AUG 2020

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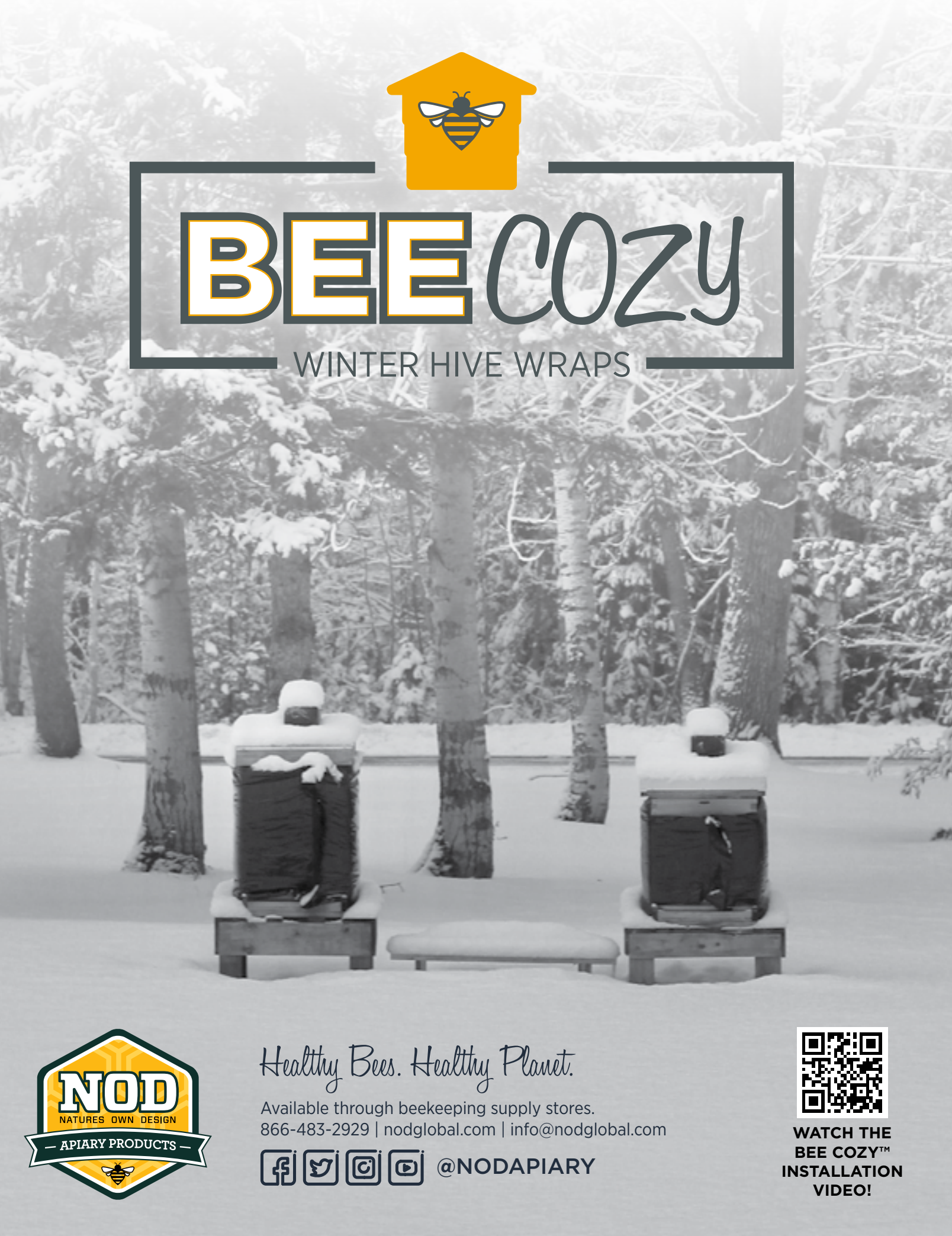

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August Features . . .

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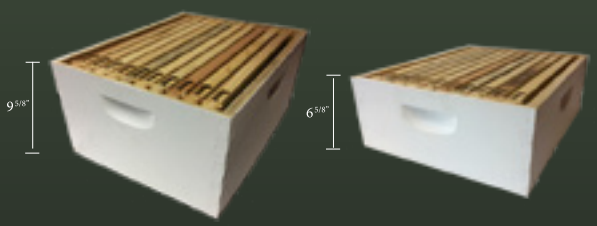

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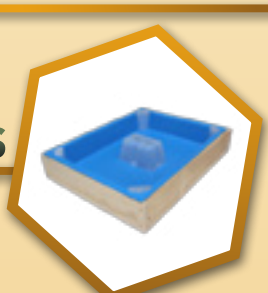

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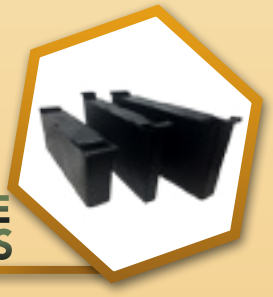

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Page 59

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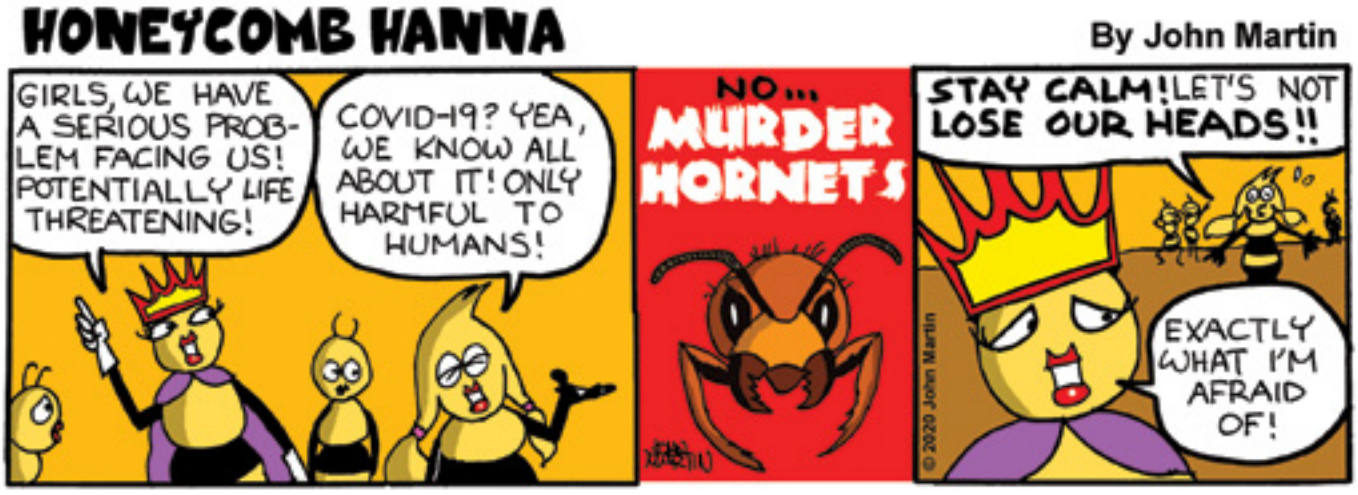

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Scoring More Bee Food

Missouri now joins seven other states with pollinator-friendly solar scorecards including Minnesota, Illinois, Maryland, Michigan, South Carolina, Vermont and Virginia. Pollinator-friendly Solar scorecards are also published for more than a dozen states. The solar site score cards are used in several other states and in county ordinances including Michigan, Ohio and North Carolina.

This evaluation and planning tool has been created to assist in the establishment and management of habitat beneficial to Missouri native pollinators at solar energy systems. Score card users check the boxes and add up points to determine whether their habitat planting plans add to pollinator habitat: **https://extensiondata.missouri.edu/Pro/MasterPollinatorSteward/Docs/pollinator-habitat-planning-tool-solar-sites.pdf**

According to the law, "An owner of a solar site implementing site management practices specified in the bill may claim that the site is pollinator friendly or provides benefits to pollinators if the site and its vegetation management plan adhere to the criteria set out in the scorecard. An owner making a claim that it is pollinator-friendly or provides benefits to pollinators must make available to the public and provide to the University of Missouri extension service and a nonprofit solar industry trade association a copy of its completed score."

The score card was developed by University of Missouri's Robert A. Pierce, II, Associate Extension Professor and Wildlife Specialist; James Quinn and Tamra Reall, MU Extension Field Specialists in Horticulture. This planning tool has been reviewed by the Missouri Master Pollinator Steward Steering Committee and Missourians for Monarchs Collaborative.

The Collaborative represents more than 100 state and federal agencies, including Missouri State Beekeepers Association (MSBA), working together to develop more Missouri pollinator habitat. The goal is to add 385,000 acres within the next 15 years.

The solar site score card is the latest step to help increase pollinator habitat, which is one of three goals set in the 2016 science-based U.S. Pollinator Research Action Plan:

- Reducing annual honey bee losses to less than 15 percent over the next 10 years;
- Increasing monarch populations to at least 225 million at wintering grounds in Mexico by 2020 and
- Restoring or enhancing seven million acres of pollinator habitat across the country via public/private landholder relationships.

In Missouri, more than 90% of the land is privately-owned so landowners play an important part in providing more pollinator habitat.

Charlotte Ekker Wiggins
MSBA Partnership Liaison

Salisbury, Maryland: Perdue Farms Headquarters requires pollinator-friendly ground cover throughout its solar farms. Perdue is one of the largest organic poultry producers and organic soybean growers. (Photo courtesy Perdue)

*A honey bee visits Showy Goldenrod (*Solidago speciose*) during Missourians for Monarchs Collaborative 2019 Annual Meeting in Belle, Mo. A native Missouri wildflower that blooms August-November, it provides honey bees with nectar and pollen during Missouri's Fall nectar flow.* (Photo by Charlotte Ekker Wiggins)

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

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

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

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

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

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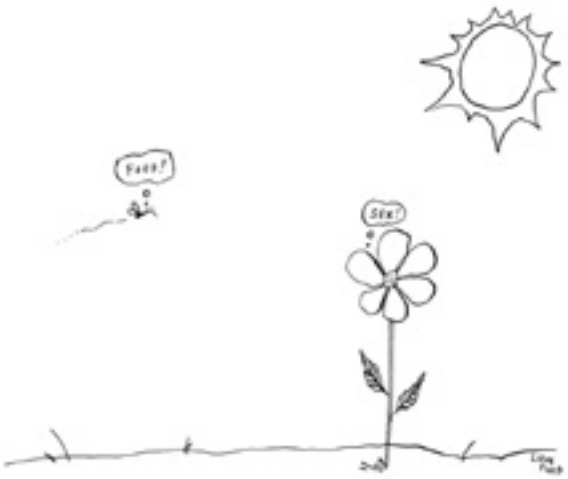


RHUBARB AND SWISS CHARD????

Question – Jerry, I am the editor of the Northeast Indiana Beekeepers Assn. and have had several members ask me if I could have something in the newsletter about the use of rhubarb leaves and swiss chard leaves as a control for mites. I have read of the use of them in Poland with mixed results. Do you have any information that I may use in the newsletter that would satisfy their curiosity?

David McKinley

Answer – As a first swing at this rhubarb leaves and swiss chard leaves do have oxalic acid in them but at very low levels, 0.2% to 1.3%.

If you have ever eaten rhubarb pie it is made out of the stems not the leaves. The reason for this is that a long time ago our ancestors found that eating the leaves caused health issues. They didn't know why at the time, but it was because oxalic acid if eaten in rhubarb leaves causes calcium to be removed from our bones and kidney stones (calcium) to sometimes form. Pretty painful. That is why only the stems of rhubarb are used to make pie as they have much less oxalic acid in them. Swiss Chard has much, much less oxalic acid in its leaves so if you have some in a salad every now and then it doesn't do much damage.

Some Polish beekeepers are putting whole rhubarb leaves in beehives. As the bee's tear these up to remove the trash they are supposed to be exposed to enough oxalic acid to control *Varroa*. I doubt it as the amount of oxalic acid is very low as noted above. If somebody wants to put rhubarb or swiss chard leaves in a colony to keep busy it won't hurt the colony as there is hardly enough oxalic acid in them to do much. And it will keep the colony busy as they try to drag this 'junk trash' out if you don't want them actually doing other more important activities in the hive. Lots of stupid stuff on the internet. I would go to actual science and the Honey Bee Health Coalition (HBHC) website and read/memorize/share the Tools for *Varroa* Management Guide.

BACKYARD CHICKENS EATING BEES

Question – Hey Mr. Jerry

I am new to beekeeping and live in Florida. I am 12 years old and love the 'From The Editor' part of *Bee Culture*. We have a small backyard farm. I have one super so far, I am going to add two in two weeks, Anyways, we have chickens in a separate part of the yard but, I saw the one that we call Sunshine killing a bee then feeding it to the one we call Elsa. We are going to move the chickens in the backyard with the bees and the garden. I know that the chickens will eat any beetles or small pests by the hive entrance, but I don't want them killing all my bees!! Please help!

Cheyenne

Answer – The reality of nature is what you are seeing.

Your chickens are looking for a nutritious diet and in their genetics they know bugs are part of it. If your bees go to the waterer or feeder and a chicken can grab it they will. Eating a few a day will not negatively impact your colony much as 100's die everyday as they complete their life cycle. Part of the scheme of life.

Eating a worker honey bee gives the chicken an upset stomach because of the venom sac in the bee. So chickens learn not to eat too many.

Take care and stay safe and well.

LAWN TREATMENTS

Question – Hello! Do you know of a lawn treatment that will kill ticks and mosquitoes, but is safe for honey bees?

Emily

Answer – Not that I want you mowing all the time but ticks and mosquitos use tall grass and bushes to hide and wait in for a mammal to walk by and they grab them for a 'blood meal' so they have the nutrition to lays eggs and make babies. If you choose a pesticide that kills ticks and adult mosquitos then it will kill, hurt or damage honey bees and other pollinators if exposed to it. Get your mower out.

WHEN IS HONEY READY

Question – Hello, Jerry, I hope you are well.

Thanks for your help in the past. I am a hobbyist beekeeper (seven hives, in the city of Richmond). How do I know when to harvest my honey? I only want to do this once, and I want the bees to have enough time left to put up their winter stores. I only take about 1/2 of their capped honey, but what is the best sign to say let's harvest? Thanks

Bill

Answer – I think you already hit on the two main factors ie. honey stores for Winter food and when is honey generally ready to harvest for the colony and the beekeeper. The general rule of thumb for many parts of the U.S. is 50 lbs of honey stored for use over Winter and more importantly the early Spring build up before flowers bloom. And the other rule of thumb is when the honey is capped the bees have made the internal decision that it is ready to be stored for later use. Which means it

is ready for you to harvest as well. Stay safe and well.

PRACTICING EGG LAYING

Question – Long time no write! I hope you are staying safe and well during this weird time. Speaking of weird, I have a Queen who is 'challenged' when it comes to laying eggs. During an inspection last week I was seeing many eggs in all the cells so of course I assumed it was a queenless colony with the laying workers. Then I saw this massive Queen running around. I decided to close everything up and come back a week later. Yesterday I checked and she is laying multiple eggs in cells but she seems to be getting better at laying only one egg per cell. What's going on?

Lara

Answer – Many times, when there is a brand-new Queen from supercedure or swarming she has to get used to being a Queen. And the biggest part is how do I lay eggs? What does it entail? What does it feel like and how can I control this, so I only lay one egg in a cell? She has never done this before and figuring out how to control egg laying to one egg at a time takes lots of practice. My bet is she is new and practicing.

Treeage G-4/emenectin benzoate

Question – Hi Jerry,

Hope you can answer this question!

I have a large ash tree in my yard near about eight hives. I haven't had an arborist out yet, but in talking with one I was going to have them come by to see if emerald ash bores are in it (looks like some evidence already). He said the treatment is much cheaper than taking down the tree.

When I told him I had bees nearby, he said they use Treeage G-4 emamectin benzoate as the active ingredient, injected into the trunk. This is systemic and would still be in the tree when it produces blooms.

I'm usually tuned in to any tree producing blooms bees may be interested in but to be honest never even noticed blooms – do bees care? Are ash trees nectar producers?

And most importantly would this hurt bees?? Trying to determine whether to pursue the treatment or have tree taken down and would prefer to save it if this won't harm bees. Thanks for your help !!!!!

Mary Ellen Raymond

Answer – Treeage G-4 emamectin benzoate is highly toxic to honey bees if directly exposed or residue on a blooming tree. Ash do not produce nectar and are wind pollinated. But, kind of like honey bees and corn pollen if there is nothing else available, they will collect corn pollen and in this situation Ash pollen. How much of the pesticide would appear in the Ash pollen I don't know. And if it did what would the toxicity be for Honey Bees?

I copied Barb Bloetscher from the Ohio Dept of Ag. on this as she deals with this two sided issue often. This is her response.

"Dr Reed Johnson (Ohio State University) has found that bees do collect ash pollen in central Ohio, probably as Jerry said, it's there so they collect it.

Whether or not they use it to make bee bread to feed bees I don't know. If your area has plenty of forage, they may not touch your tree.

If it's a mature tree, the benefit to birds and other animals may outweigh the risk that the bees may collect and use enough pollen to affect the colony but that is completely up to you. Treating the tree every year can be expensive, but the overall benefit of a large tree usually makes it worth keeping.

Get an estimate of the cost to remove it to help you make the best decision."

OXALIC ACID

Question – I hope you and the *Bee Culture* staff are doing well.

At the ABF conference during a breakout session which you led, you said "each generation of bees should be only treated once" with OAV. Also you questioned the effect of repeated treatments on the queen. Your comments made sense to me and I shared your comments in a recent presentation (Mite Management).

I was wondering if there is any research related to repeated treatments, e.g. treat six times four days apart.

There seems to be a lot of opinions out there but I haven't seen any good studies. If you have, I would appreciate you pointing me in the right direction.

I raise queens and sell them locally. There seems to be a correlation between folks that use repeated OA treatments and sudden (unexplained) loss of their queen. Correlation is not causation though.

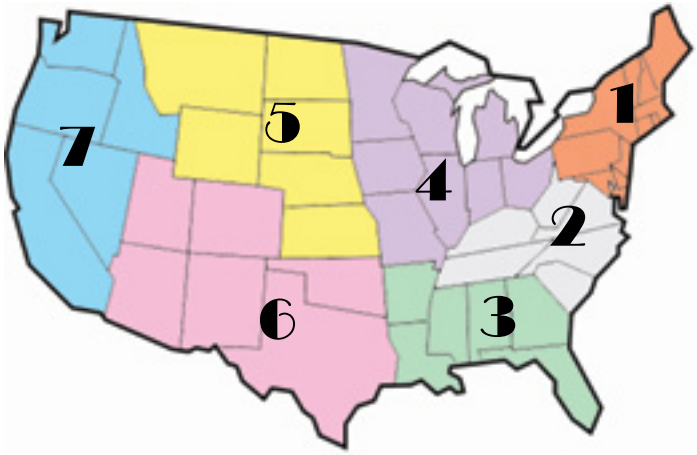
John A. Gaut

Answer – Take a look John.
https://www.apidologie.org/articles/apido/abs/1999/03/Apidologie_0044-8435_1999_30_4_ART0004/Apidologie_0044-8435_1999_30_4_ART0004.html
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5186740/

"Regarding the influence of these treatments on the development of colonies, no abnormalities were detected immediately after treatment with oxalic acid. Studies with a higher concentration of 5% described doubled bee mortality in Autumn, bad overwintering (reduced colony strength) of treated colonies and impaired Spring development (Charrière 2001). Colonies treated twice with 3% oxalic acid dihydrate solution (7.3 and 6.4 g per comb side, one gram corresponds here approximately to one millilitre) resulted in high bee mortality averaging 170 dead bees after each administration and queen loss in one colony (Nanetti et al. 1995). The effect of oxalic acid on bee larvae was investigated by Gregorc et al. (2004). A solution of 6.5 g oxalic acid dihydrate/50 g sugar/100 mL water sprayed on honey bee larvae (0.121 mg/larvae) affected the columnar cells of the midgut, leading to necrosis."

