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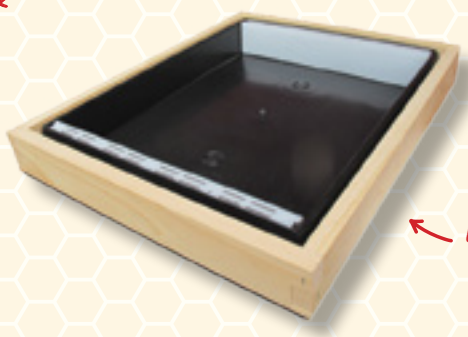

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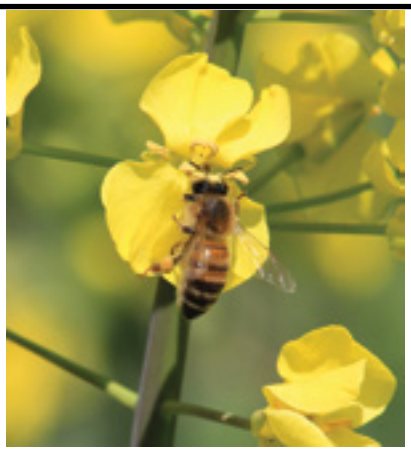

Honey bee on Canola. See story on pg. 62. Photo by Karen Sowers.


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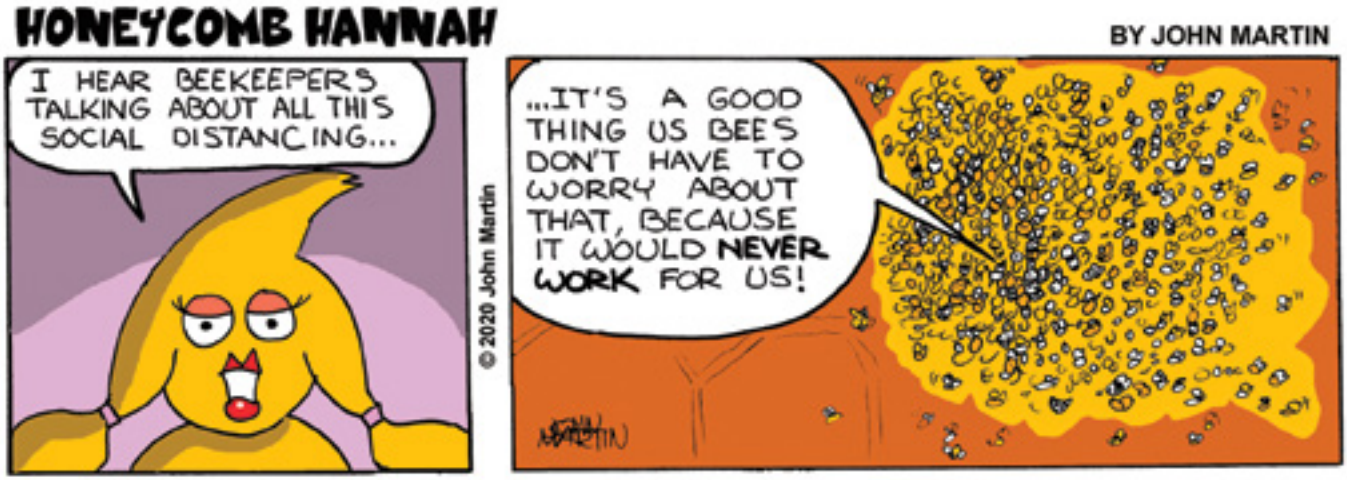

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Can We Just Change The Subject

We've all heard the adage "Ask five beekeepers a question and you'll get 10 answers." But climate change is so politically charged and is a much more divisive topic than a discussion, say, about screened bottom boards versus solid or wooden ware versus insulated equipment.

Both climate change proponents and climate change deniers are pretty entrenched in their beliefs. The chances of anyone from one camp convincing anyone in the other camp of their ignorance about climate change is pretty much nil. Even more so when pejoratives are included in the discussion.

Personally, I read *Bee Culture* looking for those "ah hah!" nuggets. Selfishly, I don't want to miss them simply because I lack the patience to wade through someone's five paragraph manifesto endorsing or decrying climate change so that I can find that one sentence "If your bees are doing such and such, I found this maneuver helpful."

There's an old saying that's almost never used anymore "We'll have to agree to disagree." So can we do that? Can we please find a topic that will help unite us as beekeepers instead of emphasizing our differences? Please?

Marguerite Weiner
Upton, MA

Kudos To Ross Conrad

I enjoyed your May article immensely. I agree. I believe that to have dominion over all of the earth carries a great responsibility as a caretaker, which has been, in many respects, ignored. When I look back to many years ago I realize that I too fit in that category. Many of us have lost contact with the natural world, and we are much the poorer for it.

Thankfully I am somewhat wiser than I was in my younger years. As to queen replacement, when I started beekeeping in 1980, I too replaced (killed) good queens, because that was what I was taught. Many of them would be much better queens than I have today. Anyway, thanks for a very thoughtful article.

Ron Marshall

Author's Response: *Thank you for your message. It is always a pleasure to hear from a fellow beekeeper.*

Thanks also for your kind and thoughtful words about my May article on requeening in Bee Culture *magazine. It is good to know that you resonated with the ideas expressed in the article. I have to admit it was a bit of a stretch for me as I don't typically mention religion in my beekeeping articles.*

I hope you and the bees are doing well during these Covid days. Thanks again for taking the time to get in touch.

•

I am so glad I finally got to meet you at our Northern Michigan Bee Conference last Fall. What a strange ride this year has turned out to bee.

I just wanted to thank you for your very well written article in *Bee Culture* in May (I'm just catching up with my reading). I often speak with beekeepers too about the yearly requeening program. It never ceases to floor me. I'm not so eloquent, I just say WHY would you do that unnecessarily? I think your response points to much needed changes, from our historical colonizer mentality approach to beekeeping, as well as in so many other arenas. This fundamental shift in perspective you call for can begin to heal our relationship with this one earth we call home starting where we are.

I find myself in a very interesting position in regards to commercial beekeeping but heart really lies in a animist and feminine centric approach towards beekeeping. It is refreshing to read an article that so clearly outlines the needed changes in the way we partner with honey bees regardless of religious affiliation. I think the times are calling for this shift in consciousness. I believe we are ready plus Just makes good sense. Blessings.

Sharon Jones

Author's Response: *Thank you for your email message and for your wise words regarding the topic of my May* Bee Culture *Article. I think you are right on target and encourage you to find a way to continue to follow your heart within the realm of the commercial beekeeping world that you find yourself in. Keep up the good work.*

What's Not Being Discussed

Well – as I've related before – I consider myself pretty much retired from hands-on beekeeping nowadays.

Just a personal note here: But I do not feel that beekeepers are facing some sort of environmental 'crisis' or that we need to adopt a lot of new methods to keep bees successfully. I feel that as a community and industry (in the commercial sense at least) *we have all the tools we need presently if we only apply them conscientiously, and informedly.*

The bigger problems for the beekeeping industry it seems to me, relate primarily to the vast numbers of new and 'save the bees' people who have tried to take up the craft over the past 20 to 25 years or so. Their lack of practical knowledge and experience seem to me to be one of the root causes of disease spread and 'mongrelizing' of our domestic honey bee gene pool (particularly in the U.S.)

The reasons/motivations for many of the 'newbees' to get a hive or two is also misguided I feel. As

I've mentioned before I feel that the proper role of beekeepers is to be good *'Bee Stewards'* which implies that *before* acquiring hives of their own these folks need to take sound courses on basic bee biology and behavior as well as learning best management practices (such as the excellent courses that the University of Montana offers online for example).

When I've taught classes on basic beekeeping I've frequently advised some participants to not actually start hives of their own *if* they weren't prepared to learn more about good basic bee biology management and 'bee stewardship." That's why we started coining the term *"Beekeeping Ambassadors"* for those folks interested in bees and beekeeping but not actually willing or prepared to do the 'homework' necessary to *ensure their longer termed success*.

Another complicating factor over the past 15 years or so from my perspective has been the rise and ubiquity of the Internet which has only exacerbated the problem with newer beekeepers getting into it for mainly ideological and/or impractical reasons.

From my perspective the number one problem that we beekeepers face nowadays world-wide (with *A. mellifera* species) is due to the parasitic and viral vectoring effects of *Varroa* mites without question. And the only sustainable way to remedy that will be through genetic means bee breeding and/or genetic modification methods where found to be safe and practicable. Many bee breeders have touted '*Varroa* resistant bees' but very few have actually delivered on those claims I believe. I am personally interested to help further legitimate efforts currently being made within our industry as well as at USDA facilities to see that happen. As an 'old man' nowadays that's an effort that I feel I can still contribute to meaningfully.

As far as other commonly voiced concerns about 'bees going extinct' 'pesticides poisoning the bees and environment' 'industrial agriculture/monocultures significantly reducing foraging habitat' I do not agree that those situations are a major factor negatively affecting bees and pollinators (although I do agree that they need to be monitored/managed wisely). Generally speaking I consider myself to be a practically oriented sort of guy. And in the case with bees and beekeeping I readily acknowledge that my concerns are primarily focused on furthering sustainable and successful beekeeping.

I hope that my comments here are helpful.

Al Summers
Longmont, Colorado

Rehabilitation

In the past we have seen articles about beekeeping and beekeeping education as a form of skills training in correctional facilities. States that have beekeeping programs in them have shown to reduce prisoner crime and lower recidivism amongst program participants. Once released it helps to prepare trainees for job opportunities. One bit of information I find quite alarming is that a place commercial beekeepers like to go during the Summer months for the lush fields of canola, sunflower and clover does not have a beekeeper training program.

North Dakota Department of Corrections and Rehabilitation has three men's facility prisons and one women's prison. At all three men's and women's facilities in the state there are vegetable gardens, flower gardens and even service dog training programs. Where are the bees? There are men and women at these facilities that are willing to learn and eager about honey bees.

North Dakota is highest volume honey producer in the U.S. and migratory beekeeping operations as well as domestic producers would benefit greatly having a pool of trained workers from which to draw once inmates are released.

Funding for such a small investment in equipment could be readily found from state beekeeping licensing fees or easily allocated through the education department. In ND the money is (or at least should be), the least of the concerns given the lucrative tax and revenue streams from the petroleum industry.

One doesn't have to look far to see the countless benefits education and vocational training provides. This is especially true in a prison setting as that captive population will soon be back in the public seeking gainful employment. Please take a moment of your time to contact Facility Director Colby Braun at the North Dakota Department of corrections at 701.328.3100 and encourage him to keep beehives at all four North Dakota prisons.

Matthew Kriedeman
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Honey Bee Health Coalition

For over 40 years I have worked in and around the honey bee and beekeeping industry. After a stint as a High School teacher, I went back to college at Ohio State University to learn about Honey Bees from Dr. Jim Tew. Then on to the USDA Bee Breeding Stock Lab, (as it was titled back in the 80s), for a short time, then to Dadant and Sons and the *American Bee Journal* for a long time. I then joined the Florida Dept. of Agriculture and Consumer Services as the Chief of the Apiary Inspection Section for almost a decade. I then went on to work on RNAi with Monsanto to control *Varroa*, and now as editor of *Bee Culture* magazine.

I've been a beekeeper before *Varroa* and now on this journey after *Varroa* and all the collateral health effects that we are struggling with. I've seen bees mysteriously disappear with CCD. I've seen people and animals killed by Africanized Bees. I've seen prairie lands converted to ag lands, which meant fewer flowers for bees and more impacts from pesticides. All of these things changed how a beekeeper operates and put a strain on the longstanding relationships between farmers and beekeepers and the environment – both in the informal sense, where a case of honey was exchanged for putting hives on a neighbor's lands, to more formal contract pollination services and a business relationship.

Our vocation and/or avocation of Beekeeping, our relationship to our vital environment and partnership with this little insect along with our connection with agriculture was tittering on the edge and something had to be done to save it.

On a cold day in December 2013, myself and 37 other bee health professionals stepped off a bus into eight inches of freshly fallen snow in Keystone, Colorado. We holed up at 9,000 feet to discuss what pivot was needed to change the course of bee health decline, specifically on and around agriculture lands as this was where many were convinced honey bee health decline began. We began by discussing all the other great work being done on this issue and whether, and if so how, we could complement other efforts and not compete with them. We all agreed that everyone was busy and that if something were to stick, we'd have to be an action- and results-oriented group first and foremost.

We set to work and identified our mission and vision. We formed smaller working groups to address what's called the four Ps – pests and pathogens, pesticides, and poor forage and nutrition – and determine what each of the groups' first order of business would be. We developed a governance system that gave everyone an equal voice. After two days, we formed the genesis of the Honey Bee Health Coalition.

Hopefully, many of you reading this have heard of the Coalition or perhaps seen our seminal work, the Tools for *Varroa* Management Guide. Since that first meeting, we've developed an extensive library of resources for beekeepers and farmers and provided guidance and tools for how we can all play a part in reversing bee health decline. Beyond what we've produced, there's an intangible benefit that still permeates our meetings. This was born out of hard conversations, raised voices, and staunch disagreements. After six years of sitting in the same room, donning bee suits, visiting farms, and enduring hundreds of hours of conference calls, relationships and trust have formed. These relationships enable the group to talk about difficult topics deliberately and respectfully. We don't discuss the relative weights of the four Ps. All are equally important, and all require the same level of attention.

All these things have enabled the Coalition to keep churning out and marketing a slew of high quality, free, and dependable resources for farmers and beekeepers.

Over the next several months, I would like to use this column to tell you about what the Honey Bee Health Coalition has done. And what it needs to do but can't as quickly as needed without your help. My not-so-hidden agenda is to get you to know about these tools and resources and then actively use these tools and resources. I want you to share these with your fellow beekeepers and use them to have conversations with your farmer brethren. Farmers and beekeepers rely on each other to bring sustenance to our fellow Americans. We are all part of the environment and agriculture, and I look forward to showcasing an extensive body of work that I think you'll find both helpful and intriguing.

We are all in this together.

Jerry Hayes

Learn more at
www.honeybeehealthcoalition.com

•

Is It Honeybee or Honey Bee?

Writing insect names using American English can be difficult. Some species have different names depending on where you are, or with whom you are speaking (think "ladybug" or "ladybird" or "lady beetle"). More often than not, an insect may not even have an official common name because out of the million or so insects that have been discovered and described, only a couple of thousand have been designated with common names by the Entomological Society of America (ESA).

To make matters worse, even the ones that DO have official common names – ones that we see nearly every day – may have different spellings depending on whether they appear in scientific publications or other print media, such as newspapers or magazines.

For example, according to *Merriam-Webster's Dictionary,* "honeybee" and "housefly" and "bedbug" are spelled as one word. However, according to the **ESA Common Names of Insects Database**, they are spelled as two words – "honey bee" and "house fly" and "bed bug."

Newspapers such as the *New York Times* or the *Washington Post* tend to use the dictionary spellings, while scientific journals such as the *Journal of Medical Entomology* or *Annals of the Entomological Society of America* will of course use the spellings that

are officially sanctioned by the entomological community as they appear in the **ESA database**.

The reason for the discrepancy is that entomologists use two words if a common name accurately describes the order to which a particular insect belongs. For example, all true flies belong to the order Diptera, so true fly names will be spelled using two words by entomologists — house fly, horse fly, pigeon fly, or stable fly, for example. However, despite their names, dragonflies and butterflies are NOT true flies — their orders are Odonata and Lepidoptera, respectively — so they are spelled as one word.

The same goes for "bed bug" or "stink bug," both of which are true bugs in the order Hemiptera, which is why they are spelled as two words in the entomological community. However, insects that are not in the order Hemiptera, like billbugs or sowbugs, are spelled as one word.

Likewise, honey bees and bumble bees are true bees in the order Hymenoptera, so entomologists spell them as two words, even though the dictionaries and newspapers spell them as one.

In his book *Anatomy of the Honey Bee* from 1956, Robert E. Snodgrass wrote:

Regardless of dictionaries, we have in entomology a rule for insect common names that can be followed. It says: If the insect is what the name implies, write the two words separately; otherwise run them together. Thus we have such names as house fly, blow fly, and robber fly contrasted with dragonfly, caddicefly, and butterfly, because the latter are not flies, just as an aphislion is not a lion and a silverfish is not a fish. The honey bee is an insect and is preeminently a bee; "honeybee" is equivalent to "Johnsmith."

So there you have it. If you're ever in doubt, check the **ESA Common Names of Insects Database**. If you can't find what you're looking for there, find another reputable source and check on the insect's order, and remember this short rhyme: "If true, then two."

•

Excerpt from an old A.I Root Publication, 'The Honey Bee – A Grower's Guide'. We're not sure of the actual date – but there was a video offered with the guide for $49.95.

The Inspection Process

The only fair way to judge a colony is by a visual inspection of the nest. While some growers judge the value of a colony by the level of foraging activity at the colony entrance or by the number of bees in the field, neither of these methods is likely to give you a true picture of the colony's worth. Temperature, level of sunlight, wind speed, and the time of day all play important roles in determining foraging activity. Also, a low number of bees foraging in your field may be the result of your crop's failure to produce a large enough amount of nectar to attract the bees, or of competing crops in nearby fields. All of these circumstances are out of the beekeeper's control. So, to be fair to both beekeeper and grower, a visual inspection of the nest is best. The inspection should be conducted when the temperature is above 60°F. If the temperature is lower than this, the bees may be clustered tightly on the comb, and it will be more difficult to obtain an accurate assessment of the colony.

Bees In The Field

Remember, when inspections are conducted, most of the foraging force will be in the field. This field force can represent a substantial portion of the colony's population, and it is essential that these be counted and added to the total estimate for the number of combs of bees. To make this adjustment, you must make an assumption about the average length of a foraging flight. While the actual length of individual foraging flights can vary widely, an estimate of 30 minutes is reasonable in light of available information.

To estimate the number of bees in the field, the consultant should count the number of bees returning to the nest during a one-minute period. For example, if the average round-trip flight time, t, for a forager is 30 minutes, and the number of bees, n, returning during a one minute period, is 150, then the total number of bees in the field, TB, can be estimated as:

TB = t x n
= 30 minutes x 150 bees/min
= 4,500 bees

After you obtain this number, you must convert it to the equivalent number of full-dpth combs of bees. Assuming that there are 2,000 bees per full-depth comb (both sides), the adjustment (ADJ) to the number of bees, expressed as equivalent full-depth combs of bees, is:

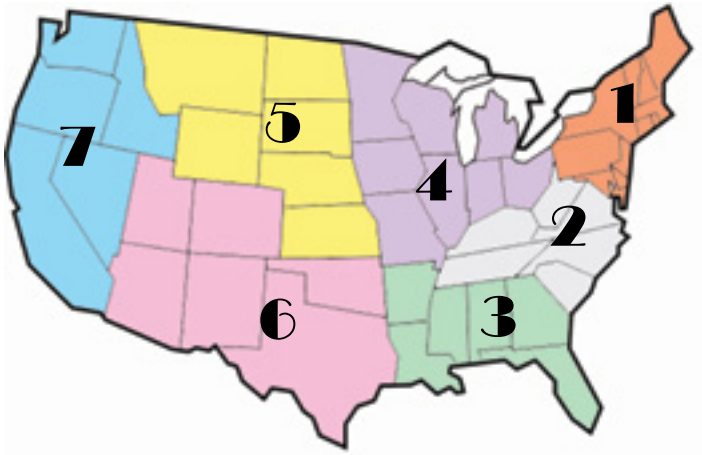
ADJ = 4,500 Bees x 1 Comb/2,000 Bees
= 4,500 Bees x 0.0005 Comb/Bee
= 2.25 Full-Depth Combs

This number is added to the estimate of the number of full-depth combs of bees in the colony. On the data collection form, the calculation of the adjustment factor is set up as:

ADJ = _B/M x 30M x (0.0004) = _ (in Full-Depth combs of Bees)

Where B/M = number of bees per minute counted at the entrance, 30 = the average length of a foraging trip in minutes, (0.0005) converts the number of bees to the equivalent number of full-depth combs of bees.

SEPTEMBER – REGIONAL HONEY PRICE REPORT



Winter Losses, Summer Crops

About this time every year we take stock of colony losses both last Winter and so far during the Summer. Last year Wummer losses were actually greater than the previous Winter's losses, and we wanted to continue that observation for another year. We also look at both the Spring and Summer honey crops (if there are any where you are), and what effects the weather had on them this season.

Across all regions, Winter losses during the 2019/2020 season were at an average 24%, higher than most of us would like certainly, but better than the 37% reported last year. The range however was significant to location, ranging from a low of 4% in Region 2, to a high of 39% in Region 5 and 38% in Region 1. Summer losses, that is between April and late July averaged 4% across all regions and all reporters. This is certainly a much brighter spot compared to last years 8%.

44% reported a below average Spring crop this year, while 12% don't have much of a Spring, crop, meaning that about 40 some percent have had a good to average Spring crop. Things picked up a tad this Summer, because only 36 reported a below average crop, while 40% were at, or above average so far. Interestingly, 25% usually don't have a Summer crop.

Weather is always one of the villains or heros of a season's success or failure, and this year was no different. Across all regions, 31% of our reporters felt that favorable weather improved their crop to above average, 44% had a reduced crop because of unfavorable weather in their opinion, while 18% had a much better than average season because of favorable weather, but for 8%, the weather was so awful, they had essentially no harvestable crop due to the weather.

We are looking for reporters in Region 7, so if you would like a free subscription, can supply prices for most of the wholesale or retail prices on the front, and would like to be a part of monthly survey, contact **Amanda@beeculture.com**.

	REPORTING REGIONS							SUMMARY			History	
	1	2	3	4	5	6	7	Range	Avg.	$/lb	Last Month	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS												
55 Gal. Drum, Light	2.01	2.33	2.15	2.05	2.04	2.35	2.00	1.50-2.50	2.13	2.13	2.16	2.18
55 Gal. Drum, Ambr	2.00	2.25	2.01	1.94	2.05	2.38	1.85	1.35-2.75	2.06	2.06	2.05	2.13
60# Light (retail)	228.64	195.25	185.00	171.83	157.50	199.50	205.00	120.00-325.00	199.53	3.33	205.01	203.82
60# Amber (retail)	222.50	221.70	190.00	181.75	215.25	189.67	197.50	120.00-325.00	208.00	3.47	204.24	206.70
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	98.69	75.60	90.00	74.00	61.20	108.94	108.94	60.00-194.40	90.69	7.56	88.80	91.05
1# 24/case	150.51	150.85	124.50	105.11	152.50	119.88	144.00	85.00-300.00	136.00	5.67	138.65	124.41
2# 12/case	134.89	101.41	113.43	97.44	71.52	96.00	132.00	31.20-246.00	118.70	4.95	120.67	119.31
12.oz. Plas. 24/cs	103.86	119.22	88.67	85.00	83.76	101.88	120.00	66.00-172.80	99.39	5.52	99.56	95.98
5# 6/case	153.75	112.40	108.00	110.30	110.58	105.00	146.30	71.50-240.00	136.85	4.56	139.25	137.52
Quarts 12/case	183.21	174.81	147.72	105.30	185.04	155.94	216.00	56.00-300.00	161.58	4.49	151.80	153.50
Pints 12/case	97.55	103.60	83.00	75.28	139.00	104.00	97.76	60.00-140.00	95.53	5.31	95.91	91.30
RETAIL SHELF PRICES												
1/2#	5.65	5.77	3.50	4.58	4.60	5.63	5.63	3.00-9.00	5.27	10.54	5.18	5.20
12 oz. Plastic	6.67	6.97	5.55	5.46	5.83	6.29	6.00	3.79-12.00	6.19	8.26	6.16	6.34
1# Glass/Plastic	8.73	8.75	8.22	6.11	8.53	7.99	7.00	4.79-17.00	8.18	8.18	8.13	7.95
2# Glass/Plastic	14.64	13.75	14.84	11.23	15.30	10.90	13.00	6.79-25.00	13.97	6.98	14.29	13.51
Pint	11.49	11.84	7.74	12.40	10.75	10.37	12.71	4.00-24.95	10.94	7.29	11.20	11.05
Quart	19.93	19.81	14.31	12.95	19.05	19.33	18.00	7.00-32.00	17.88	5.96	18.14	18.41
5# Glass/Plastic	30.42	27.47	35.00	29.00	18.86	21.45	30.34	13.57-50.00	28.90	5.78	29.05	29.37
1# Cream	10.18	8.45	10.55	9.44	7.55	10.55	16.00	6.00-16.00	10.10	10.10	10.66	10.14
1# Cut Comb	12.88	13.21	14.95	14.00	15.00	14.25	14.97	8.00-25.00	13.45	13.45	13.00	12.93
Ross Round	10.93	7.12	10.96	15.00	10.96	10.96	15.00	7.00-15.60	10.63	14.17	10.77	9.98
Wholesale Wax (Lt)	7.84	6.17	5.60	6.30	5.75	4.50	7.11	3.00-12.00	6.72	-	6.56	6.66
Wholesale Wax (Dk)	6.92	5.30	4.52	4.83	6.06	3.75	6.06	2.55-10.00	5.85	-	5.51	5.42
Pollination Fee/Col.	76.82	67.00	80.00	105.00	80.00	73.86	73.86	10.00-130.00	77.73	-	87.17	82.85

NEXT MONTH

It is September as we live by the days. Summer is waning for those in the upper tier of States and for you below its still hot and humid in the SE or hot and dry if you are in the SW. The West Coast is a different thing. Days are getting shorter regardless for us and our 'bees'. They know this and are preparing for a change in their colony dynamics. 'Winter' bees are being raised that have more vitellogenin 'fat bodies' so they can survive long periods without flower food resources outside the hive. Honey has been stored and I hope you didn't take all of this natural food from them. If you did take it all I hope you have fed them a Sucrose Sugar syrup to store as they would Honey for those even shorter darker days of Winter. You, of course sampled for mites in August and treated and then sampled again to see if your mite management decisions got individual colonies down to less than three mites per 100 bees. If not that colony is most likely dead it just doesn't know it. Beekeeper meetings are still being Zoomed if not cancelled. They aren't the best but it is better than nothing. We need this connection as Beekeepers. And we want you to be Successful so here are the suggestions by Region from experienced Beekeepers. Which means they have been where you are and are still Beekeepers.

Region One
- Feed if they don't have at least 50 lbs.
- Treat for Nosema
- Combine weak colonies. Take your losses now.
- Sample and Treat 'Better'
- Insulate Hives
- Check Mite Levels more often
- Help 'New' Beekeepers in your area . . . No 'Mite Bombs'

Region Two
- Check Food Stores. Weather is Hot then Cold
- Lots of Brood Rearing Still. Sample often
- Mites, Mites, Mites and oh Mites, Mites, Mites.
- Get rid of Italians and get Russians
- Sample and Treat, Treat and Sample

Region Three
- Check Colony Stores and Feed
- Combine Weak Colonies
- Repair Equipment
- Check for Mites Earlier
- Change mite Treatment used last year.
- Treat for Nosema
- More vigilant on mite sampling

Region Four
- Fall Re-Queening
- Closely monitor Mites and Control better
- Make Winter Nucs
- Control Mites Earlier
- Pray
- Treat for Mites. Mites are getting harder to kill
- Add Top Insulation

Region Five
- Feed
- Sample, Treat, Sample then do it again
- Take off Honey, then feed and treat
- Combine Weak colonies

Region Six
- Feed
- Mite Control
- Put on Winter Patties
- Mite Sampling. Then Treat if Needed
- Monitor Food reserves
- Combine Weak Hives

Region 7
- Check for Mites / Treat
- Check Food Stores
- Move colonies to better full sun locations
- Combine colonies
- Make winter Nucs

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It's Summers Time –

More Summer and More Loss –

We're still having an abnormally hot Summer for our part of the world. And as far as moisture, that's been very sporatic too. We had about two weeks or more with hardly a drop of rain, then we had four days of downpour. So Kim spends a lot of time watering because it's so hot and dry and then no watering. I didn't mow the lawn for three weeks and then what seemed very sudden it was out of control after the four days of rain and of course then I couldn't get to it for a few days longer. But Summer is always a nice adventure to me. We have so many different kinds of plants and trees and there's just always something blooming, vegetables growing, eve night blooming flowers. It's so easy to lose ourselves out here in our little Spieth Road spot. For brief moments we can forget what a crazy world it is that we're living in.

Our Bee Bee (*Evodia*) tree is in full bloom. I know some of you remember Richard Taylor, and some of you younger beekeepers have heard about him. Kim got the Bee Bee seeds from Richard probably close to 30 years ago. You can see in the photo the tree is right next to our back door which is where we go in and out. It's hard to see in the photos but it is covered with bees today. It's 85° and sunny and it sounds like a swarm when you walk out the door. The bees love this tree and it blooms steady for close to a month depending on the weather.

