this year," she said. "The nectar flow was non-existent, and the recent fires haven't helped. For the first year ever I am harvesting no honey from my yard at home."

Hustead home-schools her twins. "I am very serious about home-schooling my kids, and part of our curriculum is extensive travel."

Master Beekeeper Amy Hustead in training

The Hustead family has visited a number of states in the nation, and has already been to Mexico, Ireland, Costa Rica. "We are planning a Europe trip as soon as possible."

Since late 2016, CAMBP has certified 206 Apprentices and 22 Journey-level beekeepers, who have volunteered more than 24,510 service hours in science-based education and outreach in beekeeping and environmental stewardship. Total value of the service hours: $623,289. Total number of individuals served: 98,618.

"This year, despite COVID-19 constraints, the California Master Beekeeper Program continues its mission of using science-based information to educate stewards and ambassadors for honey bees and beekeeping, by moving its courses and exams online," Mather said.

Master Beekeeper Amy Hustead and her son, Jacob, tend the hives.

Online Exams

CAMBP's current 53 Apprentice candidates took their online exam Sept. 12. To pass, they had to score at least 75 percent. "Candidates uploaded videos or partook in 'live from their apiary' Zoom sessions to satisfy the requirements of the practical rubric," Mather said.

The Journey-level candidates have completed the online written portion of their certification and their videos and Zoom practicals are in progress. "So far, we're proud to announce that all 15 Journey level candidates scored above 80 percent on their written exams, and their videos and Zoom practicals are looking great!" Mather commented.

The Master level usually takes an average of five years to achieve. Some candidates choose to remain as Apprentice or Journey-level beekeepers. CAMBP offers pre-approved Master Capstone Tracks, but also encourages candidates to follow their passion if their favorites are not on the list, which includes:

- Native Bees and Pollinator Gardens
- Commercial Beekeeping
- Scientific Research
- Education and Outreach
- Policy for Honey Bees and Native Pollinators

Seven Master-Level Candidates

The seven Master-level candidates for the 2020-21 season are pursuing a variety of projects, including mapping drone congregation areas, authoring a book on the history of honey in ancient Greece, establishing a pollen library for the state of California, starting a commercial beekeeping business, and training a "detector dog" in the apiary.

To maintain active status as a Master Beekeeper with CAMBP, members are required to perform and log 25 hours of BEEs (Beneficial Education Experiences). Hustead will perform a minimum of 25 volunteer hours annually. Her volunteer service, at the minimum, is valued at $25.43 per hour or about $600 per year.

"Amy will have no problem doing that as she's active as the president of her local beekeeping club," Mather said, "and she mentors many new beekeepers to help them become science-based stewards and ambassadors of honey bees and beekeeping."

For more information about CAMBP, see its website at **https://cambp.ucdavis.edu/** BC

The UC Davis-based California Master Beekeeper Program has announced its first "Master Beekeeper": Amy Hustead of Grass Valley. Here she tends her hives.

Healing Wounds!

Farlyn **Lucas**

Humans have eaten honey for over 8,000 years, and they've used it almost just as long to treat wounds. A plethora of current-day treatment options exist for wound care, and wound dressings featuring honey are now the standard. Do they work? Why use them? And what is so special about honey?

What is honey?

Honey is a sweet, amber, viscous liquid made and stored by bees. One pound of honey is the processed and concentrated nectar made up of two million flowers. It is broken down by the honey bee in a unique structure known as the bee crop. The flower nectar changes from a liquid of 90% water and sucrose into its final form, a viscous material containing 15-20% water.

Raw honey, unpasteurized, contains fructose, glucose, 22 amino acids, 30 bioactive plant compounds, and 31 minerals, including zinc and magnesium. Glucose oxidase is also present and produces hydrogen peroxide and gluconic acid when water is added. Commercial processing of honey for food and other uses involves heating and filtering, which destroys many of these compounds.

There are numerous varieties of honey, commonly named based on geographic origin or some specific flower that makes up the bulk of the nectar source. Clover honey, Manuka honey, Jamun honey, are just a few examples. Both Manuka and Jamun honeys originate from single-flora flowering shrubs of the family Myrtaceae. Continents apart, Manuka and Jamun honey have been successfully used for treating wounds - Manuka, derived from the *Leptospermum scoparium* flowers, and Jamun, from *Syzygium cumini* flowers.

Honey in Wound Care Today

Honey used in today's wound care treatments is medical-grade honey, and is highly antibacterial. It is raw honey which has been treated with gamma irradiation, filtering, and testing. Medical honey has not been pasteurized and still contains many of the original compounds present in raw honey. Any risk of contamination by *Clostridium botulinum* spores (botulism) has been eliminated. A pH of 3.5-4.5, 0.5% gluconic acid, and hyperosmolar quality make honey an excellent antibacterial substance. Glucose oxidase is of variable concentration. When applied to a wound and in the presence of water, glucose oxidase produces hydrogen peroxide and gluconic acid. Hydrogen peroxide occurs at various degrees, and, in some honey varieties, does not occur to much extent at all.