"In order to determine the tolerance of bees to these treatments, and avoid a possible weakening of colonies post treatment with oxalic acid, monitoring of treated colonies is performed by repeated checks the strength of the colony during Autumn and Winter. In general, we observed a significant drop in bee populations during the winter. The colonies treated with oxalic acid solution of 100 g group are weakened by 25%. However, the colonies of the second group treated with a solution of 70 g of oxalic acid have lost 15% of their bee populations. With the third processing, distribution, there has been a weakening of 10%. It is therefore apparent that the higher the oxalic acid content increases, Winter losses more significant."

AUGUST – REGIONAL HONEY PRICE REPORT



Selling Honey

Honey Prices during the COVID-19 shutdown and now in this 2nd wave have been relatively stable even with social distancing and restricted access to retail stores. 80% of the U.S. population lives in Urban areas and they have been buying Honey in bulk in many cases anticipating a 'food apocalypse'. Manuka Honey from NZ has seen a surge because of its enhanced health properties. With the 2nd wave of Covid-19 and its continued social distancing restrictions many people are buying honey especially if they can get it locally from real Beekeepers or newly organized regional online markets. Honey is considered a natural food that can fill health and wellness gaps. If you haven't done it already be sure to share by text or email with your friends, neighbors and community that you are a local Beekeepers and have X amount of local, natural honey for sale. And don't be bashful on price. You fill a gap with a trusted food that you want to build local support with. Time to be an Entrepreneur!

If you don't want to be an entrepreneur that is fine too. Put your surplus Honey in ½ or 1 lb. jars with your label on them and take them to the local food bank. Those out of work and in real need will appreciate the Honey and get tremendous food value from your local Honey and you the local Beekeeper.

	REPORTING REGIONS							SUMMARY			History	
	1	2	3	4	5	6	7	Range	Avg.	$/lb	May 2020	Last Year
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS												
55 Gal. Drum, Light	2.21	2.26	2.18	2.11	2.20	1.93	2.50	1.53 -3.00	2.15	2.15	2.16	2.17
55 Gal. Drum, Ambr	2.12	2.19	2.02	2.01	2.12	1.78	2.43	1.35-3.00	2.07	2.07	2.05	2.07
60# Light (retail)	210.00	199.80	193.33	172.57	163.33	183.95	205.00	131.84-325.00	203.50	3.39	205.01	204.69
60# Amber (retail)	200.00	200.20	203.33	167.43	213.26	182.46	206.25	119.84-325.00	204.11	3.40	204.24	207.03
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	74.00	79.73	97.20	79.50	61.20	107.88	107.88	60.00-194.40	88.56	7.38	88.80	89.49
1# 24/case	120.00	131.57	138.94	113.82	152.50	94.60	144.00	45.00-300.00	135.46	5.64	138.65	132.49
2# 12/case	102.00	108.70	118.35	103.69	111.84	96.00	132.00	72.00-246.00	119.66	4.99	120.67	115.39
12.oz. Plas. 24/cs	89.00	103.74	104.67	92.22	94.00	101.40	120.00	66.00-180.00	99.77	5.54	99.56	102.41
5# 6/case	80.00	114.48	190.50	113.82	113.16	105.00	148.52	71.50-240.00	141.30	4.71	139.25	129.43
Quarts 12/case	140.00	156.63	133.65	139.42	168.20	155.70	204.00	109.20-300.00	158.42	4.40	151.80	153.66
Pints 12/case	90.00	98.74	77.67	86.47	149.42	94.00	103.24	60.00-159.84	96.56	5.36	95.91	94.81
RETAIL SHELF PRICES												
1/2#	4.50	5.38	4.88	4.72	3.80	5.65	5.65	3.00-9.50	5.05	10.09	5.18	4.92
12 oz. Plastic	7.50	7.21	5.38	5.65	5.10	6.33	6.00	3.50-12.00	6.05	8.06	6.16	6.17
1# Glass/Plastic	9.50	8.58	8.44	6.82	8.45	6.86	8.33	4.79-17.00	8.21	8.21	8.13	7.86
2# Glass/Plastic	14.50	13.57	14.66	11.73	13.90	13.50	15.00	8.39-25.00	13.86	6.93	14.29	13.11
Pint	12.50	11.13	8.21	11.31	10.80	10.75	12.57	4.00-25.00	10.64	7.09	11.20	10.65
Quart	19.50	18.98	15.57	15.36	17.25	17.60	20.33	8.00-32.00	17.73	5.91	18.14	18.21
5# Glass/Plastic	34.50	27.17	42.67	26.14	18.96	20.95	30.52	13.77-50.00	29.16	5.83	29.05	28.18
1# Cream	9.50	8.44	8.00	9.26	8.25	10.29	14.00	6.00-16.00	9.59	9.59	10.66	9.82
1# Cut Comb	12.50	11.25	10.74	11.83	10.00	13.45	13.45	6.00-24.00	11.89	11.89	13.00	11.99
Ross Round	9.50	7.50	11.24	12.00	11.24	11.00	15.00	7.00-15.60	11.18	14.91	10.77	10.02
Wholesale Wax (Lt)	6.50	5.95	6.00	6.72	6.67	4.90	8.33	3.00-11.00	6.70	-	6.56	6.61
Wholesale Wax (Dk)	4.50	4.88	4.52	5.70	5.46	3.00	5.46	2.00-9.00	5.41	-	5.51	5.10
Pollination Fee/Col.	200.00	70.83	80.00	91.67	80.00	91.94	50.00	50.00-150.00	83.89	-	87.17	86.22

NEXT MONTH

It is NEXT MONTH already!! How did that happen? We only have a few things to think about, a Pandemic, Social inequality, the Economy, Work and Occupations plus important others. Aren't we glad we can escape for a few minutes and build a relationship with an insect, the Honey Bee. This unique insect that has a positive relationship with the environment. It helps environmental health, offers key plant reproductive assistance, provides food for many other creatures as it supports plant growth and it is patient with another species of animal who puts it in a box, feeds it un-natural foods, and doesn't allow it to build free form comb. But, if the human is doing hers/his job the human also provides essential care for it to stay alive and active and healthy by controlling *Varroa* mites, SHB, AFB, EFB and many other pests, parasites and diseases.

As a reward if we are doing our job we get the taste of flowers . . . called Honey. The taste of Summer. The reminder of Summer. All provided by the Honey Bee as she is preparing always for Winter when there are not flowers, or pollen or nectar to survive until next Spring. Liquid stored Honey is the food of summer for a Honey Bee colony in those dark days of Winter.

As flower growth is peaking in late Summer so is the collection of nectar from those flowers. And in many parts of the U.S. August/September is the marker for the oncoming Fall season. It is time for us Beekeepers to really be active and concentrate on being Terrific Beekeeper Managers. If you aren't paying attention in August for NEXT MONTH you are automatically making a decision to put your colony (ies) under stress as they start replacing the Summer Workers with long live Winter Workers.

Here are the directions from our reporters in your Region on how to be successful i.e. keep your Honey Bees alive over the next many months.

Region One
- Make sure there is plenty of honey storage space
- Sample for mites and treat (All 27 Region 1 Reporters)
- Verify overall health
- Feed if necessary if you took all their honey
- Requeen now to have young queens going into Winter.

Region Two
- Remove surplus honey
- Sample for mites and treat (All Region 2 Reporters)
- Feed if necessary
- Replace Queens if over three years old.

Region Three
- Sample for mites and treat (All Region 3 Reporters)
- Feed if necessary
- Place SHB traps in colonies
- Remove honey supers and store properly
- Check queens

Region Four
- Sample and treat for mites (All Region 4 Reporters)
- Feed if necessary
- After goldenrod flow put feeders on light hives
- Combine weak colonies or make Winter nuc with new queen

Region Five
- Check queen vitality
- Sample and treat for mites (All Region 5 Reporters)
- Feed if necessary

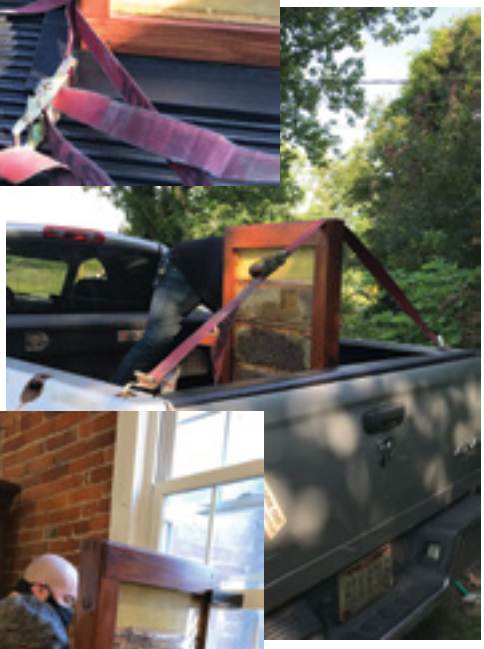
Region Six
- Sample and treat for mites (All Region 6 Reporters)
- Feed if necessary
- Combine weak hives install new queen

Region Seven
- Feed, Feed, Feed
- Sample and treat for mites (All Region 7 Reporters)

Honey Reporters Wanted

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

It's Summers Time –



Getting Back To (somewhat) Normal

It's looking like a very long, very hot Summer here in Northeast Ohio. By the time you read this we will most likely have exceeded our average of 90°+ days for this year. We usually average around 10 for the whole Summer and today marks at least number six. Today, as I write being the hottest so far – about 93°. And I know some of you are laughing, including some of my family members. I grew up in TX and CA and I know it gets a lot hotter in those places during the Summer. But for us, who are not quite accustomed to this, it's uncomfortable.

On the upside the tomatoes and squash are growing like crazy – lots of sunshine and lots of humidity. The comforting thing about gardening and beekeeping during these strange times is it's easy to social distance. So on some level life seems almost normal again.

The bees came home to the Root Company this week. Kim and I have managed for several years now the observation hive that lives in our Root Candle store. We didn't get it in last year because there was construction going on and it was just a little iffy for this year. But the ladies in the store wanted their bees back.

So Kim and I got it all put together and our good friend Johnny – he's our IT guy here at Root – along with Jerry and Kim loaded it into Johnny's truck, anchored it safely down for the seven mile journey into town and away we went. And I'm happy to say it went like clockwork. No hiccups! And we haven't heard anything from the store, so I'm hoping that means everything is good. Thanks guys for making this task easy and bringing the bees home.

Just to update you on the *Bee Culture* team we are mostly still working from home due to most of our team being in that somewhat risky category. Thanks to technology we can still get the job done. We're able to check phone messages and emails and usually able to solve most of your questions. Ironically, there have been some weird postal issues – not many – with some of you not getting your magazines. And we check, and you're on the list with the correct address and we don't know what happens. Like so much of life, we can't control the Post Office. So give us a call or email one of us and we'll get your magazine in the mail.

I hope you enjoy the rest of your Summer. Please be safe and we'll continue to do our best here at *Bee Culture*.

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

My mother has diabetes and only "Pure Honey" has helped her. Finding Pure Honey in the U.S. has been hard because so much of it is blended with the Sugar Syrup that beekeepers feed their bees. I have tried finding other honey labeled raw but it was never 100% Pure due to the feeding process. Can you help?

A. Congratulations, you have asked the $100,000,000 question. Ohio and the FDA have label laws that prohibit selling blended or honey mixed with sweeteners as honey. Honey by definition is the substance that was made by honey bees and can only contain honey, thus it does not need to be called "pure honey." "Pure honey" is a marketing tactic to help people understand that nothing was done to the honey, but legally it is unnecessary.

To be assured that you are purchasing honey with no additives, first read the label. The label should have the name and address of the beekeeper. If it reads "blended" or it originates from a state (vs. specific address), or another country it is "blended" honey meaning the producer receives honey from multiple sources and blends the honey to produce a final product. Who knows how or where the bees were kept and the honey originated. Blended honey is often heated to above 98°F that destroys most of the nutritional qualities of honey and strained to remove pollen grains so that the source of the honey cannot be determined. Why eat honey if it no longer holds any of its special nutritive value?

People use terms like "honey sweetener" or "honey based" to indicate that they added sweeteners to the honey. Look at the size of the font on the label. Honey (or Pure Honey") should be in a larger font than "flavored with…." in a smaller font, indicating that the product is mostly honey with some sweetener added. People also add flavors which would also be in a smaller font than the word "honey." If "honey" is the same size font as "sweetener," or "flavored," or whatever, it means that the percentage of honey is the same as the sweetener.

Beekeepers feed sugar syrup to bees in the Spring and periods of dearth so the bees don't starve, however responsible beekeepers remove the honey supers (where the bees store honey) when they are feeding the bees. Some people though, may not strictly adhere to label laws. The FDA has reported that honey imported from other countries has been found to contain artificial sweeteners to keep costs down, but at times it has occurred in the U.S. Therefore, it is advisable to purchase honey from local beekeepers that have the name and address of their apiary on the label.

In Ohio, at least 75% of the honey has to come from that beekeeper's own honey bee colonies however it does not guarantee that they didn't supplement their honey with other's honey harvest, so a quick trip to the apiary should answer your question. To produce enough honey to sell at a market or store, the person should have multiple beeyards (apiaries) with 20 or more colonies per yard. The bees should be buzzing in and out of the hives. Even from your car, you may be able to tell if the colonies are healthy and doing well.

A taste test will help too and can be fun to do with friends. Buy honey from a local beekeeper and compare it to store bought honey "from X state" or "X country" and some corn syrup. You may be pleasantly surprised to notice all of the flavors that comprise "homemade" local honey, compared to artificially sweetened, blended, imposter honey. Purchasing honey directly from the beekeeper or a farmer's market (if easier for you) not only ensures that you are buying "honey" in its purest and most fresh form, but you are also supporting the hard work of local beekeepers and benefiting from all the proteins, vitamins, minerals and natural sugars of real, pure honey.

More information on the Ohio Honey Law and links to the FDA's Food Labeling Law can be found at **https://agri.ohio.gov/wps/portal/gov/oda/divisions/food-safety/resources/honey**

It is still possible that the honey is not pure, or made from their bees. ***Barbara Bloetscher, OH***

A. Thanks for your message. You are correct to have some concern about the quality of honey from hives that are fed sugar syrup. However, it is not common for beekeepers in the U.S. to sell honey made from sugar fed to bees. Reputable beekeepers only feed their bees sugar syrup either weeks before applying honey supers that will be harvested, or after the honey to be harvested has been removed from the hive. This prevents any of the syrup from making its way into the honey. The only way sugar syrup could make it's way into honey is to feed the bees syrup when combs of honey to be harvested are on the hive, or to place harvestable combs on the hive immediately after feeding sugar syrup allowing bees to potentially move the sugar syrup from storage combs into the honey combs planned for harvest.

There are many people in the U.S. who feed their bees honey rather than sugar like myself. However, there are times when there is not enough honey produced by the bees and there is no other option than

to feed sugar syrup. Sugar syrup is preferrable in such cases since when a beekeeper feeds honey from an unknown source to his bees, they run the risk of passing along disease and killing their bees if the hive that the honey was harvested from was diseased. Thus, even though 90% of my bees get honey exclusively, there is a small percentage of colonies that may get fed sugar syrup in a given year. However, as noted above, syrup feeding does not take place at any time close to when honey combs intended for harvest are on the hive, so I know the integrity of the honey I harvest is protected.

Another way to know you are avoiding honey made from sugar syrup, or honey that has been adulterated with sugar syrup after harvest, is to buy unheated, unfiltered chrystalized honey. As far as I know, syrups added to honey will not crystallize like real honey and will remain liquid. I hope I have not confused you and this information has been helpful. ***Ross Conrad, VT***

A. I don't know where you learned that most honey on the shelves has sugar syrup blended into it. All commercial beekeepers stop feeding before the honey flow starts so syrups don't get into the boxes of comb for honey production. Beekeepers have to feed to keep hives alive during the Winter and when there is no honey flow. When you see honey that is blended with honey from another country it is all pure honey at least from the Western Hemisphere. Almost all big packers of honey test their honey for purity for additives, pesticides, syrup, etc. In fact, an industry task force tested the top 20 selling brands in the country for syrups and foreign sugar in those samples and they all came back clean. There have been tests come back that some of the Asian honey does have some rice syrup or other syrups at small levels. It is always better to buy 100% U.S. honey. Raw honey is becoming more popular. Rice's honey under the Local Hive brand along with Nature Nate's can be found in WalMart, Target, Costco and other big box stores. This honey has not been pasteurized or filtered. Buying from a local beekeeper at a farmer's market also insures it is locally produced and most sell raw honey. ***Chris Hiatt, CA***

Every Club Needs One: Bee Coroner

John **Miller**

Recently, I visited a thriving Bee Club in El Dorado County, California.

El Dorado invests a lot of resources in teaching and training new beekeepers.

During the visit, one of the members of the club was introduced to me as the Club Coroner.

Coroners, generally speaking do not seek attention. In our communities, Coroners are tasked with respectful handling of deceased, and importantly, determining cause[s] of death . . . was the midnight hatchet-blow to back of head lethal; or the food poisoning in the earlier evening meal sufficiently lethal?

We have lots of ways of dying. As Gordy Wardell says: "We have lots of ways of reducing our crops and our outfits."

Does your Bee Club have a Club Coroner?

Generally speaking, Coroners have seen a thing or two because they've been keeping bees for a decade or two. A good Coroner is not judgmental. His task is to objectively determine: 'Why did my hive die?' For some beekeepers, running a single hive or two, a perished hive is a family death. A good Coroner has empathy. A hive can die from lots of causes; and some are maddeningly difficult to diagnose. Dr. Jim Tew will tell us: "I have no earthly clue." Clarity and humility from a long-time hive Coroner.

The club Coroner recognizes the witche's cauldron of diseases afflicting beehives. Some diseases are contagious, very contagious. If the remedy to a disease is to burn the equipment, the Coroner empathizes with [the quivering lip of] a mourning beekeeper. The Coroner is firmly grounded in observation and literature when making a diagnosis; even an unpopular diagnosis. Club Members respect the Coroner, and should obey the counsel.

If a death in your beehive family has occurred, it's important to bring the corpus to the Coroner.

Nevada County Beekeepers Assn., the Club Coroner is Randy Oliver. NCBA has no idea how fortunate they are. But Randy can't read minds. He best diagnoses 'what happened?'is found with the corpus. Bring the frame. Describing a frame as . . .'well, it's sort of spotty brood, and some gunk in the bottom of the cells' is not enough information for the Coroner to diagnose.

Can a Club Coroner save a bee club? Can a State Bee Inspector save a bee outfit? Can the Bee Informed Project save an industry? Depends.

Some Club Members defy the Coroner's diagnosis, defy the literature, and the collapsing hive becomes a pathogen bomb, exploding into the neighborhood. We see the same behavior in landowners who ignore the patch of leafy spurge. Spurge then explodes across an area. This time of year, spurge dominates Wyoming landscapes. Ignored, Avian flu wipes out birds. Mis-diagnosed, swine flu spreads faster than foul brood.

A correlation: Many, many almond orchards are managed hygienically. For Navel Orange Worm control, two or fewer mummies per tree equals hygienic. Some almond orchards are managed carelessly, with some examples of over 100 mummies per tree; creating a virtual NOW Bomb for all surrounding orchards. Beekeepers and Club Coroners know the hygienic control number for *Varroa* is two or fewer *Varroa* per 100 bees.

Beekeepers, Almond Growers and Club Coroners understand the importance of the #2.

In the words of Dennis vanEnglesdorp; "If you have five mites per hundred – your hive is dead, it just doesn't know it yet."

Every community has a Coroner.