Evodia tree and blooms. If you look close you can see a couple of honey bees.

The goldenrod is just approaching blooming and it will be interesting to see what kind of flow we get. If you remember goldenrod bloom depends on the amount of rain you had around the fourth of July, and of course I can't really remember if we had a lot of rain then. But hopefully we did and soon we'll start to smell that unique, somewhat offensive smell of goldenrod as the bees process it in the hive.

Moonflowers.

Once again I have to talk about folks we've lost since the last time. The beekeeping world lost two souls this past month – John Thomas and Bill Wilson. Please make sure you read about them on page 93 of this issue. Our hearts go out to their families.

And on a very personal note I lost my sister a week ago. She was 82 and she had been sick and for a few weeks we knew what was coming. But somehow that doesn't make it any easier. Her name was Ellen, but most of the world just called her Auntie. In fact, my two boys were probably 10 years old before they realized that she had a name other than 'Auntie'.

It's hard under 'normal' circumstances to lose someone who has known you literally your whole life. But it's hard and confusing and disturbing under our present situation. You see my sister lived in Northern California and one brother lives in Southern California and another brother lives just outside New Orleans. So we can't be together, it's just not safe to do that. So what do you do. We've lost several close friends during this pandemic and every time we've said we'll do something later. We'll have a celebration when we can. But when will that be.

Resurrection lilies – sometimes called surprise lilies and sometimes called naked ladies.

So my niece is organizing a graveside service that we will all be at via ZOOM. Now the thing you need to know about Auntie is that she was the least techy person you've ever met. She had not embraced any of the digital world, ever.

We will all miss her and hopefully before too much time passes we can all get together – really together – and celebrate Auntie.

Summer is winding down. This is the September issue already. Can you believe. Have a good rest of the season.

Hugs to all of you. I hope to see you next year, somewhere at a bee meeting. Be safe.

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 – I am a new beekeeper going into my first northern Indiana Winter. I think I have read everything I can but just want to be sure. I sampled for Varroa and came up with eight Varroa per 100 using alcohol wash August 1st. I treated for Varroa mites using ApiGuard. Then I sampled again and came up with three mites per 100. Is that OK?

A. First of all, way to go for sampling for mites and taking steps to reduce their population in your hive! Second of all, two thumbs up for thinking ahead about the winter season and how you can start prepping your hives now so they are healthy and strong to survive the coming months. Thirdly, great job for sampling before AND after treating the hive so you know first, whether you need to treat and then, if your treatment worked. It sounds like ApiGuard did reduce the *Varroa* population, but I would consider doing a follow-up treatment to try to get the mite count as close to zero as possible. You could potentially wait a month, resample to see if the mite population has changed, and determine your next steps from there. One thing you have to keep in mind though is when temperatures in your area are going to drop to the point where it would be too cold to open the hive to apply a treatment or take another sample. You want to make sure the colony is ready to go before the cold weather hits so you don't have to break their cluster. Regardless, if you decide to apply another treatment, make sure you do not use ApiGuard or any other thymol-based treatment. Using the same product repeatedly can cause *Varroa* mites to develop resistance to the chemical and thus it becomes an ineffective control method. Check out the *Varroa* Management Decision Tool from the Honey Bee Health Coalition if you need help figuring out what your other options are (**https://honeybeehealthcoalition.org/Varroa/**).

Mary Reed, Chief Apiary Inspector,
Texas Apiary Inspection Service

A. If you check **https://honeybeehealthcoalition.org/varroatool/** you will see that at any time of year, 3% is considered the danger zone, warranting prompt action. At some times of year, this number is 2%, so it is a good idea to remember this great resource and use it. It will even tell you what the options are for conditions and weather. Kudos to you for monitoring for mites, treating with an organic option, and checking again.

Tina Sebestyen, President Emeritus,
Four Corners Beekeepers Assoc
Vice pres, CO State Bkprs Assn.

Question – What do you think about requeening in Fall instead of Spring?

I think requeening in the Fall is a great management practice that not many beekeepers incorporate in their operations. To me, the benefit of requeening in the fall is that you can create a brood break (a great Integrated Pest Management technique for controlling *Varroa* mite populations), and you have a young, viable queen ready to go for the following Spring. Beekeepers in the northern states may need to think a little more about when in the Fall they will requeen, to make sure that there is a strong worker population for the cold Winter months. Beekeepers in the south may have a bit more leeway with timing, since the winter season is typically more mild.

Mary Reed

I am a big proponent of requeening in Fall instead of Spring. (Fall being at the end of July for bees.) Colonies that raise Winter bees with a brand new queen rather than one that has been through a Spring build-up raise 3000 more Winter bees, go into Winter with fewer Summer bees to feed, and come out in Spring really fast and strong. The slight brood break afforded by requeening allows time to treat for mites before the Winter bees are born, for better health and longevity. In most places, Winter bees begin to appear starting at the end of August, so work backward from there to plan your re-queening. Here's a great research paper on this **https://www.researchgate.net/profile/Lloyd_Harris2/publication/272812304_The_effect_of_requeening_in_late_July_on_honey_bee_colony_development_on_the_Northern_Great_Plains_of_North_America_after_removal_from_an_indoor_winter_storage_facility/links/56b6271508aebbde1a79ca27.pdf.**

Tina Sebestyen

Question – What is wrong with the existing queen?

In the Fall, the scarcity model firmly dominates the hive. Nutrition sources become scarce. Brood rearing slows, or ceases.

Fall bees are long-lived super organism guardians, morphometrically ideal for scarcity.

The instinct of the hive bets it's life on the well being of the queen for over Winter survival.

If your queen is meeting the instinctive needs of the hive – she is fine.

Next Spring, if the super organism of the hive decides to requeen; you'll know.

Installing a new queen in the Fall may be right in some instances.

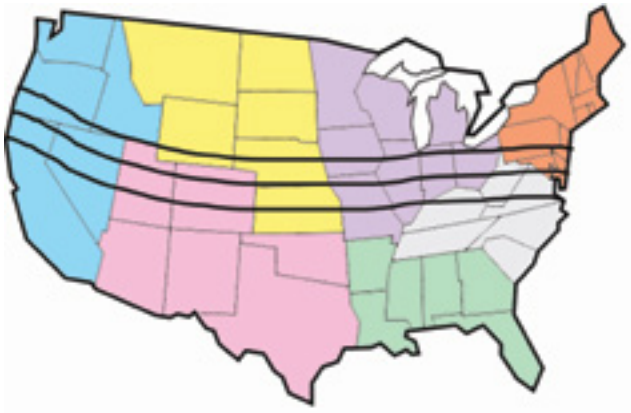
I tend to do less hive disturbing in the Fall. The hive knows better than I the well being of the queen.

John Miller
Commercial Beekeeper

All Beekeeping Is Local And Different

Kim **Flottum**

To be sure that information is relevant as to where you live, I try to time things that need to be done in the southern and northern sections of the country because temperatures, honey flows and stresses can be significantly different. Look at the map on this page that roughly divides the U.S. as north and south. Of course the border areas tend to be somewhat schizophrenic, some years north, some years south. So if that's where you live, you'll need to pay attention to both areas, because it'll probably be different next year. And above all else, remember that all beekeeping is local



In The South

July is the key month for a lot of tasks in the beeyard, and in the bee hive. In the south, harvest is mostly complete because the majority of bloom was over by late June, with perhaps a few crops hanging on for another month or so. Food may be a problem for your bees, more so the further south you are. If you harvested from an overwintered hive, you may have to feed, and the feed you are giving is going to be Winter food, to be stored, and, food for right now. Get a Spring scale, one that you can hold in one hand, with a hook on the bottom. Lift the front, lift the back, add the two weights and, for two 10-frame deeps, top and bottom, bees, brood and food, the total should be 150 pounds or more. If lighter first choice is honey from one of your healthy hives that has extra. Honey is always the best choice. But if not, feed a 1:1 sugar syrup in July, moving to a 2:1 in September until your weight is enough. And if you're in a dearth, get in and out during your inspections to avoid too much exposure and starting a robbing session. First year hives are especially vulnerable now, so keep checking for food as often as you can and feed until full. And what's the small hive beetle situation? If you're seeing them on frame tops, inner cover and in cells you've got too many, not at all uncommon in the south. Get traps, yesterday. The between-frame V shaped plastic work well. And do your varroa test by mid-July if possible. You should treat if you find more than one in a 300 bee wash. And you want none now because the bees that are born from now until October are the bees that overwinter, and you want them healthy, wealthy and wise. Find out what others are using for treatments and follow instructions. Besides food, check for any diseases, and how the queen is doing. There should be several frames, six to 10, of all stages of brood in July, tapering off in August and not having much by the end of September. Combine weak colonies if necessary, keeping the best performing queen.

In The North

In the north, there are still honey flows going on after July, but check in July just in case. You may be able to get a short harvest now from overwintered hives, leaving enough for Winter food. If you started as a package, probably no extra honey will be available. Be generous the first season and let them have it all. But, on occasion you may have had a generous Summer flow that you can sneak some of. And consider a three for one check. You're looking at how much honey is on the hive. If you've already harvested from stronger hives you'll need to make sure that what's left is going to be enough. A good rule of thumb is to assume the honey flow ends tomorrow and this is all you'll get. If it's not enough, watch into August to see if more comes in, and feed if not. The second thing to check is the queen's performance. Your first year brood nest should have, in July, at least seven or eight frames with brood of all stages on both sides. Don't worry if it's close, rejoice if it's more. Older hives should have more. But if not, queen replacement is something to consider, if you can find one. By September, hives with under-performing queens should be combined with strong, healthy colonies, removing the queen from the smaller colony. Check for all the usual suspects when it comes to diseases, and make sure, make doubly sure to check your varroa population. If more than one in a 300 bee sample, you can probably get away with a treatment right now, before the Fall flow from goldenrod. But don't treat during the goldenrod flow. And, by all means, treat rather than harvest. Treating now means you'll have bees next Spring. Do the Spring scale trick mentioned above and you should be at 150 pounds or more by the end of September. Feeding for Winter food, if needed can start toward the end of that month, continuing until hard winter sets in.

For both areas, take a look at your beeyard. Weedy? Messy, with unused equipment or weeds all over, blocking entrances? Start getting it spiffed up now, so when the Winter work begins in October you have nothing in your way. BC

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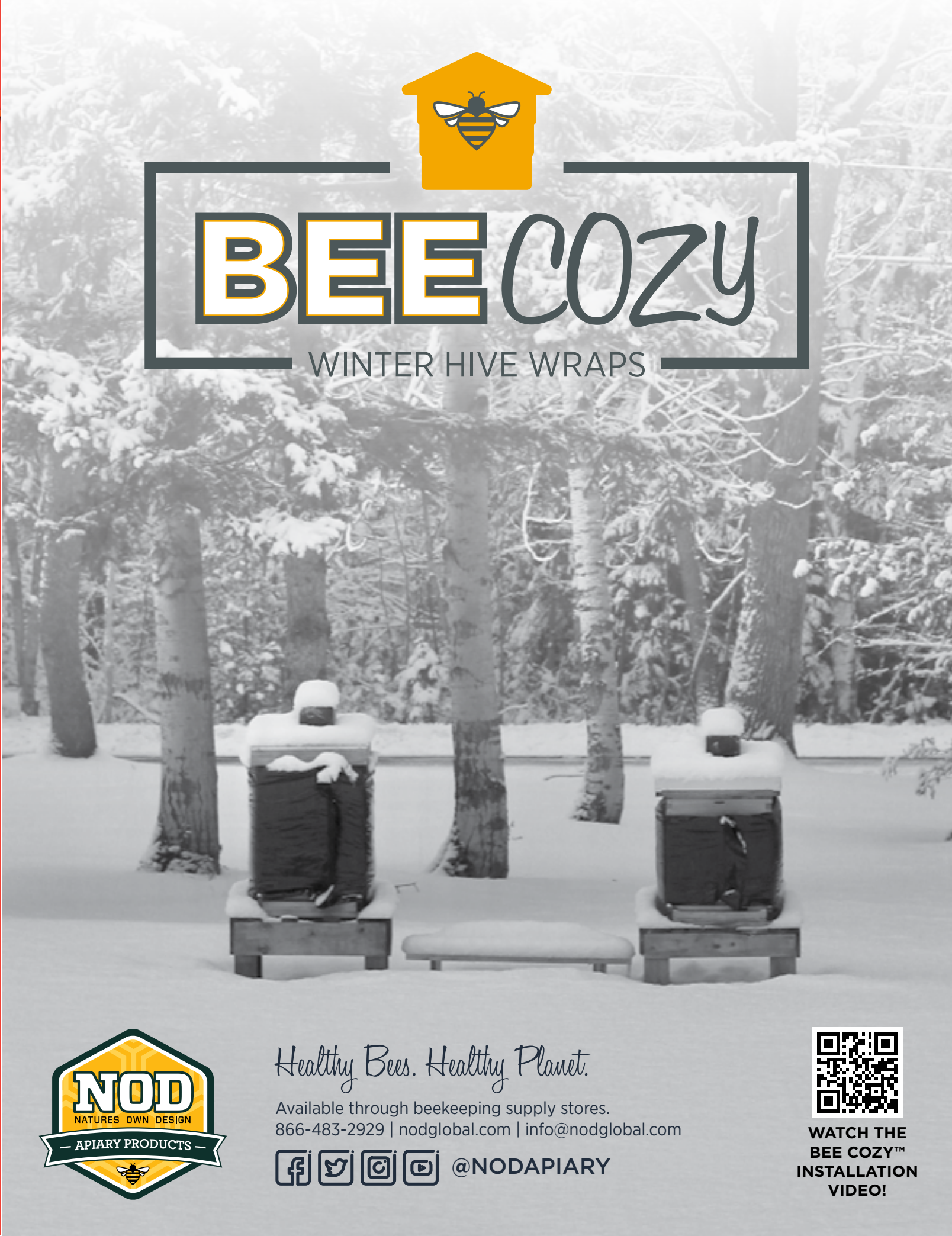
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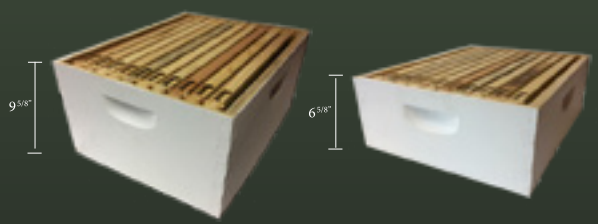

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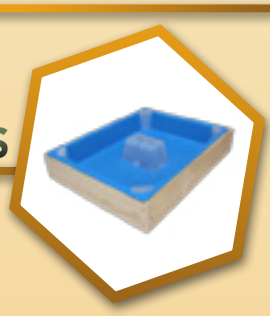

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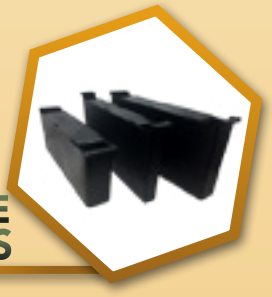

IN-HIVE FEEDERS

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Anel, formerly a major supplier to Brushy Mountain produces the yellow "floaters" division feeders which have proven to be a Bee's best friend. The floaters prevent drowning and come standard in every deep division feeder.

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Another pair of popular feeders from Anel are the Nuc feeder and the ten frame top feeder.

Both simply sit on top of the box, and the lid fits over the feeder. The unique design helps prevent the bees from entering the liquid, thereby reducing drowning. By leaving the top feeder in place, the bees don't become agitated while you refill the tank.

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Anel offers a 10-frame hive lid which is insulated with high density foam (think refigerator sides) plus ventilation holes to remove moisture. The lid, as is all the Anel products fit both wood and plastic hive bodies usng clamps (included).

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And both fit 10-frame wood hive bodies.

For information on any the Anel products check with your local dealer, or go to **www.southeastbee.com** to find the dealer nearest you.

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

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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)

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Apistan: 95.22% (2017, FNOSAD, France)

Apistan should be used as part of an Integrated Pest Management Strategy

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New Reading For The Fall –

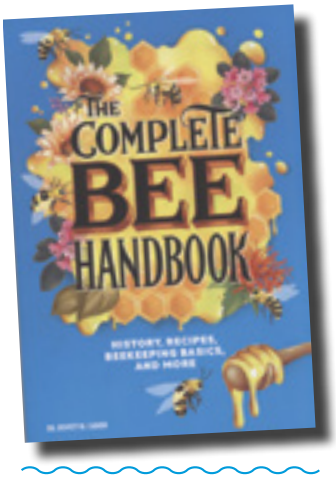
The Complete BEE Handbook. History, Recipes, Beekeeping Basics, and More. By Dr. Dewey M. Caron. Published by Rockridge Press, www.Rockridgepress.com. ISBN 978-1-64611-987-5. 183 pgs., soft cover, Color throughout, $16.99.

If there's one thing you can say about Dewey Caron, it's that he never sits still. He gives talks all over the country, works at the Oregon State University Dept. of Horticulture, writes reports for a host of beekeeping educational associations plus over 20 book chapters, helps with Master Beekeeper classes, and keeps Africanized bees in Boliva. And he writes books. Nine of them now.

Though definitely educational and full of great information, this book isn't a hard core classroom text book. It's fun, colorful and has both great graphics and great photos. He divided the book into basically three sections, each with three chapters. Section 1 is The Past, Present and Future of Bees, where he looks at evolution, bees and society and the future of bees. Section 2 is All About Honey Bees, where he looks at the history of beekeeping, the honey bee itself and basic beekeeping as practiced today. Section 3 is The Bee Lover's Home and Garden. Here is where I was surprised. There's lots about gardening for all kinds of bees, and all about honey bee products – honey, beeswax, propolis and pollen. And the finish was a real surprise – he put in a whole boatload of recipes using honey, how to make candles, lip balm polish and soap. I didn't know you had it in you Dewey.

Each chapter also has a short section that sort of summarizes, or sometimes highlights the information in the rest of the chapter. One is always numbers – called, appropriately, By The Numbers:. Another is called You Better Bee-Lieve it. And sometimes he'll add a page labeled FAQ, and sometimes a page titled Bees in the popular imagination. These pages are always a color other than white and are easy to find, and full of good information – even for those of us who have been at this as long as Dewey has, which is over 50 years now.

In the back there are measurement conversions, temperature °F and °C, and weights in ounces and grams, a page of resources, a list of beekeeping books for those more inclined (thanks for mentioning the Backyard Beekeeper), and trustworthy internet sites. And he finishes with all the references, sorted out by which chapter he used them for. This is a book you should have on your shelf, because it has all the right information, and it would be the perfect gift for someone who is interested in bees, but doesn't know it yet. *Kim Flottum*



Bee Space to Bee Hive. Hives, beekeeping equipment and beekeeping methods. Written by UK Master Beekeeper Andrew Gibb and US Master Beekeeper Ann Harman. Published by Bee-Craft Magazine in the UK. Available from Bee Craft Limited and Northern Bee Books. 168 pages, color throughout, soft cover, $32.00.

In the UK, there is a Master Beekeeper program. It is, however, significantly different than any Master's program in the U.S. They have what are called Modules, there are eight of them, and cover the basics of honey bee management, honey bee products and forage, honey bee biology and behavior, breeding and history. There is an individual exam for all of these, and only a select few are given each year, administered by the British Beekeepers Association. For the exams that require hands-on bee management reviews, an examiner comes to your home and you will manipulate your own bees.

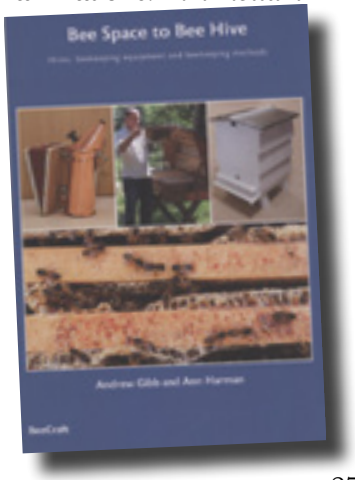
Each exam has a study book so you can prepare for the exam. After passing modules 1, 2, and 3 and one other from 5, 6 and 7 you are awarded the Intermediate Theory Certificate and after passing all modules you are awarded the Advanced Theory Certificate. The last exam you take is on the history of beekeeping, which this book partially covers in much more detail than the existing study guide. When you pass the eighth exam you become a Master Beekeeper.

This book provides a fascinating insight into how beehives, beekeeping equipment and beekeeping methods have developed over the centuries. Lengthy observation enabled the discovery of the importance of bee space by Rev. L. L. Langstroth, and after this discovery the ingenuity of many beekeepers has solved numerous problems associated with colony management.

Bee Space to Bee Hive is the first of two books describing the background to beekeeping as it is today. It covers the evolution of beehives, the introduction of various types of beekeeping equipment over the years and the development of a whole slew of beekeeping methods and practices.

These include the contributions of Francois Huber, William Carr, Julius Hoffman, Robert Manley, the Porters, Colin Butler Charles Miller, Gilbert Doolittle, Padgen's swarm control, Snelgrove and Taranov and many, many more.

This publication and its companion, Bee Hive to Beekeeper, to be released in September 2020, will be invaluable to students of Module 8 of the British Beekeepers Association examinations. *Kim Flottum*



A Story Of What Goes Around Comes Around

Steve **Roth**

The story begins at the Belmont Correctional Institution, a Level 2 prison located in St. Clairsville, Ohio housing over 2600 inmates. Five years ago, a swarm of honey bees descended upon the correctional facility, landing on a chain link fence. It was an occurrence foreign to the employees and inmates, requiring quick action to minimize the confusion and potential risk. Prison employee Will May was summoned. As a beekeeper and member of the Tri-State Beekeepers Association located in the neighboring city of Wheeling, WV, Will successfully captured the swarm without incident and relocated it in his own apiary.

This unusual event sparked the interest of Belmont Correctional Institution's administration including employee Wayne Shook, a fellow beekeeper and member of Tri-State Beekeepers Association. As the correctional team strives to develop programs that educate and prepare inmates for reintegration into society, the concept of a novice beekeeping program and apiary within the prison was born. Will and Wayne set off to develop the Belmont Correctional Beekeepers Club– an educational program designed to cultivate and inspire novice beekeepers.

In its infancy, the program accepted 50 inmates from a pool of 200 applicants. Selection was based on a variety of factors including past beekeeping experience, behavior while incarcerated, participation in other functions, and level of commitment to the program. Will led the charge as the program instructor and, as the curriculum evolved, additional support was solicited from community partners. Enter master beekeepers Steve Roth and John Welty, also members of the Tri-State Beekeepers Association. Steve and John served as guest lecturers, and both were extremely impressed by the level of attention the inmates maintained throughout their presentations – a degree of enthusiasm not often found in classroom settings.

As the program progressed into the second and third years the need for additional equipment, colonies and textbooks became evident. This is the part that begins the goes around. Members of the Tri-State Beekeepers and Harrison County Beekeepers of Ohio joined forces and raised over $3500 to fund the educational program. The generous financial gifts were used to purchase the necessary items to create a formal apiary within the prison yard.

And now for another goes around. For several years, the Tri-State Beekeepers have held their club meetings in the main building of the Good Zoo, located in Oglebay

Zoo hive.

Zoo hive.

Park in Wheeling. Sharing a passion for bee and pollinator conservation, the Zoo provides complimentary meeting space for the Association. To show their appreciation, the beekeepers again solicited donations to purchase hives and colonies that would be placed throughout Oglebay Park to educate guests about the importance of honey bees and pollinators.

But wait, there is another comes around. The club gave the equipment to the inmates to design, fabricate, and decorate the colonies. Not only did these talented men construct hives, they created beautiful works of art that capture the viewer's attention, underscoring the important role of pollinators in our ecosystem. Located at the Good Zoo, four of the artistic hives feature elaborate paintings of zoo animals, while the other is a realistic replica of the original summer homestead of Colonel Earl Oglebay dating back to the early 1900s. The hive has been placed in the atrium of Oglebay's Wilson Lodge and has become the focus of demonstration and lectures.

Now in its fourth year, the Belmont Correctional Beekeepers Club boasts 65 members with experienced inmates serving as mentors for newer students. The partnership between the Tri-State Beekeepers and the inmates of the Belmont Correctional Institute has benefited both groups as well as continued to give back to the surrounding community. The inmates have designed masterpieces that are not only appealing to the eye, but also call attention to the pollinators and their role in the environment that we strive to preserve. We are grateful to them for their contribution and look forward to the next episode of goes around comes around. BC

Mansion hive.

OUT OF THE PAST

The Representation and Symbolic Meaning of the Honey Bee through Time.

Isabelle Hopkinson

From the Greeks to the Egyptians, from Napoleon to the Mormons, and Karl Marx to the City of Manchester, the bee, and more specifically the honey bee, has been a persistent and recurring image throughout human history. Following the Manchester bombing attacks in 2017, the image of the bee became a defining symbol to reflect a collective show of solidarity to the tragedy. In fact, the bee had long been an emblem for Manchester, symbolising the city's industrial past when workers were dubbed "busy bees". The crest on the City's arms include Seven bees.

Prior to going to University to study anthropology, I became interested in the way in which the bee has been used and represented in different cultures and societies through time, the reasons why and the meaning given to it, which I hope to reveal in this short article.

The Bee in Ancient Greek society (2000-300 BC)

Bees and honey were a major and persistent symbol in ancient Greek culture and were often linked with knowledge, health and power. Bees were considered servants of the Gods and honey was worshipped due to its healing attributes and power. They are represented in jewellery, money, and statues of Goddesses.

One of the most famous legends of the Gods in Greek history is of 'Melissa', the Goddess of the Bees. In the human world, priestesses were referred to as 'Melissae' in the temples of the Goddesses. In Greek mythology, Melissa was a nymph who was shown the use of honey by the bees. She was one of the nymph nurses to Zeus when he was born to Rea in a cave that was sacred to bees. There have been two versions though of the myth. One states that the bees nurtured Zeus, whose son was then nurtured by the 'Melissae'. The other states that it was Zeus who was fed with the milk of goats and with honey by the 'Melissae.

Melissa, the Bee goddess of Mount Eryx. (British Museum, Wikipedia).

Images of Melissa. (Ransome)

The Ephesus statue Al

The Roman one (Ransome). Artemis, the Ephesian Goddess of the Hunt and Fertility has connections with the honeybees in Ephesian worship. The statue originally had no bees, but a second statue in Roman times depicts two bees on either side the middle the column. Diana was still worshipped in Roman times - in the Acts of the Apostles we can read about the people heckling "Great is Diana, God of the Ephesians" causing great disruptions in Thessaloniki and Corinth.

Honey is often referred to as a gift, the 'nectar of the Gods'. Greek Gods were often described or depicted drinking ambrosia. Historians have suggested that ambrosia was a representation of honey due to its colour and taste. Ambrosia was believed to quench any thirst or hunger for the immortal beings of Mt. Olympus. It did, however, have other purposes such as being used as a balm for Gods to transfer immortality. For example in the myth Achilles was bathed in honey and then passed through the fire so that all his mortal parts would die. However, because he was held by his ankle, this was the only vulnerable part of him. The mystique of ambrosia was reinforced in the myth of Tantalus who is punished for stealing the ambrosia and giving it to humans. Those who drank it would no longer have blood running through their veins but Ichor (the mythical fluid in the veins and arteries of the gods).

In other legends such as those surrounding Zeus, bees were represented as messengers between Gods and men and carriers of wisdom and knowledge. In the story of Apollo and Delphi, the Boeotian (a man from central Greece) who had come to consult Delphi is referred to another oracle but on their journey he and his companions became lost. They followed a swarm of bees that lead them to Trophonios. Here the bees are represented as guides with close links to the Oracle, leading them to find another one. Through this myth bees are associated with prophecy, knowledge and foresight.. a representation that continues to the present day.

Honey also played a very practical role in Greek society and in everyday life. It was a source of food and associated with celebration and good times.

Honey was also widely used for healing wounds and preservation, essential requirements for health and prosperity. It is therefore not surprising that the bee and honey featured prominently on key material artefacts including jewellery, statues, pots and coins Moreover, as Greek civilisation spread this meant that the bee began to appear in other cultures such as that of Ephesos (Ephesus, Turkey) on items such as coins which are themselves both a physical and symbolic representation of wealth.

The Minoan pendant found in the Minoan Palace of Malia, Crete. It originates from around c.1800 BC. Bees were believed to connect the natural world to the underworld which might explain why it was put in the tomb with the deceased. The bee was the symbol of Potnia, the Minoan-Mycenaean Goddess.