Available in ointment form, impregnated into gauze, or combined with hydrocolloids or calcium alginate, honey offers an alternative to harsher antiseptics or silver-containing products. Honey products are also contraindicated in the presence of a bee allergy. The form of honey selected for treatment can prove challenging to apply in some types of wounds.

Why use honey wound dressings?

Honey seems to be an effective wound treatment for three main reasons: it is antibacterial, anti-inflammatory, and has antioxidant properties. Inflammation and bacteria delay and inhibit wound healing. The presence of bacteria feeding and metabolizing various amino acids in the wound is the cause of malodor in wounds. Using honey as the wound dressing decreases the odor by both an antimicrobial effect and by providing a preferential found source for bacteria: glucose. Unlike the metabolites of amino acids, glucose does not produce odorous amines and sulfurs as byproducts of metabolism.

What kind of honey is used in wound care today?

Manuka honey, or Leptospermum honey, is the most widely used variety of honey in wound care today. Manuka honey has an additional antibacterial activity not found in the same concentration in other honeys. Methylglyoxal is an antibacterial present in high levels in Manuka as-is. It is formed when the dihydroxyacetone found in the Leptospermum nectar is converted into methylglyoxal over time.

Manuka Honey

Because Manuka honey is only produced in one area of the world, it is more expensive and in-demand, and the potential for adulteration does exist. Manuka honey is sold worldwide approximately ten times more than it is produced.

In 2018, the government of New Zealand introduced a testing standard for Manuka honey. One required test used to determine the honey's quality is the presence of DNA from Leptospermum scoparium pollen found in the honey.

Healing Wounds with Honey Dressings

Various product names exist for wound dressings containing medical-grade manuka honey. These include Activon Manuka Honey, Medihoney, Therahoney, and Manukahd, to name a few. Each comes in different forms and formulations, and should provide the specific benefits that honey offers to wound healing.

Additional research and time are needed to demonstrate the effectiveness of any single product, and also to demonstrate what characteristic or component is the actual active ingredient. Counterfeit honey is common, and Manuka adulteration creates the possibility that the potential benefits of honey could be lost, and the benefits of a specific honey variety lost entirely.

In any case, honey dressings do seem to offer a treatment option that allows for moist wound healing, and they can also provide added antimicrobial and anti-inflammatory effects. The rigorously-tested products with a higher percentage of actual honey are likely to be more effective, and they're likely to contain all the beneficial properties of raw honey as it was first used thousands of years ago. BC

Bee Basin – Time To Make One!

Erin **Gerlach**

Bees face many threats today including drought, loss of forage areas, and colony collapse. There are many ways to help the bees like creating bee-butterfly friendly flower gardens in our yards but you don't have to become a backyard beekeeper to help the bees or environment. You can help by avoiding pesticides and other chemicals on your lawn, donating to organizations that work to protect the bees and other pollinators, purchasing local honey and products from your local beekeepers, AND by placing containers of water in your yard so thirsty bees can get a drink . . . BUT there is a little catch you should know about leaving water out for the pollinators – they have to be able to get to it and not drown! SO Today I'm going to show you how to make a pollinator friendly basin using a pie plate and a recycled ceramic pot into a work of functional art that is sure to bring pollinators right where you want them and help avoid areas where you don't. This is also going to be really spectacular looking where ever you end up placing it.

I love to repurpose, upcycle and make functional art because recycle, reduce, reuse helps everyone, and it's just fun to make art like this – so that is what I will use for this project. We're going to use a ceramic pie plate, a stone pie plate or shallow dish of some sort will also work great, or a former bird bath top.

***Pick a ceramic or stoneware shallow dish to be your basin** – (avoid glass as it can be a real problem if it gets knocked over by an animal and broke in your yard). The shape is not important as long as it can hold few inches of water and cover your base. We will be adding a base that will keep it off the ground.

***Find a base – that supports your basin top, it really could be anything you want it to be.** I'm using a recycled ceramic pot that we will turn over and use that for our base, you want it nice and sturdy, not easy to tip over. Test fit your basin to your base. You can choose to adhere your basin directly to your base or make the basin removable for easier cleaning.

You can make this piece decorative and functional in a variety of ways – we are going to use an adhesive water proof epoxy clay to embellishing blobs or around the edge of the bowl with some crushed rocks. Expand on that idea by adding texture with stamps/press molds such as adding leaves, vines, mushrooms, anything you like using a press mold to your basin or base. FIXIT Sculpt is highly sculpt-able so if you wanted you could sculpt something. I'm going to keep it simple by embellishing with shells and rocks, however you can incorporate found objects or anything that is able to be left outdoors and safe for bees and other pollinators: rocks, marbles, tiles etc. I'll also walk you through how to create a removable basin top for easy cleaning by adding a ring to the bottom of the plate to hold it into place!

If your pot is broken or chipped – now is a great time to repurpose it – and you can catch the next episode of make it artsy to see just how to do that and make it look really artsy and ready for outdoors! *** Check out the next episode on Make It Artsy to see how I repair and artfully restore broken pots! **

Ready to mix FIXIT Sculpt? Okay Let's do this!