Every Bee Club should have a Hive Coroner. BC

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Number 1 Tip of the Month – Permanent Hive Stand

Here is a permanent hive stand and frame holder that you can build yourself for about $15. I build mine from treated 2x2, 1x6, 1x4 and deck screws. You can leave natural, paint or stain. It is free standing, strong, about 12" tall, holds either an eight or 10 frame hive, and holds eight to 10 frames depending on how long you make the arms. This design also allows mites to fall to the ground using screen bottoms and can also have moats under each leg to stop ants. No more carrying "hook on arms" to each hive or spending $80 on a similar stand. Usually a miter saw cuts all the angles which are either 22½ or 90 degrees and a drill to run in the 2" screws. I keep a couple extra to hold more frames or act as a table for working your hives. If you make arms longer to hold more frames then treated lumber is bound to twist. Also very easy to block up legs to get the hive leveled like you want. Happy beekeeping! *Frank Pennas, Rainbow Roe Apiary, Union, SC*

Tips For Around The Beeyard

Beekeepers are always looking for new ideas to make keeping their bees easier and better.

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

Send your ideas to

jerry@beeculture.com

Bee Valve For Observation Hive

An observation hive always seemed to be a natural progression in beekeeping. When I made mine, I decided that I wanted it to be perennial and knew that I would need a way to feed pollen patties without getting bees all over the family room. The solution is the Bee Valve.

The valve consists of a PVC union cut and epoxied to the handle and screwed into the obs hive top, which is cut to allow the two openings to marry when opened.

Here is the feeder box with Bee Valve closed with patty loaded and cover in place. The cover holes are larger than the screw heads and offset to allow manipulation without tools.

Here we see the bees entering with the Bee Valve in the open position. Looks good so far.

I expected this to just be something to look at, but it has issued two swarms this Spring which I was able to install in hives on the yard. It is very pleasing to sit and listen to queens piping while establishing dominance. *Mike Haney, Ohio County Kentucky.*

The joy we feel has little to do with the circumstances of our lives and everything to do with the focus of our lives.

Russell M. Nelson

X Marks The spot

Have you ever accidently put an escape board on upside down? I have. It is so frustrating to come harvest supers only to find them full of bees!

A simple solution is to mark an arrow on the escape in the direction that the bees will go. I can glance at all of my colonies as I leave the apiary, reassured the escapes are on correctly. *Heath Wind, Winston-Salem, NC*

The Bee Informed Partnership 14th Annual Survey

The Bee Informed Partnership (BIP; **beeinformed.org**) recently conducted the 14th annual survey of managed honey bee colony losses in the U.S. This past year, 3,377 beekeepers collectively managing 276,832 colonies as of October 2019 provided validated colony loss survey responses. The number of colonies managed by surveyed respondents represents 9.9% of the estimated 2.81 million managed honey producing colonies in the nation (USDA, 2020). During the 2019-2020 winter (1 October 2019 - 1 April 2020), an estimated 22.2% of all managed honey bee colonies in the U.S. were lost (Fig. 1). This loss represents a decrease of 15.5 percentage points compared to last year (37.7%), and a decrease of 6.4 percentage points compared to the 28.6% historic average Winter colony loss rate documented by previous surveys. This year's estimate is the second lowest level of Winter loss reported since the survey began in 2006-2007, and it directly follows the highest loss on record that occurred during the 2018-2019 Winter. Similar to previous years, backyard beekeepers lost more colonies over the winter (32.8%) compared to sideline beekeepers (31.8%), but this difference was negligible. Commercial beekeepers experienced less drastic Winter colony losses (20.7%) than the other two groups. Backyard, sideline, and commercial beekeepers are defined as those managing 50 or fewer colonies, 51 to 500 colonies, and 501 or more colonies, respectively. During the Summer 2019 season (1 April 2019 – 1 October 2019), an estimated 32.0% of managed colonies were lost in the U.S. (Fig. 1). This is the highest Summer loss rate ever reported by this survey. It is much higher than last year's Summer colony loss estimate of 20.0% (an increase of 12.0 percentage points), and much higher than the 21.6% average Summer loss reported by beekeepers since 2010-2011 (a 10.4 percentage point increase), when Summer losses were first recorded by BIP. The observed increase in Summer mortality during 2019 can most likely be explained by the high losses experienced by commercial beekeepers (33.0%). Their historic average Summer loss rate was 22.0%. For the entire survey period (1 April 2019 - 1 April 2020), beekeepers in the U.S. lost an estimated 43.7% of their honey bee colonies (Fig. 1). This is the second highest annual colony loss rate reported since the survey began estimating this measure in 2010-2011. This average annual loss rate is greater than last year's estimate of 40.4% (a 3.3 percentage point increase), as well as the average annual loss rate since 2010-2011 (39.0%, a 4.7 percentage point increase). Please note that lost colonies are represented by those that died or were combined with others, and that annual loss rate was not estimated by summing the individual Summer and Winter loss rates. This year's state-specific loss rates will be added to previous years' results on the BIP website in the near future (**https://bip2.beeinformed.org/lossmap**).

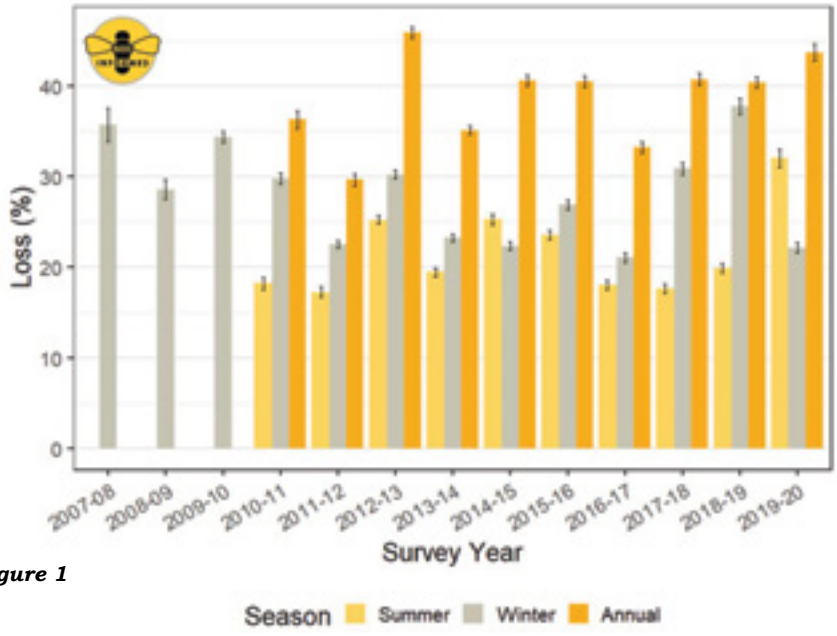

Figure 1

BIP 2019-2020 Honey Bee Colony Losses In The U.S.

Odd Year for U.S. Beekeepers Who Reported Lower Winter Losses but Abnormally High Summer Losses

Annual Bee Informed Partnership survey results highlight the cyclical nature of honey bee colony turnover rates and the variety of factors affecting each new season

Beekeepers across the U.S. lost 43.7% of their managed honey bee colonies from April 2019 to April 2020, according to preliminary results of the 14th annual nationwide survey conducted by the nonprofit Bee Informed Partnership (BIP). These losses mark the second highest loss rate the survey has recorded since it began in 2006 (4.7 percentage points higher than the average

annual loss rate of 39.0%). The survey results highlight the cyclical nature of honey bee colony turnover. Although the high loss rate was driven by the highest Summer losses ever reported by the survey, winter losses were markedly lower than in most years. As researchers learn more about what drives these cycles of loss, this year emphasizes the importance of the Summer for beekeeper losses.

This past year, Winter losses were reported at 22.2%, which is 15.5 percentage points lower than last year and 6.4 points lower than the survey average. However, high summer losses were reported at 32.0%, which is 12.0 percentage points higher than last year and 10.4 points higher than the survey average.

"This year, Summer loss was actually the highest we've ever recorded, even higher than Winter losses, which is only the second time we've seen that, and it's mostly commercial beekeepers that are driving that loss number, which is unusual," says Nathalie Steinhauer, BIP's science coordinator and a postdoctoral researcher in the University of MD Department of Entomology. "So that makes this year different and interesting to us, because we want to know what is driving their losses up in comparison to previous years."

Commercial beekeepers typically have lower losses than backyard and smaller operations. Commercial honey bees pollinate $15 billion worth of food crops in the U.S. each year, so their health is critical to food production and supply.

"When BIP started doing this survey, winter loss was the main focus because that period of the year was thought to be the most challenging for beekeepers and their colonies, especially in temperate climates," says Geoffrey Williams, assistant professor of entomology at Auburn Univ. and co-author of the survey. "Adding Summer loss into the survey in 2010/11 was quite revealing. For the first time, we had the numbers to show that loss occurs throughout the year, and that Summers are not insignificant for beekeeper losses."

Since beekeepers began noticing dramatic losses in their colonies in the early 2000s, state and federal agricultural agencies, university researchers, and the beekeeping industry have been working together to understand the cause and develop best management practices to reduce losses. The BIP annual colony loss survey, which has been conducted since 2006, has been an integral part of that effort.

The survey asks beekeeping operations of all sizes to track the survival or turnover rates of their honey bee colonies. This year, 3,377 beekeepers managing 276,832 colonies all across the country responded to the survey, representing about 10.4% of the nation's estimated 2.67 million managed colonies.

According to Dan Aurell, BIP field specialist based at Texas A&M Univ, the factors that go into Summer and Winter losses are quite different, as are the consequences for commercial beekeepers, who seem to have struggled the most this past year based on the survey results. The health of the queens that head production colonies is a major factor in Summer losses. In addition, beekeepers split their colonies after Winter to strengthen them as a best management practice, and the health of those colonies at that time is critical to their longevity.

"Factors that often contribute to Summer loss tend to be if your splits are in poor condition or don't have the right resources, and queen failure," says Aurell. On the other hand, Winter loss is closely related to Fall management practices, Aurell explains, such as whether your colonies have good conditions during the Summer to build up to a robust Fall population, and if the Fall *Varroa* mite loads were high.

"I've heard beekeepers say that the CA queen raising season in 2019 was the worst in 30 years," Aurell adds about one of the major queen-raising markets in the U.S. According to Aurell and his colleagues at MI State Univ, UC Davis, and OR State Univ who all work with commercial beekeepers, this could have been a contributing factor.

"Commercial beekeepers pretty consistently have lower losses than backyard beekeepers – you don't get to a level where you are managing more than 500 colonies, and often a lot more than that, without learning good management strategies," says Aurell. "But high losses for commercial beekeepers can be really costly. It may be that 400 colonies cost upwards of $80K to replace. And even if the rest of your bees are healthy and strong after a big loss, it is a lot of labor to split those and restore balance in your operation. If you've had a big loss, it's often the case that your surviving colonies are also in poor condition."

Many of the Summer losses this year could represent carry-over from a particularly poor Winter last year, where BIP reported the highest winter losses it had ever recorded at 37.7%. Higher levels of the parasitic *Varroa* mite reported that Winter may have weakened colonies going into the spring of 2019. Additionally, weather conditions may have promoted brood diseases, affected the availability of mated queens when they were needed, or contributed to a lack of food for honey bees at key times throughout the year, such as during the almond blooms.

"While these explanations are entirely based on what we have been seeing and not on data, our conversations with beekeepers and colleagues across the country support these issues as potential reasons for the particularly high summer losses this past year," says Aurell.

In addition to the loss survey, BIP conducts a management survey to connect management practices to losses, exploring ways to manage and reduce losses overall. However, according to the researchers, losses are a natural part of the beekeeping industry, rising and falling with the weather, *Varroa* loads, pesticide loads, and a variety of other factors.

"In the survey, we ask what beekeepers consider to be acceptable loss in the Winter, and that number has crept up from 15% to 25% pretty steadily, so it is slowly trickling into the beekeeper's mind that losses have gotten worse over time, and they have to accept more as a new normal," says Steinhauer. "There is always going to be some turnover, but it is about what is a normal turnover and what is abnormally high, and how BIP can help arm beekeepers with the information they need to manage it."

Williams adds, "BIP is working on an epidemiological approach to really understand the health issues of bees. It's using correlational information generated by the loss and management survey results to drive

more hypothesis-driven research to validate and verify findings and causes of mortality."

The survey is conducted by the Bee Informed Partnership with data collected and analyzed by the University of MD and Auburn Univ. Survey results are available here on the Bee Informed Partnership website, with a summary provided below.

Winter Loss Estimates:

1 October 2019 - 1 April 2020: 22.2% losses

15.5 percentage points lower than Winter 2018-2019

6.4 percentage points lower than average Winter loss (2006-2020): 28.6%

Summer Loss Estimates:

1 April 2019 - 1 October 2019: 32.0% losses

12.0 percentage points higher than Summer 2018

10.4 percentage points higher than average Summer loss (2010-2020): 21.6%

Commercial beekeepers (manage more than 500 colonies): 33.0%, 11.0 percentage points higher than average commercial Summer loss (2010-2020) of 22.0%

Total Annual Loss Estimates:

1 April 2019 - 1 April 2020: 43.7% losses

3.3 percentage points higher than 2018-2019

4.7 percentage points higher than average annual loss (2010-2020): 39.0%

Winter Loss Comparison by Beekeeper Category:

Backyard beekeepers (manage 50 or fewer colonies): 32.8%

Sideline (manage 51-500 colonies): 31.8%

Commercial (manage more than 500 colonies): 20.7%

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Note: This is a preliminary analysis. Sample sizes and estimates are likely to change. A more detailed state-specific report will follow at a later date.

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New Summer Reading –

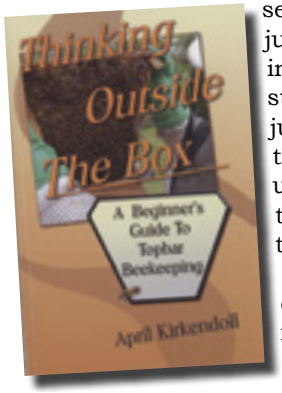
Thinking Outside The Box. A Beginner's Guide To Topbar Beekeeping. By April Kirkendoll. Published by Lysmata Publishing, Georgetown, Florida. ISBN978-0-9667784-9-6. 5.5" x 9", 256 pgs., soft cover, B&W. $18.95.

She's a little edgy, this author. Oh, it's topbar hive, top bars are part of a frame. Topbar is a type of hive. Then, it's honeybee here, not honey bee, because, she says, most people think of honeybees when they think of bees. And, it's her book, deal with it, OK?

The difference between a Langstroth and topbar hive, somebody said, is that with Langstroth hives, you work your bees, and with topbar hves you work with your bees. White boxes mean micromanaging. Topbar hive management is more bee oriented, and over all the bees are in charge. Problems? A few. Not as much honey and more steps to harvest, and they are more difficult to move.

Advantages? Well every topbar hive user will tell you they are more natural to the bees than a tall hive and there's essentially no heavy lifting or bending. Plus, when you examine a Lang hive you take off the whole roof, which can really upset the bees (sometimes), and disrupt the brood nest temperature regime. With topbar hives, you only open up a space as wide as only one or two top bars.

She has, right off, a very, very good piece of advice about online videos however. The internet, she says has lots of videos on topbar beekeeping, but remember, she cautions, there is at least twice as much junk as there is useable information out there. And, it seems much of it is just sort of a selling-my-way, or my stuff rather than just the facts. And that kind of sums up a lot information you'll find there.



A dozen pages on bee biology follow with a few photos. A good summary, but not much detail. But to get started with bees, how much do you need? Take a class. There's three times as much space used on how to build a topbar hive as there is on biology.

The most detailed section is on management – getting started, growing, moving combs, Fall and Winter (slowdown time) and Spring (speed up time).

Bee-Mageddon covers mites, beetles, wax month, GMO crops, systemic pesticides and even climate change – something that's getting more attention, finally. The rest of the diseases get a nod, but not much attention because if you keep your bees healthy, they'll be OK.

She brings in the other topbar authors, so knows about them and advises reading those, too.

This should be one of the books topbar beekeepers shouldread, but you'd be caught short on a few things ~~if it was the only one.~~ But not too short. *Kim Flottum*

Bee Optimism: Translational Research Can Rescue Honeybees And Other Pollinators. Jay Evans. Published by IBRA and Northern Bee Books. ISBN 978-0-86098-290-6. 6" x 9", 140 pgs. Soft cover, color. $22.95

Dr. Jay Evans, Research Leader USDA Honey Bee Research Lab, Beltsville MD, writes a monthly column for *Bee Culture* Magazine called Found In Translation. He started a few years back when I was Editor there, and I found his articles interesting, easy to read, and popular with our readers. So what he's done is to take 34 of those articles and tweak them, update some or a lot, and gather them into five chapters, with each chapter containing a collection of related articles, giving each a sort of different focus.

The five chapters are Challenges and Opportunities, Sweetness and Light, Royal Decrees, Climate Change (there's that topic again) and Closing.

Challenges looks at issues surrounding viruses and their mutations, Sammy Ramsey's work with fat bodies, Stress and how it challenges the immune system, behaviors, and shortens life, following foragers with RFID tags, probiotics, and nosema, and pesticides. It covers a lot of what is troubling our bees and beekeepers at the moment.

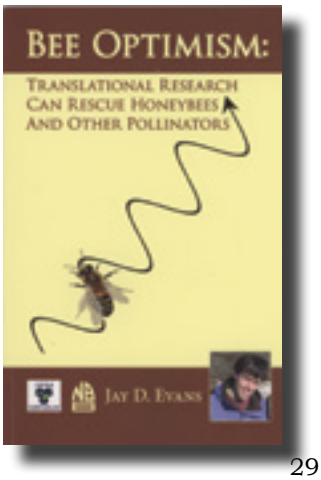
Sweetness and Light is about honey, mostly. Pollen DNA ID for honey, early harvested vs. late harvested honey differences, propolis and health, and a bit about soybean pollination.

Royal Decrees looks at queen replacement, effects of mites on queen development, larvae choices by the bees when replacing a queen and a look at how solitary bees handle all this.

Climate Change covers a lot of topics you probably don't consider very often. He looks at the historical record of weather patterns and compares these to honey production and overwintering success in various parts of the world. The effects of rain, temperature can be predictive of losses next spring. And he looks at the superorganism of a whole hive in response to these events, not just individual honey bees. And stresses from habitat climate and disease stresses combined over long periods of time, and he takes a look at long time pollen collection, diversity and what can be learned from these studies. He uses a phrase here that I found interesting. With all this, scientists are looking for Signals In The Noise. Exactly.

But he is optimistic – lots of new beekeepers and lots of new researchers. New methods, treatments and diagnostics in the works. Grand new collections of data, available in the cloud from individuals, from colony level studies, data collection organizations and research, available to decipher some signals in the noise.

I was lucky to have Jay approach me with his idea for his column, and wise enough to say yes. We are smarter, and better because he raised his hand. *Kim Flottum*



New For You –

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Commercial beekeepers who have been using HiveAlive will be delighted to know that it is now available in a larger container size. The 2.64 gallon (10 litre) bottle has just been launched in the U.S. and Canada and feeds up to 1000 colonies. HiveAlive is the #1 feed supplement for honey-bees worldwide and has been fed to over six million colonies.

"We have had high demand for the commercial offering in territories like New Zealand, Australia and Europe. Having received many requests from beekeepers in the U.S. and Canada looking for HiveAlive in larger bottles, we are happy to finally launch it now", says Dara Scott, creator of HiveAlive.

Beekeepers who have been using HiveAlive in the U.S. and Canada cite increased yields and improved survival as the main benefits of feeding. It also prevents syrup from fermenting. HiveAlive is the only feed supplement with published proven long term data (published in the Journal of Apicultural Research).

HiveAlive has also started distributing all sizes of HiveAlive to U.S. and Canadian retailers and customers directly, which will mean improved customer service. So, whether you need the smallest bottle to feed 10 colonies or the largest to feed 1000, visit **usa.hivealive-bees.com** to find your local retailer or to order directly.