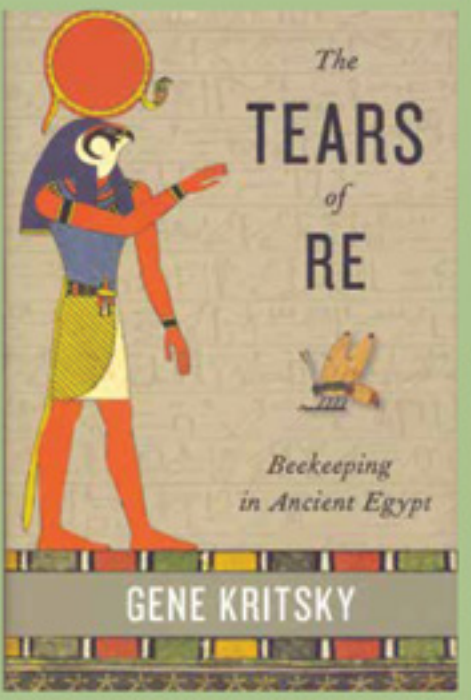
The Bee in Ancient Egyptian History (3000- 30BC)

Ancient Egyptian society is regarded as the first great civilisation period, lasting nearly 3000 years. As in ancient Greece, bees and honey feature in myths and legends where they formed an important part of everyday life - including honey being used to pay tax.

The bee appeared in writing, sometimes to refer to the bee or bee keeper but also in terms of Royalty. The 'bee' was the name given to the lower half of Egypt as it was full of flowers which the bees would pollinate. The Pharaoh was known as 'he of the sedge and bee' which translates as the King of Upper and Lower Egypt.

Representations of the bee throughout Ancient Egyptian times. (Ransome)

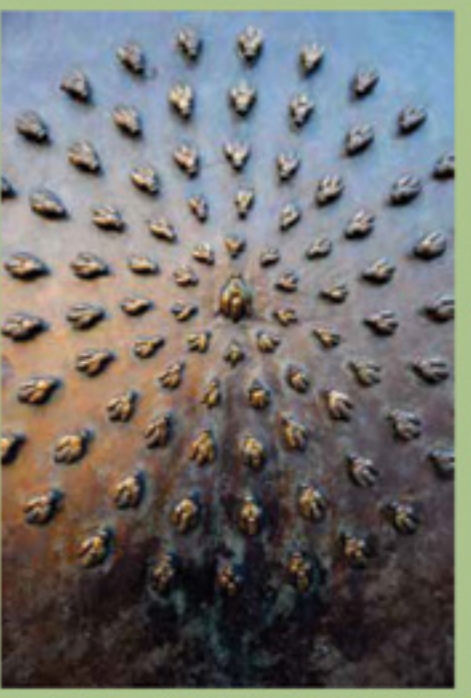
The sun God Ra plays a central role in Ancient Egyptian culture. Ra was described as the father of the Gods and the creator of the pantheon. All Gods should represent an aspect of Ra whilst Ra represents all Gods. Ra was considered to be the creator of the seasons, animals and mankind. The legend is that bees were created from his tears that fell to earth passing on a secret message. The right eye was said to have healing and protective power. Bees were regarded as servants of the Gods, delivering messages and healing powers from them to mankind. The role of bees as messengers of the Gods is also central to the myth of the lost God Hittite Telepinu. Telepinu was the God of farming who one day due to frustration stormed off into a meadow and fell asleep. His anger upset the world of nature and nothing grew in the fields. Due to this destruction the Gods tried to search for him, but to no avail. Eventually the bee was asked to find him and did so, stinging him to wake him up which only increased his anger. However, the Gods were able to calm him and he returned to tend his fields and bless the rivers.



The Sun God Ra. (Cover of Professor Kritsky's remarkable book on the bee in Egyptian times).

Unlike in the myths of Ancient Greece, the bee also features as a symbol associated with death and the resurrection of the soul and Egyptian culture showed a belief in the afterlife. Pyramids were constructed to provide the Pharaohs with all the things they would need in the afterlife. The mummification process was to preserve all the vital organs so that the body could be resurrected and images, artefacts and symbols of bees are commonly found in tombs and burial chambers.

The bee and honey are manifested in the material artefacts, myths, beliefs and practical everyday lives of both ancient Greek and Egyptian society. As we turn the clock forward, we see that the bee and honey continue to appear with remarkable regularity in different cultural settings. As we shall see, however, their appropriation, symbolism and meaning shifts in line with cultural values and wider historical, social and economic context.



Bees in the Time of the Medicis. The plinth of the Ferdinando I de' Medici (r. 1587-1609), in Florence, is decorated with bees surrounding the queen.

Fontana delle Api in Rome, completed in April 1644, to relinquish the thirst of both people and horses, the father spouting from the mouths of honeybees.

Napoleon (1804 – 1814/15)

The positive qualities associated with the bee and honey continued well beyond ancient society. As an example, the bee became a significant symbol in the Napoleonic period. Following the French Revolution (1789-1799), Napoleon became Emperor of France (1804) replacing the monarch dynasty that had ruled for several hundred years. Royalist assassination attempts threatened Napoleon. He asserted his power and authority by adopting a number of features of the Ancien Regime, including moving into the palace of Versailles. He created a council commission its sole purpose being to 'plan everything to

do with the coronation of the Emperor and Empress'. They decided to adopt the bee as his symbol as it represented immortality and resurrection.

The symbol of the bee flooded the courts of Napoleon and became associated with many different qualities including hard work, industriousness, vigilance and, due to its production of honey, sweetness and benevolence.

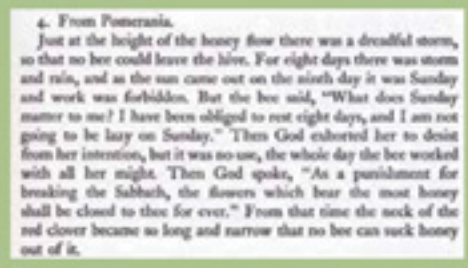
The Napoleon bees used as part of the cover design of a beautifully leather bound book. (Geoff Hopkinson).

The bee also had historical links with 'Childeric I, founder in 457 of the Merovingian dynasty', who ruled Northern Gaul (modern day France) from 437-481 AD). The tomb of Childeric was discovered in 1653 and found to contain many precious artefacts including 300 winged bees.

The Childeric Bees. (Wikipedia)

Bees and Freemasons

It was not just the freemasons who adopted the hive as a symbol to represent ideals and virtues. Nineteenth-century leaders of The Church of Jesus Christ of Latter-day Saints (more often referred to as Mormonism) consciously created symbols to promote their democratic ideals. The symbol of the bee encompassed all aspects of Mormon life as shown by their use in modern temples,



4. From Pomerania.

Just at the height of the honey flow there was a dreadful storm, so that no bee could leave the hive. For eight days there was storm and rain, and as the sun came out on the ninth day it was Sunday and work was forbidden. But the bee said, "What does Sunday matter to me? I have been obliged to rest eight days, and I am not going to be lazy on Sunday." Then God exhorted her to desist from her intention, but it was no use, the whole day the bee worked with all her might. Then God spoke, "As a punishment for breaking the Sabbath, the flowers which bear the most honey shall be closed to thee for ever." From that time the neck of the red clover became so long and narrow that no bee can suck honey out of it.

So, are bees ever seen to have negative qualities? There are folk tales from many countries that explain why bees are unable to make use of red clover. The one here comes from Pomerania.

caskets and tombstones. The origins of the bee and the beehive are reputedly drawn from the 'Book of Mormon' published in 1830 by the founder, Joseph Smith. It is also said that in the journey to what is now Salt Lake City, they 'did also carry with them deseret which, by interpretation, is the honey bee'.

Masonic Firing Glass.

Bees and political economy

The advent of mass industrialisation from the 1830's onwards saw the bee and the hive being appropriated as symbols of industry and the virtue of hard and selfless working for the greater good. The bee was adopted by Manchester Council as long ago as 1842, and workers in the city were often referred to as being 'as busy as bees'. The beehive has often featured in the political imagination as an allegory for the working class, drawing parallels with a proletariat 'which lives from the sale of its labour and does not draw profit from any kind of capital.'

The coat of arms of Manchester. The seven bees above the helmet are a tribute to Manchester's long association with industry. (Wikicommons).

Others viewed the hive less favourably, highlighting how the 'hive' symbol removes individuality and showed a work force no longer being celebrated for their unique individual talents. During the cold war, rather than the virtuous association of collectivism, bees began to be used to represent the Russians as evil collectives and symbols of anxiety.

Conclusion

In conclusion, symbols of the bee, hive and honey appear in many different cultures and societies through human history. This short article has covered a small number of examples to show the wide range of symbols, representations and meanings. Whilst the majority reflect positive or virtuous characteristics of bees they can also be interpreted as displays of wealth, power and control. This begs the question not only of what the bee represents but who creates, controls and reproduces the symbols and material artefacts and for what purpose.

Isabelle Hopkinson

Based on an Extended A level Project Qualification submission by Isabelle Hopkinson, supplemented by additional work as a 1st year student reading Anthropology at Exeter University.

DELICIOUS HORNETS

Kathy **Keatley Garvey**

They don't taste like chicken.

The larvae and pupae of the Asian giant hornet taste like French fries.

So says UC Davis-trained entomologist Matan Shelomi, assistant professor of entomology at the National Taiwan University in Taipei, Taiwan, whose course on "Edible Insects" is the largest in his department.

Shelomi, a graduate of Harvard University, holds a doctorate in entomology from UC Davis, where he studied with major professor Lynn Kimsey, who directs the Bohart Museum of Entomology and serves as a professor of entomology in the Department of Entomology and Nematology.

Shelomi recently posted an intriguing comment on the Facebook page, ***Is This a Murder Hornet***?

"More like delicious hornet," he wrote.

Asian giant hornets, sensationally nicknamed "murder hornets" by non-entomologists, continue to grab front-page headlines. The first colony detected (and eradicated) in North America occurred last September on Vancouver Island, British Columbia. Then a single dead one was found in Blaine, WA, in December.

The world's largest hornets (they can measure approximately two inches in length), they attack and kill honey bees and feed the remains to their young. They can decimate a hive. Thus, beekeepers worry that AGH will invade North America, become established, and cripple the apiculture industry. The Washington State Department of Agriculture and Washington State University Extension are asking residents to keep a lookout for them and report any sightings.

The newly acquired nickname, "murder hornet," triggers fear. But amid the panic, terror and near hysteria, it's important to point out that there is NO national invasion and they are NOT coming for us.

This insect was previously known as the Asian giant hornet or AGH before the BBC, the *New York Times* and other media labeled it "the murder hornet."

UC Davis distinguished professor **Walter Leal**, who studied and worked in Japan, and speaks Japanese, says someone's mistranslation of Japanese research led to "yellow" translated as "killer." Leal told us: "The Asian giant hornet, *Vespa mandarinia*, is called "Kiiro Suzume Bachi" in Japanese. It injects its venoms, sometimes inducing severe anaphylaxis. The translation is incorrect. Kiiro means yellow, but it was translated as "killer."

Indeed, the BBC report on May 4 managed to insert "coronavirus," "murder hornets" and "terror" in the same sentence. The lead: "Even as the U.S. remains under attack from the coronavirus outbreak, a new terror has arrived: 'murder hornets.'"

Not "murder" hornets to Matan Shelomi: "Delicious hornets."

On the newly created Facebook page dispelling the myths and misinformation about the giant hornet, Shelomi posted photos of *Vespa mandarinia* larvae and pupae dishes, "raw and fried, from a small restaurant in Hualien in eastern Taiwan. You can also find it in the Huaxi night market in Taipei, if it's in season."

"Several bee and wasp species have edible brood, which can be fried, steamed, roasted, cooked with soy and sugar, or eaten raw," Shelomi wrote. "Even honey bee brood is edible! While it's not exactly commonplace, Asian giant hornet has been or is still consumed in parts of China, Japan, Taiwan, and northeastern India." (Source: "Edible Insects of the World" by Jun Mitsuhashi)

"To get the brood, you must harvest the nest. 'Isn't that dangerous,' you ask? Yes, in the same way extracting honey is dangerous. Stay safe by collecting at night when they are resting, using smoke to pacify them, and wearing protective clothing. To find the nests of edible wasps, Japanese harvesters tie a cotton ball to a piece of fish meat and present it to a female wasp. She will carry it home, and you can follow her to find the nest! That's a bit harder with the giant hornet, as they can travel 2km on their foraging runs. They are not exactly rare in East Asia [for now], so those in the know can find nests easily. A helpful trick is to harvest the adults first. At night, knock down the nest, put a big bowl of rice wine in front of the entrance, and shine a bright light. The wasps get stunned by the light and fall into the wine. You can then harvest the adults and steep them in wine to make a medicinal alcohol, and take the brood as a snack. Who's murdering who now!"

"In case you were wondering, fried murder hornet tastes like French fries: if you can eat a potato, you can eat a pupa. That said, if you are allergic to shellfish, you may also be allergic to insects and should not consume them."

"Oh, and insects cannot get any coronaviruses, so don't worry about that either. Save a pangolin; eat a wasp."

Shelomi's post prompted Facebook member Geevee Snow of Brooklyn, NY, to comment: "My stomach just growled." BC

Photos by Matan Shelomi.

FOUND IN TRANSLATION

Parasites With A Mind Of Their Own

Jay **Evans**, USDA Beltsville Bee Lab

By definition, parasites and pathogens are not in it for the benefit of their hosts. Fortunately, their appetites for host destruction are constrained by their small size, reproductive rates, and the need to keep their food sources (us, in some cases, bees, in other cases) alive long enough to sustain them or their offspring and deliver them to the next victim. Parasites and pathogens are also constrained by social, behavioral, and internal defenses mounted by their hosts. It is especially interesting when a tiny parasite or pathogen changes the behavior of a giant walking, or flying, victim. For the most part, these behavioral changes benefit the host: picture bees that bite mites or those that clean out diseased brood. Hygiene is a key behavioral defense of humans as well, along with social isolation (heard of that?) and other highly evolved behaviors, up to and including our search for medicines and treatments. Nevertheless, when looking at the behavioral responses of our species to the parasite-of-the-day, some might argue that our behaviors are instead driven by the will of these parasites to survive and reproduce. Hopefully this is not often the case for humans, but such parasite-driven behaviors are very much a 'thing' in nature and they might well be important for bees and their attackers.

The British Broadcasting Corporation presents a top-ten list of parasites that change the behaviors of their hosts in an article entitled "Ten sinister parasites that control minds" (**http://www.bbc.com/earth/story/20150316-ten-parasites-that-control-minds**). They start with zombie ants, whose fungal parasites drive them to a perfectly moist tree habitat, then paralyze them as the fungus continues growing. Eventually the fungus bursts from the long-dead host and showers future victims below with infectious spores. As another sample, many species of crickets and grasshoppers, which rarely swim, are driven to leap into water when infected by parasitic 'hairworms'. In an extensive study by Frédéric Thomas and colleagues ("Do hairworms (Nematomorpha) manipulate the water seeking behaviour of their terrestrial hosts?", *Journal of Evolutionary Biology*, **https://onlinelibrary.wiley.com/doi/full/10.1046/j.1420-9101.2002.00410.x**), the answer was a clear "Yes!". Insects found in pools inevitably had hairworms, while this parasite was rare in more typical insects found grazing on dry ground. The passion of infected insects for water was absolute, i.e., "Crickets (*N. sylvestris*) that had been rescued (n =10) immediately returned to the edge of the swimming pool and jumped in again." More ambitious parasites cause their hosts to move somewhere that a new host, often a different species, stands ready to be infected. A classic such behavior involves the parasite *Toxoplasma* and mice. Mice infected with this parasite throw caution to the wind and *seek out* cats, the primary reproductive host for *Toxoplasma*. The cats oblige by eating the mice, parasites and all (see "Rats, cats, people and parasites: The impact of latent toxoplasmosis on behavior", ***Microbes and Infection***, 2002, **https://doi.org/10.1016/S1286-4579(01)01459-9**, by Joanne Webster).

But enough about other species, *Bee Culture* readers surely want to know if something like this could happen in bees. In the column "Bee space in the time of disease" (*Bee Culture*, July, 2020), I showed examples of infection-driven behavior that benefited bee hosts, including grooming and social distancing, alongside hints that parasites were tied to behaviors that benefit the parasites at the expenses of bees or their colonies. This topic was tackled in a grand way in a recent paper by Amy Geffre and colleagues entitled "Honey bee virus causes context-dependent changes in host social behavior", (**https://www.pnas.org/content/117/19/10406.short**). These researchers studied Israeli Acute Paralysis virus (IAPV) a worldwide virus of honey bees. They carefully infected some bees with IAPV while others were given a non-infectious immune-stimulating mimic of this virus or simply sugar water. Infected and healthy bees were then returned to small colonies in which every single bee had traceable tags mounted on their backs. Infected bees roamed the hives much like healthy bees, and even received contacts by nestmates at the same rates, as measured by antennal taps. Still, virus infected bees, along with bees that had received the sham immune-stimulation, were less likely to share food with their nestmates. There was something about this

perceived or real sickness that cut bee-to-bee feeding short at the last moment. The authors suggest that the chemical smells released from challenged bees were perceived by their nestmates, leading these same nestmates to decide to distance. The fact that both an actual infection and a sham simulated infection caused shunning suggest that this might be a general trait of bee social interaction. This is perhaps not surprising given the strong pressure on colonies to squash potential infections in their ranks.

Behaviors became even more interesting when challenged bees were introduced to the guard bees of neighboring colonies. Surprisingly, infected bees, and not those with simply a turned-on immune response, were accepted by guard bees at a high rate. Guard bees are not known to express anything close to empathy for the sick, so it is plausible that infected bees had a unique smell, induced by the virus, that made them somehow less offensive to bees from another colony. It is tempting to speculate that this change is driven by the virus itself, as an avenue for increasing its spread, but that is a lot to ask of a tiny virus. Perhaps it is, again, a general feature of sick bees that is independent of the agent that caused them to become sick. Either way, these results are important for understanding how viruses and other agents move through apiaries, and there are many more diseases that would be interesting to test as bee door-busters. These new technologies, paired with the expanded acceptance that tiny parasites and pathogens might commandeer their hosts, will allow this to be done. And, before you think that humans are immune from such manipulations, there are indeed some studies showing we are increasingly social, if only slightly, when exposed to viruses and parasites. At least we do not need a hairworm infection to jump into pools, nor do we pounce on infected mice. Yay, us, for that. Keep fighting back! BC

SPLIT MY COLONY?

Katy **Evans**

5 Easy Steps

Splitting, or dividing colonies is a common practice for beekeepers to help prevent swarming, and is an excellent tool to increase colony numbers and compensate for previous Winter losses. Swarming is a normal sign of a productive and strong colony, but it can pose a problem for many beekeepers and severely depress honey crops due to loss of bees. Swarming is when the queen, along with the majority of worker bees, leave to establish a new nest, for example in a neighboring tree or shed. Despite the many tools available to prevent swarming – including creating additional space with supers and removing queen cells – the most reliable tool is to split a colony before it swarms. Peak swarming season coincides with peak floral bloom during Spring, as lengthening days and ample floral resources stimulate brood rearing, which can lead to overcrowding inside the colony. Early Spring is the best time to perform splits, which in temperate regions typically occurs in April or May. It is not uncommon to split during Summer to prevent a small secondary peak in swarming coinciding with the onset of fall blossoming.

Splitting a colony can be a daunting task, particularly for beginners. Here are step-by-step instructions for a simple technique to split a colony, without needing to move or shake frames of worker bees. This technique involves five steps: (1) deciding when to split, (2) equipment prep, (3) finding the queen, (4) splitting the colony's resources (pollen and honey), and (5) switching locations. I have also included a sketch that illustrates this splitting protocol.

Step 1 – The biggest challenge of splitting a colony is knowing exactly when to split. Colonies begin swarming preparations weeks in advance and if you know what visual cues to look for, you will know when to split. These include colony congestion, presence of queen cells, drone brood, and increased flowering intensity. However, waiting for all of these cues to be evident runs the risk that the colony swarms before you can act. Many beekeepers split early in the season, about four to six weeks prior to the peak floral bloom. This allows ample time for bee populations to build up and produce enough honey for harvest. If you are splitting a colony before queen cells are present but you don't have access to a queen or queen cell, it is not uncommon to let the bees rear a queen from worker eggs. Nonetheless, a common mistake is to split a colony that is too small; it is advisable to wait until the colony is at least two, preferably three, hive bodies tall and seems crowded.

(a) The queen and about 60% of workers leave en masse and cluster on a nearby object, such as a tree, before finding a suitable nest. (b) A colony occupying an abandoned shed near harrison Valley, PA. (photos by Katy Evans)

Step 2 – Once you have decided it's time to split, the second step is to gather your equipment including a smoker, hive tool and an empty hive. For the specific method outlined here, it is important to split on a sunny afternoon (above 50˚F) when the bees are active. This ensures enough bees are foraging (see step-5), plus the bees will be relatively gentle and the queen easier to find. To make the transfer of frames easier, I set up the empty hive close by the colony that I will split.

Step 3 – Now you will need to find the queen. Finding the queen takes experience and can often be difficult for beginners. Two options to make her easier to find are (i) a few days in advance, find and place her in the top or bottom super with a queen excluder or (ii) marking her with a paint marker (purchased at a local office supply). Once you have spotted the queen, move her along with the frame she is on to the new colony (*referred to as "daughter colony") to prevent injuring the queen. While searching for the queen, be careful not to damage any queen cells. These are typically found along the bottom edge of the frame, but it's not uncommon to find them on the faces of comb. You may see anywhere from five to 25 queen cells in a colony at one time.

Step 4 – After moving the queen, you should divvy up the original colony's (*referred to as "parent colony") resources (pollen and honey) equally between both colonies. I would not attempt to shake or remove bees from the frames as this will agitate them. Be sure to retain all the brood and queen cells in the parent colony; if a queen cell is placed in the daughter colony with the laying queen, it could stimulate a swarm.

Step 5 – Now you will have to switch locations of the colonies, placing the daughter colony in the same location as the parent colony. Because the majority of bees remained with the parent colony,

the daughter still has relatively few bees. After moving the daughter colony, its population will quickly rebound since the foragers – which comprise about 1/3 of the colony's population - will return to the exact GPS location where the parent colony had been. Provide the daughter colony with empty frames and a super to allot more space for the queen to continue laying and foragers to store resources. The majority of bees that remained in the parent colony are nurse bees that have yet to leave the hive and make their orientation flight and, therefore, will return to the new location that you choose for the parent colony, whether it be the same or a different apiary. As adult bees emerge, the population should grow and a new queen will soon begin laying.

At this point, you can leave the parent colony to rear a new queen or alternatively introduce a queen cell from another colony or a mated queen with specific genetics. If introducing a new queen cell, you should do it immediately. If introducing a mated queen, wait three full days before doing so and remove any existing queen cells, otherwise the bees could reject her.

It will take on average three weeks before you will spot eggs, so it is important to be patient. If the weather does not permit foraging or you are splitting early before full floral bloom, supplemental feeding is recommended. Feeding can be done by adding frames of honey or alternatively by using a mason jar, chicken feeder or a division board with sugar syrup.

More details about swarming biology and a step by step animation

Four visual cues that indicate it is time to split include (a) colony congestion (photo by Katy Evans), *(b) presence of queen cells* (photo by Nick Sloff), *(c) drone brood* (photo by Nick Sloff), *(d) and intense flowering* (photo by Katy Evans)

A marked queen. In general, it is easier to find a marked queen and allows you to monitor her throughout the course of the season. A paint marker can be purchased at a local office supply. (photo by Katy Evans)

Purchased queens commonly arrive in a three-hole Benton queen cage along with two or three worker attendants that feed and groom her during transit. (photo by Nick Sloff.

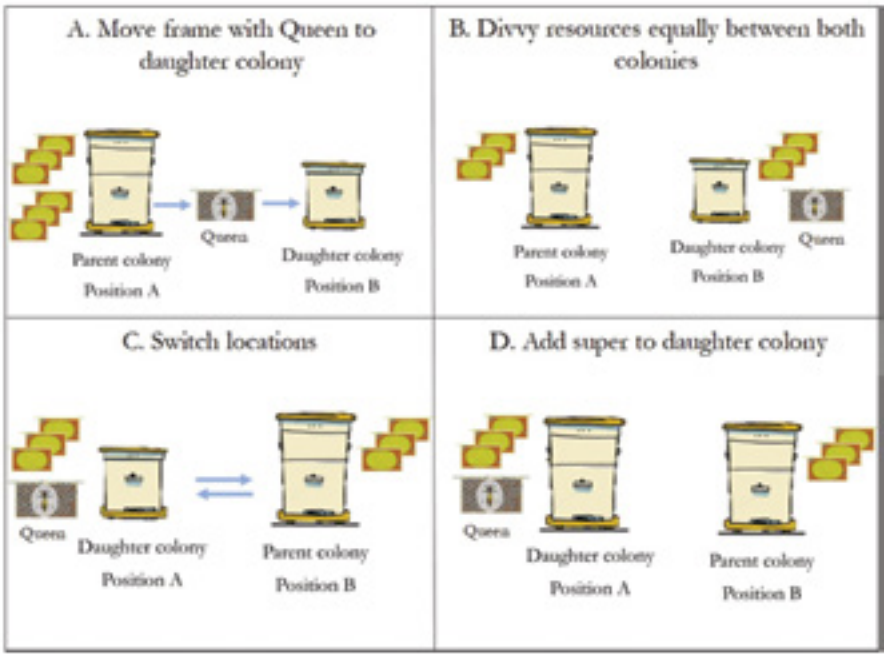
A congested colony indicating that it is time to split. (photo by Katy Evans)

Capped queen cells resemble a peanut in which the queen emerges from the tip. They are usually found along the bottom edge of a frame. A colony can rear as many as 25 queen cells. (photo by Nick Sloff)

Examples of methods to feed a colony including a chicken feeder (a) and a division board (b). With division boards, it is best to include an object that the bees can land on so they do not drown (e.g. ladders or styrofoam balls).

of splitting can be found in the video "Colony Division: an easy method to split a colony: **www.extension.psu.edu/colony-division-an-easy-method-to-split-a-colony**. Good luck and happy beekeeping!

I would like to acknowledge Craig Cella for his ideas on colony splits, Jamie McLaren for reviewing article drafts, and Nick Sloff (Entomology department, Pennsylvania State University) for sharing his photos. The video was developed in coordination with the Entomology department at Pennsylvania State University and Penn State Extension. BC



**In the video I refer to the parent colony as "original colony" and daughter colony "split".*

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BEE VET

Tropilaelosis

Dr. Tracy **Farone**

Zoonotic Disease and Public Health is a course I have had the joy of teaching to pre-health students for over 10 years. The course's content covers all types of infectious diseases and how they affect ***and*** connect humans, animals, and the environment. Some of my students affectionately call it "Zoo" or even the "poo" class, because so many diseases can be transferred through fecal/oral contamination. Eww, but true! Many students are amazed to discover how many diseases surround us, how the health of our world is so interrelated, and under normal circumstances, how most of us are blessed with a wonderful immune system. Certainly, these same observations apply to honey bees and their health.

Emerging infectious diseases is one topic we cover during the "zoo" course. Emerging infectious diseases are infections that have recently appeared in a population of humans or animals. Emerging diseases often arise when they are brought into new geographical ranges and/or species. Some causes of emerging disease may not have been previously known, while others may already be known, and pose a serious threat, if they are able to increase their geographic range. Ebola, Zika, Rocky Mountain Spotted Fever, Varroosis, and COVID-19 are all examples of emerging diseases. Many emerging diseases often originate from "foreign" or "exotic" diseases (or newly named "transboundary diseases"). Foreign, exotic or transboundary diseases are diseases that naturally exist in a certain country, continent, or areas of the world, but may cross borders, continents and/or oceans to infect new regions. If allowed to move into new geographical areas, foreign diseases can emerge in a population with little natural immunity against the disease agent. Therefore, these diseases can cause high morbidity and/or mortality when introduced to the new population of animals or humans. In our modern world, international trade and travel often accommodates hitch-hiking diseases and pests. To safeguard animal health in the U.S., a list of foreign animal diseases (FAD) is continuously monitored by the USDA and accredited veterinarians.

But what about bees? Do they have a current "FAD"? They do. It is a parasitic disease of honey bees that does not always make the headlines, but mirrors examples of other disease processes we see highlighted in our world. No, it is not the "murder" or Asian hornet, but a disease that is and should be on beekeepers', entomologists' and veterinarians' radar: Tropilaelosis.