Wearing gloves: Measure equal parts A and B FIXIT® Sculpt. Mix & Knead together for two minutes until color is uniform and it feels a little warm in your hand. (this is your signal for epoxy activation!).

***If you are making this one solid piece**: simply apply the FIXIT as desired to your base top, you can roll it and apply in a coil or just pancake it on there – you want enough clay to grip the basin top ~1/2" thick is good. Press the basin top down on the base. You can now continue to decorate that connection joint as you like or simply leave it to cure. Skip the next few steps, you're ready to make this artsy!

***If you are making the pie plate/basin top removable**: we need to form a ring to fit your top & base together. Add a piece of Ziploc bag to completely cover your base top and a good inch or two down the sides as well (tape it down). Roll out FIXIT to make a long thick tootsie roll I use about 1" roll thickness.

Before you apply the Fixit test fit and it may even help to mark where your top and bottom will connect so you know where to apply the clay to form seated ring. You want a fairly tight fit. Apply to the underside of your basin top appropriately. Work the clay into the desired shape and height (~ 1" tall and ¼" thick) smooth it out a bit with some water. Do a test fit over the plastic of the base press it down for fit form/shape as desired to seat that fit. You can allow your basin ring to cure on the plastic just like that if you are happy with it. You can make it look pretty after the ring cures. (recommended 6 hours or overnight).

Remove your pie plate/top from the plastic, decorate the outside visible area of the ring by adding more Fixit Sculpt and embellishments that are able to be outside – we are using tiles. Mix more clay according to #3 and apply as desired – you can also apply more clay and texture it with a rubber stamps even a rock, or tree bark works to texture – (mist the stamp with water press into the clay and pull off). The possibilities are really wide open. Apply the clay as desired use press molds or just embellish - anything that is safe for bees and outdoors will stick into this clay or feel free to get sculptural.

Moving to your pie plate/basin top - If you want to cover words, or make it decorative – you can do this with more FIXIT Sculpt as you wish or use a product called Apoxie Paste – mix and pour according to product package directions (add a colorant or super fine glitter if you like), smooth this into your basin bottom. Embellish if desired with material such as crushed shells, marbles, stones, mosaic glass, tiles etc. you will need to let this product cure before you can continue. At least 6 hours or overnight.

Now it's time to make it safe for the bees so they don't fall in…you can do this a variety of different ways – build up blobs in the bottom to make little rock islands for the bees to climb on, could make some steps going around the inside of the basin - float cork, burlap, sticks, or spread

rocks on the bottom – or build a rock tower that you can just pull in and out and won't get knocked over by a bird or other animal – you could even add a rock tower to an existing bird bath to help the bees not drown!

Pre-stack your rocks so you have an idea of what you're trying to make – mix more clay, roll an appropriate size ball about (marble size) and place between each rock you want to stack up. Press and smoosh the clay into the rock joint. The tower should be something they can climb on and spread a bit throughout the basin (like a pyramid).

*FIXIT Sculpt sticks to itself in any stage of set up. Have fun with it.

Use Aves Safety Solvent to remove any unwanted FIXIT residue on your rocks/tiles glass before it cures.

*Let your project sit for 24 hours to fully cure.

*Aves Clays (Apoxie® and FIXIT®) are waterproof and safe to use in or out of an aquarium so it's not a problem that it gets wet and its safe for pollinators and other animals.

Supply List:
Ceramic or stone wear Pie plate or similar
Medium size, Ceramic flower pot
Ziplock bag
crushed or polished rock…amethyst, citrine, turquoise, mixed colored natural stones
Nitrile disposable mixing gloves
Aves FIXIT Sculpt, **www.avesclay.com**
Aves Safety Solvent **www.avesclay.com**
Butterfly T-shirt Erin is wearing by: https://www.etsy.com/shop/southernyankeetees
Stone source: crystal rock **www.crystalrock.com**
Amazon: **SUNYIK Tumbled Chips Stone Crushed Pieces Irregular Shaped Stones**

Its important to have cork or sticks in the water so if the bees do fall in, they have something to grab on to and get out. I use halved wine corks to achieve this, also great choices – colorful marbles, stones, sticks, burlap etc.

Be sure to keep your basin consistently filled with water – bees add water/drinking locations to their flight pattern when they find a water source they go back and tell their friends doing a waggle dance. When water sources go dry the bees look elsewhere for constant water sources – this may be why many people are unable to attract pollinators!

Location of Basins: you will not want to keep your bee basin where you do NOT want to attract bees – I would ***not*** recommend putting these on a small porch – best to place in a garden corner or somewhere the bees will not bother people, again water sources become part of their flight pattern so high people traffic zones should be avoided. Place where you want pollination – these will also attract butterflies!

Bees and Butterflies are attracted to certain colors – use colors that match your needs, this will draw them into your basin.