If you are interested in stocking HiveAlive in your store, please email **hivealive-sales@advancescience.com**

Solitary Bees Sharing Honey Bee Comb

Francisco **Posada-Forez**[1],
Barbara **Bloetscher**[2],
Suzanne **Batra**[1], Jay **Evans**[1]

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The mason bee, *Osmia cornifrons* Radoszkowski (hornfaced bee) (Hymenoptera: Apoidae: Megachilidae) was introduced to USA from Japan as an alternative pollinator for fruit orchards in 1978 by then USDA scientist Dr. Suzanne Batra, who is now retired and living in Greenbelt, Maryland. Dr. Batra evaluated this solitary bee in Japan for pollination of fruit orchards and found it had perfect timing with early flowering plants such as members of the family Rosacea, *Pyrus* spp. and *Prunus* spp. Dr. Batra held these bees in quarantine to free them from natural enemies following USDA-Animal and Plant Health Services guidelines (1,2).

O. cornifrons was first released in Maryland where it adapted quickly, since the weather is similar to that in its original range (1). Dr. Batra distributed the bees to several farmers across the country for fruit orchard pollination and then followed its establishment by surveying farmers with numerous questionnaires. Additionally, Dr. Batra wrote a definitive manual describing how to manage and propagate these bees (3).

Dr. Batra's creative work and passion for mason bees refined and promoted the use of tubes to create nesting sites for these and other pollinators. This innovation has turned into an industry, aiding farmers and generating income for entrepreneurs who supply these types of nests to gardening stores to sell to fruit orchard famers, enthusiasts and naturalists engaged in promoting pollination and bee conservation (3).

O. cornifrons has spread throughout Maryland to neighboring states via requests from farmers and natural dispersal. A substantial aggregation of mason bees was found recently in Ohio (GPS coordinates 40.1041 N 81.1630W), nesting inside a honey bee colony (Figure 1). This aggregation was found by Joe Heider, beekeeper, who sent them to Barbara Bloetscher (Ohio Department of Agriculture, Division of Plant Health – Apiary). No signs of competition were observed as the aggregation only occupied a part of the frame cell comb. The mother mason bee (or mothers) used honey bee cells directly, with each offspring occupying an individual cell lined horizontally through the comb frames. This is opposite to the normal way of nesting in tubes. In total were found 30 cocoons on one side and 24 on the opposite side of the comb. The cells seemed to have had wax buildup as the bees developed, suggesting that honey bee might have been present during the summer while these mason bees were developing (Journal of Apicultural Research **DOI: 10.1080/00218839.2020.1740405**).

This species of solitary pollen bee belongs to the Megachilidae bee family. These bees all nest in cavities and show plasticity to turn a variety of unoccupied hollow spaces into nests, from twigs to clay tunnels. Also, they are able to nest in snail shells or wasp nests (4-6). Maybe these responses reflect habitat modification that decreases the opportunities for them to find natural nesting resources. It is unlikely that the observed nesting behavior of *O. cornifrons* poses a threat to honey bees when searching for a place to nest. A lesson of this finding is that we might need to study other possible artificial nests for mason bees, with architecture similar to honey bee combs. These might offer clean homes and new opportunities to propagate these useful insects for pollination and conservation. BC

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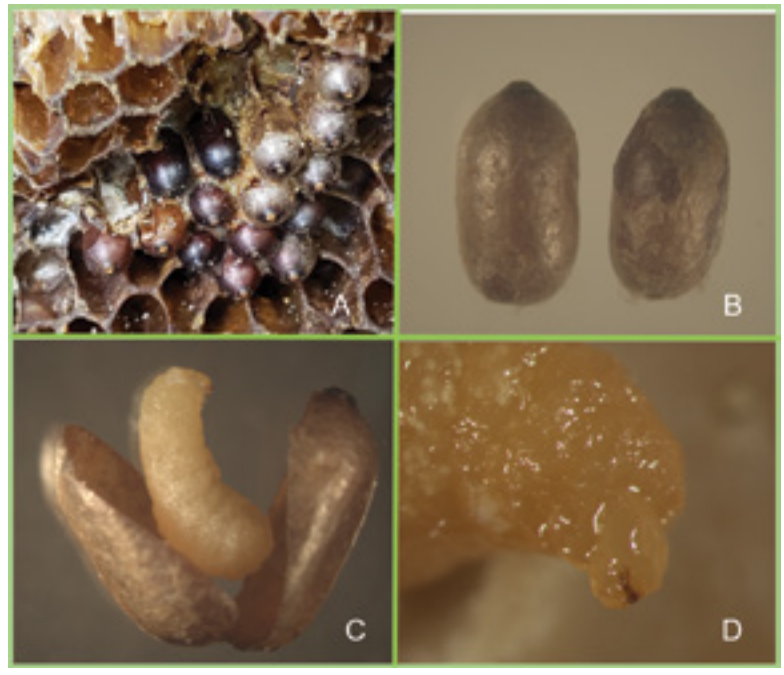
Diagnosis of cocoons found on honey bee comb cells. A – Osmia comifrons *cocoons in honey bee comb cells. B – Cocoons with black nipple. C – Cocoons cut open showing* O. comifrons *larva. D – Typical hymenoptera head and mouth parts of* O. comifrons *larva.*



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Varroa mite resistant to Amitraz?

By Dr. Malcolm Sanford

Welcome to the Bee Culture column featuring InsideTheHive.TV, "The show that takes you into the world of bees". It features the effort of Dr. Humberto Boncristiani to provide free video content on YouTube. Dr. Boncristiani is an applied honey bee researcher, affiliated with the University of Florida's Honey Bee Research and Extension Laboratory, you can find more about him at his website (www.InsideTheHive.TV). To take full advantage of this column, readers can either scan the QR code provided here using a phone or tablet , or access the video that complements this column by entering https://qrco.de/amitrazr as a browser address on a computer/laptop.

Recently, Dr. Boncristiani attended the American Honey Producers Association in Sacramento, California, and recorded the accompanying presentation by Dr. Frank Rinkevich of the Baton Rouge Bee Laboratory about Amitraz Resistance in Varroa mites. This 38-minute video is worth the extra time and effort to digest the material presented. Dr. Rinkevich begins with the idea that one particular treatment for Varroa, the miticide Amitraz, usually generates a lot of buzz with beekeepers. That's because it is known to have created resistance in Varroa mites, which are no longer killed by the substance in great numbers. Reliance on this miticide inevitably results in resistance, which is a widespread phenomenon across the insect world. He compares resistance to insecticide in house flies with Varroa in honey bees using the same characteristics. This points to both organisms becoming resistant multiple times and in different geographical situations.

Watch video

Scan the QR code using your phone or tablet to access the video. or visit: https://qrco.de/amitrazr

Research at Project Apis m is also occurring with respect to amitraz resistance. According to Dr. Rinkevich. Arian Avalos is described as working to identifying genes associated with the trait to develop a molecular diagnostic test. This could lead to an important goal of having a low cost, extensive, rapid evaluation of amitraz resistance. The take-home messages listed by Dr. Rinkevich, are that 1) amitraz resistance is rare, but detectable; 2) generally restricted within colonies and within operations; and 3) Apivar® effectiveness is a reliable substitute for measuring resistance using the parent compound (amitraz). In other words, the formulated material on strips called Apivar® is just as effective as using the chemical itself (amitraz), which makes detecting resistance much easier.

Dr. Rinkevich describes techniques to determine baseline toxicity of amitraz, the extent of resistance found in commercial beekeeping operations, along with producing validated measurements of resistance. This is done using vial bioassays for toxicity and measuring the efficiency of the commercial formulation of amitraz, called Apivar®, executed over a three-year period. A considerable number of beekeeping outfits did not show resistance, revealing it's still effective in spite of widespread and consistent use. Again, he describes resistance as mostly found within operations and within apiaries, and the range of resistance is also quite large among these outfits and apiaries. Much is not known about amitraz itself, specifically its breakdown products. In many chemicals, these can be more toxic than the parent material. Finally, he concludes the biochemical mechanism of resistance needs to be better understood, and describes a Varroa Resistance Management Network being formed as a collaborative working group to better determine intensity, prevalence and trends in detecting resistance in the future.

Dr. Malcolm T. Sanford is Professor Emeritus at the University of Florida and author of *Storey's Guide to Keeping Honey Bees. https://beekeep.info*

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The Alimentary Canal

"The alimentary canal of the adult honey bee begins at the mouth in the lower wall of the head, which opens into the cavity of the sucking pump, which stands vertically in the head. At its upper end the pump narrows to the slender, tubular oesophagus, which then turns posteriorly through the neck and thorax. From there it enters the anterior end of the abdomen which enlarges into a thin walled sac called the crop or honey stomach. It is used by the bee for carrying nectar or honey. Following the honey stomach is a short narrow part of the food canal called the proventriculus. The proventriculus is a regulatory apparatus that controls the entrance of food into the stomach. Next comes a long, thick, cylindrical sac, the true stomach or ventriculus (Snodgrass and Erickson 1992)."

"The ventriculus is where most of digestion takes place. It is a large structure, bent back in a U-shape on itself, beginning and ending towards the front of the abdomen. It has a number of constrictions, so that it has a corrugated appearance. It has an outer layer of longitudinal muscle, and an inner layer of circular muscle. It is lined with cells that produce digestive enzymes. The lining has a number of internal folds to increase its surface area, these are covered with cells which gradually break off as they progress toward the center. These cells contain digestive enzymes which are released as the cells burst.

The lining of the ventriculus is further covered in a gelatinous substance, the depth of which varies. The food within the ventriculus is contained within thin-walled membranous bags known as peritrophic membranes. This membrane is secreted by cells at the beginning of the ventriculus when food first enters. The digestive enzymes are able to pass through the membrane to reach the food and the nutrients are able to pass out. It is thought that this membrane provides protection against physical abrasion to the lining of the ventriculus from rough-edged particles, restricts bacteria and other potentially harmful small organisms and concentrates the digestive process (Stell 2012)."

"Following the stomach is the intestine which is distinctly divided into two parts: first a narrow anterior intestine which is looped or coiled in various ways according to the position of the stomach; and second, a large pear-shaped posterior intestine or rectum, opening by its tapering extremity through the anus into the cavity that contains the sting. The intestine and rectum serve principally for the discharge of waste matter and for the absorption of water, but the rectum is also a storage chamber for the retention of feces until the latter can be evacuated outside the hive. In overwintering bees, the rectum may become so greatly distended as to occupy a large part of the abdominal cavity before defecation occurs (Snodgrass and Erickson 1992)."

"At the junction of the intestine with the ventriculus, a great number of long, thread-like tubes, probably a hundred or more of them, open into the intestine. These tubes are known as the Malpighian tubules; they are not digestive glands but excretory organs that remove waste products of metabolism from the hemolymph, including both nitrogenous substances and salts (Snodgrass and Erickson 1992)."

"They are also osmoregulatory organs; maintaining water and ion balance in the medium surrounding vital cells and organs (Lipiński 2018)." "The tubules extend long distances in the body cavity, winding and twisting in numerous convolutions through the spaces about the other organs, where they are directly bathed by the blood. The products discharged into the intestine are eliminated along with the waste food matter (Snodgrass and Erickson 1992)."

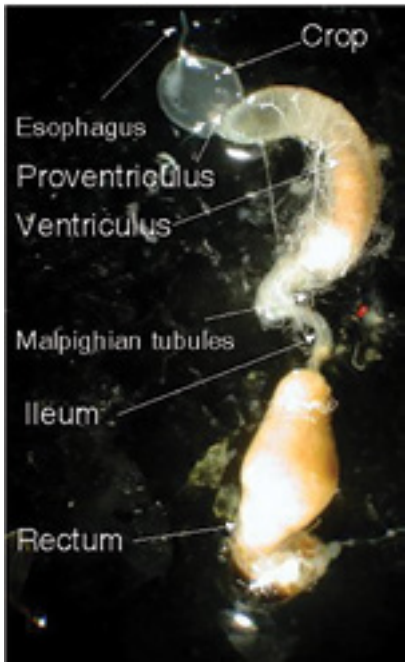
"Bees consume nectar and pollen as carbon and nitrogen sources, respectively, and both of these foods require extensive processing in the gut (Kunieda et al. 2006)."

"Digestion of food is supported by the presence of gland secretions, enzymes and bacteria (Kačániová et al. 2004). A well-balanced association of microbial species with many symbiotic and competitive interactions, referred to as an indigenous gastro-intestinal microflora, forms an integral part of the digestive system. The symbiotic microflora of the digestive tract of adult honey bees consists of Gram-negative, Gram-positive and Gram-

variable bacteria, molds, and under some conditions also yeasts (Gilliam 1987). The normal microflora is acquired by consuming pollen, other food, and through contacts with older bees in the colony (Kačániová et al. 2004)."

"Honey bees have the potency to store "huge" amounts of carbohydrate (sugars) both in the hive and in their bodies. In the hive this is stored as honey, whereas in the bee body it is stored as glycogen and circulates in the hemolymph as trehalose (Lipiński 2018)." Sugars are degraded into glucose and fructose by digestive enzymes in the alimentary tract (Żółtowska et al. 2012).

"Glucose is the main energetic substrate for bee tissues. Excess of glucose is moved to the fat body where it is used for synthesis of trehalose or stored in a form of glycogen (Żółtowska et al. 2012). When energy demands are high, during flight for example, fast degradation of glycogen by glycogen phosphorylase and trehalose by trehalase provides glucose, which is delivered through the hemolymph to flight muscles as well as to other tissues (Gmeinbauer and Craisheim 1993; Becker et al. 1996; Blatt and Roces 2001). Trehalose is the main sugar found in hemolymph of honey bees. Its concentration is very high and varies from 2 mg/ml to 40 mg/ml (Blatt and Roces 2001). Other sugars found in the hemolymph are glucose and fructose. Their concentrations are relatively low: 15 µg/ml and 7 µg/ml for glucose and fructose, respectively (Leta et al. 1996)."



"The only sugars detected in honey bee blood under any combination of age or feeding regime were fructose, glucose and trehalose (Woodring et al. 1993). Sucrose was never detected. Outgoing forager bees had sufficient tissue reserves and honey stomach (crop) stores to maintain constant blood sugar titers for 15-60 minutes, the length of time depending on the initial amount of honey in the crop. Typically, blood glucose and trehalose concentrations declined over 50% after 30 minutes without food. Normal glucose and trehalose titers were restored within 10 minutes after bees started to feed again, indicating a very rapid sugar mobilization from the gut into the blood."

"The activity of glycogen phosphorylase and carbohydrate hydrolyzing enzymes α-amylase, glucoamylase, trehalase, and sucrase was studied in the development of the Carniolan honey bee, from newly hatched larva to freshly emerged imago (mature adult stage) of worker and drone. Phosphorolytic degradation of glycogen was significantly stronger than hydrolytic degradation in all developmental stages. Developmental profiles of hydrolase activity were similar in both sexes of brood; high activity was found in unsealed larvae, the lowest in prepupae followed by an increase in enzymatic activity. Especially intensive increases in activity occurred in the last stage of pupae and newly emerged imago. Besides α-amylase, the activities of other enzymes were higher in drone than in worker broods. Among drones, activity of glucoamylase was particularly high, ranging from around three times higher in the youngest larvae to 13 times higher in the oldest pupae. Both α-amylase and glucoamylase are enzymes that breakdown starch molecules. This confirms earlier suggestions about higher rates of metabolism in drone brood than in worker brood (Żółtowska et al. 2012)."

"Proteolytic activity (proteolytic enzymes help break down and digest protein) in the midguts of pupae and imagos of worker honey bees was determined over a one-year period. The bees were of defined ages and the size of the hypopharyngeal glands was used as a parameter of their functional status. The activities of trypsin-like, chymotrypsin-like enzymes and the total caseinolytic activity were investigated. Proteolytic activity is limited in pupae and newly emerged bees, then increases rapidly in the first hours of the imago stage. Proteolytic activity and the relation between trypsin- and chymotrypsin-like activity vary with age, season and functional status of the insects. Nurse bees show the greatest proteolytic activity. Age-dependent distributions of enzymatic activities in the endo- and ecto-peritrophic space indicate that the peritrophic membrane establishes compartments within the midgut lumen (Moritz and Crailsheim 1987)."

"Carbohydrate-active enzymes play an important role in the honey bee due to its dietary specialization on plant-based nutrition. Secretory glycoside hydrolases (GHs) produced in worker head glands aid in the processing of floral nectar into honey and are expressed in accordance with age-based division of labor. Pollen utilization by the honey bee has been investigated in considerable detail, but little is known about the metabolic fate of indigestible carbohydrates and glycosides in pollen biomass. Ricigliano et al. (2017) demonstrated that pollen consumption stimulates the hydrolysis of sugars that are toxic to the bee (xylose, arabinose, mannose). GHs produced in the head accumulate in the midgut and persist in the hindgut that harbors a core microbial community composed of approximately 10^8 bacterial cells. Pollen consumption significantly impacted total and specific bacterial abundance in the digestive tract. Bacterial isolates representing major fermentative gut phylotypes exhibited primarily membrane-bound GH activities that may function in tandem with soluble host enzymes retained in the hindgut. Additionally, they found that plant-originating ß-galactosidase activity in pollen may be sufficient, in some cases, for probable physiological activity in the gut. These findings emphasize the potential relative contributions of host, bacteria, and pollen enzyme activities to carbohydrate breakdown, which may be tied to gut microbiome dynamics and associated host nutrition."

"Jimenez and Gilliam (1989) determined the influence of age and diet on trypsin-like activity in the honey bee midgut and on the ultrastructural morphology of the midgut epithelial cells. Trysin-like activity was detected in the epithelial tissue, in the fluid of the ectoperitrophic space, and within the endoperitrophic space of the

midgut of adult worker honey bees. It was highest in free-flying bees and in caged bees fed pollen. Lower levels occurred in caged bees restricted to sucrose syrup or fed sucrose syrup in addition to either Beltsville Bee Diet or egg albumin. Levels of midgut trypsin were dependent on the amount of protein diet consumed. Both diet consumption and trypsin-like activity decreased as the bees aged. Ultrastructural changes in the midgut tissue accompanied this decline in enzymatic activity. In five-day-old pollen-feeding bees, the apical cytoplasm of cells in the posterior midgut contained numerous electron-opaque vesicles, and the brush border in the crypts of the distal midgut was composed of short pleomorphic microvilli. Apical discharge from the midgut cells released the opaque vesicles into the midgut lumen. However, in 30-day-old field bees, the number of opaque vesicles and the microvesiculation of the brush border were reduced. Thus, the presence of the endogenously produced endoprotease and the regional variation in cell ultrastructure suggest that the honey bee may rely on countercurrent flow to distribute enzymes and nutrients efficiently throughout the midgut."

Protein seems to be digested mainly in the midgut (Moritz and Crailsheim 1987). "The mechanisms by which pollen is digested by honey bees are incompletely understood. Potential methods are thought to include pseudogermination, mechanical disruption, enzymatic breakdown or osmotic shock. Understanding the role of pseudogermination in this process has been hampered by a lack of tools demonstrating retention of metabolic activity in pollen collected by honey bees. McKinstry et al. (2020) showed that pollen collected by honey bees produces reactive oxygen species (ROS) at robust levels upon germination, suggesting that ROS is a suitable marker of this process in pollen. ROS can be readily found in the digestive tract of honey bees and is localized to pollen grains within the lumen. Finally, manipulating pollen levels in the midgut can change ROS levels in the digestive tract. These data provide evidence of retained metabolic activity in bee-collected pollen that lends support to pseudogermination as a mechanism for pollen digestion in honey bees."