Tropilaelosis is a mite infestation of *Apis mellifera (European honey bee)* caused primarily by two major species: *Tropilaelaps clareae* or *Tropilaelaps mercedesae*. These mites' natural honey bee hosts (*Apis dorsata, Apis laboriosia, and Apis breviligula, "giant" honey bees*) are better adapted host species of honey bees compared to *Apis mellifera.* Their natural range is found in Asia, Indonesia, and the Philippines. The mites have also been reported in parts of Africa, including Kenya and the Republic of the Congo. Tropilaelosis is currently a disease regulated world-wide and monitored by the OIE (The World Health Organization of Animals) as a notifiable disease and the USDA as a reportable disease. These mites are one reason why honey bee importation is limited in the U.S.

The lifecycle of the mite is somewhat like *Varroa* with the reproductive cycle involving a gravid foundress mite invading a brood cell, egg laying, developing mites parasitizing and often killing the larvae/pupae, and re-emergence of new adult mites. Compared to *Varroa*, the reproductive cycle is relatively short, only about one week, and all mites emerge from the brood cell including the males. This feature allows the *Tropilaelaps* mites to

populate a colony much faster than *Varroa* and therefore, take down a colony quickly. *Tropilaelaps* mites are unable to feed on adult bees, so their phoretic phase is much shorter than *Varroa*, usually only three days. This characteristic force the mites back into the brood for yet another quick reproductive cycle, killing more brood and making more mites. Despite the short phoretic period, adult bees are still able to spread mites to other hives via swarms, package bees, exchange of frames bees between hives, drifting, and robbing.

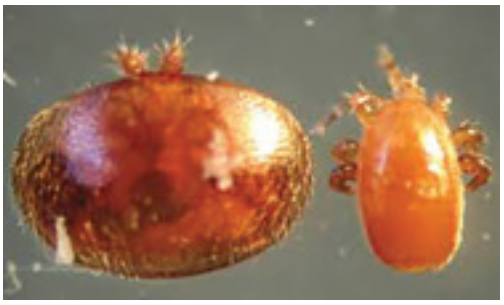
Mites are diagnosed and treated

A swarm from our apiary. Tropilaelaps can be transmitted through swarms. (photo by Deidre Ressler)

using similar methods to *Varroa*. Adult honey bee samples can be checked for mites with alcohol wash or sugar roll. While mite counts levels have yet to be established for *Tropilaelaps*, any mites found would be significant. The mites are visible with the naked eye, but they are smaller and move faster that *Varroa*. They are easier to observe in capped drone brood. Sticky board or "bumping" frames to dislodge mites onto a white surface can also be used for detection. At the colony level, infestations will result in rapid colony collapse or absconding. Brood comb may be severely affected due to high mortality infected larvae and pupae. Treatment should involve an IPM approach. Treatments can include common acaricides used for *Varroa*, along with biological controls of inducing brood breaks, brood removal and caging the queen. Treatment timing protocols should consider the short phoretic period of the mites. Being unable to parasitize adult bees is one biological weakness of *Tropilaelaps,* that we can exploit. Natural broodless periods and overwintering are ways to limit or control these parasites. Luckily and so far the geographic range of *Tropilaelaps* has largely been limited due to this "tropical nature" of the mite. However, some honey bee colonies in South Korea, with a more temperate climate, have been found to support *Tropilaelaps* mites.

There is more bad news. While rare, *Varroa* and *Tropilaelaps* can co-infect colonies, but *Tropilaelaps* usually out competes *Varroa*. *Tropilaelaps* has also been found to be a vector for viruses, like DWV. **The good news**: Tropilaelaps has not yet been reported in much of the world, including the U.S., Europe, Australia, and Canada. However, awareness and prevention of diseases are keys to keeping our honey bee population safe. How diverse animal species, humans, and diseases can be, yet how much is still shared and interconnected, amazes me. Studying and understanding these similar biological and epidemiological principles are paramount to understanding how we can all work together to best promote our collective health. BC

Danger emerging from the shadows.



Tropilaelaps, right, next to a Varroa. Univ of FL photo.

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OIE policies on Tropilaelaps mites: **https://www.oie.int/fileadmin/Home/eng/Health_standards/tahc/current/chapitre_tropilaelaps_spp.pdf**.

Great picture of Tropilaelaps: **https://beeaware.org.au/archive-pest/tropilaelaps-2/#ad-image-0**

USDA bee mite ID, Tropilaelaps: **http://idtools.org/id/mites/beemites/factsheet.php?name=15241**

Tropilaelaps info sheet: **https://www.aphis.usda.gov/plant_health/plant_pest_info/honey_bees/downloads/Tropilaelaps-InfoSheeta.pdf**

USDA national honey bee survey information including surveillance for Tropilaelaps: **https://www.aphis.usda.gov/plant_health/plant_pest_info/honey_bees/downloads/SurveyProjectPlan.pdf**

USDA reportable bee diseases: **https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/monitoring-and-surveillance/sa_nahss/status-reportable-disease-us/!ut/p/z1/lZJNU4MwEIZ_Sw8cIRvaodQbIFNQqGMtirl0gqbADCVMEmT015vWkx9tMZd8zPPuZt9dRFCOSEvf6pKqmre00fdn4mxXOFiCO8PJMrzG4EWL-DaaOwD3Nno6AsndLMD-A-g99MEL1_M0DGMb8BSR_-kfl0frN9lm5WI_**

Dr. Tracy Farone, BS, DVM, is a Professor of Biology at Grove City College. She worked in various areas of private practice, academia, and research for over 20 years. She currently teaches a wide variety of bio-health related courses and leads student research. Since 2016, Dr. Farone has been researching beekeeping and bee medicine. She was granted a sabbatical to pursue apicultural studies and develop a small teaching and research apiary at her College. She traveled to France, Scotland, and Canada, where she met and worked with multiple bee experts. These experiences provided Dr. Farone with a unique perspective in the development of relationships between veterinarians and beekeepers. To share these lessons with others, Dr. Farone has created veterinary continuing education lectures, writings, and programs for local, regional, and national audiences, focusing on bee health. Dr. Farone enjoys spending time with her family, running, horseback riding, SCUBA diving, and of course, just "beeing" with her backyard hives.

A Closer Look

FAT BODY FUNCTIONS

Clarence **Collison**

A Multifunctional Tissue

"The fat body in insects is a multifunctional tissue with intensive biosynthetic activity. In honey bees, it is found mainly in the abdominal cavity of the individuals-larvae, pupae and imago. It is composed predominantly of fat cells, where fats and glycogens are formed and accumulated. A small number of its cells (enocytes) perform secretory function. There are synthesized reserve proteins, which are important for the development of individuals. The fat body is most strongly developed in totally shaped larva after completion of its nutrition. Ivanova and Staikova (2007) investigated age specificity of protein expression in the fat body of honey bees during the ontogenesis of the individuals. By using 7.5% polyacrylamide gel electrophoresis, 189 individual samples of fat body extracts were investigated in the course of their development in the following stages and ages: larvae-third, fourth and fifth larval age (L3, L4, L5); prepupae (PP) and pupae-white-eyed and dark-eyed pupae (WP, DP). A total of 25 protein fractions were expressed in the fat body of male and female individuals during their development. Some sex-differences in studied fat body proteins were observed."

"Bees store food within their bodies at different stages in their lives, and to varying degrees through the seasons. The storage occurs in loose aggregations of cells known as the fat body. These cells are predominantly in the roof of the abdomen around the dorsal diaphragm, in the floor of the abdomen, particularly above the wax glands and to some extent around the sides of the abdomen. The cells of the fat body can store lipids (fats), carbohydrate (as glycogen) and protein in albuminoid granules. Scattered among the fat body are cells known as enocytes. These are larger, and have a more uniform appearance to the cytoplasm. They have a different origin to other fat body cells, being derived from the ectoderm or surface layer; whereas the fat body cells are mesodermal. The enocytes enlarge markedly when wax production is taking place. The precise function of enocytes in fat metabolism and nutrition is still uncertain (Stell 2012)."

Insect fat body is a specific tissue, the role of which is not limited to the storage of energy resources in the form of fat and glycogen. It is also a site in the body where numerous metabolic processes occur. Moreover, it plays a role in detoxification, as well as being a precursor of the synthesis of egg yolk. The fat body is also responsible for magnetoreception and the immune response. It is a heterogeneous structure and exhibits regional differences that can be distinguished morphologically. Its functions can vary at different stages of the insect life (Chobotow and Strachecka 2013).

"The gene vitellogenin (Vg) is generally expressed in the abdominal fat body cells and serves as a yolk precursor in egg development in reproductive females (Nunes et al. 2013). However, Vg has evolved non-oogenic (egg development) functions where the gene is expressed not only by reproductive queens but also by male drones and functionally sterile female workers (Engels 1974; Rutz and Lüscher 1974; Trenczek and Engels 1986; Piulachs et al. 2003). In worker honey bees, Vg protein is found in hypopharyngeal (head) glands and brain, in addition to fat body and ovary tissue (Seehuus et al. 2007; Münch and Amdam 2010). In workers, Vg has several functions: it incorporates into the hypopharyngeal glands for synthesis of proteinaceous secretions (jelly) that are fed to larvae, the queen and all other adult bees (Amdam et al. 2003a), it promotes immunity, stress resilience and longevity (Amdam et al. 2004), and it influences hormone levels, behavioral maturation and foraging biases (Guidugli et al. 2005; Nelson et al. 2007)."

"Honey bee societies are maintained by a highly structured division of labor between queen and workers, and between workers with different phenotypes (Nunes et al. 2013). Workers display different behavior in an age-related sequence, starting with labor inside the nest and usually ending with foraging activities (Winston 1987). A worker's transition from nest tasks to foraging is mediated by decreasing vitellogenin (Vg) levels and increasing juvenile hormone (JH). Vg and JH have also been causally linked to transcriptional, physiological and metabolic changes in fat body and brain (Robinson 1987; Huang et al. 1991; Nilsen et al. 2011; Wang et al. 2012). RNA interference (RNAi) has been used to untangle causal relationships between fat body signaling, brain and honey bee behavior (Amdam et al. 2003b; Patel et al. 2007; Nelson et al. 2007; Nunes and Simões 2009; Ament et al. 2011). RNAi mediated gene knockdown of Vg revealed

The fat body is also responsible for magnetoreception and the immune response.

a number of the protein's effects in honey bee workers, including that Vg slows the onset of foraging, promotes pollen collection, and increases immunity, oxidative stress resilience and lifespan (Amdam et al. 2003a; Amdam et al. 2004; Nelson et al. 2007)."

"Bees involved in brood care (nurses) have higher lipid stores in their abdominal fat bodies than forager bees. Pheromone communication plays an important role in regulating honey bee behavior and physiology. In particular, queen mandibular pheromone (QMP) slows the transition from nursing to foraging. Fischer and Grozinger (2008) tested the effects of QMP exposure on starvation resistance, lipid storage, and gene expression in the fat bodies of worker bees. They found that indeed QMP-treated bees survived much longer compared to control bees when starved and also had higher lipid levels. Expression of vitellogenin RNA, which encodes a yolk protein that is found at higher levels in nurses than foragers, was also higher in the fat bodies of QMP-treated bees. No differences were observed in expression of genes involved in insulin signaling pathways, which are associated with nutrient storage and metabolism, thus, other mechanisms may be involved in increasing the lipid stores. These studies demonstrate that pheromone exposure can modify nutrient storage pathways and fat body gene expression in honey bees and suggest that chemical communication and social interactions play an important role in altering metabolic pathways."

"Shehata et al. (1981) examined seasonal physiological changes in both queen and worker honey bees. Queens were relatively heavy and had large, well developed ovaries in the early Summer. This condition coincided with a period of intensive egg-laying. Ovary development was accompanied by a large drop in fat-body lipids and a significant increase in fat-body protein. Ovaries of laying queens were about eight times as large as those of virgins. Between November and January, when no eggs were laid, queens were lighter and had smaller, less-developed ovaries. The weight of workers remained essentially unchanged throughout the year. Fat-body stores in both queens and workers were high in Summer, and then declined during September and October. A gradual build-up in queen fat-body stores began in November and continued through March. Total stores in the worker fat-body rose sharply in November, then fell again in December and January."

"Blood sugar concentrations were high in both queens and workers between June and October; caste patterns diverged between December and June, when concentration dropped nearly to zero in queens but increased to a level of more than 4% in workers. Blood sugar levels varied inversely with levels of fat-body lipids during late Autumn and Winter. More protein bands were observed during periods of heavy egg laying and brood rearing than at other times. The female-specific protein 'vitellogenin' was observed in both female castes. The concept of 'summer bees' and 'winter bees' appeared to be appropriate to queens as well as to workers (Shehata et al. 1981)."

Fat-body stores in both queens and workers were high in Summer, and then declined during September and October.

"The hypopharyngeal glands (HGs) of honey bee nurse workers secrete the major protein fraction of jelly, a protein and lipid rich substance fed to developing larvae, other worker bees, and queens. A hallmark of poorly nourished nurses is their small HGs, which actively degrade due to hormone-induced autophagy (consumption of the body's own tissue as a metabolic process occurring in starvation). To better connect nutritional stress with HG degradation, Corby-Harris et al. (2019) looked to honey bees and other insect systems, where nutrient stress is often accompanied by fat body degradation. The fat body contains stored lipids that are likely a substrate for ecdysteroid (hormone) synthesis, so they tested whether starvation caused increased fat body lipolysis (the breakdown of fats and other lipids by hydrolysis to release fatty acids). Ecdysteroid signaling and response pathways and IIS/TOR are tied to nutrient-dependent autophagy in honey bees and other insects, and so they also tested whether and where genes in these pathways were differentially regulated in the head and fat body. They also injected nurse-aged bees with the honey bee ecdysteroid makisterone A to determine whether this hormone influenced HG size and autophagy. They found that starved nurse aged bees exhibited increased fat body lipolysis and increased expression of ecdysteroid production and response genes in the head. Genes in the IIS/TOR pathway were not impacted by starvation in either the head or fat body. Additionally, bees injected with makisterone A had smaller HGs and increased expression of autophagy genes. These data support the hypothesis that nutritional stress induces fat body lipolysis, which may liberate the sterols important for ecdysteroid production, and that increased ecdysteroid levels induce autophagic HG degradation."

"Ramsey et al. (2019) showed that the parasitic varroa mite is not consuming hemolymph, as has been the accepted view, but damages host bees by consuming fat body. Both hemolymph and fat body in honey bees were marked with fluorescent biostains. The fluorescence profile in the guts of mites allowed to feed on these bees was very different from that of the hemolymph of the host bee but consistently matched the fluorescence profile unique to the fat body. Via transmission electron microscopy, they observed externally digested fat body tissue in the wounds of parasitized bees. Mites in their reproductive phase were then fed a diet composed of one or both tissues. Mites fed hemolymph showed fitness metrics no different from the starved control. Mites fed fat body survived longer and produced more eggs than those fed hemolymph, suggesting that fat body is integral to their diet when feeding on brood as well. Collectively, these findings strongly suggest that *Varroa* are exploiting the fat body as their primary source of sustenance: a tissue integral to proper immune function, pesticide detoxification, overwinter survival, and several other

essential processes in healthy bees."

"The fat body cells of the honey bee was shown to be reduced by the parasitic mite *Varroa jacobsoni* at the invasion intensity of one or two mites per bee (1153.01 ± 139.05 mkm^2) and 3-4 mites per bee (952.68 ± 137.72 mkm^2) compared to un-invaded bees (3030.31 ± 336.87 mkm^2), and as the consequence, the lifetime of the bees invaded by mites decreased (Nemkova and Rudenko 2003)." BC

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Before *Varroa*, The Deadly Threat Was Tracheal Mites

M.E.A. **McNeil**

Trachael mites inside of the thoracic tracheae of a honey bee, magnified 400 times. The mites multiply until they impede the flow of oxygen to the bee's organs and the expiration of carbon dioxide. Photo by Lilia de Guzman, USDA-ARS

They measure in millionths of a meter – about the width of a human hair, the thickness of a coat of paint or a dust particle, so small that the size of the tracheal mite is noted with its own sign: µm. But they were big enough to take down honey bees and their keepers.

Around 1985, California queen breeder Pat Heitkam met a beekeeper from Washington over a beer. "He offered a great apiary location in huckleberries," said Heitkam. "I took 216 hives up, and when I got them back they looked terrible." The colonies declined, "until I had maybe 30 left. I remember on one I wrote: '8 bees and the queen.'"

The Washington beekeeper brought all his own bees to California in November in time to go into the almonds. "From 1200 colonies he ended up with 20," said Heitkam. "I took some to Katy [Garrison, the bee inspector] in Shasta County who looked at them under a microscope. She said, 'Bingo!' By then we knew it was tracheal mites."

Acarapis woodi *is the minuscule mite that wrecked havoc with honey bees around the world, creating devastating losses.*

"When it hit us," said California queen breeder Jackie Park-Burris, "it was really hard; the years around 88, 89, 90, strong hives were softball size. It was a real challenge."

To address the losses, The California Department of Food and Agriculture (CDFA) called an open invitation meeting in Fresno. "It was huge, it really was," said Eric Mussen, then the U.C. Davis Extension Apiculturist, who was in the thick of it. "Every beekeeper interested brought their wives and kids and people working for them." The CDFA proposal was whether to begin a search and destroy program with the aim of eliminating the mite.

That mite, *Acarapis woodi*, came with a history. On the Isle of Wight, off the coast of England, a devastating bee epidemic killed 90% of the bees on the island between 1905 and 1919, caused, it's thought, by the tracheal mite, with possibly Nosema. The problem spread to mainland England and continental Europe. As a result, importation of live bees into the United States was banned with the U.S. Honey Bee Act in 1922.

In 1980, tracheal mites were found in Mexico, and four years later they were in Texas. They spread to all the major beekeeping states in fewer than five years. High losses in 1986-1989 were attributed to the mites in the U.S., and they ultimately reached Asia, parts of Africa and North and South America.

Think of it, *Acarapis woodi* is half the size of a dust mite. It is semi-glossy, has multiple setae (bristle-like hairs), six legs, and a piercing mouthpart for feeding. It hangs out in the adult honey bee respiratory system and can't survive outside of the host for more than a few hours.

One Small Step for a Mite

Acarapis woodi is one of three species of the genus *Acarapis*, mites found on the honey bee. The other two, *Acarapis dorsalis* and *Acarapis externus* are scavengers that perch externally, the first on top of the

thorax and the second in the neck region of the bee where they benignly go about their cleanup duties. "There appears to be a natural relationship," said Keith Delaplane, a professor of entomology at the University of Georgia. In a lecture, he points out the tracheal openings in a bee, the spiracles, which he figuratively likens to nostrils. "See that little flap of the nostril cover? Some of the *dorsalis* figured out that they could shimmy under that little covering and get inside the warm and protected 'lungs' of the bee, living quite nicely there. This was a relatively easy adaptation for *Acarapis* to make."

For whatever reason, *Acarapis woodi* does not make an appearance in the record until early in the 20th century. "I would pose it more likely that *Acarapis dorsalis* differentiated into *A. woodi* in Europe sometime much earlier than that," said Delaplane, "but that human changes in beekeeping management, namely higher-density apiaries, provoked a proliferation of *A. woodi* in the 19th and early 20th centuries. The rarity and spotty distributions of *A. woodi* in the 1600s and subsequent centuries meant that the North American importations dodged the bullet by sheer luck, until the luck ran out in 1984."

Baited Breath

Bee "lungs" are actually branching tubes, tracheae, which lead from five pair of spiracles to reach every organ in the bee's body, transporting oxygen directly to the cells and eliminating carbon dioxide.

Mites are attracted to the exhausted air of the spiracles and to specific hydrocarbons from the bee's cuticle. Female mites enter the spiracles of adult bees and lay half a dozen or so eggs over a few days. All of the instars live and mate within the tracheae, except for the brief period when a mated female goes out to find a new host. She waits on the tip of a hair on her host bee's thorax until a passing young bee brushes by (she's picky, no oldsters) and she can attach to a new host.

In the tracheae, the mites damage the walls by piercing them with their sharply pointed mouthparts, stylets, to feed on bee hemolymph, the fluid of the circulatory and lymphatic systems. Mite populations build up in the larger trunks of the tracheae and progressively occupy smaller tracheoles, limiting air flow. Although drones can harbor more mites than workers, workers are the primary host, since they are available all year. When queens are infected, their weight suffers.

An infestation of mites affects bee metabolism and can cause diminished ability of the bees to regulate temperature. Clusters loosen, populations drop, honey consumption increases – which combine to cause colony death.

Identification

A bunch of [mite-infected] bees would bail out of the hive," said Mussen, "come marching out, half the colony over two days, all over the ground, some with K-wing. I could find only 20% in a microscopic study with tracheal mites that were pulling 80% of the bees out. They'd be gone in a week or 10 days. We'd find lots of dead bees; it looked like a pesticide kill."

But how could beekeepers know the difference? Tracheal mites are not easy to diagnose. "Most beekeepers checking expected to see mites running around on bees," said Mussen. "But they are invisible, except to very young eyes." That was only the start of the enigma: There are no reliable symptoms of mite infestation. Other problems, like Nosema and some viruses, are also associated with disabled bees crawling on the ground or K-wing (separated double wings).

Jerry Hayes, editor of this magazine, said, "Honey bee wings are held together with hooks and loops almost like Velcro. When the bees had tracheal mites, it was like they have asthma: The bee didn't have the strength to keep her wings held together because of lack of oxygen. And they detached and voila the wings positioned themselves at a certain angle like the letter K."

The only real way to diagnose a tracheal mite outbreak is to examine the bees, and that requires dissection. The bee's head, first set of legs and first ring of the thorax, called the collar, are removed with scalpel and forceps to expose the tracheal trunk for placement on a slide. That's most easily done under a dissecting microscope, which is different from a compound microscope, used to examine the tracheae of infected bees. Darkened blotches can indicate infection, with healthy tracheae light in color. However, trachea may not always be discolored when mites are present, and discolored tracheae do not always contain mites.

Nonetheless, Park-Burris, whose family has been breeding queens in Northern California since the 1930s, bought some microscopes and went to work. "Our bee inspector Katy Garrison taught dissection lessons," she said. "We had to wing the treatments."

A group of professionals playfully calling themselves the Possum Breeders – which Heitkam said produced "some hilarious meeting minutes" – got very serious about the tracheal mite situation. They brought Bill Wilson, then head of the Weslaco lab in Texas, to speak: "He knew all about menthol. We got a quick special-needs permit the second year to treat with menthol. It was somewhat effective. People also started grease patties that were developed by Wilson. Most of us mixed Terramycin in – Terra Patties, which some say added to resistance

Jackie Park-Burris, a Northern California queen breeder, is part of a family that has been breeding bees since the 1930s. Like beekeepers across the nation, her operation was severely impacted by the tracheal mite infestation.
photo by Kathy Keatley Garvey

build up." The shortening appears to disrupt the questing female mites as they search for a new host.

"It was the first time that beekeepers put chemicals into hives," said Mussen. "Until then, agricultural chemicals were the worst thing. They tried a series of pesticides. Menthol has to be 60°F or warmer [to volatilize for effectiveness] but up to 90°F it will fumigate a colony."

Park-Burris said, "I learned to dissect bees before treatment and after. After treatment, the number of mites was better, but the bees were not better. For three to five years it was a struggle to make a pollinating colony."

The bee on the far left has disjointed wings, also called K-wing. A number of things can cause this, including tracheal mites but also nosema and possibly viruses. Photo courtesy of the Bee Informed Project

The Fateful Decision

At the Fresno meeting, the large crowd listened to presentations. One of the problems was that the literature from Europe did not always agree, and beekeepers, research scientists and regulatory officials had differing opinions on the data. A British honey bee disease specialist, Leslie Bailey, came to say the mites were nothing to worry about. Roger Morse from Cornell said the same, although he later changed his view. Beekeepers at the meeting reported that the mites were having a serious impact and spreading faster than predicted. CDFA scientists said that the situation looked bad. People flew up from Mexico to say it was very bad indeed. The queen breeders wanted a 17-county zone free of tracheal mites, and others spoke passionately for no restrictions. Each was defending his livelihood. "There was strength on both sides of the argument," said Mussen.

"It's like Covid," said Heitkam, "Same question." Close for safety or open for economics.

"The vote was not even close," said Mussen. "It was 'We don't want the mite.'" In the San Joaquin Valley, a search-and-destroy program eradicated a lot of bees, some from North Dakota, and the State threatened to close the border to tracheal mites. It put many beekeepers out of business, one after another. "It was really, really bad," he said. The closure of the Canadian border to honey bee imports in 1987 multiplied the problem many times over.

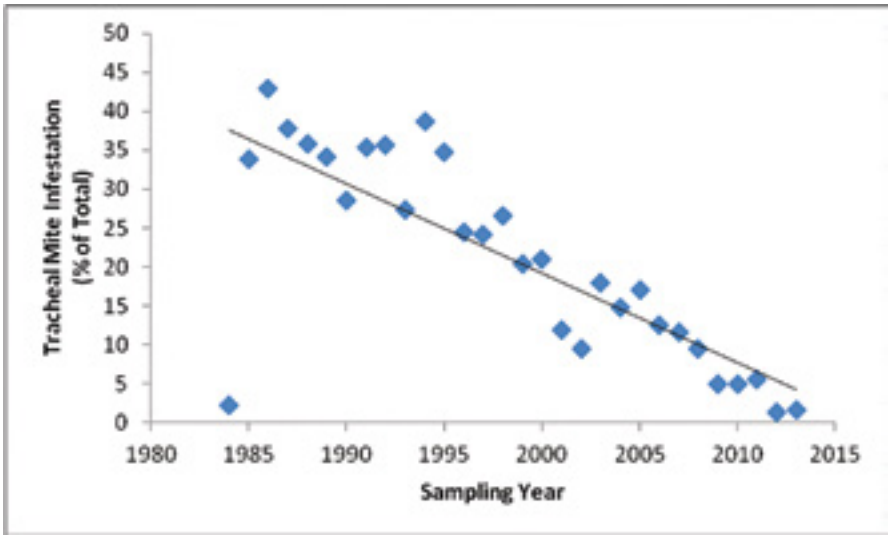
Delaplane said, "In 1990 it was an absolute maelstrom. The Georgia Department of Agriculture had adopted a program to eliminate this mite. They were depopulating entire apiaries. It was a very bad situation."

We called the [California] program off," said Mussen. "They couldn't control it. It was always ahead of us. We wouldn't have a beekeeper left in the state."

What Happened to the Tracheal Mites?

Heitkam said, "I realized early on that you couldn't fix them. You couldn't medicate them, you couldn't see them." Early on he got permission from the depleted Washington beekeeper to choose from his remaining hives and brought six back to share with the Possum Breeders. "I figured if a guy had 1200 and had 20 left and I could pick the best, we'd have something." Adding a couple of pounds of healthy bees to an infected hive seemed to help. "What happened to the tracheal mites? I don't know what happened," he said. "We tried to select for hygienic behavior. We don't even look for them anymore. It was a bad deal over a long time."

Park-Burris said, "When we first looked, the bee's trachea was just plugged with them. We had 90% – out of 10 bees, nine were infested – and at the end, 1-2%. We did all the things I normally do to select a breeder. At first I took one with 10% and then 5% of mites, and then we had some that didn't have any. What we were doing helped, but the bees themselves adapted to it. The Tech Team said, 'You're the only ones still testing for the [tracheal] mites.' We came up with



This graph illustrates the rapid decline of tracheal mites found in diagnostic samples sent to the USDA-ARS bee lab in Beltsville Maryland. Courtesy of Jay Evans, USDA-ARS

zeros so many times we just quit."

Mussen said, "Not many beekeepers had microscopes to check, but they went to a county ag department. There were fewer and fewer calls. I don't know why. Most susceptible bees died. Did *Varroa* treatment have a negative effect on them?"

Jay Evans, Research Leader at the USDA in the Beltsville lab, said of the decline of tracheal mites, "I am guessing it is increased miticides, including the organic acids lately, but staring with Apistan in the 90s." Jerry Hayes agreed, observing that strip miticides used against *Varroa* were ingested by the bees through grooming, making them systemic and causing damage to tracheal mites as they fed on hemolymph.

Bob Danka of the USDA-ARS bee lab in Baton Rouge said, "Tracheal mites came in in 1984 and were depopulating colonies in Louisiana in 85. I think they got to the lab about 1988. We were hearing nothing about this from Europe, they're fine. In the Winter of 88-89 half of our bees died, and in the Winter of 89-90, half of our bees died again. But those losses quickly ended, and after that, they really weren't the problem. Bees got over tracheal mites in a couple of years in most people's experience. That's Mother Nature at work I think. We don't really know but that's my best guess."