Fun Facts:

- All worker honey bees are female.
- A single honey bee will visit millions of blossoms in her lifetime
- Bees collect flower nectar, which is then converted into simple sugars and stored in the honeycomb inside the hive. The warmth of the hive causes evaporation and transforms the sugars into liquid honey.
- Honey is used as food for the bees, so beekeepers take only the surplus. The average healthy hive produces about 65 pound of harvestable honey each year. BC

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*Learn more about how you can save the bees and support your local beekeepers by purchasing local honey, wax, and other bee related items;) Links to learn more:
www.beeculturemagazine.com
PAm (Project Apis m) **https://www.projectapism.org/**
HBHC (Honey Bee Health Coalition) **https://honeybeehealthcoalition.org/**

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November 2020

Standardizing Data On Bees And Beekeeeping

Joseph **Cazier,** Etienne **Bruneau**

Many readers will recognize Apimondia as the world's oldest and largest federation of beekeeping organizations globally. Founded in 1895, their mission is to promote scientific, ecological and economic developments in apiculture globally. One of their newest initiatives is the formation of a new working group for the standardization of data on bees and beekeeping.

Joseph Cazier, Executive Director of the Center for Analytics Research and Education at Appalachian State University chairs this new working group. Etienne Bruneau is the President of Apimondia's Technology and Quality Commission that this group reports to. In the text below, Etienne interviews Joseph about why this working group is so important for beekeepers and how you can help.

Can you tell me about the goals of Apimondia's Working Group #15 on Standardization of data on bees and beekeeping?

More data is being collected about bees and beekeeping than ever before. This is a good thing. However much of the data is being collected and recorded in different ways, making it difficult to merge and harmonize datasets. This limits the ability of us to take advantage of tools like machine learning that require large datasets to work effectively. The goal of this working group is to do the work needed to enable data sharing so those that are willing to share may do so efficiently.

Why is it so important to share data?

Data sharing enables data science to be applied at scale to beekeeping. Beekeeping is a hobby or profession carried out by many wonderful people and organizations. Most of these organizations are relatively small in data science terms where you are used to companies with many terabytes or exabytes of data.

In addition, the data science needs for artificial intelligence techniques to be applied to apiculture are much greater than we see in many commercial applications. This is because many of the current applications of big data revolve around closed systems with only a handful of variables needed to make a product or manage a customer.

However, when dealing with living organisms impacted by climate, diseases/pathogens, genetics, management practices etc, the problem is much more complex. The more variables impacting the problem, the more data you need to analyze effectively. Therefore you need more data than many current big data applications and we currently have much less. The only way to take full advantage of data science in the bee space is to share data, otherwise we will never have enough.

What are some of the likely benefits from applying data science to beekeeping?

Most readers of this article will have heard of a smart hive. A smart hive is one that can tell you about itself. Weight, temperature, humidity, sounds, images and bee counters can tell you a lot about what is going on in a hive. This is interesting, but to be helpful, you then need to know what to do with this information.

This is where data science comes in. Data science is about making sense of large amounts of data. In this case, it would help us go from a smart hive that tells you about itself to a genius hive that can tell you what it needs to be better. With enough data we can identify personalized best management practices to optimize your hives, guiding actions to better beekeeping. We can track policy implications in real time and predict what will happen next, and so much more.

This will take time, but if we don't start now by paving the way to sharing data, it will never happen.

How does this working group facilitate data sharing?

The working group has identified three main areas that we can work in to enable data sharing. These are:

- Agree on and make recommendations for standard formats for storing data related to bees and beekeeping.
- Encourage and publish harmonization studies finding ways to better aggregate large data sets on measuring similar items. For example, harmonizing several methods of measuring *Varroa* so that this data, measured differently, could be aggregated with some degree of statistical confidence.
- Make best practice recommendations in collecting, storing or securing data to facilitate sharing.

I have heard you use the term BeeXML in reference to this group, can you explain that term?

Most of our readers will be familiar with HTML (Hyper Text Markup Language) which is a way of standardizing the presentation of data in a web browser so documents look similar regardless of the computer or browser used.

XML (eXtensible Markup language) is a twin of HTML that focuses on the meaning of the data. Using similar user defined tags to HTML, groups can mark up their data and share it through this technology. It is a framework and language for creating a standard that once adopted allows for easy sharing of data that has been used thousands of times from sharing documents to Beer XML. This is where we get the term BeeXML.

One key advantage XML has over other standard languages is that it is human readable. We wanted the standard language to be accessible to all, which gives XML a clear advantage over other options.

How can people help?

They can join the working group by emailing me at **cazierja@appstate.edu**, adopt the standard in their organization, give feedback on proposed standards or donate to our university research center at **care.appstate.edu** to support this effort. BC

Warm Fall Recipes

Shana **Archibald**

Mini Pumpkin Pies

For the Crust
2½ cups all purpose flour
½ teaspoon salt
¾ cup cold butter (cubed)
½ cup cold water
1 teaspoon apple cider vinegar

For the Filling
1 cup pumpkin purée (that's HALF of a 15-oz can)
¼ cup brown sugar
2 tablespoons of honey
½ teaspoon cinnamon
½ teaspoon pumpkin spice (if you don't have pumpkin spice, just use a small combination of ginger, cinnamon & nutmeg)

For Brushing
1 egg yolk (beaten with 1 tsp water)
light brown sugar (for sprinkling)

To Make the Crust

In a large bowl mix the flour and salt well. Cut in the cold butter until crumbs form. Combine water and vinegar, then add 1 tablespoon at a time to the bowl and stir until pastry comes together. Quickly push the mass into a ball, flatten slightly and wrap in foil. Chill at least one hour.