"Honey bees satisfy their lipid (fat) requirement by consuming pollen. The free fatty acid content of the midgut was used to quantify fat digestion. Midguts extracted from younger workers of known ages and from foragers were divided into three components: endoperitrophic region (peritrophic membrane with gut contents), extraperitrophic region and intestinal wall. Both the total amount of pollen and the amount of free fatty acids in the endoperitrophic region and in the intestinal wall depend on the bee's age. The amounts increase within the first three days of a honey bee life, reach maxima around the age of eight days and then decrease continuously to the lowest values, measured in forager bees. Forced feeding with triacylglycerol (composed of three fatty acids and glycerol =fat) results in significantly higher levels of free fatty acids, especially in the endoperitrophic region, in eight-day-old bees and foragers. This indicates that lipolytic activity (breakdown of fats by hydrolysis to release fatty acids) depends on age and that the free fatty acid content in eight-day-old bees is primarily limited by the amount and availability of lipids ingested. The results show further that fat digestion depends on the functional status of honey bees, as is the case for pollen consumption, speed of transport of pollen bolus through the alimentary canal and protein digestion (Loidl and Crailsheim 2001)." BC

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BEE VET

Festooning

Tracy **Farone**

The importance of language and action.

When I heard about veterinary bee medicine in the U.S. for the first time in late 2016, I laughed. I was 17 years into my veterinary career and thought I had heard it all. Nope. Bees – (giggle). Even with a background in tick and public health research, I initially thought the idea was just one more thing to do. I tried to dismiss the idea. But have you ever had something just keep "bugging you", until you checked it out? I started reading. Reading anything and everything I could about bees and bee medicine. I uncovered connections and discovered that my College (of employment) had a relationship with a veterinary school in Europe which boasted a post-doctorate program in bee medicine. I also discovered that my host family at the Crow Indian Reservation in MT (a trip I take every year with students) had connections with large 10K hive migratory beekeepers. I was intrigued.

Author in the beeyard.

I realized that bees have bacterial, viral, parasitic, fungal, nutritional, and toxic diseases, like other animals. Bee diseases can be diagnosed through exam findings and diagnostic testing, and treated with environmental, nutritional, and pharmacological interventions, similar medical approaches taught universally in veterinary schools. IPM – already in the wheelhouse. I was also concerned to learn about the many challenges honey bees, other pollinators, and beekeepers face. I wanted to learn how to help, as it became apparent that I was in a unique position to do something. But I needed to understand beekeeping first and eventually become a beekeeper.

I needed prep. I applied for and was awarded a sabbatical to study this new quandary of bee medicine coming to the U.S. So since late 2016, I have been on a journey spending thousands of hours studying the evolution of this new relationship and creating an apicultural research program at my College. This journey, I would like to share, and continue, with you.

In much of Europe, an origin of our beloved *Apis melifera*, honey bees have a had a doctor, just like any other agricultural or companion animal, for decades. Bee veterinary medicine is a typical course of instruction at veterinary schools, taught alongside all the other species veterinarians may serve: cattle, hogs, chickens, horses, dogs, cats, birds, sheep, goats, rabbits, etc. An apiary is an integral part of the students' educational rotations on European veterinary campuses. It is the norm for veterinarians to be educated, and contribute to the care of arguably our most important agricultural animal, the honey bee.

During my sabbatical, I traveled to France to visit ONIRIS veterinary college, (the one with the post-doc bee program). In the semester prior to leaving for Europe, I thought it would be a good idea to learn some French. So, on my daily two-hour commute to and from work, I listened to a French conversational podcast in an attempt to learn the language. Now, I do speak some French – badly. Once in France, I worried I would insult my French colleagues by butchering their beautiful language. But I tried. To my surprise, my attempt to learn their language was the key to opening-up real relationships and trust. They welcomed me like family into their homes. We shared many meals together, and they shared what was personal and important to them. My French colleagues took me all over France showing me large portions of their bee industry, from commercial beekeeping, to honey and wax processing, to their bee veterinary medical curriculum. Explaining much in French! I was overwhelmed. I still have colleagues who have become friends, which I correspond with regularly – in French.

After France, I spent some time in Scotland (sorry Outlander fans, I did not find Jamie Frazier). Scots take pride in doing things the way they like to do things, including beekeeping, but there is no real language barrier here, right? Well . . . while walking the Royal Mile in Edinburgh, I wandered into a kilt shop and found a Mackenzie gentleman who took the time to tell me about every tartans' family meaning, colors, and history for at least 45 minutes. I listened smiling attentively, but he once kindly asked if I "dinna" understand what he was saying. I dinna always, but I got the gist and greatly appreciated his effort.

Just outside of Edinburgh, I visited the University of Edinburgh, which boasts the Roslin (research) Institute, famous for the first cloned animal, "Dolly", the sheep, and the Royal Dick School of Veterinary Studies. Yes, Royal Dick. Language, remember – some things mean different things to different people, from different perspectives. I was taken on a wonderful tour of the facilities by local gentlemen who proudly told me all about the School's history, and the contributions and shenanigans of their founders, William Dick and more likely, William's sister, Mary Dick.

Of course, with the veterinary school, there was also a beeyard

and beekeeper/bee researcher who donned a very impressive beard. The apiary was hidden in plain sight, through a sheep field filled with perhaps Dolly's colleagues? Clones? While studying in the apiary, I noticed locked ratchet straps around the hives. I knew there were no bears in Scotland but thought maybe there may be other pests. So I asked the beekeeper about the locks. He said with a wink, "Awck, we dinna have bears in Scotland, but there are other Scots." Despite all the science I learned about bees in Europe, my take home lesson was that to learn the language of another group or person is the key in developing successful relationships.

Back in the States, I had a beekeeper, now a dear friend of mine, tell me the importance of being a "doer." Perhaps because he initially thought I was a stuffy academic, but as a clinician with 12 years in the field, I understood what he was saying, took no offense, and then helped him physically build a commercial beeyard. Bees are certainly doers – they get things done. Language is important not just to speak, but to listen and ignite mutual understanding and cooperation.

Festooning is a funny little bee word. It sounds like a mix between festival and cartoon. In bee biology, festooning is a very important piece of language to understand. Festooning, regarding honey bees, is defined as a behavior in which bees cling to each other, often in single chains, reaching out their limbs to each other to make connections, with the intent to build the framework of something new. Sometimes the behavior occurs to repair old comb or measure distances between spaces. Sometimes scientists are not sure why they do it. If you are a beekeeper, you have probably noted this behavior with a smile. It is fun to watch.

Students next to the shed.

This article series covering topics on bee medicine and connecting the worlds of beekeepers and veterinarians, will be appropriately called "Festooning", as I believe the bees give us a good example of what to do. Our relationship is still in early stages, but if we reach out to each other, think of the framework we could build. Throughout this series, I would like to share perspective on what I have learned by listening, observing, and working in the field with dozens of beekeepers, entomologists/bee researchers, and veterinarians in this vast field of apiculture. I will reveal the latest "buzz" on our common challenges with solutions, what vets can do for beekeepers, and highlight topics in biology, pathology, diagnostics, and treatments related to honey bees. BC

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. Dr. Farone has logged thousands of hours working with dozens of U.S. backyard, sideline, and commercial beekeepers. 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. In free moments, Dr. Farone enjoys spending time with her family, running, horse-back riding, SCUBA diving, and of course, just "beeing" with her backyard hives.

Bee sign hotel.

Scottish beeyard.

All The Buzzz in...

Hello Friends,

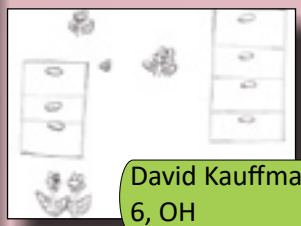
Enjoy the last days of summer.

Bee B.Queen

Bee B. Queen Challenge

Find a four leaf clover!

Ivan Kauffman, 10, OH



David Kauffman, 6, OH

Cristina Kauffman, OH

Crazy About Clover

White clover, one of the best summer blooming plants, is an excellent nectar producer. Bees lick their lips when they see these flower heads which are made up of 40 to 100 small flowers called florets. This plant provides food for bees in the form of nectar. Livestock also love to eat the entire plant! It is a treat for the six-legged and the four-legged. Then the honey becomes a tasty treat for the two-legged too!

Clover Everywhere!

In many parts of the United States, clover can be seen growing everywhere – along the roadways, in empty fields, in yards, it is everywhere!

Clover Honey

Thanks to the bees, the clover nectar makes a popular and delicious honey. Weather conditions effect the production of nectar in the clover flowers.

Photos by Scott Lehman

Clover is easy to identify. The leaves produce three rounded leaflets. The flower heads are usually white, purple, or a pinkish color, and are about the size of a marble. A white clover plant grows from seed the first growing season and then blooms the next growing season. Insect pollinators are needed for this plant to make seeds. More seeds mean more plants.

Lucky Day

If you are lucky maybe you will find a clover leaf with four leaflets instead of three. In a survey of over five million clovers, a four leaf clover is 5,000 to 1. Go on a scavenger hunt to find a four leaf clover this summer.

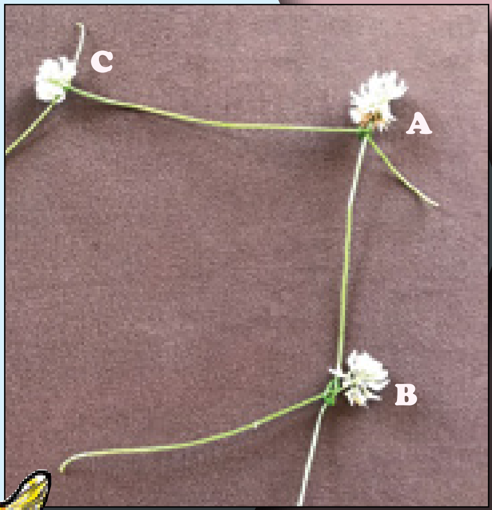
The sweetness of life lies in usefulness, like honey deep in the heart of a clover bloom.

... Bee Kid's Corner

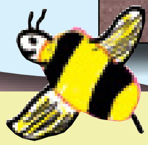
Produced by Kim Lehman -www.kim.lehman.com
www.beeculture.com
August 2020

Flower Ties

Make a clover chain. If you don't have clover growing near you, try using another kind of wildflower. It helps if the stem bends but does not break. Thinner stems are a little easier to tie, but any size stem will work.



1. Pick some clover flowers. The longer the stem the better, so pick low, as close to the ground as possible.
2. Carefully tie the stem of one flower (A) around the stem of the other (B). A simple knot works great.
3. Slide the knot (A) up to the base of the flower (B). You can then tighten the knot.
4. Tie the next flower stem (C) onto the stem of flower (A). Keep going with this pattern as long as you want. You can make a very long flower chain that could be draped over fences, around your house, or even around you! The chains make beautiful necklaces, crowns, belts, or garlands. What a lovely gift for a neighbor, family member, or friend.
5. What can you make with your flower chains?



Clover Challenge

Can you decipher this quote by Laura Ingalls Wilder, the author of the *Little House on the Prairie* books?

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
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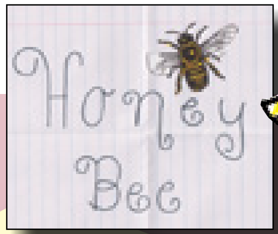

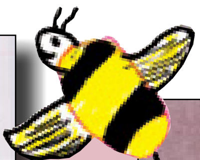

Clover Song

(Tune: "I'm a Little Teapot")

I'm a little clover small and round
Growing low upon the ground.
Bees love to visit to gather food.
Slurp, that nectar is so, so, good.

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Samuel Ramsey, PhD, Studied at Cornell University and University of Maryland, completing his Doctoral Thesis on Varroa Destructor Mites. His thesis articulated that mites were feeding off the 'Fat Body' predominately, rather than the bee's hemolymphu. Dr. Ramsey, currently employed at Bee Research Lab, Beltsville MD, is currently in Thailand researching the Tropilaelaps Mite.

Michelle Flenniken Ph.D. is an assistant professor in the Plant Sciences Department at Montana State University. She is a microbiologist investigating honey bee host-pathogen interactions, and she also serves as a co-director of the Pollinator Health Center at MSU.

Vanessa Louise Corby-Harris Ph.D.
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The common goal uniting Corby-Harris's research is understanding the ecological and physiological mechanisms that enable organisms to respond to their environment.

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Nadja's Favorites

A City Ecosystem

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

Nadja's flowers make the honey bee hives on the rooftop difficulto to notice. (photo by Julie Berg)

Finding Nadja's Minneapolis home on a Summer day does not require house numbers. Just drive until you find the bee food. From the sidewalk, a terraced slope riots with pink phlox, orange tiger lilies, lupine, white culver's root, and various milkweeds. Bees of every shape and size think they are in heaven. Looking closer, Nadja will point out funny little native woodland ephemerals – like bloodroot and yellow lady slipper – that she's coaxed to live in the shade of evergreen trees. There are wild strawberries, beds lined with giant sunflowers, and lots of berry bushes. Her modest house hides among the gardens. You might not even notice the two honey bee colonies the Bee Squad established in May of 2014 on her rooftop.

Like most of our Bee Squad Bee Network customers, Nadja is not a beekeeper. But she is one of the best bee advocates we know. Over the years, Nadja's bees have seen a surplus of honey most years along with robust *Varroa* infestations. It was in some of our newly established honey bee colonies in 2014 along with Nadja's that sounded the *Varroa* alarm for us. We saw confusingly high numbers of mites in colonies in the late Summer and Fall that resulted in early colony death, despite surplus honey and enough stores for a Minnesota Winter (75-100lbs). In some years, we have documented entombed pollen (pollen likely contaminated with an fungicide called Chlorothalonil (vanEngelsdorp et al. 2009), small hive beetles, and symptoms that suggest chronic bee paralysis viral infections in her colonies.

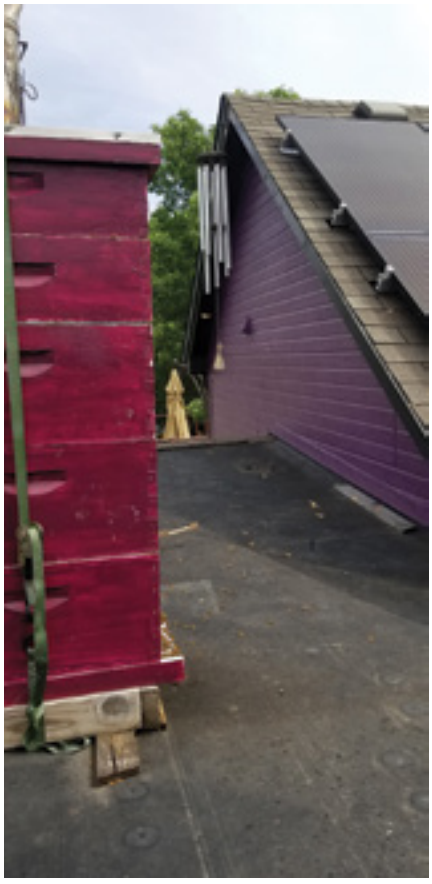
Nadja always approaches these various episodes with curiosity and a dedication to helping bees beyond her rooftop. She talks to her neighbors about eliminating the use of pesticides in home gardens, and writes passionate emails to her networks about honey bee health, mites, and planting for all bees. She volunteers with our Bee Veterans apiary (see *Veteran Mike* in the June

Nadja standing by volunteer lupines that joined her backyard. (photo by Jenny Warner)

2020 issue of *Bee Culture*), quietly tending to the gardens there, adding natives, or weeding.

One exciting day in 2017, Nadja's bees delighted the neighborhood by swarming. All who saw it were enchanted with the magic of a swarm. We were less excited about the colony's reproductive success in the middle of a city, and decided that we would manage her bees in three deeps going forward. The University of Minnesota Bee Lab's Beekeeping in Northern Climates management system includes both two and three deep colony management. The three deep method is a great beginner strategy to ensure that the bees have enough honey for the Winter without having to feed in the Fall, and it gives the bees additional space under the honey supers to discourage swarming in areas where it is less than ideal.

It is exciting to see a thriving city colony bring in so much nectar that they run out of space. It's as equally devastating to see a beautiful, thriving colony collapse in the Fall. These are both sides of the same coin in Minneapolis, a city that loves bees. While many plant food for bees, many also become beekeepers,



Nadja's rooftop hives.

creating a density of colonies that brings its own risks. Mites spread between colonies, and, with the various management strategies of city beekeepers, mites and the viruses they vector can collapse new package colonies established on foundation by the Fall.

One issue city beekeepers face is that it's hard to know how many colonies are in your area – let alone to develop a shared community management strategy. With our Bee Squad Bee Network program, we "monitor" different areas of the city by keeping hives there, to get a better sense of mite and other health trends. On the one hand, we are adding colonies to a landscape already saturated with bees; on the other, we are collecting information on various zip codes that can help us manage bees and teach beekeeping better. While we don't know how many honey bee colonies live in the city of Minneapolis, tracking (and limiting) these numbers in cities might be a good way to protect native bees while ensuring the ability to keep city bees.

Beyond this, honey bees start conversations. People see those stacks of boxes and ask questions. Neighbors get involved with planting, or change their perspective about bees from not wanting to get near them, to leaving out water baths for their pollinator neighbors. Our Bee Network hosts also become scientists in their own right. While working in her gardens, Nadja spends hours closely observing her bees in a way beekeepers can forget or not have time to do. She notices when lots of bees are orienting to the hives, when they are bearding, and what they are visiting most in her garden. As conversations abound about the role of honey bees in the U.S. (are they negatively impacting native bees? Are they livestock? Wild? Are they pets?) Nadja gives us a beautiful answer. They are part of her personal ecosystem, where their role is to pollinate flowers and make honey, and Nadja's role is to share that honey with neighbors, speak out about the issues bees are facing, and plant flowers on behalf of the neighborhood bees.

Some of Nadja's Favorite Flowers for Pollinators:

Angelica (not native but important; the honey bees love Korean angelica)

Culver's Root (the digger wasps go ga-ga for Culver's root, too)

Hyssop (bumble bees love it)

Tithonia (top flower for butterflies, blooms July through first frost)

Zinnias (loved by hummingbirds)

Milkweed (swamp, common and butterfly)

Mammoth sunflowers (the honey bees love the pollen

Chocoholic snakeroot (this is a cultivar the bees like that blooms into the fall.

Raspberries (yum! and good habitat for native bees) BC

Reference

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Authors

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

BIGGER PICTURE

Jessica **Louque**

Beyond Pesticides

Recently, the internet seems to have lost it's collective mind. I've always heard the phrase that the squeaky wheel gets the grease, and I've never seen it more true than now. If you use any form of media, it is blatantly obvious that everything is meant to be emotional instead of rational. I saw an email from *Bee Culture*, which in general is pretty good about just distributing information without commenting on it, but I was not particularly amused with the article in the email. It was an article from Beyond Pesticides about the effects of neonics on honey bee growth. What I'd like to do here is point out some issues I had with the article in the hopes that it helps you also be more critical when you read information. The current trend is to find something that corresponds to what you already believe, and disregard everything that doesn't match it. A lot of unease that has been going on in society is from having random information given by people who should be experts and leaders that changes on a weekly or even daily basis, leading people to follow their own conclusions and beliefs and fear alternatives.

Instead of complaining about the article's outcome, or purpose, I'd like to dissect it. Starting with the beginning, we see that it is published by a company that clearly has an agenda as stated in the name "Beyond Pesticides". When you start to read an article, watch a video, or listen to a podcast, you should always take into consideration the slant based on the presenter. What does the presenter have to gain by giving you this information in a way that agrees with them? What do they want you to get out of their topic? In this case, there is clearly an anti-pesticide agenda. Whether you agree with this stance or not, you should be mindful of it when reading it, and probably more so if you are pro-topic. You don't want to fall victim to blindly following a side just because you want to believe it. While you read/listen/watch your media, be aware so you can critically think about the information given. It might also be useful to consider what the presenter has to lose if you choose to disregard their information. Using the current example, if they can persuade you to feel passionately about their stance, perhaps you will pay them to have membership in their organization, or even buy their merchandise to display. If they fail to convince you of their argument, then they have less people in their organization to lobby, donate, or spread their information.