Lilia De Guzman, Research Entomologist at the USDA Baton Rouge lab, has worked with the question of resistance to tracheal mites, and she has three theories about their decline:

"1.*Varroa* mites are brood parasites primarily, and tracheal mites are parasites of adult bees. If brood is dying from *Varroa* parasitism because of the viruses *Varroa* mites inflict, then tracheal mite transmission, invasion and reproduction is likely disrupted.

"2.It is also possible that treatments for *Varroa* are also effective against tracheal mites. However, if you think about it, the external *Acarapis* are more exposed to acaricides than the tracheal mites. But external *Acarapis* mites are still common.

"3.Resistant genes are probably widely distributed. There are several honey bee stocks that are known to be resistant to tracheal mites – Buckfast, the Yugoslavian bees (based on my research in early 90s), and Russian bees to name a few." Research also suggests that resistance to tracheal mites is likely brought about through grooming behaviors of bees. Another possibility is that that disruptive pheromones are involved.

How About *Varroa*?

Delaplane said, "Fortunately, the problem [of tracheal mites] more or less went away on its own. This doesn't mean we didn't try for some years to concoct some controls. All of this rather was in vain in the end of it all, because in a matter of one or two years, the problem just simply went away. Vanished. To the point that today we simply can never find them. What happened? Well, it was probably a very rapid evolution of resistance by the host honey bee. And that's something to hang our hats on. It happened very quickly. Why is that? Why has it taken so much longer for the honey bee to develop resistance to *Varroa* mite than it did to the tracheal mite? It goes back to that evolutionary distance. The tracheal mite is a natural parasite of European honey bees. And we shipped some European honey bees to North America in the 1600s, within historic time. And even though *Acarapis woodi* apparently evolved after the year 1621, there is still enough evolutionary distance in the bee that it had the same tools in the toolkit, so to speak, for dealing with that kind of a parasite. The other two, *Acarapis dorsalis* and *Acarapis externus*, are only a little different. So it was a relatively easy thing for our unexposed North American *mellifera* to very quickly evolve resistance to this parasite because it was such a near parasite to a parasite they were already familiar with. That is diametrically not the case with *Varroa*, because that distance is 14 million years. And not only that, *mellifera* never had an experience in Asia ever. So it had no tools at all to co-opt when it was exposed to *Varroa* for the first time in the 20th century. Having lived through both mite introductions, the difference between the two is night and day. It is a primo case history for how evolutionary distance between host and parasite can dictate virulence potential."

Lessons Learned

When Mussen was preparing for the same kind of meeting that was held for the tracheal mite infestation, but this time to stop *Varroa*, "We decided it was too late in many places. We learned our lesson: We couldn't kill bees and put beekeepers out of business."

Park-Burris said, "I think the wounds have healed. We all work together really well now."

A Sleeping Menace?

"Once in a while I hear that someone finds them," said Mussen of the tracheal mites. A third-hand report that there was a spike in cases in Tennessee failed to yield any data.

Delaplane reported that there has been no resurgence in Georgia for decades. His literature search for all related post-2016 publications in North America found no papers. Although he found a flare-up in Japan, a recent survey in Argentina found zero incidents. "Now there are molecular detection methods as well as direct microscopic examination. I suppose we should never become complacent, but right now I don't think tracheal mites are a problem," he said.

Park-Burris said, "Marla [Spivak] and Katie Lee came with the first Tech Team" to test her hives. "Uncle Homer may have been doing the same thing when he said, 'Just look for a clean hive.'" BC

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PROVENTRICULUS

Honey Bee Stomach Filtering Valve

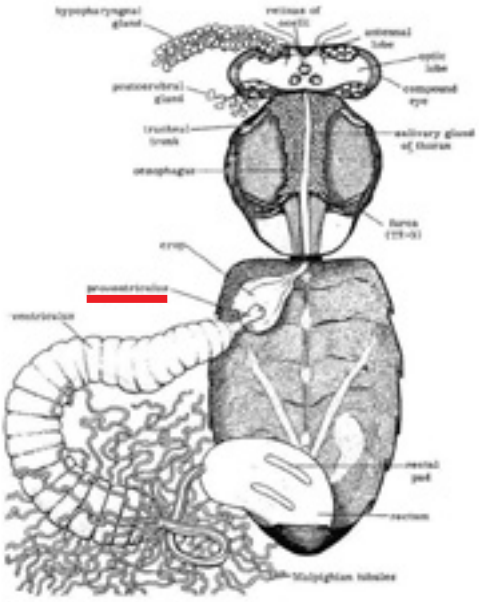
Graham **Kingham**

The entire honey bee castes have a filtering valve, called a proventriculus (meaning before the belly) situated in their honey stomach, also known as the crop which acts as a storage organ for nectar and water and is capable of great distension. The filtering is done by the mouth piece that sticks up into the crop; which prevents the contents of the crop from running into the true stomach, the ventriculus. See Dade's Plate 9.

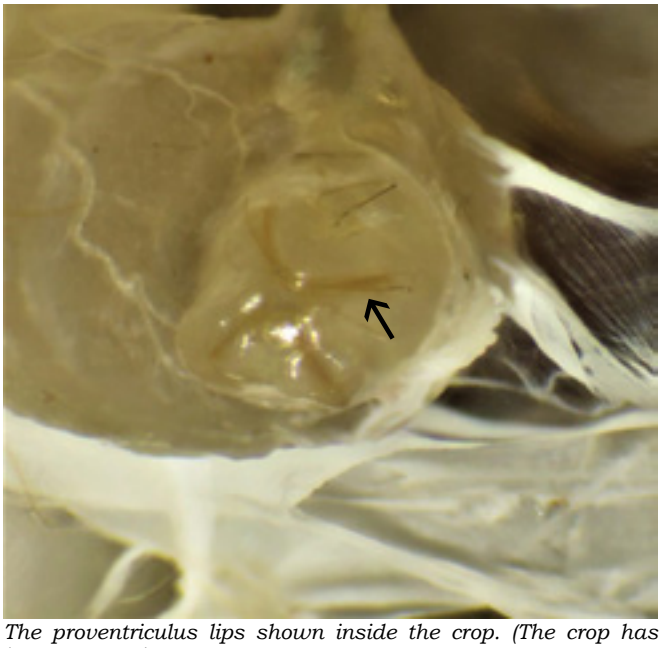
Both crop and proventriculus have an outer layer of transverse musculature and an inner layer of longitudinal musculature. The longitudinal musculature of the proventriculus is powerful and by contraction causes the lumen (cavity) of the organ to enlarge. The 'lips' are extensions of the folds beyond the encircling band of transverse musculature. The combs of filiform (thread like) hair on the edge of the folds appear to be capable of being folded in upon the surface of the fold or to be opened away from the surface.

These hairs give unrestricted entry to pollen grains rushing in to the expanding lumen (cavity) of the proventriculus; they are capable of filtering particles as small as 1 micron. The contraction of the circular muscles will cause the expulsion of the fluid contents of the proventriculus back into the crop, the thicker sphincter layer preventing entry into the ventriculus (true stomach). Pollen grains will be sieved off by the comb and forced into the pouches as the folds collapse upon each other. Repeated intake and expulsion of contents in this manner will gradually cause a mass of pollen grains to accumulate in each pouch. Finally, a large mass of pollen grains is collected, and then the contraction of the circular muscles forces this large bulk against the hairs of the combs.

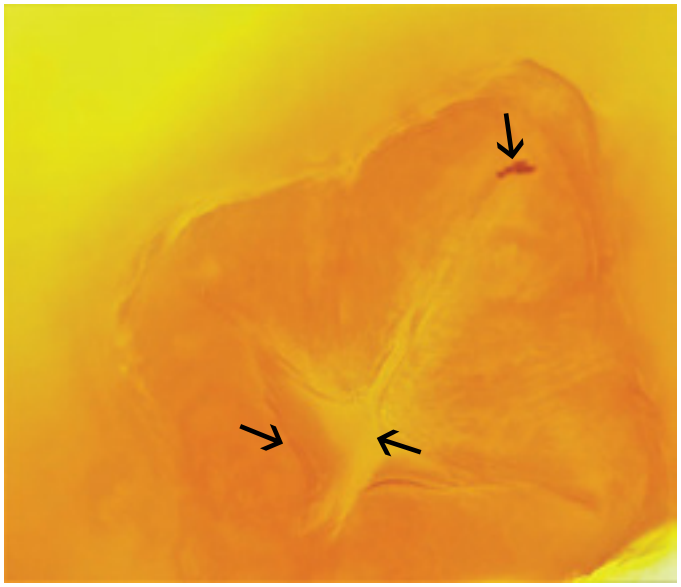
A bolus (meaning a ball) of pollen then passes through the neck into the ventriculus leaving but a few grains of pollen behind in the collapsed pouches. Whitcomb & Wilson in 1929 show that the shells of the pollen grains are not broken at any stage, yet their contents are completely digested in the ventriculus. The boluses pass quite quickly towards the posterior end of the ventriculus within 5-20 minutes, depending on the concentration and amount of pollen suspension which is fed. The proventriculus filters off the pollen as compact masses and leaves the nectar or honey behind. (An Australian study in 2004 found that between 0.15% and 0.433% of pollen has been left in honey, showing how effective a filtering mechanism it



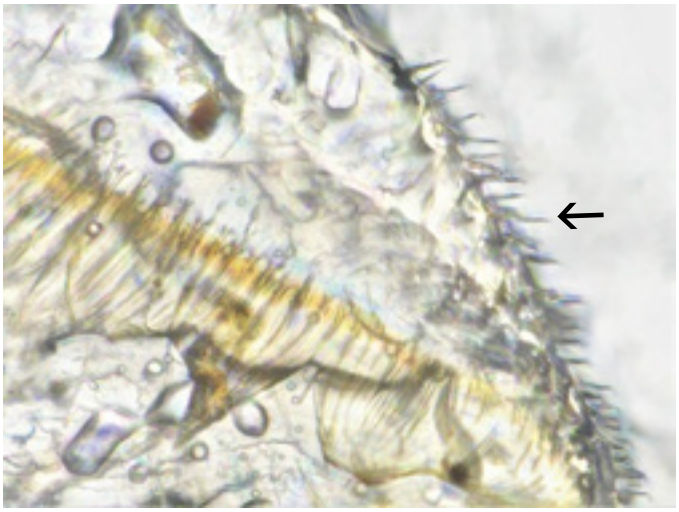
Dade. Plate 9: *Dissection of worker. Alimentary canal displayed. Both crop and proventriculus have an outer layer of transverse musculature and an inner layer of longitudinal musculature. The longitudinal musculature of the proventriculus is powerful and by contraction causes the lumen (cavity) of the organ to enlarge. The 'lips' are extensions of the folds beyond the encircling band of transverse musculature. The combs of filiform (thread like) hair on the edge of the folds appear to be capable of being folded in upon the surface of the fold or to be opened away from the surface.*



The proventriculus lips shown inside the crop. (The crop has been removed) x40.



Mouth x 100. Showing lips, pouch and lumen.



Inside view of lip. x400. Showing long filiform hairs about 70 microns long and bristles.

is.) This alone probably facilitates the digestion of pollen, since the proteolytic enzymes (these are also called protease, proteinase, or peptidase, and are any of a group of enzymes that break the long chainlike molecules of proteins into shorter fragments peptides and eventually into their components, amino acids) are not diluted by an excess of fluid. The proventriculus therefore serves the purpose of dividing the two principal items of food for separate treatment. The volume of fluid within the honey stomach, the size of particles in suspension and their concentration has significant effects on the rate and efficiency of filtration by the proventriculus. Within the ventriculus the swallowed pollen is kept within a membrane, the peritrophic membrane. These thin membranes are secreted by the cells lining the ventriculus (epithelial cells). Nearly all insects have membranes like these, and a considerable amount of study has gone into establishing the role that they play in digestion. In the honey bee these membranes are produced by some of the epithelial cells and successive sheets of membrane peel away from the wall and coat each bolus of pollen as it arrives. The membranes were previously thought to provide protection for the lining of the ventriculus from sharp points on the pollen. However, it is more likely that they are important in concentrating a range of digestive chemicals (enzymes) where they are most needed. BC

All photographs by G Kingham Dade drawings by kind permission of IBRA

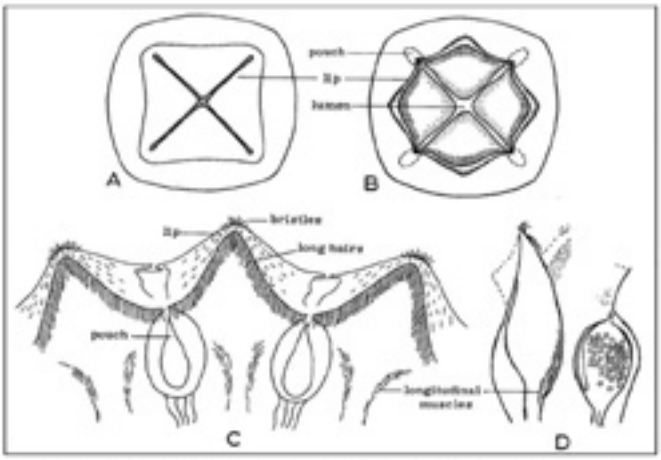


Fig. 16. The proventriculus. ***A.*** anterior aspect, lips closed; ***B.*** ditto, lips open to show the short spines and long hairs of the lips, and the lumen partly closed by the muscles below the lips, also the pouches which open into the lumen. ***C.*** part of the proventriculus laid out after slitting up on one side; three of the four lips are shown, with the pollen pouches between them. ***D.*** sketch of a longitudinal section, on the left through a lip, on the right through a pouch.

Source: Dade *The Action Of The Proventriculus Of The Worker Honeybee*, Apis Mellifera L. By L. Bailey Bee Research Department, Rothamsted Experimental Station (Received 13 October 1951)

PROVENTRICULUS

Beemail

Inbox Answers

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

The University of Minnesota Bee Squad has their finger on the pulse of the general pollinator zeitgeist. How? We read emails. Everyone sends us emails. Beekeepers, bee advocates, bee haters: we read and respond to all of them. Communicating science-based pollinator information is our job, and we take it seriously. Bee Squadders are paid to stay up-to-date on research and to study wild pollinators so we can address a breadth of bee-related concerns. (We draw the line at answering non-pollinator related concerns, like whether you can safely eat worm infested mushrooms.)

As a beekeeper, you automatically become an ambassador for pollinators, and friends look to you to answer their stinging-insect questions. We thought we'd share a few common questions, to help you talk to your neighbors, communities, and other beekeepers.

***Question**: Where did my bees go?*

One of the most common emails we get goes something like this: "My bees disappeared in the Fall (or Winter) and I can't figure out why. They had plenty of honey and the colony was my best Summer performer." The answer is most often that they died of mite-vectored viruses. The myth persists amongst backyard beekeepers that you can visually see if your colony is overrun with mites. In reality, seeing one mite on a bee – or seeing any signs of deformed wing virus or parasitic mite syndrome –means your colony is already above a treatment threshold and severely damaged, if not dead (Lee 2018).

Check out this site for an abundance of education regarding death by *Varroa*: **https://pollinators.msu.edu/keep-bees-alive/**. Use the Honey Bee Health Coalition's *Varroa* Management Decision Tool for help with management: **https://honeybeehealthcoalition.org/varroatool/** and please report your data to **www.mitecheck.com**.

***Question**: My honey is funny.*

Some people get concerned when honey changes texture, and worry it has gone bad. Here in Minnesota, honeys crystalize pretty fast (some of us prefer crystalized honey anyway). We share the National Honey Board's website (**www.honey.com**) for honey questions as well as recipes and educational materials for kids.

***Question**: More honey for me?*

On the other hand, many beekeepers ask whether you can eat honey from a deadout. This is an emphatic NO. While technically honey can last forever and can be eaten straight from an ancient Egyptian tomb, eating honey from a deadout is not a good idea. Brood nest honey is stored in wax cells that have previously been brood cells. Sometimes there is bee poop on those frames, or mold, or pesticides from mite treatments and contaminated pollen (Mullin et al., 2010). Mice and other vermin often visit deadouts and could contaminate the honey. We do feed deadout honey to bees, as long the frames are free of brood and spores from American Foulbrood. Deadout honey should be stored where it can freeze, or at least stay sealed from mice. Honey for human consumption should be extracted from frames where no brood has been reared.

Frantic Question: Oh No! I've got bees!

Our most popular question is about bee removal. People email us when they find bees or wasps on their properties, asking us to relocate them. Usually, people have found bumble bee or wasp nests. This is our chance to talk about the benefits of wasps (pest control) and the importance of native bees. After we share information about the species' life cycle, and the relatively low threat of whatever pollinator they have in their yard, many people are willing to leave the nest alone until they naturally die off in the Fall. Occasionally, people do find honey bees (see Farmer Keith's photo) that have taken up residence in an unusual place. A local beekeeper can often be convinced to remove them.

***Question**: How can I help bees?*

Some people want to help bees by becoming beekeepers, and others want to know what to plant for bees. We underline that planting flowers is the best way to help bees, and that becoming a beekeeper is a lot of work! For those who want to make the leap, we direct them to beekeeping clubs and mentorship that will give them a proper start. New beekeepers (and their bees) benefit immensely from following an experienced, successful beekeeper.

As far as flowers go, we focus on planting for diverse bees, not just honey bees. In particular, we point people to plants that provide wild bee habitat as well as early and late season food for all bees. We share this habitat assessment guide, which the lab developed in collaboration with Xerces. **https://xerces.org/**

Varroa *can be hard to count when Summer bee popuations are high and there is a lot of sealed brood in the colony.* Photo by Judy Griesedieck.

publications/habitat-assessment-guides/habitat-assessment-guide-for-pollinators-in-yards-gardens. This is a great tool for optimizing pollinator friendliness in different landscapes.

Planting guides and bee management support will differ depending on your geographic region. Please reach out to your regional beekeeping clubs, universities and horticultural experts for pollinator resources!

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

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.

We receive many emails regarding unwanted honey bees. Photographic evidence rarely points to honey bees (usually they are wasps or bumble bees), but sometimes we are surprised. Photo by Farmer Keith Johnson

Honey Bees And Canola

Angela **Dansby**

Did you know that honey bees and canola are in love with each other? They are the perfect partners, nourishing their respective growth.

"Bees are essential for hybrid canola seed production," says Pat Murphy, president of the **U.S. Canola Association** and canola grower in Minot, ND. "They increase seed germination, reduce green seed counts and raise oil content."

In hybrid seed production, honey bees deliver pollen from male parent lines to female parent plants, increasing germination of resulting seeds from 83 to 96 percent, according to the Canola Council of Canada.

Bee pollination in all types of canola encourages higher yields with better ripening. It results in more uniform flowering and earlier pod-setting; increased pods per plant, seeds per pod and seed weight (from 13 to nearly 50 percent); and reduced canola bloom time (by 17 percent).

In turn, canola provides the perfect home and makes wonderful meals for honey bees.

"Canola flowers produce high amounts of nectar and pollen, offering a good sugar profile for honey production and a nutritional balance of proteins and fats," notes USCA Past-President Rob Rynning, canola grower in Kennedy, Minn. "Since canola fields bloom for relatively long periods, they provide bees with a good source of nectar for up to a month."

Bountiful canola flowers also allow bees to feed efficiently within reasonable distances. So this is no long-distance romance.

Sweet on Stewardship

Because of the love affair between their "children," beekeepers and canola farmers have a vested interest in working together. That's why the U.S. Canola Association (USCA) – in partnership with the **Honey Bee Health Coalition** – issued "Best Management Practices (BMPs) for Pollinator Health in Canola Fields" with related materials for growers and beekeepers. The 1-2-3s of protecting bees include:

1) *Communicate and coordinate with beekeepers.* Before planting, growers should find out if hives will be placed in or near their fields. If so, they are advised to create an agreement with beekeepers to guide interactions throughout the growing season based on what, where and when they apply insecticides.

2) *Reduce exposure to pesticides.* Growers should only use insecticides when necessary as part of an Integrated Pest Management program and choose products with low toxicity to bees and short residual toxicity time. It is important to follow label instructions, use technologies and techniques to minimize drift, not mix insecticides with other pesticides, and avoid generating dust with treated seeds. If possible, farmers should avoid spraying when bees are present, during bloom, on other flowering plants or when weather could increase risk of exposure. They should also practice good clean-up and disposal of treated seeds, insecticides and their containers.

3) *Provide safe forage.* Growing no-till canola is an ideal habitat and food source for bees. If planting cover crops, farmers are advised to add flowering plants into the mix. In non-crop areas, growing flowers, trees and shrubs is also good for bees. Farmers should control flowering weeds prior to planting, avoid mechanical tillage where

possible, and not spray non-crop areas with insecticides.

These BMPs complement stringent regulations to ensure crop protection products, such as neonicotinoid insecticides, do not pose unacceptable risks to wildlife when used according to label instructions. Seeds treated with neonicotinoids prior to planting reduce the amount of pesticide spraying required for healthy crops. In addition, the crop protection industry is doing everything it can to reduce potential risk to pollinators from dust created during planting of treated seeds, such as improving seed applications and planting technology.

Interest Groups "Colonize" to Protect Bees

To boost efforts to improve and protect pollinator health, several stakeholder groups have banded together in the Honey Bee Health Coalition since 2014. The U.S. Canola Association is among 30+ member organizations across the food, agriculture, government and conservation sectors in this public-private coalition. Its mission is to achieve a healthy population of honey bees while supporting native and managed pollinators in productive agricultural systems and thriving ecosystems.

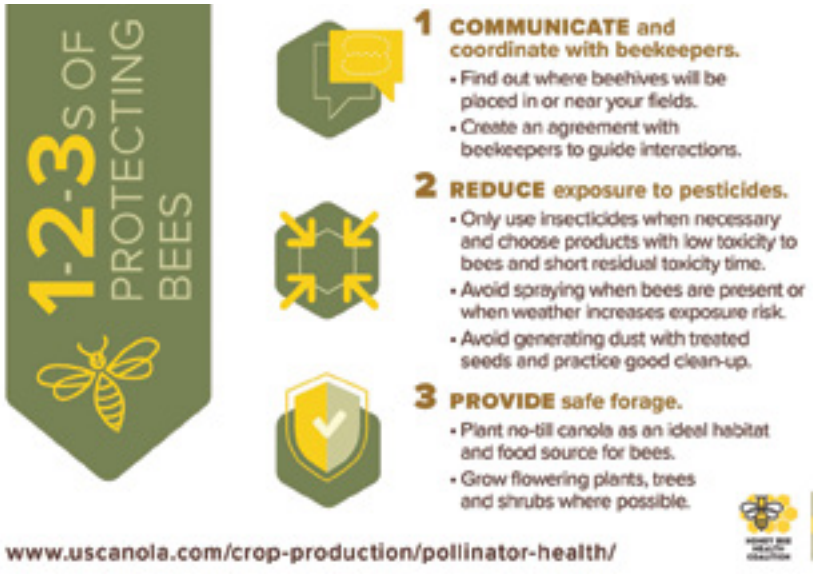
The coalition is focused on four areas: 1) forage and nutrition; 2) hive management; 3) crop pest management; and 4) outreach, education, and collaboration. They combine to achieve a vision of "healthy bees, healthy people, healthy planet."

While all types of bees, butterflies, beetles and other insects are natural pollinators that play a role in agriculture, honey bees are by far the most important. Keeping them healthy is essential for crop production and ultimately, feeding the world.

One-third of the crops consumed today depend to some extent on insect pollination for reproduction. In fact, the total economic value of pollination worldwide is estimated to be more than $200 billion and accounts for around 10 percent of agricultural production.

That's why Honey Bee Health Coalition members are doing everything they can to ensure "busy bees" can maintain their vital service to agriculture. For canola and honey bees, this means a lifetime partnership. BC

Angela Dansby is director of communications for the U.S. Canola Association, which is based in Washington, D.C.



What's The Future Of Beekeeper Meetings?

John **Miller**

Earlier in 2020, I wrote about why we attend bee meetings.

Beekeeper meetings are changed.

Mostly, cancelled.

The Minnesota Summer Meeting, a well-attended meeting, sometimes a multi-state meeting – was scratched. Lots of other meetings are or will be cancelled.

What is the future of beekeeper meetings?

Big meetings, like the California State Beekeepers Assn. meeting is a bee meeting where real business takes place. Respected tribal elders attend, sharing valuable insights. The give and take of supply and demand for honey and pollination services occurs in real time in presentations, in the halls and in restaurants.

Leadership teams behind the meetings carefully prepare agendas and presentations – some-times years in advance – to get the best speakers and best researchers.

Beekeeper organization members, vendors and non-members scan web sites – deciding to attend or not attend – based on meeting content, speakers, exhibitions, and location. Does anyone not like going to a CSBA meeting at Tahoe?

The Hospitality Industry sees in Beekeeper Meetings an opportunity during 'slack' seasons to fill rooms and occupy exhibition space, food service, rentals, AV expertise all are in the mix of good meeting preparations. Now: Hospitality, Airlines, Rideshares, Car rentals; are all upended. Hertz is in bankruptcy.

Vendors make calculations on where they will best find and connect with customers. Beekeeping supply houses do not relish packing a semi-load of supplies to set up and tear down – but how better to sell than the personal greeting, the hand of a given product [there is a difference in hive tools], testimonials given by loyal customers to friends wavering on a major decision. Extracting equipment manufacturers, Trucks and Forks and Trailers bring their devices large and small, haul, set up, demonstrate, educate, and hope to sell enough equipment to justify the expenses and fill the 2021 order book. [I'm waiting for the booth dedicated to "Build An Indoor Wintering Facility with Us!"]

Arts, Crafts, Ingredients, Honey Packers, Employment Agents, Non-Profits, Publishers, Insurance Services, Trucks, Forks, Woodenware, Dreamers, Schemers and Hustlers occupy exhibition space. Beekeepers value the opportunity to see innovation and problem solving in an industry almost impervious to change. Beekeeping is convulsed by change; the Four Ps: Parasites, Pasture, Pesticides, Pollination, Politicians [whoops that's Five] . . . maybe a 6th . . . Pandemic?

What is the Future of Beekeeper Meetings? Literally, without all of the above, the future of beekeeper meetings is at risk. Project Apis m., and Bee Informed Partnership are two beekeep-ing industry non-profits caught in the Covid parallel universe. PAm & BIP meet via Zoom on choppy wonky platforms. These platforms eliminate travel; allow us to meet, greet, and watch people napping. Zooming is not authentic. Zooming lacks the verve, the life; the experience of seeing friends we miss.

Vendors look forward to strengthening relationships at bee meetings. Beekeepers scan for bee-themed gifts. Non-profits represent the opportunity to get involved in our own success with forage recommendations, and fundraise to address much needed solutions. It's *Varroa*, *Varroa*, *Varroa*! – and Forage! And everything else. For everyone in an exhibit hall, it's a big investment. For every leadership team, it's months and months of preparation. For every hotel, airline, and rental outfit, it's revenue. For every speaker – it's about an hour of preparation for every minute of presentation.

The National groups and a few state and fewer yet local Bee Clubs do their best to keep members and visitors abreast with improved websites and content. These are not beekeeper meetings. Websites are not intended to replace the in-person, hands on, participation of a beekeeper meeting.

What is the future of beekeeper meetings? BC

Synthetic Wax

BetterComb And The Demise Of 100% Beeswax.

A recently adopted innovation in beekeeping is the use of completely drawn out honey comb made of synthetic wax. Modern beekeepers have long used Perma Comb, a fully drawn out plastic comb, in hives but this is the first time wax combs other than beeswax have been commercially available for use in hives.

Marketed under the dubious name of BetterComb, it is produced by Hexacells in Hungary for the beekeeping supply company Betterbee, of Greenwich, NY. The product is made from food grade or pharmaceutical grade nontoxic materials many of which are the same fatty acid monoesters, dieesters and trimesters, Hydrocarbons, Fatty acids, etc, found in beeswax. Unlike beeswax however, Bettercomb does not have the sweet smell of beeswax. In fact, it does not seem to have much of a smell at all.

Benefits of the ready made combs of synthetic wax include being able to introduce drawn comb into a hive immediately for faster package and nuc build up. It is also reported that wax moths are not attracted to the synthetic combs until the combs are used by the bees. Company officials also claim that the synthetic combs are pesticide free, a claim that beeswax foundation makers are unable to make due to the ubiquitous contamination of our environment by the "economic poisons" known as pesticides. As one would expect, Bettercomb is approved for food contact by the U.S. Food and Drug Administration so honey meant for human consumption can be harvested from synthetic wax combs without concern about contamination issues.