To Make the Filling

Mix all filling ingredients in a small bowl.

To Assemble

Preheat the oven to 350°F. Line two baking sheets.

Roll the pastry into a thin (1/8 – 1/4 inch) rectangle. With a round cookie cutter (I used a mug) cut out circles of about 2½ inches in diameter. Spoon about a teaspoon of filling onto half the circles and cover with the other half. Seal the edges with the back of a fork and make three small incisions on top. Lightly brush with egg wash and sprinkle with light brown sugar.

Bake for 20-25 minutes or until golden. Cool on the cookie sheet for 10 minutes, then remove to a cooling rack. If you can make these look prettier than I did (which shouldn't be hard haha!) I would love to see!

Honey Baked Ham

8 lb bone-in spiral sliced half ham
2 Tbsp butter, melted
3 Tbsp honey
1½ cups granulated sugar
½ tsp seasoned salt
½ tsp onion powder
½ tsp ground cinnamon
½ tsp ground nutmeg
¼ tsp ground ginger
¼ tsp ground cloves
¼ tsp paprika
pinch of allspice

Trim ham if needed, then place in slow cooker. Combine melted butter and honey, then massage over ham, getting in between the slices a little. Cover and cook on LOW four to five hours.

At the end of the cooking time, preheat broiler to HIGH, and line a roasting pan with heavy duty aluminum foil.

Combine sugar, seasoned salt, onion powder, ground cinnamon, ground nutmeg, ground ginger, ground cloves, paprika and allspice in a small bowl. Pat half of the sugar mixture over the top of the ham.

Broil for several minutes, until bubbly and caramelized, then remove from oven To a small saucepan, Add three Tbsp of either water or ham juices from bottom of the slow cooker. A combination of water/ham juice and bourbon is a nice alternative! Stir, and heat to a boil. Boil for about a minute, then remove from heat.

Brush or pour glaze over the ham, then broil again for a minute or two (careful not to let it burn!). Remove from oven and let ham rest for 5-10 minutes

Serve warm or cold and enjoy!

Applesauce Cake

3 cups all-purpose flour
3 teaspoons baking soda
2 teaspoons cinnamon
½ cup (1 stick) butter, room temperature
½ cup honey
1 ½ cups granulated sugar
2 large eggs
2 ½ cups unsweetened applesauce

Preheat oven to 350˚F. Lightly spray baking pan with cooking oil.

In a large mixing bowl, whisk together flour, baking soda, and cinnamon.

In the bowl of an electric mixer, cream together butter, sugar, and honey.

Add eggs. Beat until combined.

Mix in applesauce.

Gradually add flour mixture and beat just until incorporated.

Pour evenly into pan.

Bake loaf for 35-45 minutes or until a toothpick inserted into the center comes out clean.

If removing the cake from the pan, cool for 10 minutes in the pan before removing the cake to cool completely on a wire rack.

Unsolved Mysteries

James E. **Tew**

Bees And Their Keepers

Beekeepers are a curious lot

Through the years, I have spent, a remarkable amount of time, thinking about beekeepers – not just their bees. Without people keeping bees, I would have had no career within the university system. Obviously, I have always wanted a good crop of beekeepers. I still do.

What is it about a person who brings (drives, forces, teases, or maybe pushes) them to the craft of beekeeping? I have never figured it out. It's not due to any effort put forth by the bees. Indeed, I sense that bees really don't care for us, nor do they appreciate all the expense and devotion that beekeepers allocate to them. Not a bit. We love them, but they do not love us back. Even worse, they have never pretended to love us or appreciate us. The bees did not, *"lead us on."* Our beekeeper/bee love relationship has always been one-sided. If we can be objective for just a moment – step away and look at our association from afar – it can only be described as weird. Yes, we are weird about bees. In essence, it could be said that we stalk our bees.

Go ahead. Give me the requisite honey and pollination arguments. *"We keep bees to produce food for us."* Yes, those are salient points, but those points only describe specific types of beekeepers. Someone still had to decide to keep bees for those reasons. But not all beekeepers are bonkers for honey and supplemental pollination.

There are beekeepers and then there are super beekeepers

If one says that they are a beekeeper, it's much like that person saying that they own a car. While all cars have much in common, all cars are clearly not the same. All beekeepers have much in common, but all beekeepers are not the same. Some are more extreme than others. Now I am back to where I began – what brings a person to beekeeping? Short term or long term, I still don't know.

I'm not a cool guy and I'm not making this piece about me, but I am one of those people who has consistently gone beyond normal beekeeping standards. I have been devoted to bees for decades and even I cannot explain my own behavior. Why would anyone need to know so much about another species? Why my obsession? Why yours?

My observation hive, my teacher, my comforter

A few months ago, after missing the past two years, I restocked my observation hive. In previous articles, I have written about the various units I use and have used. Nothing special there, so no reason for great detail on observational hive instruction.