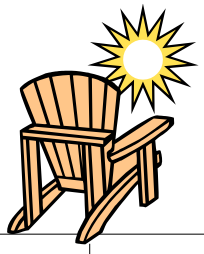
When you start assessing your information, a good place to start is with the informant. Is this a primary, secondary, or tertiary source? Our example is using an article published in Scientific Reports, owned by Nature Research. If you are reading a secondary source, the expected difference would be that the presenter is giving you their information from their viewpoint and/or opinion. If you read the original, you may view things differently than a secondary source. When viewing our example, it leads you back to the Beyond Pesticide page that has the original version of the article, including a bit more opinion-based arguments. At the bottom, the original publication link can be found so you can peruse the first article. This secondary source gives some information about the article in a way that argues their point, but requires some critical thinking. Obviously the point of this is to prove that neonics negatively impacted honey bees. They explain that low levels of neonics have a significant impact on the behaviors of honey bees. When you read articles that have a scientific background, there are some key words that you should look for. Typically, a scientific paper may use the word "impact" without expressing it as a negative or positive (unless there is a number correlation) to not introduce bias. The word "significant" also means that statistics were ran, and the data from one treatment was statistically

different from another treatment. If you're reading anything on honey bee studies, there are a few important things to think about. Even if you have sister queens, honey bee colonies are not the same. I'm sure some of you with multiple hives have attributed personalities to certain hives, or at least recognize that some colonies respond differently to the same thing. Or, if you have siblings, I'm sure some of you are vastly different from your brothers and/or sisters. If a study is run on bee colonies, how many colonies were tested? If you only test one colony, how do you know if you picked up the one colony that is going to react differently? If you test 4 colonies, is it enough? What number, n, are you dealing with? In our example, the article does not mention this information, which normally strikes me as questionable. I also want to know what rates were used. Words like low, mid, and high, when describing a treatment rate, are qualitative not quantitative and can vary from person to person. Looking at the original article, there was one colony tested per treatment, and the rates were an untreated control, 1 ppb and 10 ppb of clothianidin, and 200 ppb of thiacloprid. If I'm reading an article that is a secondary source, I think it's more trustworthy if it presents the facts up front.

After a few sentences saying that the research found significant effects on neonics, it goes on to lament the thought that the EPA will not use research such as this to augment their decisions on labels. There is direct insinuation that research paid for by pesticide companies is questionable, and that only organizations like their own care about the environment. I will admit an observer bias in this part, because as a Contract Research Organization, it is offensive to me that my scientific integrity is purported to be purchased. Who else would pay for these studies? I'll be the first to admit I'd be pretty mad if my tax money went to funding this research and the companies that profit from the research weren't paying for it. I also think a lot of fearmongering statements like this are used to prey upon people who don't understand the failsafes in the research industry to prevent things like cheating and corruption of data. Let me assure you – I'm not going to jail for anybody over lying about data, or risking the future of my business over your pesticides. If it's harmful, I am more than happy to do some more work and figure out how to make it less dangerous for bees. These studies though, done by researchers at universities, they just don't have the resources to do them on a scale needed to see an actual effect. When we test pesticides, we're typically working on a minimum of 4 colonies per treatment with multiple rates (3 is the minimum needed for stats). In studies similar to this one with feeding as the method of exposure, we usually have 24 untreated colonies and 12 colonies per treatment rate. However, I'd like to note that the original article specifically states "In conclusion, we can neither clearly confirm nor refute a neonicotinoid effect on nursing behavior and larval development throughout all experiments, although we observed various indications of such effects." The point here is that the original research has flaws that were recognized by the researchers. They were mostly excited to prove that their technology worked in their limited scope, and hope to be able to use it for more research in the future.

Obviously, a lot of people disagree with me on my personal stances. I think pesticides have their place when used correctly and safely, and I don't promote bans on chemicals that are safe to humans and workers with adequate precautions. Humans are the first and foremost importance in chemical safety, but pesticides keep the price of food down to be able to be more affordable for the general public (as opposed to organic food on a scale to feed the population). I do not oppose organic for people who want to do it, but I don't see it as large-scale feasible. As far as pesticides, I think misuse should have a higher penalty, but not to the producer of the chemical. If you are responsible enough to purchase chemicals, you are responsible enough to use it correctly and be held accountable for use. The thing here is that you don't have to agree with me, or with anything I write, and that's how it should be. I want you to go look up this information, read it for yourself, and think about what you read in a critical fashion. Even if it's something you agree with, don't let people spreading misinformation represent you or your beliefs. Educate yourself so you can have constructive conversations with people who think differently than you do, but remember to just be nice to people. Even if you disagree, please remember to be respectful to people in person, online, over the phone, or wherever you may be conversing. You don't even have to like or agree with the person, but please do yourself and everyone else a favor by being considerate and compassionate to others. The world definitely needs more of that right now, and you will have a lot better chance of persuading others to whatever argument you are trying to make. BC

Jessica and her husband Bobby run a business, raise bees, kids and all sorts of things at their home in North Carolina.



CSA – Community Supported Agriculture

Farming Is Always An Uphill Battle.

Pandemic resistant honey sales

The Covid-19 pandemic has impacted our world in profound ways, none more so than our economic system. Many beekeepers saw their markets dissolved overnight. People have become afraid of venturing out in public and state and local governments have enacted temporary bans on public gatherings and business activities considered nonessential. Restaurants were temporarily closed and limited to curb-side pick up. Many institutions suspended operations. Farmer's markets went on a forced hiatus. Meanwhile Tyson Foods took out full page ads in the Washington Post and the New York Times claiming that "the food supply chain is breaking" and millions of pounds of meat was about to disappear from the supply chain as huge meat packing plants owned by Tyson Foods, Smithfield Foods and JBS are forced to close due to almost 12,000 of their workers contracting Covid-19 and dozens dying from the virus. In response, President Trump issued an executive order reopening the closed plants and now meat-packers no longer release data on how many workers are sick or dead from the corona virus. They have stated that they will close if more than 10% of their workforce gets sick. One could get the impression that these mammoth food operations are more focused on profits than the health and safety of their employees.

An Alternative Model

One bright spot in our food system is the direct to consumer model of the Community Supported Agriculture (CSA) operation. Since the carona virus pandemic hit, CSAs around the country have reported a large surge in the number of people signing up for locally produced food.

CSAs are agricultural operations that are supported by people within the community who share both the benefits and risks of food production. Similar your *Bee Culture* subscription, CSA members pay for their CSA subscription upfront in the beginning of the season and receive a regular share of the farm's output throughout the rest of the year. This provides valuable capital for the farmer early in the season when the cash flow is typically low and expenses are high, and in return the CSA member receives a better deal on local food direct from the farm than they would get by simply purchasing similar products from their local grocery store.

Farming is always an uphill battle, and CSA members also share in the inherent risks associated with agriculture. If the farmer's crops fail, the CSA member is obviously not able to obtain the bountiful share of the harvest that had been anticipated.

Food Quality and Safety

Despite the inherent risks, consumers are being drawn to CSAs in record numbers as people seek out high quality nutritious foods. Food grown locally is fresher and therefore tastes better and is more nutritious.

There is also a greater sense of safety when folks have special access to their food supply, know where their food comes from, and know who is involved in producing it. There is also peace of mind in the knowledge that fewer hands are touching your food before it arrives in your kitchen.

Rebuilding the economy

The economic upheaval caused by the pandemic has motivated folks to want to do more to support their neighbors and community. Money spent at your local farm tends to circulate within the community at a much higher rate than money spent at national grocery store chains which siphon money out of a community. The increased local circulation of money creates a multiplier effect that helps create more local jobs, higher local wages and increased tax revenue for local governments, all of which may lead to a better standard of living within a community.

This pandemic is proving that small-scale and local foods systems are able to adapt to shocks to our food system much quicker and more successfully than the large scale industrial systems. These smaller localized food systems and their shorter supply chains are more resilient and are more reliable during economic and social upheavals. Who would you rather place your trust in, your neighborhood and community producers or the John Tysons of the world?

Local is more environmentally friendly

Locally produced food has great appeal to the environmentally conscious consumer as well. With fewer food miles travelled from farm to plate, local food has a smaller carbon footprint. Because there is no tilling, planting, cultivating and fertilizing involved in beekeeping, locally produced honey has one of the smallest carbon footprints of any food you can buy.

Less food is wasted when it is produced locally and not having to be shipped thousands of miles. This is a major concern considering that the USDA estimates that 30-40 percent of our food is wasted and about 40 percent of that food waste occurs during transportation and storage. Reducing food waste was identified as the third most important action we can take to address global climate destabilization by the coalition of scientists that assembled the most comprehensive plan ever proposed to reverse global warming titled *Drawdown* and edited by Paul Hawken.

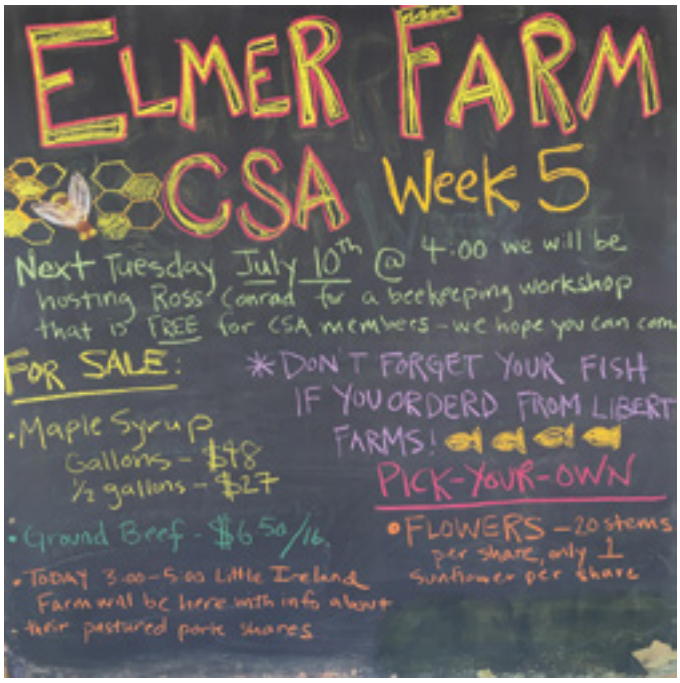
Relationship building

As an alternative socioeconomic agricultural model, the CSA closely connects consumers and producers in a way that builds close relationships that are long-term and strengthen the sense of community through local markets. This strong rapport helps build customer loyalty which in turn helps prevent sales declines, buffering the financial volatility that can occur during difficult and unpredictable times.

CSAs can be organized as a single farm, or a group of farms. Participating farms often seek to cultivate the producer – consumer relationship through regular newsletters with the latest about what is happening on the farm, open farm events and educational activities, or by inviting members to come to the farm to observe or even assist with the harvest.

Most farms simply charge a set fee for the seasons share, often offering different size shares to accommodate different size households. While most farms collect payment in the beginning of the season in return for a prepared box of farm produce, other farms work on a debit system and while payment is also made upfront the value of what folks choose on pick up day is simply deducted from their account balance. Some CSAs will even allow members to exchange labor in return for a discount on the cost of their share.

Produce and other farm goods are most often picked up or delivered weekly, but may also be organized around bi-weekly, monthly, or even a quarterly schedule. While many CSAs provide food from a single farm, single source CSAs may also make available other local farm products that they don't produce. Such add-ons are available either as part of the weekly share received by all members, or as separate items available for purchase on pick-up/delivery day. This helps create a more convenient one-stop shopping experience for participants making the CSA even more attractive and useful for food shoppers.



CSAs enhance their relationship and value to their members by offering educational events and products produced by other local farms. (Photo courtesy of Jennifer Blackwell, Elmer Farm, Middlebury, VT.

How can beekeeping fit in?

Herein lies an opportunity for the enterprising beekeeper looking to add more resilient markets to their distribution networks or simply replace lost markets due to the pandemic. The simplest way to take advantage of the current growth and interest in CSAs is to supply your local CSA with honey. It is relatively easy for an existing CSA operation to make additional products from other farms available for sale to folks when they are picking up their regular CSA shares. This option is especially attractive if you maintain an apiary on the farm that offers the CSA. Your bees are already part of their farm story and participate in the production of the food being produced. This type of option may

Spencer Blackwell of Elmer Farm takes some of the his CSA member families on a fun wagon ride around the farm. Photo courtesy of Jennifer Blackwell, Elmer Farm, Middlebury, VT.

also be attractive to non-CSA farms that have a busy farm stand and are open to including your honey and value added items to their product offerings.

Beekeepers who do not live near a CSA or who are ambitious may want to set up a CSA of their own offering not just honey, but additional value added products from the hive such as beeswax candles, salves, or propolis tincture to shareholders on a monthly or quarterly basis. Offering shares of the harvest from an entire apiary rather than specific hives will go far in mitigating the chance of not successfully supplying CSA customers with an adequate share from a single hive that gets hit by a bear, swarms, becomes a drone layer, or collapses from mites, disease, or CCD during the season. A longer time between distributions may be more appropriate for honey CSAs that do not produce the kind of wide variety offered by your typical vegetable farm and what is produced is not usually used up on a weekly basis. If you are located on a well-travelled road, setting up your own honey farm stand may also be a viable option.

Of course local food is not the whole answer as our family farmers cannot supply us with the coffee, bananas, chocolate, and other imported foods we consume as a society. However as Americans proved with their victory gardens during World War II, we could be producing a lot more of the food we eat regularly than we currently do while creating many decent employment opportunities in the process. Just as we need honey consumers supporting their local beekeepers, we need to support our local vegetable, fruit, grain, dairy and meat producers. (Full transparency: I prefer a vegetarian diet, but do not hold this against carnivores.)

A Changing paradigm

Subscribing to a CSA can be a lifestyle change for consumers. It means eating more in season, learning to cook unfamiliar vegetables, and knowing the names of the people who produce the food their families eat. People who are quarantined or self isolated at home are learning to cook again. Before the development of the industrial food system, almost all food was produced and consumed locally. We can only hope that this resurgence in the reliance on local foods and recognition of the importance of local farms solidifies instead of returning to business as usual once the current pandemic passes.

The local food movement is growing nationwide. This movement is part of a badly needed paradigm shift in order for farms to remain viable in face of the multiplying disasters to come – not only from this and future pandemics, but floods, droughts, fires, hurricanes and other symptoms of climate destabilization. Such collaborations between local farmers and consumers could mark the beginning of a new agricultural economy laboring to be born. One based more on the cooperative spirit of the honey bee colony than the rugged individualism and competition of our capitalist society. BC

Ross Conrad is the author of Natural Beekeeping and *The Land of Milk and Honey* and is a member of his local CSA in Middlebury, Vermont.

Virtual Georgia Beekeepers Conference

Linda **Tillman**

As beekeepers we are each navigating the coronavirus and what it has changed in our lives. As an organization for beekeepers, the Georgia Beekeepers Association is also trying to navigate the changes of the coronavirus.

As soon as the national shutdown began in March, GBA bought subscriptions to Zoom to allow our local clubs to have a way to meet. The lifeblood of a bee club is the interaction provided at bee meetings, whether to have a discussion, to hear a speaker or to demonstrate a skill. So we subscribed and offered the use of our subscriptions free to all of our GBA bee clubs.

About one-third of our 46 clubs have taken advantage of this. The clubs have held their board meetings via our Zoom accounts; had monthly speaker meetings with our accounts, done virtual hive inspections on Zoom, and taught honey harvesting workshops via our Zoom accounts. When in-person meetings resume, some clubs are discussing the possibility of continuing to use Zoom for their elderly members to make it easier for them to participate in meetings. In addition, GBA has used our accounts to have organizational committee and board meetings.

The side-benefits of having Zoom subscriptions include having speakers at club meetings who might not be able to travel as far as where the club meets. This benefit can continue after the COVID-19 crisis. In addition, using Zoom, our local clubs could invite national speakers to address their members without the time and cost of bringing them to Georgia.

If they are willing, we record the talks given to local bee clubs on Zoom. We are delighted to be developing a "lending library" of GBA videos of some of the best speakers in the state. These videos are also free to clubs to use as the focus of a club meeting.

Typically GBA offers our members two annual conferences, one in the Fall and one in the Spring. It's clear because of public health considerations that gatherings of groups as large as ours will still not be possible in the fall when we typically have a conference. We held a Zoom virtual board meeting to decide what to do. The vote was 22 - 4 to hold our Fall Conference virtually.

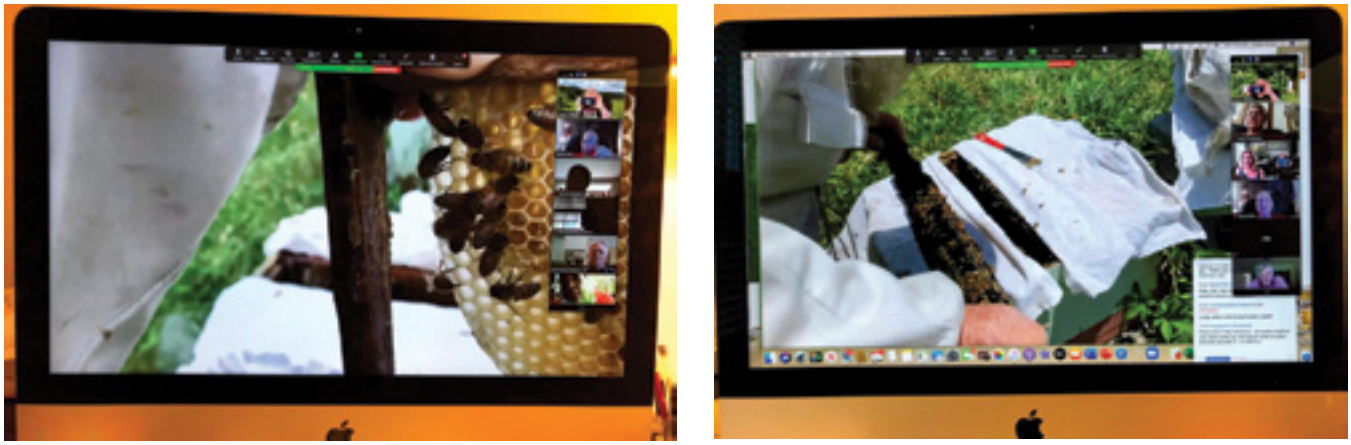
We checked with our nationally well-known speakers to see if they were open to presenting to us via Zoom. Every one of them: Dave Tarpy, Jamie Ellis, Keith Delaplane, Cindy Bee, and Virginia Webb all said yes! Buoyed with enthusiasm, we contacted our breakout speakers, typically people from our GBA members across the state. They agreed as well to present virtually. One of our presenters, Bethany Beck, is demonstrating how to make honey lollipops and she is going to film herself in her kitchen doing this and then show the video and talk about it during her Zoom breakout.

We will even have a virtual honey show! Our honey show committee, including Welsh honey judges, Brutz English, Mary Cahill-Roberts, and Marilynn Parker, have used their creative energy to tweak the rules to allow our members to submit their entries by mail for judging. (They won't count off for honey on the jar lid!) The winning jar and wax will be announced via Zoom during our virtual conference.

We are even having a **national black jar contest** as part of our honey show. Entries will be welcomed from all over the United States and our judges will determine who has the best honey in the USA.

We are excited to offer a VIRTUAL GBA CONFERENCE, marking our 100th year anniversary as an organization. The conference committee has been working creatively to figure out how to provide a conference for us to bring the beekeeping education to our members as is our mission. The conference will occur on September 25 and 26. **We will provide a bee conference adventure** to our attendants virtually.

While we are sad not to meet in person, we are looking forward to this new bee adventure. BC



View of a virtual hive inspection on a Zoom call.

Robbing And Thieving In The Bees' Natural World

James E. **Tew**

Can you give us novices any hope?