Ross **Conrad**

While the comb made from synthetic wax is very similar to its 100 percent beeswax counterpart, it is not beeswax. Researchers have yet to be able to identify all the constituents that make up real beeswax, making it impossible to accurately duplicate this amazing substance that honey bees produce in a laboratory. Only bees are able to produce beeswax. This difference is highlighted by the company recommendation that when mixing Bettercomb frames with normal beeswax frames of comb, alternating the frames is *not* recommended. It appears that when given a choice the bees will choose pure beeswax comb over the synthetic version every time. The bees will only use combs made of synthetic wax if they are provided no choice in the matter. This makes one wonder: what do the bees know that we don't?

Of course developers and marketers of new innovations are known to promote and even exaggerate the benefits of their inventions while downplaying their shortcomings. For example, Betterbee is quick to point out that candles made from a mixture of pure beeswax and synthetic wax appear to burn the same as regular beeswax candles. I say appear to burn the same, since it is well established that pure beeswax candles burn significantly longer than candles made from paraffin wax. So far as I can tell, no-one has tested the burn time of pure beeswax candles compared to candles made from a mixture of beeswax and synthetic wax. So what are the other possible downsides of synthetic comb aside from the fact that the bees, the beings that the Bettercomb product is made for, don't like it?

One problem with the new combs is that they are fragile and are not recommended for use in hot climates or for extracting honey unless extra time and expense is spent on wiring the comb into the frame.

Another issue is that extensive use of synthetic comb will greatly reduce the amount of wax that the bees need to produce themselves. From a strictly human perspective this can be considered a benefit. When combs made from synthetic wax are used less honey is consumed by the bees in producing their wax combs so there will be more honey for the beekeeper to harvest. Estimates are that bees must consume somewhere between six to eight pounds of honey to produce one pound of beeswax. Considering the number of combs in the standard hive this can amount to over 50 pounds of honey: a significant investment by both the bees and the beekeeper. However focusing solely on the amount of honey sacrificed to produce comb, ignores the fact that honey bees have a physiological need to produce beeswax. When researchers placed a package of commercially purchased bees in a hive and prevented the bees from foraging and fed the bees a steady diet of sugar syrup, the resulting beeswax combs were found to contain the typical miticide residues found in commercial beeswax. Since the bees were not allowed to forage freely and no pesticides were used in the hive, how did the chemicals get there? Since fluvalinate and coumophos are not used in the production of sugar cane or sugar beets, the only explanation is that the bees themselves had picked up the pesticides from the hives they were originally raised in before being packaged and sold. Just as perspiration is a way for people to

remove toxins from their system, it appears that through the process of sweating out wax to build comb, bees are able to detoxify their systems. The well meaning beekeeper that is trying to reduce the pesticide load in their hives by using "pure" combs of synthetic wax, may actually be making it more difficult for the bees in their hives to lessen the pesticide contamination within their bodies. While we know from numerous studies that pesticide residues in beeswax is not conducive to a healthy hive, I am not aware of any research that has looked into whether the presence of pesticide residues in the hive is less harmful when it is in the beeswax or when it is in the bodies of the bees themselves. I would bet that it is worse for the bees to have the toxins in their bodies than in their wax.

An even bigger issue with these new wax combs is that wax from synthetic combs are inevitably going to be mixed with the wax from normal beeswax combs. This will eventually lead to the contamination of all commercial beeswax with synthetic wax. Sure some beekeepers may initially try to segregate the synthetic wax combs from the beeswax combs, which means marking and keeping track of all frames and rendering them separately, but not all beekeepers are going to do this and inevitably the waxes will get mixed together especially in operations that purchase large amounts of beeswax from numerous sources. It was bad enough when we learned that all commercial beeswax has become contaminated with pesticide residues, mostly from the use by beekeepers trying to control varroa mites. As more and more beekeepers start to use the new synthetic comb the commercial beeswax available on the market will become more and more contaminated with synthetic wax from the old combs that get rendered. Perhaps Hexacells and Betterbee, since the beekeeping industry has grown accustomed to the idea of all beeswax being contaminated with pesticides, will not worry about adding synthetic wax to the mix. While this may be true for some, there will be beekeepers who will want to prevent the contamination of the wax used within and produced by their operation. These beekeepers will have a hard time finding commercial beeswax foundation that has not been contaminated with synthetic wax and thus will end up having to make their own foundation (a daunting task – see the April 2019 issue of *Bee Culture*), simply using strips of wood to encourage the building of comb within frames, or using plastic foundation or permacomb. The latter will result in more plastic being used and eventually disposed of by beekeepers wishing to avoid having synthetic wax mingled in with their beeswax. This trend toward more plastic will be terribly unfortunate given that as a society we need to be moving away from products produced by fossil fuels (most plastics are made from petroleum) and eliminating the production and release of the highly toxic chemicals that are part and parcel of plastic manufacturing.

Rather than allow bees to build comb during a nectar flow, or by creating an artificial nectar flow by feeding syrup, beekeepers can now order fully drawn out comb developed in a laboratory using synthetic wax. What could possibly go wrong with this plan?"

In the end the only way that I as a beekeeper can protect the integrity of the beeswax produced by my operation is to isolate my apiaries by not bringing in combs from other operations (such as in nucleus colonies) and stop using wax foundation. I will also have to render all my wax myself, or try to find someone to do so for me and guarantee that the are able to segregate my wax from others. Otherwise I will no longer be able to claim that my beeswax or beeswax products contains only 100 percent beeswax. The contamination of beeswax with synthetic wax will be especially important for operations that produce value added products from their beeswax. Undoubtedly there will be labeling issues since those who have used beeswax in their products in the past will now will have to spend time and money changing their labels so they are accurate, though inevitably there will be beekeepers with lower moral standards that won't bother correcting their product labels and instead rely on consumers who are not informed and aware that the "pure" beeswax in the products they buy is no longer actually pure beeswax. We do not yet know how the introduction of synthetic wax into the commercial beeswax stream will impact folks who make salves, balms and other cosmetics containing beeswax and if it will change the characteristics of the final product. Nor can we predict how much of the beeswax market will be lost to other competing waxes, such as Carnauba Wax, that have not been contaminated with a synthetic copycat and what this will do to the price of beeswax.

Since synthetic wax is made up of many of the same components found in beeswax, it will be extremely hard if not impossible to test beeswax samples to determine if they contain synthetic wax. Hexacells could have chosen to add a non-toxic benign ingredient that is easy to detect to its synthetic wax so that testing and preserving the integrity of 100 percent beeswax could be a possibility and purity proven, but so far they have chosen not to do so. We beekeepers already have a huge problem dealing with the purity of honey and now we can add to our woes the purity of beeswax. In the end only a few industries will profit from the sale of synthetic wax combs while bees, beekeepers, those who produce value added products from beeswax, and their unsuspecting customers will all pay the price. BC

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*Ross Conrad is the author of N*atural Beekeeping and The Land of Milk and Honey.

Fungicides And Bee Decline

Etienne **Bruneau**

For years, fungicides were not considered toxic to bees. Today, however, questions are being asked and some scientific articles are calling this into question. One can wonder whether fungicides do not have an active role in the phenomena of Winter decline of bees observed in some years in our regions. Here is a quick overview of what can be found today in the scientific literature.

Fungicides and bactericides occupy an important place in the world of pesticides. According to Eurostat, in 2016, they accounted for 46% of the sales volumes of pesticide products in 20 member countries. France was in third place (31,910 mt.) behind Spain (38,905 mt.) and Italy (37,047 mt.). Belgium came in 8th position (2848 mt.).

According to the FRAC (Fungicide Resistance Action Committee) fungicides cover chemical molecules that can have a wide range of modes of action and can act on: nucleic acid metabolism, cytoskeleton and protein constitution, respiration, amino acid and protein synthesis, signal transduction, lipid synthesis or transport, membrane integrity or function, membrane sterol biosynthesis, cell wall biosynthesis and melanin synthesis in cell walls. They can also act at different sites. Some fungicides have unknown modes of action and others act at multiple sites. There are thus 76 (47 + 29) FRAC[1] codes, each code corresponding to a type of activity with a specific or multiple target. Knowing this, it can be deduced that apart from the fact that they destroy fungi, their harmlessness to pollinators may vary greatly depending on their active ingredient, mode and site(s) of action.

Fungicide residues

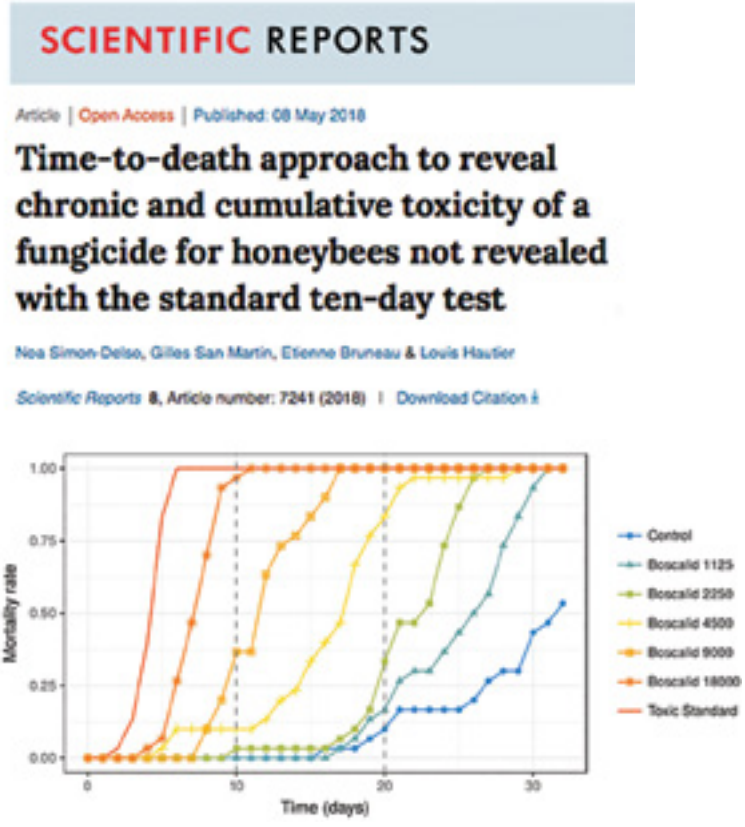
Given their widespread presence in the environment, it is quite logical to find them in the products of the hive. A review of studies that have analyzed the presence of pesticides in various bee matrices confirms this fairly widespread contamination. One can take the example of the results of the Italian BeeNet[2] study which covered the whole country. If they highlighted the presence of funcigides on bees in certain years, it is at the level of bee bread that the frequency and concentrations were the highest. In the Beesyn project, which sampled about a hundred apiaries in Belgium, pesticides are the molecules most frequently found in the bee matrices sampled (bee bread, honey and wax).

Knowing this, it is questionable what impact they can have on the colonies. To date, we have not found any publications relating to field trials showing a direct relationship between the phenomena of poisoning with fungicides. On the other hand, the study carried out in the Walloon Region «Experimental approach to unexplained mortality of bee colonies in Wallonia «[3] shows that more fungicides are found in colonies showing signs of decline than in colonies without signs. This may be related to a direct effect of fungicides. They are found because of their slower degradation dynamics in the environment. Bee decline was also linked to the presence of a culture environment. This study also highlighted the link between the cultivation areas near apiaries and the probability of decline. Work by the USDA-ARS Honey Bee Breading, Genetic and Physiology lab in Baton Rouge[4] showed that the presence of fungicides in bee bread was linked to dieback at different times of the year.

Furthermore, it was found that a hot, dry period in 2018 was followed by a winter with low mortality. It is known that during these summer periods the bees collect the pollen needed for overwintering and that the amount of fungicide used is lower than in colder, wetter years. Luxembourgers have also shown that relatively cold (17.2 ± 1.4°C average monthly temperature) and humid (110.8 ± 55.5 mm/month) conditions in July have been associated with greater losses in Luxembourg[5].

Toxic fungicides

In light of this, is there any research that shows a direct link between fungicides and toxic effects on bees? Here are some publications that show toxic effects directly related to certain fungicides.



The first[6] clearly shows an effect of Boscalid on the life span of bees. If, during the first 10 days of intoxication, no effect can be observed, after a fortnight, the life span of bees subjected to Boscalid at doses ranging from 1250 to 4500 ppb is rapidly reduced compared to control bees. It should be noted that Boscalid belongs to the new family of SDHI (succinate dehydrogenase inhibitors). These fungicides target the cellular respiration of all living organisms. The targeted enzyme, once blocked, leads to the accumulation of a small molecule, the succinate, which has a direct impact on the epigenome. A defective SDH enzyme, even partially, leads to profound metabolic changes and epigenetic modifications (hypermethylation of histones and DNA), which are at the origin of diseases. Toxicity is not immediate.

These contaminants are not genotoxic (do not induce mutations) and do not kill cells. Thus, according to these criteria, assessment agencies do not consider them toxic to humans and the environment. Some, however, are alerting public opinion to the need for a real assessment to be realized.

A study[7] on the diet consumed by larvae contaminated with prochloraz (an imidazole-based fungicide that can alter the immune genes of bees at different stages of development) may present a danger for the development of immunity and the detoxification mechanisms of bees.

A third study[8] investigated the sublethal effects of chlorothalonil exposure on bee immunity, nutrition and development. It thus demonstrated effects on:

1) resistance and/or tolerance to viral infection of bees by decreasing the survival of bees following a viral challenge (contact with viruses) ;

2) social immunity, by increasing the level of glucose oxidase activity;

3) nutrition, by reducing total carbohydrate and protein levels;

4) development, by reducing the total weight, head width, wing and body length of adult nurse bees and foragers.

Synergistic effects with other pesticides may also be observed. For example, combined toxicity was noted between the fungicide propiconazole and the insecticide chlorantraniliprole at rates used in almond orchards in California[9].

Effects were also demonstrated on bumble bee colonies[10]. Within one month, fungicide residues caused a decline in bumble bee colonies in experimental cages.

Through the use of powerful molecular tools, the ecological complexity of the pollen microbiome can be better resolved. A plethora of naturally occurring bacteria and fungi collectively contribute to the maintenance of the colony's fitness. In particular, yeasts that have been isolated from pollen are known to have bactericidal properties and will promote fermentation, both of which are essential for the development of bee larvae. Such ecological associations suggest a high degree of mutualism between bees and the pollen microbiome. In the absence of these key symbionts, pollen supply appears to be compromised to unknown degrees.

In summary, it can be said that some fungicides may have an effect:

- on the bees' diet,
- on the life span of the bees,
- on the development of bumblebee populations,
- on the immune system due to synergy with pathogens and/or other pesticides.

It can therefore be assumed that some fungicides may be involved in bee decline phenomena.

Unfortunately, current laboratory tests do not show such effects and it is therefore essential to be able to demonstrate the potential delayed toxic effects of some fungicides. It is therefore necessary to review the current duration of the tests in order to be able to analyse the effects of fungicides on the total life span of the bees. Tests related to the feeding and digestibility of pollen subjected to fungicides are indispensable.

This will require an improvement of the guidelines which are not yet approved in their current form. BC

The origin of this paper was a conference Etienne gave at the FNOSAD congress in Mâcon (France) last October. It has been published first in the Belgium beekeepers journal «Abeilles & Cie». And it was in this late and somewhat modified version in the journal «La Santé de l'Abeille». Reprinted here with permission.

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Clarence H. Collison

Honey Bees Pollinate Trade Opportunities

Andrea **Durkin**

Harvesting season in the Central Valley

Stretched across some 500 miles throughout California's Central Valley, almond hulls are splitting open, signaling the beginning of harvesting season.

The U.S. Department of Agriculture is forecasting that California's almond growers are set to produce a bumper crop this year of about 2.5 billion pounds, about 70 percent of which will be exported around the world.

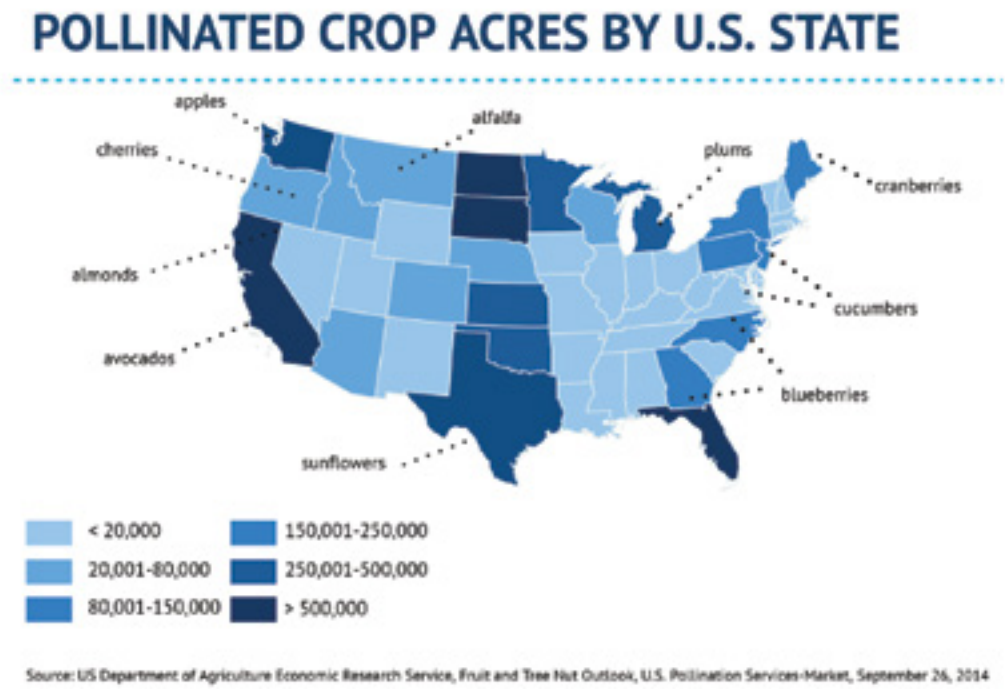
It's an industry that drives about one-quarter of California's farm exports and generates about $21.5 billion in economic output for the region including growing, processing and manufacturing activities.

A productive crop must be nourished

California is blessed with the perfect climate for almond production, but it must import one of its most important ingredients: pollinators for the almond blooms.

Every February, more than two out of every three commercial beehives in the United States are transported to California, their bee residents pressed into service of the almond bloom.

In fact, it's just the start of an annual food pollinating bee tour. Anywhere from 60 to 75 percent of the bee population kept as livestock crisscross the United States foraging on the blooms of crops that will eventually make their way into our grocery stores and into overseas markets.



Source: US Department of Agriculture Economic Research Service, Fruit and Tree Nut Outlook, U.S. Pollination Services-Market, September 26, 2014

Millions of bees are "exported" state to state to pollinate 90 different American crops.

First stop, almond orchards

For most commercial bees, the pollinating season begins with almonds, California's largest crop. To provide a sense of scale, Scientific American estimates it takes some two million hives – more than 31 billion honey bees – to pollinate the Central Valley's 90 million almond trees during their two-week bloom. It's a symbiotic relationship: the bees gather nectar and pollen to feed their colonies, enabling them to triple their population.

Once almonds bloom in January, hives are moved to other spring-blooming orchards such as cherries and plums in California or apples in the Pacific Northwest. Some head to Texas to pollinate squashes, others to citrus fruit orchards in Florida, and others are dispatched to pollinate cranberries in Wisconsin and cherries in Michigan.

In all, these busy bee travelers pollinate over 90 different crops and then sweeten the deal by shifting into delicious honey production by the end of summer, which they will nourish themselves on over Winter while we get to consume the rest. Americans consume a staggering 1.6 pounds of honey per person every year. Even though U.S. beekeepers produced 148 million pounds of honey in 2017 and exported 9.9 million pounds, we imported 447.5 million pounds to keep up with demand from consumers and food producers.

One in every three bites of food

From cucumbers and citrus fruits to watermelon, kiwis, berries, cherries, apples, melons, peaches, figs, tomatoes, pumpkins and almonds, one-third of the U.S. food supply relies on pollination by the hard-working honey bee.

And, of course, since the United States is a major exporter of agricultural crops, we could say that honey bees help pollinate our trade opportunities. That's true globally for hundreds of billions worth of crop production and internationally traded food that depends on pollinators.

Healthy bees, healthy trade in food

When bees get sick, the health of the U.S. agriculture economy and agricultural exports is imperiled.

Although honey bees are not the only pollinators supporting U.S. agriculture, they are the most important, adding more than $15 billion in value to U.S. agricultural crops each year according to the U.S. Pollinator Health Task Force.

Colony collapse disorder over the last few years drew widespread attention, but the decline in North American honey bees is a long-term trend. In 1947, there were about six million colonies but today we are down to about 2.5 million.

Sharp declines were seen following the introduction in 1987 of an external parasitic mite, aptly named *Varroa destructor*, that feeds on the fat bodies of honey bees. Loss rates over the winter have been averaging around 31 percent since 2006, far exceeding the 15-17 percent that commercial beekeepers say is economically sustainable.

The rise of monoculture agriculture with increased reliance on pesticides and reduced use of cover crops is thought to add stress on bee health. The bees are struggling to maintain a varied and high-quality diet – they need protein from pollen and carbohydrates from the nectar of flowering plants. Without adequate nutrition, they are also more vulnerable to viruses.

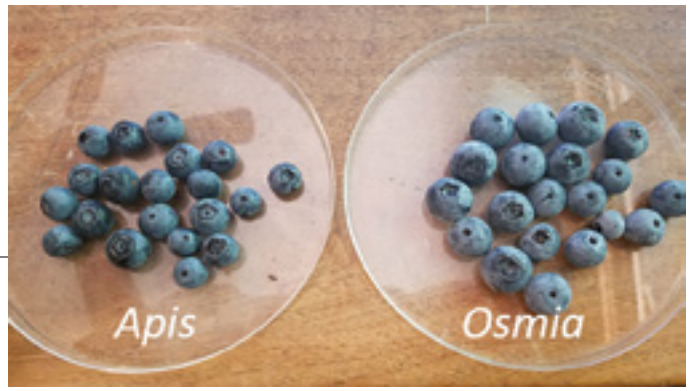
Experts have organized into research consortia, working groups and task forces to try to determine what can be done. The factors negatively impacting bee health are multiple, complex, and interacting, requiring a similarly comprehensive approach to combat them, including restoration of habitats, dissemination of best practices in hive management, and investments in research to better understand how to prevent colony loss. We are all invested in their success, and when you see honey bees buzzing around your garden, think about the humble but essential role their busywork plays in U.S. food production and agricultural exports. BC

This article was originally published in TradeVistas.org, ***https://tradevistas.org/honey-bees-pollinate-trade-opportunities/#top*** *"*

Assessing Pesticide Exposure Risk To Mason Bees

Christine **Fortuin**

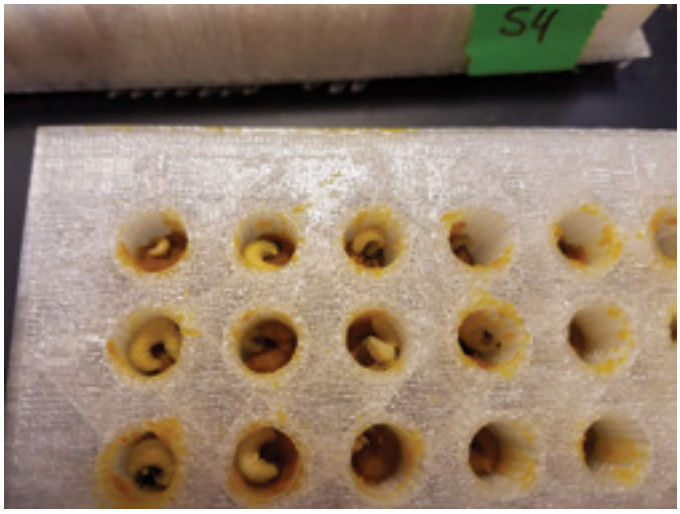
University of Georgia Warnell School of Forestry and Natural Resources, Forest Entomology Lab. **www.forestbees.org**



Pesticides are often implicated as contributing to pollinator decline, however an understanding of toxicity in combination with exposure risk can help inform bee-friendly management practices, mitigate risk and promote pollinator health. While our understanding of both pesticide toxicity and exposure risk to honey bees has greatly improved over the past two decades, our understanding of toxicity to *Osmia* is moderate, and understanding of exposure risks to *Osmia* and other pollinators is much farther behind the curve. One major knowledge gap is the question of how soil residues of neonicotinoid pesticides might affect bees which collect soil for nesting. Many neonicotinoid pesticides can persist in soils after application, and therefore bee species which interact regularly with soils may be at risk of exposure to residues. Because honey bees (*Apis mellifera*) do not interact with soil, the current imidacloprid risk assessment used by EPA does not consider contact with soil as a potential exposure pathway. The objective of our study is to contribute to understanding of both toxicity and exposure risks to *Osmia* at all life stages, focusing on soil-based exposure, and to collect data which can inform future risk assessments and management practices which are protective of not just honey bees, but also our many species of solitary bees including *Osmia*.

We designed a series of experiments to determine exposure risks to adult nesting females as well as developing larvae. Laboratory-reared *Osmia lignaria* (Blue Orchard Mason Bee) females were exposed to three different levels of imidacloprid in soil, then individually marked and released in large flight cages enclosing rabbiteye blueberry (*Vaccinium ashei* Reade) shrubs. Nesting behavior and progress was observed and tracked over a three-week period, and impact of pesticide exposure on nesting behavior and nesting productivity were assessed. Fruit set and berry size of blueberries pollinated by *O lignaria* vs. those pollinated by honey bees were also assessed to determine pollination efficiency of *O. lignaria* on blueberry. Because Osmia collect mud, we recognized that soil moisture levels may need to be considered when assessing exposure risk. Thus, another group of *O. lignaria* bees was reared in small bug dorms in the laboratory and exposed to the same residue concentrations with two differing soil moisture levels. To determine effects on developing larvae, *O. lignaria* eggs and early instar larvae were grafted onto pre-made soil partitions which had been treated with differing concentrations of imidacloprid and observed daily in the laboratory during development. An additional experiment is being developed to determine female preferences for soil, and whether actively nesting females are capable of 'choosing' uncontaminated soils.

Preliminary results indicate that acute exposure to adult females has negative impacts on nesting behavior



Larvae feeding tray.

Field cage.

and reproductive output, and that mortality is increased with exposure to soils at moisture levels higher than 30%. There is some indication that females may select uncontaminated soil to use in their nests, however they still interact with the contaminated soil before making their selection, which means the risk to the adult female may still be a concern. Larvae appear to show some resistance to exposure, and mortality and development of larvae appear unaffected, however all results are preliminary at this time. Once final results have been determined, we intend to conduct risk assessments for soil exposure and make recommendations for management of soil drench applications in forestry and orchard systems.

An additional finding of this study was that blueberries pollinated by *O. lignaria* were on average 1.6mm larger in diameter and 0.45 g heavier than those pollinated by honey bees, a difference which was clearly visible to the naked eye. Recognizing that *O. lignaria* does not generally prefer blueberry flowers when other resources are available, other species of *Osmia* in the southeast are important for rabbiteye blueberry, and *O. lignaria* can be considered a surrogate for pollination efficacy of *Osmia* species in general. It appears that *Osmia* species are able to produce larger, more marketable blueberries than do honey bees. BC

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Dr. Tom Seeley's Evolutionary Adaptedness

David **MacFawn**

Is There Progress?

Dr. Tom Seeley, professor at Cornell University, has made 14 suggestions to improve colony performance based on what he has found with wild colonies (see the final chapter in his book, *The Lives of Bees*). These suggestions are currently being implemented in the Columbia, South Carolina, area but we have found trade-offs need to be made. This article discusses our progress to date and trade-offs made.

Implementing 11 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
10. Do not disturb the colonies in the Winter – no feeding syrup or pollen
11. 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

1. Space the colonies as widely as possible; the average number of colonies in the wild is 2.5 per square mile;

The Congaree River basin is largely swamp. This makes it nearly impossible to do bee lining and determine the colony density in the area. Dr. Tom Seeley indicated, "I think wide colony spacing is for bees like clean air is for us: something that is healthful, but not essential, for survival. In the Congaree River beeyard, two hives were placed on an eight-foot landscape timber on top of three cement blocks. The eight-foot landscape timber hive stands were spaced approximately five to ten feet apart facing different directions.

2. Use small hives consisting of one deep and one shallow; colonies will produce less honey but will be healthier

Wild colonies average five to eight combs. The eight-frame equipment was used as a trade-off between 10-frame equipment and five-frame NUCs. Five-frame NUCs take more management to keep from swarming and help survive the Winter. Also, with eight-frame equipment, the brood nest is mainly in the bottom deep box with the nest expanding up into the medium food chamber during intensive spring brood rearing. This results in pollen storage around the brood nest in the upper food chamber. Eight- frame equipment does not have the extra space that ten-frame equipment has but is not needed.