When I look through the glass, I voyeuristically peer into the life of another species. Many characteristics and behaviors were long ago documented, but so many others were not. I postulate that anyone, at any level of beekeeping, who looks at an observation hive long enough will generate questions. That's one characteristic feature of observation hives. They easily generate questions, but produce answers much more slowly.

From my observation hive... Stargazers

I have spent just under 500 words getting to this point. As beekeepers, will we ever tire of yet another question about bees? With that in mind, I ask, *"What are these bees doing?"* exhibiting a peculiar behavior in my viewable hive.

In seemingly random locations, at seemingly random times, and in varying numbers (but never very many), there are bees that take a solid stance and peer upward. It could be said that they are holding their heads at an uncomfortable angle – nearly level with the glass. While all other bees are in a flurry, these *"stargazing"* bees are above the fray. They don't move. They are bumped and nudged. They are crawled upon, and they are even offered food (which they usually accept). They may hold this statuesque position for many minutes.

While bees that are facing me stand on four legs with the front two in the air, some of the *"stargazers"* assume contorted positions and face away from me. Maybe their oddly positioned head is within a cell opening. They exhibit the same immobility and odd head position.

Abruptly, these mystery bees are finished, and they move to other tasks. There may be some tongue stropping but otherwise, they are immobile. What are these bees doing and does anyone care? Is this just a bee thing or yet another question from an impassioned bee person?

For now –

These bees are doing something. I don't know what. I don't think they are "sleeping" or guarding – too much antennal movement.

Could we please maybe talk more about this peculiarity later. Due to the reflective observation hive glass, my photography is not good. If I open the glass, I disturb the whole bee scene. As it were, I upset the quantum mechanics of the colony. Is this seasonal or does the undescribed job occur throughout the year? I will work on capturing video and improving my still shots to describe the activity. Until then, what do you think these specialists are doing?

The three bees encircled are immobile but alert. Their heads nearly touch the glass. Their antennae are active. At some point, they abruptly stop this behavior and move on to other tasks. This static photo destroys the moment. All other bees are actively moving except for these bees that I call "Stargazers." Silly, I know. I have no idea what these bees are doing, but they do not appear to be simply watching me.

Mandibles and antennae being used during washboard behavior. Note the scoured appearance of the hive box corner. Captured from high definition video.

Again, from my observation hive – wash boarding behavior

It's time for my annual discussion about washboarding behavior. My wife, who is also one of my editors, has told me *enough already* with this topic, but I just can't stop. This question definitely fits within my *"need to know"* characteristic about bees.

On my list of commonly visible bee behaviors are: (1) foraging, (2) water collectors, (3) stinging, (4) swarming and (5) wash boarding. Our bee literature is replete with information and instruction on 1- 4, but for all of the obviousness of the rocking behavior, only conjecture and speculation are well documented in washboarding behavior. My inability to understand what the bees are doing with this obvious behavior weighs on me during every *"wash board"* season. I don't know what these bees are doing or why they are doing it, and I have observed it for decades.

Some of my non-scientific observations and comments follow.

1. Each season, starting in mid-late July, a few bees begin this rocking motion on the front of my hive just above the primary entrance. As the season progresses, the number of rockers increases around the primary entrance, and they begin to appear at secondary openings. These unique bees don't seem to appear at cracks and crevices. At the peak of washboarding season (in my case, the two to four weeks of August) most colonies are involved to some degree. Some colonies are simply stunning in the number of bees that will be rocking while other colonies show only small involvement. In essence, some colonies are crazy about this behavior while others are only modestly involved. I suspect that the number of rocking bees is related to the total population of the particular colony. That is my speculation.
2. They perform the behavior at the hive entrances throughout the night. I suppose rain or windy weather would affect the behavior, but I have not been out on windy, rainy nights to check. However, on pleasant warm nights, they are on the job – seemingly in similar numbers.
3. Some of the bee literature speculates that the behavior is in some way marking the entrance(s), either with visual cues or with some pheromone concoction. I can't say that idea is incorrect, but it does not seem to answer all of the issues. Why do bees need navigational assistance during part of the annual season and not the remainder of the season?
4. In articles past, I have shown that simply wetting the washboarded area shows a ghost-like grayish film where the bees were working. I don't know what causes the soft outline. After drying, the bees quickly return to rock the area.

A washboarding bee with full baskets of unprocessed gum. Is she multitasking?

5. I have seen a few resin collectors with raw gum on their pollen baskets. I surmise they are simply opportunists. Upon returning from a foraging trip, they got distracted by the washboarding behavior. Their loads are not yet mixed with wax to form propolis. Why are these few bees mixing behaviors? It appears that gum foraging is being blended with the rocking behavior. I cannot offer an explanation why those bees should be there.
6. If the rocking bees are applying propolis to the surface, where is the supply chain? There are seemingly no breaks being taken by rocking bees to run get another load of propolis. But possibly the liquid film being applied is very light and a crop full of diluted propolis mix will last quite a while. I'm out of guesses.
7. I have pushed my macro photographic and video graphic ability to the maximum of my ability – even beyond. It has helped, but I still cannot draw clear conclusions. The mandibles are clearly involved, and the tarsi and tarsal claws are in constant use. The bees appear to be abrading and scraping the surface on which they are working. I just can't quite tell, and the resolution of my video is pushed beyond clarity, but it nearly seems that the bees are occasionally touching the surface with their tongue – possibly

even the back of their tongue. The entire scraping/abrading/licking procedure is very, very fast – and constant.