Keeping bees for the long haul has its ups and downs. I mean – really, can anything be fun and enjoyable *all* the time? On a recent Colorado Zoomcast, after a "down" discussion on some specific troublesome aspect of beekeeping, a Colorado beekeeper abruptly asked, *"Can you give us novices any hope?"* At once, he was both jocular and sincere. Comments and chuckles were had by all, but the comment stuck with me.

A totally new beekeeper and a newborn human infant have much in common. Each has a lot to learn. For both, there will be falls and stumbles along the way. Both mistakes and successes will be experienced. While the parents will superhumanly try to help and support, at some point, the growing child (or young adult as the case may be) will have to be on their own. Parents, do you remember that first bicycle ride or the first time your new driver merged the car onto an interstate lane? This maturation and learning process happens to all organisms – great and small. Beekeeping novices are not excepted.

Oddly, at once beekeeper neophytes experience both the best and worst aspects of beekeeping. They are in the most eager and enlightening phase of their bee lives. Everything beekeeping is new and exciting. But on the other extreme, they usually have only meager amounts of extra equipment and necessities like drawn combs and additional hive bodies. They have limited managerial experience, and they commonly have limited hive numbers. These people are in a vulnerable phase of beekeeping. It will be easy for them to take a tumble. Parent-like mentors try to help, but ultimately, the novice beekeepers will have to grow all by themselves.

Learning beekeeping is no different than learning to walk, swim, ride a bike, pass second year of algebra, cut hair or cook a great meal. Slog it out bee novices. Keep learning and experiencing. In time, you will all learn the great bee secret – we are all beekeeping novices – some just more novice than others.

Robbing

That novice thing I just put you through was as much for me as for you – and unfortunately, I am not simply humbling myself. Even after keeping bees for decades, it is not impossible to stumble into issues for which I really have no answers. Guesses at best.

For instance, to become familiar with the hive location, young bees take orienting flights. At first, such flights are thought to be just in front of the hive, but as their experience grows, they roam farther and farther away. That's a true, direct concept. But what's ongoing when, from a colony initiated from package bees hardly eight weeks ago, hundreds of bees come roaring from the hive and hover in front and around the hive – for all in the bee world – looking as if it were swarming (or possibly absconding). My first thought was, *"Oh heavens! My expensive package bees are absconding!"* (I didn't feel that they were populous enough to cast a swarm.) I was helpless.

Other than write about the phenomenon in *Bee Culture*, there was nothing that I could or should do. The bees were not casually walking out, yawning, stretching, and then taking an orienting flight, but they were running, in significant numbers, from the hive. Within twenty minutes or so, the colony entrance activity had returned to normal. My point? Even after all of my decades of beekeeping, the bees can still easily stump me. Robbing behavior comes to mind.

Thieving bees

We call it *robbing* but I suspect the bees would simply refer to the behavior as *foraging*. They just happen to be foraging in a neighboring colony's hive. During the Zoomcast I referred to above, yet, another Colorado beekeeper made a broad reference to *"nature reallocating resources."* Beekeepers see robbing as a somewhat unnatural behavior. The behavior readily happens naturally, but within our compacted apiaries, the behavior is amplified – sometimes greatly amplified.

Without replicated proof to support my conjecture, I posit that a beekeeper can tell if a nectar flow is ongoing by the rate of apiary robbing activity. I have noticed that empty equipment is much more interesting to bees if they are otherwise unemployed; ergo, "nothing else is flowering." For a while, meaningful numbers of bees may be around an exposed sugar source, but some days later, that same source will be of little interest.

So, I wonder, in nature, would not the reward from a wild colony be significantly less than what could be stolen from one of a beekeeper's established colonies. Do robber foragers constantly monitor colony cues on natural nectar sources? Do they only rob when there is nothing else to do? Instinctually sensing that the "take" from robbed sources will be small, are foragers always eager to get about the bee business of finding natural sources of nectar rather than robbing meager amounts of honey from colony neighbors? Why am I asking you all of these questions that, apparently, do not have ready answers? Because I recently tried to use the natural robbing behavior to help me out of a messy situation.

The bane of "dead-out" honey

Late last year, I was distracted by some health issues that have now been resolved – thanks to the marvels of

modern medical procedures. During that time, my bees were on their own. Even though it was a mild one, some of my colonies did not survive this past Winter. Though I was gimpy, I did what I could to help, but it was not enough.

As I have done for the past several Winters, I ended up with stored honey on dead colonies. Normally, I have been able to use such honey for supporting new package bees and/or splits, but this time, I had too much. Even though it was probably edible, I did not want to consume it, nor did I want anyone else to eat it. But what to do with it?

I planned to extract it during the Winter and early Spring, but the Covid-19 virus caused confusion. I suspect the real cause was that extracting honey that I would only re-feed to the bees would not be an enjoyable job. While I was pondering and formulating plans, the small hive beetle and wax moths formed their own plans. A bad situation was successfully made even worse. This was an ugly crop in good combs.

A nontarget use of robbing

Since I was unintentionally encouraging wax moths and small hive beetles in my heated shop, I moved the deeps to the beeyard until the weather warmed, and I could devise a plan. Early in the season, I noticed that bees were beginning to rob the deeps. I selected the frames that they had selected and moved those frames to functional colonies. I only moved one or two frames during each procedure. I feared that putting too many frames on my young colonies would be too much of a burden. Particularity, I did not want to encourage moths and beetles.

Two deeps of honey

I have been able to get much of the dead-out crop removed/used by my bees by slowly presenting it to populous colonies. By that I mean putting only a single frame – or maybe two depending on the conditions of the frames – in deep supers above the brood nest. I chose the best of the bad frames. Those frames that were unchosen will need to be either discarded or refurbished. I plan to tinker with my pressure washer to see if that machine has any use in cleaning needy combs.

Honestly...

Honestly, I can't say what I would have done if I had had a great deal of honey like this. The process I have used is labor intensive and only practical for smaller quantities of old honey. The bees did their magical thing and made the mistreated stores look normal.

I'm not the only beekeeper who has had to deal with dead-out honey. If you have been forced to develop a procedure that worked, I would like to hear what you did.

Bees robbing each other is NOT a good management plan

When bees rob within the apiary, the beekeeper is unable to manage the colonies and bees frequently become defensive and flighty. Additionally, robbing spreads both disease and pests. Though I did use the frames that robbers were using, I am unprepared to recommend that others use robbing behavior as a routine management scheme. Essentially, I suppose I am saying, *"Don't try this at home."*

Speaking of bee things that work but are impractical....

A beekeeping friend of mine had a replacement air conditioner compressor installed. The technicians sat the outdoor compressor on a heavy plastic pad. It presented a nice, level and stable platform on which to put the air processing machinery. I took one look at that setup and envisioned a beehive on it rather than an AC compressor.

If there were a chapter two to this story, it would be that my own AC compressor died and required replacement and – yes – upon asking, I learned that my new unit would be put on such a pad. At $40 each, I ordered two extras. Why would I do this?

My tall, heavy colonies lean

Not knowing anything about soil types, my elementary investigation seems to indicate that my bee colonies are sitting on "silt loam" soil. As my colonies gain weight and sit on four hive stand legs, invariably one begins to sink . . . And sink . . . until the colony has a pronounced lean.

While I have not had a hive fall over, such an event is possible. True. I could remove surplus honey at several intervals, but I want to do all the extracting at once rather

This comb was essentially full of honey that I did not consider to be food quality. The bees did their miraculous job of emptying it. The wax moth damage will most likely result in some drone comb production when it is replaced.

One of my hives positioned on an air conditioner pad. In the photo, the pad appears to be warped, but it is flat. Most of my equipment is wooden and sits on Bee Smart hive stands. This hive setup is unique in my apiary.

than set up the equipment more than once. I speculated that the plastic base, if sat on reasonably level ground, would distribute the "footprint" of the colony, thereby keeping it level.

I have it set up. After several seasons, if the colony is still level and happy, I will give a followup report. At the selling price of the pads, I don't see how this can be practical for beekeepers with more than a few colonies. But for those with a scenic hive in a garden or other special place, this could work. The pad is remarkably easy to run a weed trimmer over.

Some praises of propolis – again (and again)

Other than write about it, I don't know what to do or think about propolis and my beekeeper relationship with it. The bees are bonkers for its use and reuse. We provide supplemental nectar to our bees. We have many protein supplements for our bees. I have a watering device that I never let run dry. I treat for various bee diseases and pests. I prepare my colonies for Winter. I monitor expensive queens. I do everything I can to subsidize my bees – except propolis. I do *nothing* for my colonies gum needs except rail against its stickiness and confoundedness. Yet my bees show me – clearly – time and time again that this totally unloved product is highly valuable to them.

The bees repurpose it

My bees (and yours) will readily reuse propolis. Would supplying my Spring/Summer bees with a ready supply of bee-produced propolis help meet their colony propolis needs? For several years, I simply put scraped propolis on the top of a neighboring colony. Indeed, within a few months and for about two years, bees foraged on that propolis source.

Propolis re-feeder?

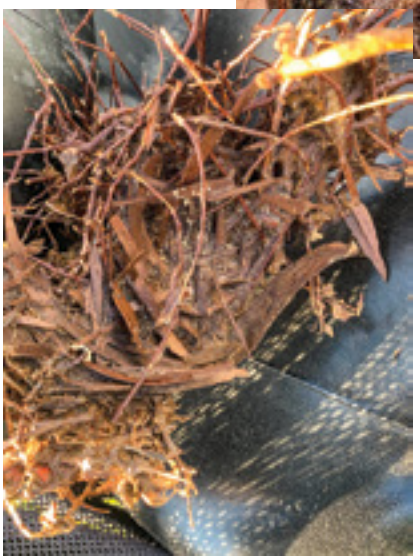
Like a bird feeder, should I have a propolis re-feeder within my apiary? Or maybe it should be more like a wax melter than a bird feeder? When I scrape that big glob of propolis from a colony, rather than drop it in the grass, should I run put it in the propolis re-feeder?

I don't sense that propolis is attractive indefinitely – if exposed to the elements – maybe a couple of seasons. If I am correct, what changes? Texture or health benefits? I have uploaded a short video of a gum forager selecting propolis bits and yet dropping others. Seemingly, repurposed propolis bits are not serviceable. I don't know what makes up her collection criteria.

A gum collector that has found a source of old propolis. She selects some bits and drops others.

Beekeeper Joann Rizkallah graciously sent me some interesting photos on her bees' use of propolis inside a natural nest cavity. The bees' use of this colony-manufactured product is profound.

Propolis use within a natural hive. J. Rizkallah photo.



A propolis-infused bird's nest that was "paved over" as the bees overtook the cavity for their use. J. Rizkallah photo

I am not declaring that I have discovered a secret of the bee universe. Beekeepers and propolis medicinal uses have been around since Egyptian pyramid construction days. But I am saying, that through all that time, as beekeepers, we have not done much (that should read – *nothing*) to help our bees with their biological gum needs. Since I have reflected time and again on this hive product and its mysteries, be assured that I will revisit it in future pieces.

I always appreciate you reading my pieces. It's a beautiful day here today. As soon as I get this draft to Editor Jerry, I plan to spend time in my apiary with two of my grandsons. It's a good day to be a beekeeper.

Thanks, Jim BC

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

Or look at:
https://youtu.be/iRZSMstPLUo

Probiotics And Prebiobiotics

Viewpoint. Strong Microbials

Vera **Strogolova**

Probiotic bacteria are found in raw foods: fruits, vegetables, nectar, and pollen.

Long before humans started to take advantage of the microbes used for food fermentation and preservation, these microbes were found in nature, but not as cheese or yogurt. These microorganisms naturally inhabited the microbiome of plants and grasses.

An apple contains about 100 million bacteria. Most are inside, not on the skin of the apple. They come from many different taxa – as opposed to the probiotic-supplement pills, which tend to be only one type of bacteria. These microbes are not dirt or contamination. Of the millions of bacteria in any given apple, very rarely are any them the kind that causes a disease; most are innocuous or even beneficial.[1]

A meadow of clover or alfalfa visited by honey bees is home to probiotic bacteria *Lactobacillus plantarum*, *Enterococcus faecium*, *Bacillus subtilis*[2]. Pollen and nectar contain diverse environmental bacteria – lactic acid bacteria and acetobacteria[3]. These bacteria aid in digestion and provide countless benefits to their hosts, one of the potential benefits being resilience to pesticides[4].

Thus, honey bees can get their probiotics without beekeeper's intervention. Unfortunately, honey bees and pollen have been exposed to antibiotics and antimicrobial substances for decades. Processed foods fed to bees - sugar syrup and protein supplements – are sterile at best. These modern agricultural and apicultural practices destabilize microbial balance, while individual (Nosema) and colony-level (migratory beekeeping) factors add to the disruption.

That's why a probiotic supplement is now available for honey bees. Quality probiotic supplements deliver probiotic bacteria in a safe and practical manner.

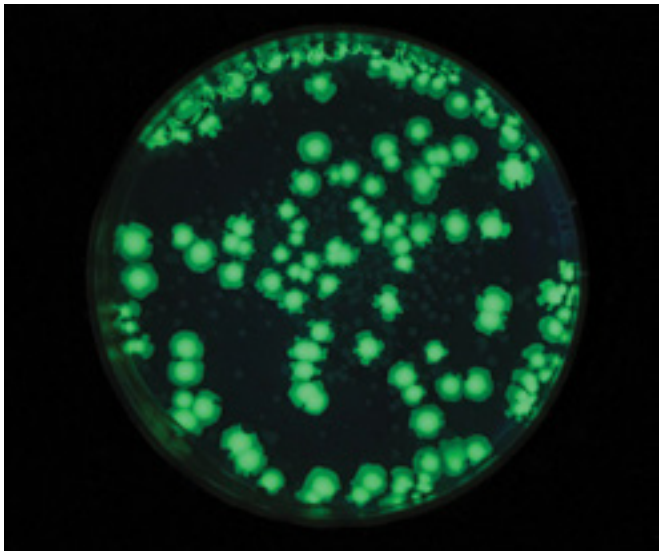
Feed and food supplements for humans and animals are regulated by the United States Food and Drug Administration (FDA). The FDA designates safe food ingredients as Generally Recognized As Safe (GRAS). The GRAS list includes best-known probiotic microorganisms. SuperDFM-HoneyBee™ ingredients were selected for documented safety when fed to honey bees. All are GRAS microorganisms.

Probiotic supplements provide situation specific results. Saskatchewan Beekeepers Development Commission Technology Adaptation Team has been working on a three-year in vivo study of prebiotic and probiotic feed additives and their impacts on Nosema disease & colony health in honey bees[5].

SBDC research leader Hannah Neil works closely with beekeepers and university researchers. "In the first two seasons of our applied research project we noticed no significant effect of these supplements on Nosema spore counts or colony strength. One more season of this project is upcoming and will hopefully generate some more concrete results to make recommendations on these products."

"We had seen more successful results in a smaller scale demonstration on prebiotic and probiotic feed additives in 2017. We found Super DFM to be the most successful additive at increasing the area of capped brood and cluster size during spring buildup when compared with other available products. More research should be done on the dosing and application of these treatments to generate long term benefits to colonies."

Many research groups are working on addressing the questions of probiotics in honey bees. Strong Microbials is committed to research, science, and evidence-based implementation of probiotics in agriculture. Beekeeper M.E.A. McNeil correctly reported in the March issue of *Bee Culture*, that there is a lot yet to discover when it comes to probiotics for honey bees. After all, nearly a century of scientific research into human probiotics did not begin to exhaust the scientific questions. BC



Petri dish with bacterial colonies under UV lights.

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http://saskbeekeepers.com/research/

COLONY SIZE DRIVES HONEY BEES' OVERWINTER SURIVAL

Meredith **Swett Walker**

When the temperature drops and the days get shorter, honey bees don't hibernate – they huddle. Meanwhile, worker bees produced in the Fall are plump and have longer lifespans than their spring counterparts. These winterized workers form a "thermoregulatory cluster" around their queen. Powered by honey stores, they shiver their muscles to produce heat, keeping temperatures at the center of the cluster around a comfortable 21°C (69.8°F). Still, Winter is a stressful time for honey bee (*Apis mellifera*) colonies. In the United States around 30 percent of colonies don't survive until Spring.

In Europe, overwinter survival of honey bee colonies is generally better, and evidence shows that honey bee populations may be "locally adapted" to regional climatic conditions. For instance, honey bees originating in Greece are less likely to survive a Winter in Finland than are local honey bees. But honey bee populations in North America are a lot more "geographically scrambled." That's because commercial beekeepers in North America routinely move bees great distances. Colonies providing pollination services are moved around the U.S., and queens are shipped great distances by breeders. So, locally adaptive genetic traits may not necessarily stay in the place where they are advantageous.

But could North American beekeepers boost overwinter survival of their hives if they used bees from closer to home? In a new study published in December in the Journal of Economic Entomology, Mehmet Döke, Ph.D., along with colleagues at Pennsylvania State University and Embu University College in Kenya, examine whether U.S. honey bee stocks may be locally adapted to their regional climate and have higher overwintering success in the climates where they were bred versus elsewhere.

The researchers looked at overwinter survival of honey bee colonies in central Pennsylvania, where winter temperatures dip down to -4°C (25°F). They compared survival of colonies headed by queens bred in the northern U.S. (Vermont or West Virginia) versus colonies those headed by queens bred in the southern U.S. (Texas and Florida). They established 60 colonies at three different apiary locations near the Penn State campus and maintained them using standard beekeeping practices. The researchers tracked numbers of adult bees and brood and size of food stores, as well as net colony weights (combined weight of adult bees, brood, and food stores). In addition, they looked at DNA microsatellites to determine if northern bees differed genetically from southern bees and if bees from different breeders within a region differed. The landscape around each of the three apiary locations was also assessed to determine differences in floral resources.

About 30 percent of the colonies in the experiment did not survive the Winter, but there was no difference in overwinter survival between bees bred in the north versus the south. This was unexpected and Döke says the most surprising finding was how little northern and southern bees differed genetically.

"The extent of genetic differentiation between the queens from four different providers in distant parts of the U.S. was nowhere near as great as I would expect," he says. "There was virtually no difference within region – i.e., the two northern stocks were the same and the two southern stocks likewise – and a small but significant difference between the regions, north versus south. Given the distance between our providers, I had hoped to find more of a difference than what we saw."

The best predictors of overwinter survival were colony weight and the number of worker bees in October, just before Winter weather begins. There appeared to be a threshold colony weight, with colonies weighing less than 20 kilograms (or about 44 pounds) having low survival and colonies weighing more than 30 kg (or about 66 pounds) surviving at high rates (about 94 percent). Döke and colleagues suggest that colonies with more workers might be able to form more effective thermoregulatory clusters and use their food stores more efficiently.

Colony weight and survival also differed among the three apiary locations. Assessing landscape effects on overwinter survival was not the main question in the study. And, because only three apiary locations were used, the effect of landscape could not be statistically tested, but the difference between the apiaries was suggestive. The apiary location with the highest colony

weights (averaging about 31 kg) and best overwinter survival (90 percent) was surrounded by a mix of agricultural and natural landscapes, while the other two locations were surrounded by a mix of forest and developed land providing less abundant and diverse flowers. The authors suggest that higher abundance and diversity of flower resources may support larger numbers of worker bees in a colony, which increases the likelihood of overwinter survival.

So, what does this mean for beekeepers? Döke says there's no one-size-fits-all recommendation because the goals of backyard versus commercial beekeepers (and all the beekeeping operations in between) differ greatly. But, if beekeepers want to maximize overwinter survival, Döke recommends building strong colonies by using quality queens and controlling *Varroa* mite parasites, as well as tracking colony weight during the Summer. If colonies are underweight, keepers may be able to supplement them with pollen and sugar syrup to boost worker numbers before Winter comes. Or, small colonies can be combined to increase the odds of overwinter survival.