3. Use rough-cut lumber on the inside to encourage an increase in propolis coating

Allen Johnson and Robert Abshire (**johnsonsbeesupply.sc@gmail.com**) in Williston, South Carolina, custom made eight-frame brood chamber deeps and medium supers out of dimension rough-cut yellow pine lumber. The dimensions of rough-cut lumber are variable, so they made sure the inside dimensions were correct for a standard eight-frame hive. This resulted in some outside variable dimensions. The equipment was glued and nailed. We replaced all the hive equipment with this rough-cut dimension lumber as of February 2020. Rough-cut equipment is its own type similar to commercial-grade equipment. Solid bottom boards are used with the entrance reducer on the smallest spacing, no screened bottom boards. In the wild, trees have "infinite" wood on the top and bottom of the colony resulting in more insulation on the top and bottom than Langstroth hives. Of significant concern is heat loss through the top, so two 23/32" Advantech tops are being used with solid board insulation between the tops. The inside roof needs to be kept warm in the Winter so the humidity coming up from the brood nest spills over to the cooler side and condenses on the sides and not the top. This will keep the moisture from raining down on the cluster in the Winter.

The inside propolis coating will be assessed after one year of equipment use. This assessment will determine what percent the inside rough surfaces are entirely covered with propolis.

4. Target diverse pollen sources for the location as much as possible

A special beeyard location was obtained along the Congaree River, across the Congaree River from Congaree National Park, outside Columbia, South Carolina. This site has a unique warm ecosystem with plentiful Tupelo Gum trees (*Nyssa aquatica*), American Holly (*Ilex opaca*), Sparkleberry (*Vaccinium arboreum*), Tulip Poplar (*Liriodendron tulipifera*), and a large variety of flowers.

5. Maintain 10- to 20- percent drone comb

Deep frames with a one-inch foundation starter strip at the top of the deep brood frames were used. This will result in the bees building comb with an average of 17 percent drone cells. We do have some frames with all foundation/drawn comb that are being transitioned out of the hive.

Foundation usually only has worker-size cells; in the early part of the 20th century it was thought the more workers available would result in more honey. For the most part, this has been found not to be true. In recent years the philosophy has changed to the view that healthy colonies usually produce many drones, but weak colonies usually do not produce many drones. Healthy colonies have more workers.

We will measure the drone comb amount.

6. Obtain and keep bees adapted to your location

This is done by utilizing walk-away splits located in the area/beeyard location we want the bees to adapt to. The half of the walk-away split without the original queen will raise themselves another queen that will be mated locally. If the queen is not healthy or is a poor layer, then the bees may supersede her or the beekeeper can promote this by actually removing the queen. If the queen is removed, a concern is that there are enough workers available to get through the queen transition. Raising and mating queens in the area you want your colonies adapted to will also work.

Rough-cut dimension eight-frame equipment. (MacFawn photo)

7. Keep the nest structure intact; keep the original frame location in the hive and the original frame orientation; do not reverse boxes

Most beekeepers today need to keep the original frame location in the hive and original frame orientation. It is important not to reverse boxes. The brood nest should not be split in cold weather by reversing the boxes. Usually, the queen will go down into the lower region of the hive on her own.

8. Use two-inch bottom opening: no top entrance

This is easy to do by always using the two-inch orientation of the entrance reducer. In the wild, there is "infinite" insulation on the top and bottom of the colony. This results in condensation occurring on the frame bottoms and not at the top of the hive. Water/moisture in the Winter is used by the bees rather than having to forage for water in the Winter, or water condensing on the hive top and "raining" down on the colony, chilling the colony in hives with poor top insulation. The hive top will be insulated such that the inside bottom of the cover is warm and the moist air condenses on the hive sides or frame bottoms.

9. Allow condensation during the Winter in hives is the Winter water source for the bees

See #8 above for an explanation of condensation as a water source for bees in Winter.

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

By feeding syrup or pollen, a false nectar or pollen flow is created. This makes the bees adapt to this false flow, resulting in the bees consuming more stores, out of sync with nature, and the local environment. If the colony is light in the fall, then fall feeding can be done.

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

The nectar flow typically starts April 1 in the Columbia, South Carolina, area. We split the end of February at the earliest. If we split the end of February, it means first workers from the queenless split emerge mid-April, with the first foragers typically three weeks later or the first part of April. The flow is over usually the first week in June.

At the end of February 2020, I split all the Congaree colonies (except one) that had at least a full brood chamber and medium food chamber full of bees and brood. There were enough bees to cover all the brood in both split halves for the cool weather we were going to have for the next week (lows at night in the mid-30sF.). I therefore did individual walk-away splits and did not do over/under splits as I originally planned. There are now nine colonies/splits in the Congaree bee yard. I divided the brood/honey/pollen equally between the splits and made sure there were eggs/young larvae in both splits so I did not worry which split had the queen.

By feeding in the midstate area of South Carolina from the end of February, when some splits are made, until

the nectar flow around the first of April, I am violating the no- feeding syrup recommendation. By feeding syrup, I am implementing another false nectar flow, but this is necessary to keep the bees alive. I suspect if I did not feed from the end of February to around April 1 the bees would adapt and start swarming around the first of April. The first year I plan to feed 1:1 syrup until the nectar flow starts the end of March/first of April. After the walk-away split queens have mated locally the first year, the colonies will not be fed the second year.

We can treat the high-mite colonies with Mite Away Quick Strips (MAQS) and requeen rather than euthanize. However, note that treating may interrupt the bee gut microbes. The colonies with high varroa mite loads will be moved to a nursery yard.

Monitoring *Varroa* mite levels and treating if necessary is especially important beginning the end of May through November in South Carolina. Mite levels should be monitored at least monthly, if not bi-monthly.

Progress has been made in implementing Dr. Tom Seeley's Environment of Evolutionary Adaptedness (EEA). Some tough decisions need to be made such as feeding and reversing boxes. Colonies that are not adapted will be lost, but splits and queens raised in the local environment will quickly ensure the bees are adapted to the local environment. Consideration initially may be made to feed splits but to allow open mating in the local environment which will help ensure the queens adapt to colonies surviving locally.

We need to consider being able to find an isolated nurse yard to move issue colonies to. I am not sure that some colonies can sustain a higher mite load then others, so there is the issue of mites contaminating other colonies if I do not euthanize them. Also, by using Mite Away Quick Strips (MAQS), I am impacting both good and bad gut bacteria which may be an issue.

It seems most beekeepers trying treatment-free beekeeping only have their colonies last two to three years. We will see how this beeyard in the Congaree Park area survives; yes, I am doing a calculated gamble. BC

Dr. Tom Seeley's Environment of Evolutionary Adaptedness (EEA) *and the Valentine Hive, Bee Culture*, David E. MacFawn, November 2019.

Deep Forest Bee Hunting Robin Radcliffe and Tom Seeley. *American Bee Journal,* Volume 158, No. 8, August 2018.

Summer Time Recipes

Shana **Archibald**

Hot Honey Corn
4 cups water
1 cup milk
1 stick (8 tablespoons) unsalted butter
1/2 cup honey
1 teaspoon red pepper flakes
1 teaspoon kosher salt
6 ears corn, shucked and halved

Fill a large pot with water and bring to a boil over medium-high heat. Add milk, butter, honey, red pepper flakes and salt. Carefully add corn and reduce the heat to medium. Boil the corn for eight minutes. Use tongs to remove the corn from the butter bath and serve immediately.

Simple and delicious!

Honey Garlic Ribs
2 racks baby back pork ribs
1/3 cup Soy sauce
1/3 cup apple cider vinegar
2/3 cup honey
6 cloves garlic
1/2 tsp black pepper

Preheat the oven to 250°F.

Place the ribs meat side down on a cutting board and use a knife, to slide it under the membrane covering the back of the ribs and pull it off. This ensures that the sauce will penetrate the meat, adding more flavor.

In a bowl whisk together the soy sauce, vinegar, honey, garlic and pepper.

Place a large piece of tin foil on a baking sheet or a large baking dish, place the ribs, meat side down, onto the tin foil and then pour the sauce over top making sure that it coats both sides.

Fold the tin foil up over top of the ribs and pinch the sides together so that the ribs are completely covered. Place the tray in the oven and bake for two hours removing from the oven and basting in the sauce every 30 minutes.

After two hours the ribs should be tender. Turn the heat up to 350°F and flip the ribs over so the meat side is facing up, baste in the sauce and then leave them to cook for 15 minutes uncovered so that the meat browns on top. Brush the ribs with more (if desired) sauce before serving.

Connie **Krochmal**

Summer Blooming Bee Plants

The Northeastern region has a rich array of bee plants that bloom during the Summer. This article highlights some of the major nectar and pollen plants in the area. Among those are natives, cultivated plants, and naturalized species.

Although fuchsias are typically thought of as tender plants, at least one species is hardy to zone six and thrives in the Northeast. **Magellan fuchsia** (*Fuchsia magellanica)* is an erect, vigorous shrub that is evergreen in warm areas and deciduous elsewhere. One variety is reportedly hardy in zone five if given a sheltered spot.

Unlike the large-flowered fuchsias, this one has very slender, petite, bicolored blossoms with pollen and nectar that is easily accessible to bees. With a purple corolla, the flowers contain red tubes and dark red sepals. The blossoms are present from mid-June into Fall.

One particular **teasel** called the cut-leaf teasel (*Dipsacus lacinatus)* has naturalized in the Northeast. It can be found in damp ditches, prairies, meadows, savannahs, and along roadsides. The plant features bristly, hairy leaves and prickly stems.

Opening from July through September, the blossoms are usually white, but occasionally can be lilac. These form heads surrounded by bristly bracts. The teasels are excellent bee plants.

Bees love the flowers, which bring pollen along with lots of nectar. A good crop of honey can result. The thin bodied honey is water white to transparent with a fair to excellent flavor, although the taste can vary slightly.

The various kinds of **thyme** thrive throughout the Northeast. These very hardy, evergreen herbs are hardy to zone four, depending on the species. Usually less than a foot in height, they bear richly scented foliage and very tiny blooms that are eagerly sought by bees. The flower color varies from white or pink to mauve.

Thyme blossoms can provide a delicious, premium quality honey with an appealing thyme-like aroma. With a good body, this features a distinctive, mint-like flavor. The color ranges from golden to amber.

The plants can bring forty to over a hundred pounds of honey per colony. This honey is reluctant to granulate. Thyme is also a major honey plant in the western half of the country.

Spotted knapweed (*Centaurea maculosa)* is an invasive species in the Northeast. It also occurs in many other areas in the East and West. The very common weed can be found along roadsides and in disturbed sites, waste places, old fields, and pastures. The plant is also known as star-thistle.

The blossoms typically appear from mid to late Summer, mostly from late June into August. These flowers resemble those of the cultivated cornflower except the color is different. Spotted knapweed blossoms are usually pinkish-purple to purple, but sometimes they can be white.

The outer petals form a fringe around the edge of the flower. The common name, spotted knapweed, refers to the black-tipped bristles around the base of the flowers that give the plant a spotted look.

Spotted knapweed is a major source of nectar with a good honey yield. The premium quality, delicate flavored, light colored honey has a heavy, thick body. Much in demand, it is reluctant to granulate.

Evodia or bee bee tree (*Tetradium spp.)* is one of the best known Summer-blooming bee trees. It is a member of the rue family. The most widely grown species is the fast growing, short lived, very floriferous Korean evodia (*Tetradium daniellii).*

Easy to grow, this typically reaches 30 feet in height with a matching spread. When in full bloom, evodia is a mass of white and is always humming with bees. Blossoms appear for three weeks or so in large clusters.

The individual blossoms are quite tiny. The flowers are sources of pollen and nectar, and are a favorite of the bees.

Several species of **smoketrees** (*Cotinus spp.)* are in cultivation. The plants can be either shrubs or trees. One species is native.

The blossoms begin appearing in early Summer and continue for weeks. With five small petals, the rather inconspicuous flowers are small – only 1/8th inch wide. The flower color can vary slightly by species, but is typically yellow or green.

The main source of color for the smoketrees is the showy hairs on the flower stalks. These are usually pink or red, but occasionally are purple. They account for the smoky effect for which the plant is named. Easy to grow, the undemanding plants are good sources of nectar.

The various kinds of **smartweeds and knotweeds** are major bee plants. Japanese knotweed (*Polygonum cuspidatum)* is an invasive perennial that has now naturalized in many states, including much of the Northeast. Often shrubby, this species spreads by rhizomes and offshoots.

This exotic can reach 10 feet in height. Very floriferous, Japanese knotweed is covered with small

Spotted Knapweed

Evodia

flowers, up to ½ inch in length. These can begin emerging in late Spring, but typically most flowering occurs during the Summer, lasting until October or so.

The male and female blossoms appear on separate plants with the former being erect while the latter are drooping. The whitish-green blossoms, which lack petals, contain five sepals and a winged calyx.

Well liked by bees, Japanese knotweed flowers provide bee forage when little else is available. The amber honey has a pleasing flavor.

The **common viper's bugloss** (*Echium vulgare)* is a major bee plant in both the Northeast and Southeast. My USDA list of bee plants refers to this plant as blue thistle. All of the various species of bugloss are long blooming plants.

The plant typically behaves as a biennial, flowering the second year. However, I have also seen this bloom the first year as well. It has naturalized in some areas of the East.

The 2½ foot tall, coarse looking, untidy plants are covered with bristly hairs. For that reason, I always wear protective clothing and gloves when working around it.

Flowering takes place from early Summer until frost. The very floriferous plant bears flower spikes all along the length of the stems. The bell-shaped to funnel-like flowers are quite showy.

When they first emerge, these are pink, but later turn blue. Bees absolutely love these flowers. Viper's bugloss provides lots of pollen and nectar. The delicate tasting honey is white to light amber.

Smoketree

Common boneset (*Eupatorium perfoliatum)* is a common wildflower that is found over much of the eastern half of the country. The clump forming, coarse, hairy, short lived perennial is hardy to zone three. This species is easy to distinguish from the related species by the fact that the distinctive, eight inch long foliage joins together at the bases to surround or perforate the stem.

This can reach 4½ to six feet in height. While most bonesets and other eupatoriums tend to bloom during the late Summer into the Fall, this species begins flowering earlier than most – in late July and continues into October.

Typically creamy white, the rayless blossoms are occasionally blue, purple, or purple-tinged. They feature flamboyant white corollas and long showy styles that resemble threads.

The blooms form dense, loose, terminal, flat topped clusters. Each crowded, round flower head can contain over a dozen blooms.

Various kinds of vine crops are major bee plants in this region. These include cantaloupes, cucumbers, gourds, watermelons, pumpkins, and squash. Other Summer blooming bee plants in the Northeast include sunflowers, the various kinds of thistles, golden honey plant, basswood, buttonbush, chicory, butterfly bush, black eyed susans, anise hyssop, purple loosestrife, snowberries, tickweeds, lavenders, and sumacs.

The Dogbanes (*Apocynum spp.)*

While the above species have appeared in previous articles, the dogbanes haven't. These are members of the dogbane family. Around a dozen species are found worldwide with three of those occurring in America.

These shrubby native plants can be found in prairies, savannahs, sand dunes, sandy woodlands, rocky bluffs, roadsides, woodland borders, open sites, dry thickets, and abandoned sandy fields.

The dogbanes bear a resemblance to the milkweeds although their flowers are by no means similar. Like the milkweeds, their foliage exudes a milky sap.

The leaves can be opposite or alternate. These bloom most heavily in July and August, but flowering can continue into the Fall.

The fruits are cylindrical, slender follicles on long stalks. The seeds are covered with downy fluff similar to that seen in milkweed pods. The wind spreads the seeds to new locations. The dogbanes can be toxic if they're consumed.

In addition to the two species featured below, another one called **intermediate dogbane** is found in all of the mainland states except for Oklahoma, Louisiana, Mississippi, Alabama, and South Carolina. It is widespread but not very common. This is believed to be a naturally occurring hybrid of the spreading dogbane and Indian hemp.

Depending on the source, its Latin name is either *Apocynum medium or Apocynum x floribundum.* This plant basically shares the traits of the two other species. It features lovely pink blossoms and red tinges on the lower stems.

Viper's bugloss

Spreading dogbane (*Apocynum androsaemifolium)*

Hardy to zone three, spreading dogbane occurs in all of the mainland states except for Florida, South Carolina, Louisiana, Mississippi, and Kansas. This species is also called honey-bloom and wild ipecac.

Typically two feet in height, it can occasionally reach four to six feet. The shrubby, stout, branched, tap rooted perennial is wide spreading. The stems can develop a reddish tinge.

The opposite, drooping, deep green foliage is two to three inches in length and half as wide. The ovate, pinnate leaves are lighter colored beneath. They can be hairy on the underside.

Often nodding, the relatively small, showy, whitish or pink, bell-like, bisexual, scented blossoms are 1/3 inch wide. A pink stripe runs along the center of each lobe to the corolla.

Blossoms emerge from June through August. Up to six inches long, the follicles form pairs on long slender stems.

Spreading dogbane does indeed tend to spread readily, and can crowd out slow growing species.

Indian hemp (*Apocynum cannabinum)*

Hardy to zone four, this is also known as hemp dogbane, Choctaw root, and Canadian hemp. It is relatively easy to distinguish Indian hemp from spreading dogbane as the former is usually taller – around four feet.

This erect, branched perennial features stems that are covered with stringy bark, which was used by Native Americans for fiber. Indian hemp has also been cultivated for the fiber. Indian hemp root was once used to induce vomiting.

This species bears much larger leaves than spreading dogbane – six inches long and half as wide. The opposite foliage is ovate to elliptic and can be hairy beneath.

Very floriferous, this wildflower bears both axillary and terminal flower clusters. The whitish-green, urn shaped to bell-like blossoms are ¼ inch across. The blooms typically emerge during the Summer, mostly from early Summer into August.

The seeds are borne in pairs within the long slender follicles, which are four to eight inches long.

Bee Value of the Dogbanes

Both species are considered good bee plants. Bees collect pollen and nectar from dogbane blossoms. Appearing over a long period of three months or so, the flowers are a favorite among bees.

As major nectar plants, these can bring large honey crops. The nectar flow is best during dry periods.

The honey is very white with an excellent flavor. This is considered even better tasting than fireweed honey. It has a heavy body.

Growing the Dogbanes

These wildflowers are cultivated as ornamentals. The creeping roots allow the plants to spread.

Typically, division is the preferred method of propagation although seeds can also be used. The ideal time to divide dogbane plants is when they're dormant. The seeds should be collected in the Fall once they ripen. Sow them at that time.

On the whole, the plants do best in poor, dry soils, and that is especially true for spreading dogbane. The preferred soils are ones that are either rocky, sandy, or barren.

The plants also adapt well to moderately moist soils. Although full sun is best, the dogbanes will also grow in partial to full shade. BC

Connie Krochmal is a beekeper and plant expert living in Kentucky.

BIGGER PICTURE

Jessica **Louque**

Keeping Honey On Hand

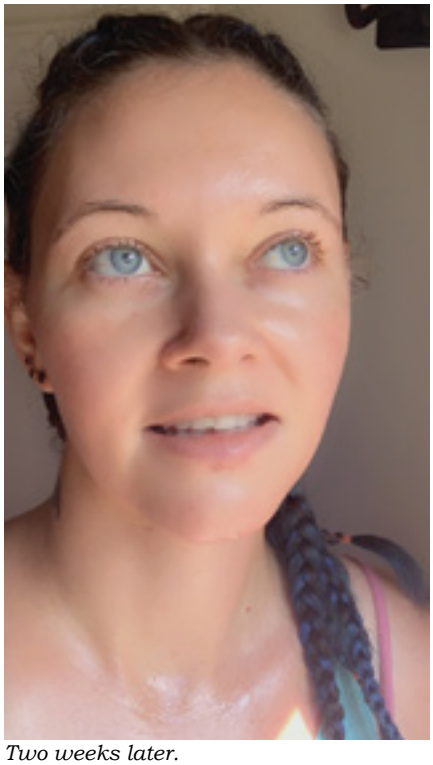
Most of you probably don't know that I am one of the most accident prone people on the planet. I started breaking bones at six years old at Vacation Bible School, with my best friend (to this day) accidentally snapping my wrist in half. I've broken, chipped, dislocated, and fractured more bones than I can remember, only counting the major breaks up to this point. It's not that I have weak bones – I just hit them really hard. My last major break was helping a friend move when it started raining. Her dad was helping me throw a tarp over my truck and tie it down with a bungee cord. The rain made them slick and he lost his grip on the hook on his side, spinning out of his hand and into my eye socket, cracking through the bone. It was so swollen it took a week to be able to X-ray it. I was lucky to not lose an eye. To date, this is the longest I've went without a broken bone, that is until two weeks ago. Lots of people have tried to tell me I'm getting too old to do things, and I laugh because it's just normal. Also, why should I stop doing things I like just because everyone is afraid of getting hurt? Fear is a dumb reason (to me, anyway).

George, Henry and Charlie – the true skateboard experts.

All of my kids skateboard, to varying degrees of success. I haven't been on a skateboard since college, and I wasn't good then. My thought process was that I'd try longboarding since I was more interested in keeping up with my kids on wheels than doing tricks and longboards are a little easier than a skateboard. I was trying out Maggie's longboard since she didn't go with us. Things were going pretty well as far as I was concerned, as we were on the greenway and made it about a mile with no accidents to the end. I wasn't as fast by any means, but I was gaining speed and balance. We were coming back and Henry encouraged me to go down this little hill. I don't know why I thought this was a good idea, and I started wobbling about halfway down. It took until the bottom to lose control, so there's that. The hill was there because it was an underpass, and the entire area was concrete and asphalt. When Charlie used Maggie's board the week before, she said he did something to it and I didn't want to break her board. I tried to catch it with my foot and ended up doing a Chinese split with the insides of my legs totally on the ground but my right foot still on the board. I felt my hamstring tear just as the board kept going and I tried to grab it. Using my hand to stop the board meant there was nothing to stop my face from hitting the pavement and I slammed my chin so hard my front teeth came all the way through and I chipped off part of one of my front teeth. This was probably lucky in the long run because if my teeth didn't go through skin, I probably would have broken both my teeth in half. Later I found out I also had a hairline crack in my jawbone. In the meantime, I hit my face so hard I didn't feel my arm snap and I broke my thumb and my radius at the thickest part near my wrist, popping it apart neatly and compacting it right back into place but maybe 1/8 inch off. I had road rash from my chin to my nose, ripped a hole in the knee of one of my favorite pairs of leggings (they have an American flag on one side and the Statue of Liberty on the other), and somehow pulled a chunk of skin off my heel while still wearing my shoe. My boys were freaking out once they turned around. Only Charlie saw me fall, but you know face injuries bleed like a stuck pig and make everything worse. I wouldn't let them take me to the hospital because of multiple reasons, like coronavirus restrictions, I hate hospitals and their bills, and I usually can evaluate myself fairly well between EMS training and personal experience. After a fitful night, I realized I could feel bone grinding and decided to go to an urgent care to check on my arm and see what kind of angle the break was.

As a beekeeper audience, I'd like you to imagine the conversation I had in the room with the nice ladies explaining that I was not going to let them put a hard cast on me because

Two days after the accident.



Two weeks later.

I still have to work in bees and the smell alone would make me get lit up like a Christmas tree and piss off the bees to no end. They put a soft cast on and referred me to an orthopaedic specialist. I ordered an air cast with thumb support from the internet and cut off the soft cast after a few days. Unfortunately, it's black, but it's washable and works really well. I did get a couple stings working, and the air cast did a great job because it has adjustable Velcro for when my hand swelled some. I can also wash it or take it off to work with the baby ducks and chickens and not get poop on it.

The thing is, the arm was a bad break. The thumb isn't concerning, and I messed up my face enough to be on soft foods for three weeks, but not need my jaw wired shut since there was so much other damage. The hamstring turned black after a couple days from my butt to my knee and it will probably take longer to heal than anything. The road rash though – that was the most concerning to me out of all of it. Another thing you probably don't know is that I take skincare seriously. I wear almost no makeup, but I seriously take care of my skin. Having a lot of my face covered in cuts and scabs doesn't make that easy. I was also worried about scarring and getting an infection. As may be deduced from my dislike of doctors and hospitals (I've also been nearly killed a couple times from misdiagnoses and negligence that required emergency surgery), I also dislike taking pills and medicine, and avoiding antibiotics is a top priority of mine. My stomach is bad for weeks and sometimes months if I have to take them. I decided to go with what worked in the past for me, and I covered everything in tulip poplar honey. I'm not saying tulip poplar works better, but it's what I had on hand. I always keep some in an easy-to-use plastic jar with either a squeeze lid or large mouth lid for burns. It is my absolute go-to for burn injuries because nothing I've ever used blocks pain and heals like honey. For my knee and heel injuries, I kept them slathered with honey and extra-large Band-Aids replaced at least daily, if not twice a day. I covered my face injuries with honey twice a day, and used straight honey as a mask. I cannot stress to you enough how well everything has healed or is healing. I had no signs of infection, almost no scarring, and it kept the pain from drying out and pulling scabs minimal. It's not able to do anything for the inside of my lip damage, and I probably have permanently lost my ability to whistle. However, my nose, upper lip, and chin had no signs of injury after less than two weeks other than a small line on my chin. The new lip hole (which I drooled out of for two very sad days until it closed) is almost healed up, also with minimal scarring. This was the most concerning because my mother kept telling me I was going to end up with giant scar wrinkles all around my mouth. I'm not sure if that was supposed to deter me from future activities that are deemed dangerous, or a dig at my obsession with skincare, but my new longboard is already on order and I think my skincare obsession, along with gratuitous use of honey, helped to drastically minimize long-term damage. A few other people around told me stories of the use of honey to help stop infections and help wound healing when I told them about mine.

We don't make a lot of honey out of our bees since they are primarily used for research, but I will definitely make sure we always have a few bottles of our own stuff on hand for things like this. If you sell your honey, it might not be a bad marketing ploy to sell four ounce bottles with a red cross on them as first aid honey. To be honest, I find this to be by far the most useful aspect of honey, even more than cooking or eating, or probably out of any other bee product. If it can keep my face from scarring, it is absolutely deserving of the moniker "liquid gold" because it's worth its weight in gold. BC

Jessica Louque keeps bees and tries to keep up with the kids at home in NC.

Alice's Healing Herbal Salve

Alice **Eckles**

Whether it's for self-sufficiency to make your own health and beauty products for personal use and gifts, or to add a product to your honey sales, making salves is an easy and excellent use of the valuable beeswax you can accumulate through beekeeping.

If you typically use store-bought lotions you may not be aware of the many benefits of beeswax salves. I was once like that. I originally started making salves because my grandmother made salves, and as beekeepers we had the beeswax. I also thought it would be good for us to have another product to offer at our honey booth. What I've learned is that beeswax salves are superior to lotions and good for a lot more than moisturizing skin.

I developed a recipe for Healing Herbal Beeswax Salve that I make in artisanal batches for Dancing Bee Gardens. By putting samples out at our booth people can try them. I explain that they can be used as an all over moisturizer and because it is infused with certain herbs there are many other healing uses for the salve as well. I use it for almost all my first aid needs. Salves are also very handy for traveling, as a little goes a long way, usually packaged in a two-ounce tin, and solid so there's no trouble getting through security when traveling by air. Salves are very small compared to a bottle of lotion leaving more space in your luggage for other things.

I have made and used my Healing Herbal Beeswax Salve over the years and have come to know its virtues, from my research and intuition, to customer testimonials and my own experience. While I provide my recipe in this article, do not limit yourself to what I have done. Beeswax can enhance the herbal and moisturizing qualities of whatever ingredients you add. Your creativity and herbal knowledge will expand the opportunities for creating your own recipes and products.

Just as when making mead you can either flavor the drink with fruits, herbs, or spices or you can make a simple mead with only water, honey, and yeast, so it is in salve making. The simplest most basic salve ingredients are: beeswax and oil. And the process at its simplest is to melt one part of the amount of beeswax into three parts oil in a double boiler, then pour the mixture into containers to cool.

For my herbal salve I use the sun-infused oil method. I begin collecting my herbs near the end of the summer when all the different herbs that I like to use are in flower. I gather these, and if they are at all moist I dry them out a bit on a screen. Then I fill a gallon jar with the herbs and pour organic olive oil over the herbs to cover. I set my jar in the sun for two weeks. I push the herbs down so that there are as few air bubbles as possible.

Herbs in jars ready for oil to be added for solar infusion."

If the herbs aren't completely dry place them on a screen until they are dry to the touch."