8. With a great deal of concern for you, the reader, and a caution to myself not to get carried away, I offer these personal observations. I can only report from my one observation hive and from the fronts and backs of my bee hives. This is not science, but here I go into the lofty realm of speculation.
   a. This procedure, though not as delineated and organized as observed on the hive front, is common within many parts of the hive interior. The head-down, in-line procedure does not seem to be nearly as important to the inside bees. It's more of a *"one here and two or three over there"* kind of thing. One place where the behavior is particularly clear is along the edges of the top bars. The horizontal lines are intact, and the behavior is clear.
   b. I routinely see bees washboarding the glass interior with their ventral surface toward me. The glare from the glass wall makes capturing a good photograph difficult. These bees, too, are somewhat random and may not always be head-downward directed.
   c. Some bees appear to be washboarding on capped brood. It is easily visible, but there is, again, no organized line or structure. This time of the year (mid-September), my bees in the observation hive appear to be a quivering mass of activity (except for the few *"Stargazers."*). Only video can capture the general vibrating activity.
9. Without an iota of science, I can only wonder if this is a hive hygienic behavior intended to suppress mold and microbial growth? Readers, please know that I do not know what I am writing. Is such microbial growth seasonal? Why just in late Summer and Fall? All experienced beekeepers have seen the mold and fungal growth that occurs on damp, extracted equipment that has been removed from the bees. I don't even know if such molds (or whatever) are household problems for bees. I had a poorly formed thought that this may be some kind of viral control event, but I have tossed that concept.

Are they simply sweeping and cleaning the hive?

The procedure could appear a combination of the mandibles loosening detritus (whatever it may be), and the sweeping/scratching motion of the prothoracic legs as a sweeping motion. If there is tongue contact, that would be akin to mop water.

One last time – my comments here are not documented science

I spent much of my opening to this article questioning why so many of us as beekeepers have an insatiable need for ever more bee information. I don't know what the peculiarly positioned bees are doing, and I do not know what the wash board behavior is accomplishing. Everything I have written here is nothing more than guesses.

But when I see bees performing the behavior during this time of the season, I simply must have some answer – even if it is a guess – to go in the answer blank. The hive hygiene concept is not a concept to which I am bonded. It is just my current guess. What's yours?

Rats . . .

I'm out of space. I had intended to review yet another situation my observation hive presented – an obvious case of Galleriasis, a wax moth issue in which larvae burrow along the comb midrib. In doing so, their tunnel webbing holds emerging bees within their cell. I watched – for several days – as the bees struggled to release the trapped emerging bees and battled to eliminate the protected moth larva. The bees won, but not without a high and consistent energy investment. I will review this next month.

As always, I truly appreciate you reading my piece. Comment as you feel necessary. At least I will know that you are out there. BC

Dr. James E. Tew, Emeritus Faculty, Entomology, The Ohio State University and, One Tew Bee, LLC; ***tewbee2@gmail.com; http://www.onetew.com.***

CALENDAR

♦COLORADO♦

The Colorado State Beekeepers Association will elect a slate of officers at its Zoom meeting November 14..

Speakers include NC State's Dr. Dave Tarpy, on "Coming out of Winter." In his second talk, Dave will speak on the history of beekeeping. Becky Tipton of Country Creek Honey in KS will show how to make soap, lotion and salves from bee products.

The cost is $5 for members. Register at **Coloradobeekeepers.org**.

♦OHIO♦

Ohio State Beekeepers Association will be November 7 as a Virtual Zoom meeting.

Speakers include Jerry Bromenshenk, Jerry Hayes, Barbara Bloetscher, Reed Johnson and more.

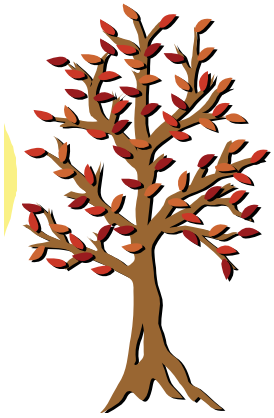
For more information and to register visit **www.ohiostatebeekeepers.org**.

♦VIRTUAL♦

The American Honey Producers Association will hold their Conference as a video conference December 3-4.

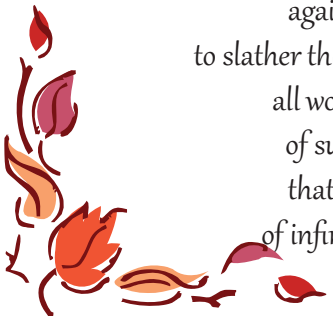
The cost is $50 and the time is 10:00 a.m. to 4:00 p.m. Central time.