The oils and herbs you choose for your salve will give it the special properties of those herbs and oils. Know your ingredients, and use what you know. You can get ideas by visiting an herbalist, or checking the ingredients in skin products you like and use. Think about what is inspiring you to do this and let your curiosity lead your research into the type of product you want to make. List any problems you want to address with the salve and let that guide your discovery of helpful herbs. I know that caster oil is great for healthy hair growth for example and have made a hair styling salve, with caster oil, beeswax, and essential oils for scent.

To start: Do you have inspiration? Do you have needs that a salve could solve or soothe? If you have decided to make beeswax salve gather all the herbs, oils, and wax that you will need. Make sure you have all your supplies before you start, and make sure they are labeled to prevent any mix-ups. You will need: clean beeswax, olive oil, a jar for solar infusing with herbs if you are doing that, a double boiler, cheese cloth for straining out herbs, essential oils for scent, containers to fill, and labels. Herbs for the most part are best collected and used immediately. You may need a screen for drying them if you can't find a dry time to collect them. See my Herbal Healing Salve recipe at the end of this article. Process your beeswax into clean smaller measured pieces like one ounce or eight-ounce blocks.

Next gather the materials you will need. What kind of containers will you fill with salve? Will you make some small test batches and reuse small glass bottles and tins or are you ready to place a big wholesale order for tins from a major company?

The way I like to make salves is to collect the fresh herbs. Most herbs will be more effective if fresh. Calendula is an exception and can be used fresh or dried. By observing the bees all summer on the flowers you will be aware of what nature is offering and in what quantities and locations. Every year is a little different. Bring a bunch of bags and visit locations where your chosen herbs grow. Harvest responsibly, by taking no more than one third of what's available in any one area. Also think of the quality of your herbal salve and don't harvest from contaminated sites. Find a sunny spot to put your jar, and fill it with clean dry herbs. Pour the oil into the jar over the herbs, pushing the herbs down to get out as many bubbles as possible. Your hand is going to be covered in olive oil so you want to be prepared for that with some sort of towel to wipe it off or just rub the oil into your bare arms and legs to moisturize. You could use a kitchen utensil to push down the herbs. I like to do this whole process outside because it can get messy. Put the lid on the jar tight and leave the mixture to infuse outside in the Summer sun for two weeks. Could you set it on a kitchen counter or in a sunny window? Maybe, but I've never tried it believing that direct sun is needed. If the herb oil mix doesn't have consistent and significant all over warmth, spoilage can occur. My intuition says no to indoor sun infusion.

After the herbs have infused into the oil by sitting in the sun it's time to strain the herbs out. Begin by stretching the cheese cloth over the opening of the double boiler pot (top part) and secure it with a rubber band around the edge and/or clothes pins. You don't want the cheese cloth to come loose while you're pouring the oil onto it to strain out the herbal material. You can let time do the job or elect to finish up by taking the cheese cloth off the pot and wringing it out so that the oil passes into the pot and the herbs form a clump inside the cheese cloth. The herbs make a great addition to your compost pile. Don't squeeze too hard and end up adding watery herb juice to the oil inadvertently. Water can cause your salves to spoil. If made with care salves can last a year or more. You can add preservatives such as vitamin E or rosemary extract and these can have other benefits as well, but remember there is no water in a quality salve and beeswax is a preservative too.

"If producing for the market be sure to weigh out the first one to get the proper fill line so it matches the weight on the label before filing the rest."

Ready to finish making these salves? Put water in the bottom of your double boiler. Add ingots or small chunks of clean beeswax to your olive oil. You can choose another type of oil, but do your research to make sure it's what you want. I use olive oil because I believe it's the most stable. I know from experience than sunflower oil does not. The proportions are four parts oil to one part beeswax. Melt gently together, if there's anything else such as essential oils that you want to add, add those when the beeswax has melted and mixed into the oil. Stir gently. I use a Pyrex measuring cup the pour the mixture into my tins and that works quite well. You will want something with a little spout to pour with. Be sure the counter or table you are working on is level but be sure to put newspapers all around on the floor just in case. By leaving a little room at the top of the containers you're less likely to make a mess. Fill the containers and wait for the salve to harden and cool before you put the lids on. Label your product! If you feel unsure of the oil to wax ratio or you want to make your salve softer or harder, simply adjust the amount of beeswax. Use more beeswax for a more solid product and less for a softer salve. To gage the effect of the amount of wax you are adding, you can start with the least amount, add a little more at a time dropping a drip of the wax-oil mixture on wax paper and putting the wax paper into the

fridge for a moment then check the cooled consistency. Keep adding beeswax until you have the consistency you like. You did it!

A resource I would recommend for concise instructions on this and other herbal preparations is Rosemary Gladstar's Family Herbal, a guide to living life with energy, health and vitality.

Alice's Healing Herbal Salve Recipe

Harvest the herbs below to fill a gallon jar. The quantity of each herb is listed in order of most to least. Though these herbs have many virtues I selected them for the quality listed after the herb.

Comfrey- heals muscles and bones
Calendula - soothing to skin irritations/inflammation
Red Clover- anticancer, lymph clearing
Plantain - soothes bug bites
St. John's wort - heals nerves and skin
Heal all - heals wounds
Sage - antimicrobial

Cover the clean dry herbs in large jar with organic olive oil.

Let sit outside in the sun for two weeks.

Strain herbs out with cheesecloth.

Ideally let the infused oil sit and settle for a day before starting production.

For each cup of oil add 1/4 cup of beeswax and melt together in a double boiler.

Add a tablespoon or two of vitamin E.

When everything is melted just before you're ready to pour you can add lavender essential oil, two tablespoons, for a pleasant scent. Pour the mixture into tins and label when cool.

I usually make a gallon of oil at a time. To this I add three eight-ounce chunks of beeswax. Half of the mixture I use for unscented saves. Only to the remainder do I add the two tablespoons of lavender essential oil. Makes about 50 tins, two-oz each. 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 Conrad and works at her own artist business* ***AliceEcklesStudio.com****.*

My Environmental System

James E. **Tew**

My Backyard

For the moment – success!

No doubt, I told you about my experiences last Autumn. I simply can't recall how much I wrote. True, I could look that up, but I have a story I want to tell you; and either way, I will need to retell parts of the past saga. The shortened version of my story was that last Fall, I had to address some *"addressable"* health issues. A surgical procedure was required, and an unexpected hospital stay was included. Recovery took longer than expected, and I was forced to take an objective look at my ever-increasing age. I'm good now.

During that time, my bees had to take care of themselves. Has *Jim Tew* not often said that the yard most distant from him and his colony management programs usually fare the best? Disappointingly and bluntly written, my bees, in fact, last winter did not do a superb job without me. Indeed, many of my colonies died last Winter.

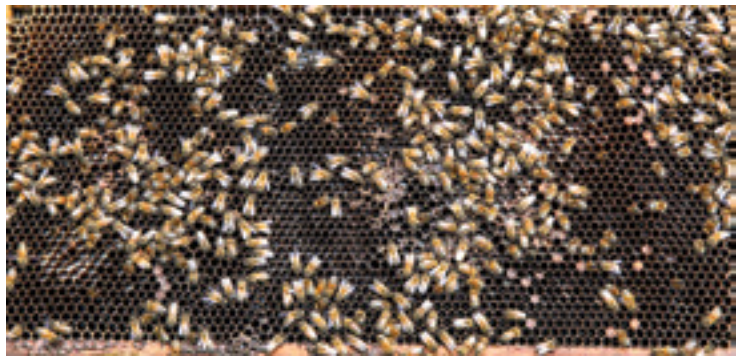
Personal observation made over many wintering seasons – Most likely due to the effects and side-effects of *Varroa* infestations, a large adult bee population and a large honey reserve will not guarantee my colonies' unquestioned wintering success. Beautiful colonies can still die an ugly Winter death. I am near the point of making the profound statement that, for successful wintering, colony health is more important than sufficient food reserves. I can supply emergency food, but I can do little about bad health in a wintering cluster.

As has been the case in other instances, these dead colonies left significant amounts of unused honey stores. In other articles, I have made light of the process of taking surplus honey from dead colonies – *Sardonic humor*. Once again, I had significant quantities of honey from winter-killed colonies that was not pristine.

This honey was ***really not*** pristine. You will see no photos – no videos - of this crop in this article. Too many of you would be offended. The options for solving this unloved honey issue and returning the committed equipment to usable condition would drain the remainder of my article space here. With honey bee package delivery imminent and hive equipment in short supply, I opted to work side-by-side with my bees. In my own non-verbal way, I asked the bees what they could do with this messy crop.

As best I could, I cleaned the frames, full combs, and hive equipment. In the traditional manner, I installed the packages and ultimately released the queens. At the time of package installation, I gave each of the packages two deep frames of the sullied honey.

As was my plan, I checked all the packages the next day. With bated breath and minimal smoke, I was elated to find that a minor miracle had occurred. Overnight, the bees had cleaned and reclaimed the two frames to the extent that they looked (mostly) like typical honey frames. As the following days/weeks passed, as needed and when possible, I continued to add blemished honey frames to the ever-growing bee population. In my defense, I never once overwhelmed them with this ugly task. I added frames slowly and over time.



This frame had mostly crystallized honey. (Lower left remains.) Bees have moved reprocessed stores to right side. Brood nest area is being repaired. New white wax on some edges. Punctured cappings are on honey – not brood. 50% of the bees have been removed to show the comb.

A needed clue – Not really knowing how the bees would react to these needful honey frames, I put an outer cover (topside up) underneath the colony and monitored the trash accumulation from the frames being refurbished. All hives had open screened bottom boards. No trash would equal no interest in the frames. Immediate trash and steady trash accumulation would mean reclamation work was underway.
In general, monitoring colony trash both in front and beneath the colony is a good monitoring procedure. Good information can be gleaned from bee colony garbage.

Massive colonies

These three-pound packages have developed into massive colonies; beyond anything for which I could have hoped. I must give the queens a lot of credit. No colony growth could have occurred without solid queen performance. Of the 10 packages with which I began, two queens were rejected. One was replaced naturally, and I simply combined the other package into a six-pound package.

In three months, from a three-pound package to these powerhouse colonies in three deeps. I have since added another deep to all colonies.

Random thoughts and admonishments

Ugly honey in the comb

Yes, the honey I gave the packages was ugly. There is simply no other word other than ugly that could have described it. But it was naturally bee-processed honey in natural wax combs. It would appear (I have no science to support my conjecture) that usable honey that needs recovering is more beneficial than a sugar syrup feed that bees must process and then build combs in which to store it. Again, it would appear that the bees professionally cleaned the product and immediately began to put it to use. If I dare write this for you, I cautiously say that these colonies are too large too fast.

Swarms

They're going to swarm. I can nearly promise you that I will get either off-season or late season swarms from these big colonies. I have learned this from painful experience. In seasons past, from colonies this size, I have had to watch large primary swarms along with my beautiful marked queen, fly away. I don't care how long you have kept bees, or how it could be beneficial to the environment – a large swarm flying away is painful.

I'm going to split them later this week. I have arranged to get quality mature cells that I will use to help speed the queen replacement process along. Colonies like I am picturing here are unnatural in the wild. If it works, I will keep you informed.

Personal observation gained from painful experience – A beautiful colony will not stay beautiful indefinitely. Truly, in this case, beauty is in the eye of the beekeeper beholder. Such colonies are unnatural, and the bees, given time, will make corrective changes – or something else will change. The season will pass. *Varroa* populations will grow. Suicide swarms will issue too late to establish themselves. Robbing. Beauty in bee colonies waxes and wanes. Enjoy them while they last. Make photos. Boast.

I have been here before

I have had colonies that looked this good before. Keeping colonies this large is hard work. It is as simple as that. They are crazy heavy. They can be defensive. They are difficult and messy to work, and they are hard to treat for mites--but I wish all of my colonies were like this.

Was Ozymandias a beekeeper?

My name is Ozymandias, king of kings:
Look on my works, ye Mighty, and despair!'
Nothing beside remains. Round the decay
Of that colossal wreck, boundless and bare
The lone and level sands stretch far away[1].

Am I in any way like Ozymandias? Did I not start this season with honey stores from Winter-killed colonies? Was my apiary not laid to waste during the past winter? Did I not have nice colonies last Summer with which I fretted and wrote articles? Did I not struggle to control varroa populations last season and all the seasons before? I must not forget that my unique success story this season is built on last Winter's killed colonies. One seasonal colony empire seems to build upon the previous one.

For this fleeting bee moment...

My bees are great just now. I don't get to say that very often. It feels good. But from years of experience, I know that this beautiful moment cannot last. I plan to photograph and enjoy, but then I must do what I must to keep them with me and not off in the wild – or worse.

Yet some other pleasant surprises

Late during the spring of 2019, I had a few remaining Ohio wildflower seed packets that I scattered in a small plot in front of my shop. Last Spring (2019), a few scruffy plants came up and put out a few desperate flowers. All the plants soon gave it up for the Winter. I thought no more about them.

The past Winter was mild with only a few truly cold periods. Not much snow. Occasionally, I would notice that the dormant native plants in the small plot did not appear to have been cold killed. Otherwise, I did nothing. This past spring, 2020, that little planting exploded. Presently, I actually look like a flower gardener, but in reality, all I did was sow a few seeds and lightly cover them with a shallow layer of mulch and then wait a year. I have been given compliments, and I have greatly enjoyed the native bee activity on the blooms.

When gardening, I don't know what I am doing. I only garden enough to subsidize my bees, but I have always had an interest in both flower and vegetable gardening. My parents and grandparents seriously gardened. I grew

[1]Percy Bysshe Shelley, "Ozymandias" in ***Miscellaneous and Posthumous Poems of Percy Bysshe Shelley*** (London: W. Benbow, 1826), 100.

This small garden germinatd from volunteer seed from the previous season. I had to support the spindly plants from falling over. Native bees and Syrphid flies love this little planting.

up with both flower beds and large garden plots, but I have not always followed through as an adult (*read that to mean that I have grown a lot of undesirable weeds in my time).*

I am not enough of an accomplished writer to express what I would like to say. My feeble effort would be that flower gardening is not beekeeping, but flower gardening is very closely allied to beekeeping. While I realize that I cannot plant enough to have any true positive effects on my bees, I still feel good about trying.

I let my lawn run wild, too.

My neighbors have grown accustomed to this lawn quirk of mine. For many seasons now past, I have stopped mowing my back lawn during clover season. I make no effort to eradicate "weedy" white clover. On either side of me, lawns are regularly manicured and trimmed.

I have written in past articles that there are some undesirable aspects of lawn wildness. I suspect I have more than my share of Japanese beetles, but that's okay. I also have more than my share of butterflies and pollinators. But I have more than my share of mice and moles, but that's okay, too. I commonly get rabbits and ground hogs too. But this season, I had a special visitor in response to my unmanaged lawn – a red tail hawk.

The majestic bird spent the morning in my back yard – apparently hunting for food in the nearly knee-deep clover and grass of my backyard. I actually limited my activities and stayed quiet – for hours – in order not to disturb the bird as it surveyed and hunted the area. On occasion it would swoop down to the grassy ground to take care of some business.

At one point, the predator bird and a squirrel had a near-confrontation that I was allowed to watch. I did not become involved. Ultimately, the squirrel opted to just wait the bird out. Both, apparently, lived happily ever after.

Beekeepers, I must say that it was an interesting

Season clover that I leave for my bees and anything else that wants to be there.

One of my bees on a clover source that I provided. Good job, Jim.

moment. I realized that my initial effort to provide a small amount of forage for my bees had allowed cover for other smaller animals which had, in turn, allowed larger predaceous animals to prey on the smaller ones. For a brief moment, I had developed a multi-tiered environment – all because I wanted to allow my bees some forage. It felt good.

Summer smells

One of the losses of written matter is the loss of all things with an odor. The clover and my small native flower garden all have a very pleasant aroma. Then there's my beeyard. I have often thought how much information that I associate with apicultural odors. Yet, I have never experienced a single lecture that could capture the cacophony of odors that come with bee management.

Just now, within my apiary is the gentle odor of nectar being processed. A few days ago, while in a frenzy to get extra equipment ready for placing on the hives, I removed some wax moth damage. Wax moth damaged combs have a unique odor. Smoke from my hive smoker leaves a residue that smells of both new and old smoke. The odor of the alarm pheromone is emitted when I am stung. The straw odor of package bees in my car as I drive home from picking them up agitates my allergies.

New beekeepers, all I can say on this topic is that there is a world of bee-related odors that you will have to discover for yourself. I can show photos and movies, but I cannot capture the associated smells that go with our beekeeping.

I have nearly missed my mark

I have nearly missed my mark in this article. My inspiration for the month was to be a review of the backyard environmental complexity related to beekeeping. This includes the interaction of other life forms in that system and the odors that are related to beekeeping.

For the past few weeks, I have deeply enjoyed diversity that has been associated with my beekeeping. Honey bees and their management are always part of a much more complex picture. For me, that picture is frequently out-of-focus. For the past few weeks, I was allowed a glimpse of that bigger picture. It was a good experience. Keeping bees is so much more than simply keeping bees. I thank you for reading this piece. BC

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

https://youtu.be/rynWVuJjJEM

Two animals sizing each other up. They ultimately came together due to my unkempt back lawn. Both survived the encounter.

GLEANINGS

SEPTEMBER 2020 • ALL THE NEWS THAT FITS

OBITUARIES

On Wednesday August 5, the world of the Texas beekeeping industry lost a giant. **Dr. John G. Thomas** passed away due to complications of dealing with the Covid-19 virus. He and Janice both contracted the virus but due to his weakened status, he passed away. Janice is recovering.

Dr. John had been involved with beekeeping since his teen years. After high school, he went to TX A&M to study entomology and essentially never left. He became one of the greatest ambassadors for the honey bee and could speak long and eloquently about that wonderful organism. He would eagerly mentor anyone who asked (and some that did not ask) about honey or honey bees. He was equally passionate about the TX Beekeepers Association and served it all his adult life. Due to his position with the Agricultural Extension Service, he never served as an elected officer but served many years as Executive Secretary and in

many unnamed roles. Dr. John was the driving force in getting a honey bee research facility built at the Riverside campus of TX A&M and he and Janice provided a substantial financial gift to the fundraising efforts. That result is the Dr. John G. and Janice Thomas Honey Bee Facility. The TX beekeeping industry will long be indebted to his love of the honey bee and his willingness to walk the extra mile in its support.

Good bye, Dr. John. There will not be another like you!

William T. (Bill or "Bud") Wilson returned to his heavenly home on June 23, 2020, after a valiant battle with vascular dementia at the age of 87. Bill was born July 22, 1932. He is the oldest child of Catherine and William Wilson Jr. He was born and raised with his younger brother, Robert Wilson (Shirley), on a small farm in the Salt Lake Valley, UT.

He graduated from Cyprus High School located in Magna, UT. He graduated from CO A&M and CO State University with Bachelor & Master Degrees. He served three years in the U.S. Air Force as a Captain. Bill entered OH State University and completed a Ph.D. in 1967 and a post-doctoral program at University of CA, Irvine. He and Mary Catherine (Cathey) were married November 28, 1958, and have five children, Mark (Joyce), Eric (Jenni), Bill (Michelle), Melissa, Cody (Audrey), 18 grandchildren and 13 great grandchildren. He spent 37 years of his career as a research leader and teacher in universities and U.S. Dept. of Agr, working in many states. During his career, he visited numerous foreign countries with work programs in Mexico, Guatemala and Morocco. He was senior or junior author on more than 250 publications. He served as assistant professor at CO State University and adjunct professor at University of WY and TX A&M University. His specialty was control of diseases and parasites of honey bees.

In 2000, he retired and moved to Summit, UT, the ancestral home of Cathey, and kept busy with family, personal history, gardening, reading and enjoying family and friends. Bill and Cathey spent the last several Winters in Maricopa, AZ.

Aspetuck Land Trust Embraces Connecticut Back Yard Beekeepers

This Spring, the Back Yard Beekeepers Association (BYBA) apiarist David Blocher contacted Aspetuck Land Trust's Land Stewardship Director Lou Bacchiocchi looking for a place to host a honey bee queen rearing project. Bacchiocchi immediately thought of Aspetuck Land Trust's Randall's Farm Preserve as the perfect spot to host bees. This Easton sanctuary is an all-encompassing haven for pollinators; the preserve has 34-acres of early blooming trees, diverse stretches of wildflower-filled meadows, prolific wetlands, and an abundance of surrounding farms whose crops would thrive with the introduction of new neighborhood pollinators.

A major goal of Aspetuck Land Trust's Green Corridor initiative is supporting pollinators, like Blocher's honey bees, due to the vital ecosystem services these insects provide. Aspetuck Land Trust is encouraging homeowners, for example, to do three things to support pollinators:

1) Plant native plants
2) Rethink your lawn and
3) Avoid pesticide and herbicide use.

Since Randall's Farm is located within the Green Corridor and more importantly is directly adjacent to the newly acquired 34-acre Gilbertie's Organic Farm, these BYBA bees will have an abundance of healthy forage nearby.

Blocher and his class of BYBA members, ranging from novice to experienced, tend to the bees at Randall's Farm while learning the skill of breeding queens. Many beekeepers buy queens and bees from breeders in southern states, so Blocher is equipping BYBA members with the ability to raise their own queens. However, this project doesn't just aim to support locally-reared bees – its main goal has a more scientific edge. These queens are strategically bred to pass on genetic resistance to a the *Varroa* mite.

Varroa infestation is the primary reason for bee colony mortality. The parasitic mites feed on adults and their young, and can transmit viruses such as deformed wing virus. Fortunately over many generations, some hives have adapted behaviors to defend themselves and their offspring from varroosis, called "*Varroa* Sensitive Hygiene" (VSH). Bees expressing this VSH trait understand how to identify pupal cells containing mites, uncap these cells, and remove the mite-infected pupae from the hive. This behavior can be passed down from the queen to each of her offspring, until the entire hive has the VSH trait. Blocher's mission is to raise hives at Randall's

As these beekeepers practice rearing queens with the ability to combat *Varroa* at Randall's Farm and in their own hives, queens from neighboring hives have the potential to mate with these VSH drones.

Bacchiocchi is especially proud that Aspetuck Land Trust supports this BYBA research project. Aspetuck Land Trust is always open to collaborating with groups and researchers to host studies on its properties. "We're using our properties not just for preservation and recreation," Bacchiocchi said, "but also for scientific research."

Aspetuck Land Trust is a non-profit land conservation organization founded in 1966 to preserve open space in the towns of Westport, Weston, Fairfield and Easton. Over the years, the land trust has protected 150 properties on over 2,000 acres of land and recently launched a Green Corridor initiative to save more land and increase biodiversity in the landscape. For information visit **www.aspetucklandtrust.org.**

The Back Yard Beekeepers Association (BYBA) is one of the Nation's largest regional clubs for beekeeping hobbyists with over 250 members. The mission of BYBA is to provide their membership with a forum for sharing knowledge and mutual interests in beekeeping, and educate and promote the benefits of beekeeping to the public. For information **backyardbeekeepers.com.**

CALENDAR

♦GEORGIA♦

Georgia Beekeepers Association will celebrating their 100 Year Anniversary September 25-26 with the first Nationwide Black Jar honey contest.

Speakers include Keith Delaplane, Cindy Bee, Dave Tarpy, Jamie Ellis and Virginia Webb.

Register at **gabeekeeping.com**.

♦MICHIGAN♦

The following Michiana Beekeepers monthly meetings for 2020 will be held at the Nappenee Public Library, on date shown from 9 a.m. to 12 noon.

September 19th - Speaker Dr. Jeff Pettis

October 17th - Speaker Dr. Jim Tew

For more information and to register contact Debbie, 574.277.0152.

♦NEW HAMPSHIRE♦

New Hampshire Beekeepers Association will hold their Fall meeting October 17 at Manchester Community College, 1066 Front Street**.**

If held in person it will be 9:00 a.m. to 3:00 p.m. Lunch will be provided for a fee. If the meeting cannot be held in person it will be held online.

Keynote speaker is Samuel Ramsey.

Check the NHBA website **www.nhbeekeepers.org** for any change in location.

♦VIRGINIA♦

October 10-11

Sun Hive Workshop: Learn how to build the Sun Hive! This exciting hands-on hive building experience will be accompanied by lectures related to the importance of hive scent and warmth, wax, form and hive body materials. Classes take place at Spikenard Honeybee Sanctuary in Floyd, VA. website: **www.spikenardfarm.org** contact: **info@spikenardfarm.org** or 540-745-2153

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I'm finishing out my term as Colorado State Beekeepers Association president, and just before the CSBA put on its Zoom summer meeting, my vice-president Tina called. She'd agreed to do a hive examination demonstration, and she phoned to inform me that she'd washed her bee jacket. That might not sound newsworthy, but I've never washed mine, and it works just fine. With age and wear, unwashed cotton stiffens and becomes even more bee-sting-resistant. Tina's implication was that maybe we ought to both spruce up for the meeting, but I refused to be bullied. Plus, I had my own beeyard message for the faithful: Don't sweat the petty stuff.

What's really important in beekeeping? Certainly not what colors you paint your hive bodies or what direction they face, or Winter insulation, or a thousand other things newbies fret over. And your bee suit doesn't have to be sparkling white.

Beginners need to remember two things: Don't let your bees starve, and keep your *Varroa* mites at bay. There are a myriad of ways to accomplish these critically important goals. But keep your eye on the ball. The rest of it will come with time, and practice.

Beeyard decisions often have both an up and a downside. I used to send bees to California for the almonds. Was that a bad or a good thing to do? Well, they generally arrived home in late March bustin' out of their boxes and bearing a pollination check. That's good. But they reliably got some chemical exposure in the almonds, and they brought home a mite load. Not so good.

Our job as beekeepers is to make decisions that to the best of our knowledge and ability, help our bees, and make economic sense. We all make mistakes. That's OK. We learn from those mistakes. We do our best, persevere, and strive to never fall asleep at the wheel.

I made some "walkaway" splits in late April, using Richard Taylor's technique for finding the queen, or at least making an educated guess which super she's in. Taylor said to pop the lid and smoke the top super heavily. Then leave that lid off for awhile. If the queen's in the top super, she'll generally retreat to the lower.

I hauled these no-queen upper-super splits to another yard, to make their own queen. The good news was that eight of nine really did turn out to be queenless. Thank you, Richard Taylor, for a priceless tip, and may you rest in peace.

The bad news was that of nine queen-less splits, only one eventually made a new queen. I'm not sure why, but that's beekeeping for you!

In my operation, queens get superseded all the time. I consider this in general to be a good thing, and Nature's way to improve a situation that the bees, in their collective wisdom, recognize needs fixing. What perplexes me is that superseded hives, weeks after they get reestablished with a new queen and full of brood, sometimes have significantly higher mite counts than their neighboring colonies. This goes against the conventional wisdom that the brood break that accompanies supesedure upsets the mites' reproductive cycle and reduces mite loads. I wonder if hives with higher mite numbers are more inclined to replace their queen. I'm not talking about sky-high mite numbers. I'm talking about numbers like eight or nine mites, in June or early July, in a 300-bee sugar-shake sample, when neighboring hives are testing at two or fewer.

When I mentioned this to Tina, she told me she'd just tested a dozen hives, nearly all showing zero or one mite per sample. But two superseded colonies tested at 13 and 18 mites.

Of course a hive with no brood that's in the process of re-queening is a perfect candidate for an oxalic acid dribble. I've lately taken to bringing along my oxalic acid garden sprayer when I visit my out-yards. That way if I run across a colony that's brood-less, or nearly so, I can give 'em the hotfoot. On broodless colonies, this inexpensive treatment typically knocks mites directly to *Varroa* heaven, doesn't contaminate the honey, and is easy on bees.

(If this dribble talk is all Greek to you, I recommend visiting Randy Oliver's **Scientificbeekeeping.com**.)

I've also begun experimenting with mid-summer treatment of selected queen-right colonies with the dribble. This is all about timing, heavy lifting, and predicting the future. Let's say that today, July 10, a hive tests at six mites – not an immediate threat to the bees. And let's assume that *Varroa* double their numbers every 30 days. So this colony, if left untreated, should test at 12 mites on August 10, 24 mites in September, and 48 in October. Yikes! Two thirds of the mites are safely ensconced in the capped brood, leaving the remaining third at large in the colony. I can treat this colony with an oxalic acid dribble now, and kill those exposed mites. I'd rather do this today, with only one honey super to remove before doing my sugar shake, than in August, when I'll have two or hopefully three honey supers to take off first, and an impending crisis on my hands. If necessary, I can retreat a week from today, and even the week following, as more mites emerge clinging to newborn honey bees. But I'd rather not.

Like any other treatment, I don't want to overuse oxalic acid, lest my *Varroa* develop resistance. My goal is not to reduce my mite numbers to zero but to bring them down to an acceptable level, so I can get some sleep.

Ed **Colby**

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