To register visit **www.ahpanet.com** or contact Cassie Cox, 281.900.9740.



The Gift of Honey

I relish the gift of honey.
To taste the apian oeuvre of amber wonder
drawn from the nectar of a thousand
unadulterated summer blooms,
to receive Nature's sweet defense
against her microbial mob,
to slather this savory spread upon my toast,
all would raise in me a feeling
of such sensory satisfaction
that I would bear gratitude
of infinite proportion for weeks.



~ Paul Forest
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Paul fishes like he keeps bees – all out. He picked me up long before daylight. The magical pre-dawn hours can make for fruitful conversation. On our drive to the river, we talked about the American Honey Producers Association's push to open federal lands to beekeepers keen to keep their bees isolated from agricultural chemicals, while they prep them for the almonds.

The AHPA's erstwhile environmental allies at the Xerces Society think this is a very bad idea, arguing that generalist honey bees might out-compete the thousands of species of native bees that specialize in pollinating particular varieties of native flora.

A pale light brightened the eastern sky when we arrived at Paul's favorite spot. He handed me a special fly he ties himself – a variation on a standard pattern. It can be deadly.

The air was brisk, the river frigid as we stepped in. We cast his special fly, then midges, then larger dry flies, as the day progressed and the weather warmed. Paul caught most of the fish. It seemed every time I glanced his way he had a trout on. But he declared one of mine the biggest. I'm not so sure.

At the fly shop on the way home, one of the shop guys pulled me aside. "We venerate Paul," he confided. "He's fished these rivers for 60 years."

It's the same in the beeyard. Paul's commitment, vast experience and second-nature understanding of honey bees and beekeeping dwarf what anyone might glean from reading books and dabbling in the backyard. When Paul talks, savvy beekeepers listen. Sixty years of fishing. Sixty years of commercial beekeeping. They both add up.

Moving right along, might I serve myself a heaping side dish of baked crow? Crow, even properly prepared, is never tasty, but it can be a tonic for the soul.

In the September issue of this very publication, I mentioned that I used an oxalic acid dribble for Varroa mite control, with honey supers in place. An alert reader left a message with my editor, wondering if it's really OK to use oxalic with honey supers.

I was confident it was safe to use, but now, too late, I wondered if it was legal.

I wrote to Randy Oliver, the father of American research into oxalic treatment for Varroa control. Within the hour I had this reply:

The EPA label for oxalic acid clearly states: "Do not use when honey supers are in place to prevent contamination of marketable honey." (I am not clear as to whether this applies to honey not intended for market). In any case, this restriction is simply because the Registrant (USDA) has not yet submitted data (available from our studies, as well as from several other countries) that shows that oxalic acid from treatment does not get into the honey to any extent of concern (since oxalic is already a natural component of honey and the human diet). Nevertheless, the label is the law.

I understand that beekeepers read my column not just to be amused by my misadventures, but to pick up helpful tips. I regret that I outlined my oxalic mite control technique, without warning readers that it was illegal.

I can't undo this. I can only apologize, Dear Reader, and I do.

I won't apologize for touching on climate change in a recent piece, however. It was my February column about the possibly imaginary bear with the Darth Vader breath that somehow veered off into an apocalyptic look into the future of life on our poor polluted planet.

This spawned an indignant response from one disgruntled reader, followed by some back and forth in the letters section of recent issues. A recent letter opined that climate change was "politically charged," and as such had no place in a magazine devoted to beekeeping.

I beg to differ. When the teacups begin tumbling out of the cupboard, it's a sign there could be an elephant in the kitchen. Right here in Peach Valley, in west-central Colorado, from mid-March until early September, we received less than a quarter-inch of moisture. Meanwhile, 10 miles to the East, this summer the Grizzly Creek Fire quickly consumed 32,000 acres in and around scenic Glenwood Canyon, making it the largest fire in the history of the White River National Forest.

Just down the road to the West, the Pine Gulch Fire burned an area four times that large – the biggest Colorado fire on record.

Earlier this Summer, the Streeter Fire north of Meeker burned one of Paul's bee yards. Down at the Palisade Farmers' Market, Tony told my gal Marilyn he was pretty sure he'd lost his High Lonesome Ranch apiary to the Pine Gulch inferno.

Here at the farm, we choked on smoke, in relentless heat. My bees barely made a living, making this my poorest honey year in a quarter-century of beekeeping.

Climate change is surely and steadily making a profound impact on beekeeping. What do you think it's like keeping bees in the hellish hills of California? And Louisiana beekeepers can't keep bees underwater.

While political ideologues might question climate change, the vast majority of scientists no longer do. There is no scientific controversy – only an intensifying nightmare of climate-science-predicted melting glaciers, coastal flooding, record-breaking temperatures, radical temperature swings, screaming "derecho" winds, warming oceans, ponderous, massive hurricanes, and, here in the arid West, drought, accompanied by fire, fire, and more fire.

We humans pump 2.6 million pounds of carbon dioxide into the atmosphere every second. You think this has no impact? Open your eyes, or put your head back in the sand.

Ed **Colby**

Side Dish Of Baked Crow

BOTTOM BOARD