"Honey bees are going through a rough time," says Döke. "We keep hearing about large-scale beekeepers of many decades closing shop due to profitability issues as a result of high loss and replacement rates over the Winter." Still Döke is optimistic that, with continued research and informed management practices, overwinter survival – and the health of the beekeeping industry – can be improved. BC

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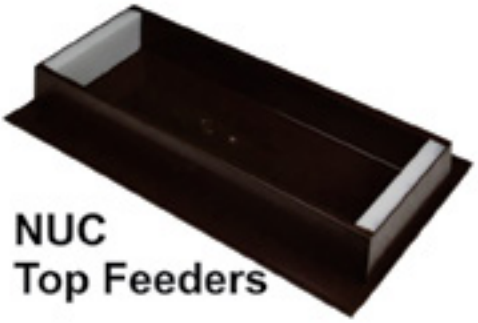

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Pollinating Canola In Southern Alberta

Shelley **Hoover,** Apiculture Unit Head,
Alberta Agriculture and Forestry

Canada is the world's largest grower of canola, and canola pollination is a major activity for beekeepers across the country. The vast majority of canola is grown in the prairie provinces of Alberta, Saskatchewan, and Manitoba, on non-irrigated land. In Canada, canola is essentially two different crops in terms of both farming practices and pollination management. The first is "commodity" or "crushing" canola, grown on approximately 20 million acres of land across the prairies, and primarily used to produce oil and meal. This crop benefits from the presence of bee and other insect pollinators through yield increases and faster more even ripening of the seed pods. It has been estimated that over half of Canadian honey bee colonies forage on canola, however canola honey accounts for well over half of Canadian production due to the strong canola honey flows. While beekeepers are not paid to place colonies on commodity canola, they are typically rewarded with ample honey production.

The second canola crop is "seed" canola, the crop grown to produce the seed that is planted as commodity canola. Seed canola is grown on approximately 50,000 acres of irrigated land in southern Alberta. This region can meet the requirements of the crop for heat, sun, water, and isolation from other canola varieties. With long daylight hours and a strong beekeeping industry, the irrigation districts of southern Alberta provide the hybrid seed production companies the perfect location to base their North American seed production. The farms are large, with fields measured in quarter sections, so they can also achieve the physical isolation they need to ensure pure varietals. Agronomists from the seed companies must work closely with the farmers and beekeepers contracted to grow and pollinate the crop. It is the agronomist that is responsible for decisions about timing of planting, spraying, introducing bees, and harvesting, but there must be good communication among all the people involved to ensure quality hybrid canola seed.

Hybrid seed fields are seeded in late May with parent stock from two different canola lines that are planted in rows or bays of male-fertile ("male") and male-sterile ("female") plants. The male plants are not harvested, and are carefully managed to ensure ample availability of pollen for the female plants. This crop is highly dependent on bee activity to transfer pollen from the male to the female plants, so that seed can be set as there is no self-fertilisation in the female lines. To ensure adequate pollen transfer, most fields are stocked with both honey bees and alfalfa leafcutting bees.

These fields typically have a central pivot irrigation system, meaning that the cropped area is circular, and there are unirrigated corners on the parcel of land. These corners are typically where the honey bee colonies are placed for pollination, and they may be covered with dirt, grass, or planted to an alternate crop such as wheat or peas. There are typically multiple hive drop sites within each field. Summer days are long and hot in Alberta, so bees are usually moved between 11:00 pm and 4:00 am. Honey bees are placed in the field at an early flowering stage, typically late June, and removed from the fields when the bloom is nearly finished, typically late July. Most of the colonies that pollinate seed canola come from central or southern Alberta, but some colonies are also brought in from northern Alberta, as well as the neighbouring provinces of British Columbia and Saskatchewan. With approximately 60,000 colonies moved in about 10 days, this is a very intense period for beekeepers!

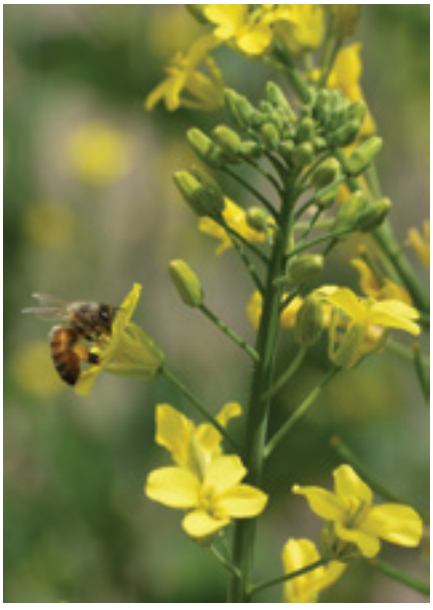
The seed companies contract directly with the beekeepers who provide honey bees for pollination. Most beekeepers have contracts for a large number of fields, and have long-term contracts with one or more seed companies. The rental fee is determined by colony strength, and a subset of the hives are graded. Typically, colonies are double brood

Leaf cutter on canola flower.

chamber colonies, with at least 15-17 frames covered with adult bees, brood, and a laying queen. The average rental fee in 2019 was $195 CDN. The stocking rate for honey bees is one to two colonies per acre, and 120-160 colonies per quarter-section field is typical. With the high field density, there are often thousands of colonies within a few square miles.

The leafcutter bees are placed in tents or shelters evenly spaced throughout the fields. They are removed from the fields later than the honey bees, as they must complete their lifecycle in the field so that next year's leafcutting bees can be collected from the nesting blocks in the shelters, and incubated over Winter. Using both honey bees and leafcutter bees ensures that this high value crop receives ample pollination throughout the field.

In addition to rental fees, beekeepers that pollinate hybrid seed canola also produce a honey crop. The honey is light in colour and mild in flavour, and in demand on world markets. However, canola honey does crystallise quickly, and must be extracted without delay. Depending on the year and variety, beekeepers typically yield 40-150 lbs of honey from colonies that are used for canola pollination although a proportion of this is from other forage. In addition, hybrid canola fields have an abundance of nutritious pollen that is highly attractive to bees, and the colonies grow rapidly.



Honey bee on a canola flower.

Honey bee colonies and leaf cutter bee shelters in a blooming seed canola field (note the visible male (narrow) and female (wider) bays, with leafcutter bee tents in the female bays).

Every Summer, the Canadian prairies are filled with beautiful fields of yellow blooming canola because 25 years of cooperation between beekeepers and hybrid seed companies has produced high quality hybrid canola seed, while stabilizing and growing the Alberta beekeeping industry. The relationship between hybrid canola seed companies and beekeepers is a sweet one. BC

Collecting Pollen

David **MacFawn**

Pollen on bee's hind leg. Sheryl Langley Brousseau photo

Collecting pollen can be a viable business. In order to be successful, the area where pollen is collected should be free of pesticides--even small amounts of pesticides can get into the pollen. If bees are surviving in the area of pollen collection and there are no issues with raising brood/larvae, the pollen should be safe for consumption. However, if there are any doubts, get the pollen tested for pesticides, herbicides, and fungicides, and determine the levels of each in the pollen. Pollen consumers need to make sure they are not allergic to bee products before consuming bee pollen. Raw pollen contains protein, carbohydrates, vitamins, and beneficial acids, as well as calcium and iron. Anecdotal evidence indicates locally collected pollen may be beneficial for local allergies.

Spring, or when the bees are raising a lot of brood, is a good time to collect pollen. It takes pollen and honey to raise young bees. Pollen is the bees' protein source and honey the bees' carbohydrate source. There is a larger colony pollen demand when the colony is raising young brood/larvae/bees. Larvae require pollen as do young house bees to develop some of their glands. Field bees require very little pollen but require more honey and carbohydrates.

There are two types of pollen:
1. wind-borne pollen
2. Insect- or bee-collected pollen

Pine trees are a good example of wind-borne pollen. In the spring the trees release a multitude of yellow pollen that dusts everything, including the other infant pine cones the pollen are supposed to pollinate.

Honey bees collect pollen directly from other plant flowers. They transfer pollen from the male part of the flower (stamen or anther) to the female part of the flower (pistol or stigma). Each seed in the ovule typically requires a pollen grain to fertilize it. When fertilized, the plant develops with meaty flavorful fruit. The bees gather pollen to feed their young protein. Bees exhibit flower fidelity where they go between the same type of flowers on a single trip, resulting in the pollination of that particular plant.

The bee-collected pollen from these plants may be medically beneficial. Sometimes there are some very small quantities of wind pollen in with the bee-collected pollen. Pollen from non-local areas may not contain the pollen that could help a person with local allergies. Those with allergies want to purchase local pollen from a local beekeeper.

There are several basic types of pollen traps:
1. bottom pollen trap
2. front entrance pollen trap
3. top mount pollen trap

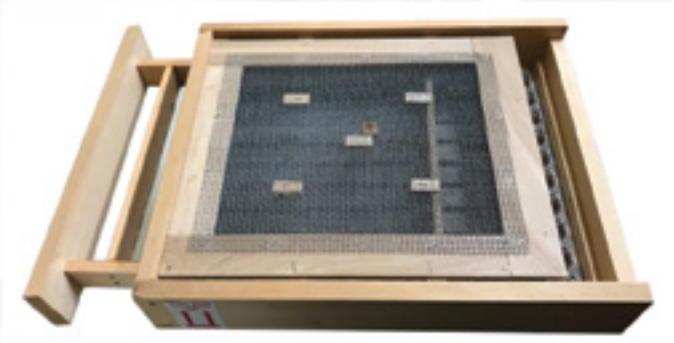
Most pollen traps are about 50% efficient in collecting pollen from the bees. A bee's pollen baskets (corbicula) are on its hind legs and made up of curved hairs that hold the 'pollen on its' hind legs. The pollen traps scrape some of the pollen off the bee's hind legs when it passes through the trap. The pollen should be collected daily or at a minimum every other day. This will keep the pollen from molding/spoiling in the pollen trap.

You can dry the pollen in a very low-temperature oven (95°F.) on a "cookie" sheet or use a dehydrator for about 24 to 48 hours. It should be noted that while heat drying extends the pollen's life, it eliminates much of the pollen's nutrients. Freeze drying (place in a freezer for at least three days in a container) immediately preserves most of the pollen's nutrients. Pollen should not be kept at room temperature unless it is dried very thoroughly.

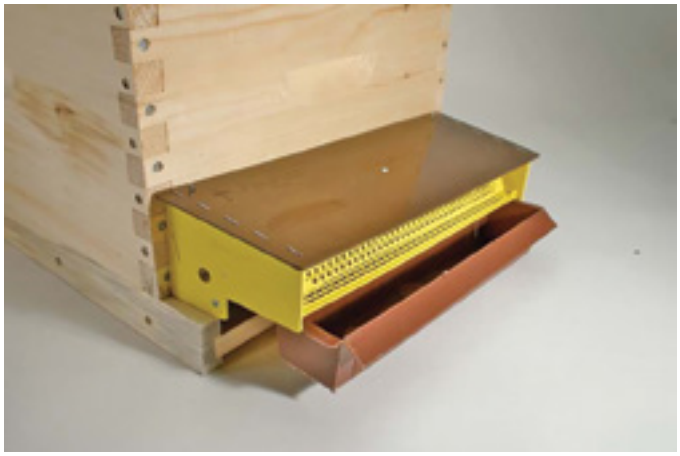
The bee's body naturally has a negative charge and attracts the positively charged pollen when the bee lands on a flower. The bee then can groom her body and place the pollen in the pollen baskets on her hind legs. The bee transports the pollen to the colony where the field bee places it in a cell. The pollen is mixed with enzymes from the bee and it becomes "bee bread" when placed in the cell.

In a fully drawn 10-frame hive, frames two and nine contain pollen and typically there is a band of pollen around the brood nest, with honey above the pollen band in the corners of the frame. If you go into a colony in the spring, when the queen and bees expand the brood nest, often the band of pollen, and honey above the pollen band, may be in the super above the main brood chamber. It should be noted, beekeepers using screened bottom boards will have the brood nest farther up in the equipment stack than beekeepers using solid bottom boards. All alternative entrances and holes in the hive should be taped shut when using a pollen trap.

Sundance Bottom-Mount Pollen Trap (photo courtesy: Betterbee). The bottom mount is the original type trap and works very well. Bottom-mounted traps are placed between the bottom board and the brood chamber. The bees are forced to go through the trap to get into the hive. The pollen trap has a grid, like hardware cloth, to scrape pollen off the bees' hind legs as they enter the hive. Often there is an option to allow the bees to get into the hive without going through the trap if you do not want to collect pollen but leave the trap on the hive. The pollen-collecting drawer is typically accessible from the hive's rear. The pollen traps are usually sold assembled. Drone escapes are placed in the pollen trap opposite of the drawer.



Sundance Top-Mounted Pollen Trap (photo courtesy: Dadant). A top-mounted pollen trap goes on the top of the equipment stack. All other entrances to the hive are blocked and the bees are required to go through the trap.



Front-Mounted Pollen Trap (photo courtesy: Betterbee). A front-mounted pollen trap fits in the lower hive entrance, forcing the bees to go through the trap. All other openings in the hive should be closed, in order to force the bees to go through the pollen trap. A front-mounted pollen trap drawer needs to be emptied more often than a top- or bottom-mounted trap.

Front-Mount Pollen Trap. photo courtesy of Dadant.

A pollen cleaner works by blowing air across pollen pellets falling through the cleaner. The bee parts and other debris are lighter than the pollen and are separated when the air is blown across the falling pollen. Several cycles may be required through the pollen cleaner to get the desired pollen cleanliness.

You typically do not want to collect pollen for more than several days from each colony. The colony will divert more field bees to collect pollen since about 50% of the pollen is being captured by the pollen trap. Pollen-collecting field bees will result in less nectar, water, and propolis being collected. Since it takes honey and pollen to produce young bees, your bee production may be impacted. Collecting pollen during the second half of the nectar flow makes the most sense. A reduction in the workers emerging in the nectar flow's second half will not impact the honey yield much since they will not be field bees until about 21 days (about 3 weeks) after they emerge from the cell. By that time the nectar flow will be over.

Honey bees collect pollen to feed their young bees a protein source. Dried pollen collected from your bees can be used to feed your bees during pollen dearths, especially in the autumn when winter bees are being raised. The type of pollen trap you use depends on how much pollen you

Kelley Pollen Cleaner.

A pollen feeder.

want to collect and over what period. Top- and bottom-pollen traps will hold more pollen than front-mounted pollen traps. However, pollen should still be collected daily. Pollen from unknown sources should not be used to feed colonies due to American Foulbrood (AFB) risks. Pollen used to feed bees can be placed in pollen feeders on a post or nailed to a tree. A pollen feeder may be as simple as a sugar syrup feed bucket, nailed 90 degrees to a tree. Pollen collection should not be for an extended amount of time (more than two to three days) since it will impact brood production. While anecdotal evidence indicates pollen is beneficial for allergies, human pollen consumption should only be considered if one is sure they are not allergic to bee products. Due to the nature and richness of pollen, in some people, it may upset their digestive tract. BC

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

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Clarence H. Collison

A few years ago, the Flow Hive changed beekeeping forever and had repercussions well beyond the borders of apiaries. In fact, throughout the industrial world, the price of stainless steel plummeted as mass numbers of beekeepers hauled extractors to the scrapyard. At one such scrapyard, L & L Scrap and Metal Salvage, I was struck with a brilliant idea – I say brilliant, but really it was just a piece of metal pipe that fell from a scrap pile. In any event, I do my best thinking at the scrapyard, and it occurred to me that the Flow Hive had merely replaced the tedious and back-breaking chore of harvesting honey. Surely, with a little fabricating and welding, and a community college course on robotics, I could pick up where the inventors of the Flow Hive left off and fashion not only a replacement for harvesting honey, but a complete replacement of beekeeping.

I'm pleased to announce to the readers of *Bee Culture* that my prototype, Beek Terminator 2.0, is nearly finished and will be mass-produced and hitting markets by 2021. This article is fair warning to sell your veils, bee suits, and smokers before they become worthless. Of course, you could keep them in hopes they become antiques, but that takes nearly a century and, well, the average American lifespan is 78.69 years and falling, so the odds of cashing in on future beekeeping nostalgia are low for any of you born before 2045. For the next century, prices for beekeeping paraphernalia will remained depressed.

In the media, much attention has been given to the upcoming extinction of honey bees, with the general consensus that some human error in beekeeping, known colloquially as "bad beekeeping," has contributed partly to the downfall of *Apis mellifera*. The Beek Terminator 2.0 solves the problem entirely by eliminating human error and, in fact, human beekeepers. Robots will soon treat bees with tender-loving care – no more dropped frames, rolled queens, or swatting at angry bees. Made of scrap iron, the Beek Terminator 2.0 is impenetrable to stingers and capable of lifting 17 supers full of honey, deep supers. This may seem unrealistic, so you'll be pleased to know I programmed the robot with many human qualities, including several poignant flailing routines.

Though the original Beek Terminator, the Beek Terminator 1.0, self-destructed (thankfully for the beekeeping community, I only suffered a flesh wound), the Beek Terminator 2.0 is completely safe. Two of the brightest mechanical minds I know – my wife's poppaw Lowry and my neighbor Tightwood – helped develop many of the safety features. In the event of a Beek Terminator 2.0 going rogue, we programmed a kill switch on the robot's back, so you just have to sneak up on the robot to initiate a shutdown.

To protect trade secrets and national security, I won't disclose further schematics of Beek Terminator 2.0, which were originally scribbled on a napkin by Tightwood, but I can tell you the robot is heavy duty and weighs nearly four tons, give or take a ton or two, depending on how many pieces of scrap iron fall off during use. These pieces can easily be welded back in place with minimal welding skills, or temporarily attached with a little dab of JB weld, bailing twine, or duct tape, whichever is more convenient. We are working on a lighter economy model called the Bee Haver 1.0, which basically takes selfies in a beekeeping veil for Instagram, but does little else beekeeping related, other than play pre-programed excuses for dead outs. Currently, we've programed excuses for pesticides, cell-phone waves, small hive beetles, wax moths, lack of forage, loose cow attacks, and alien abductions of bees that just disappear. *Varroa* mites were omitted because the Bee Haver 1.0 never reports signs of mites.

The Beek Terminator 2.0, however, is a mite killing machine, using the latest silver bullet in mite-killing technology – an x-ray beam gun. The technology was originally adapted from the pages of science fiction – in fact, I got the design for $7.95 plus shipping and handling from a little ad in the back of *The Magazine of Science Fiction and Fantasy*. The x-ray beam gum emits a small enough dose of x-ray particles to toast mites, but leaves bees largely unharmed save for minor mutations.

I'm sure some readers suspect the Beek Terminator 2.0 is too good to be true. Rest assured, it is not. I sent the robot to several *Bee Culture* writers to test. Here are their gushing endorsements:

Dr. James Tew: "The Beek Terminator 2.0 is so heavy-duty it shattered the driveway when the forklift set down the crate. I'll forward the bill from my concrete man."

Dr. Clarence Collison: "Mr. Bishop, although I generally appreciate the scientific method, this is mad science. Please cease and desist."

Ed Colby: "The Beek Terminator 2.0 struggles with the steep mountain terrain. However, it makes good yard art and resembles a snowman in blizzard conditions."

Jerry Hayes: "Why is it smoking? How do you turn this thing off?"

(Jerry, that's likely the built-in smoker, which, in realistic human mode, is programmed to extinguish itself during inspection of the meanest hive. If not, smoke is a sure sign of a meltdown, a minor flaw reported by some users, at which point it's best to run and hide under a desk.)

To pre-order your very own Beek Terminator 2.0, I started a Kickstarter Campaign (called Terminate Beekeepers to Save Bees) or you can send me a $5,000 cash deposit directly to my overseas account in the Cayman Islands to ensure a Beek Terminator 2.0 is delivered straight to your apiary. By purchasing a robot, you'll have more leisure time to reminisce about beekeeping's hardships and joys, which, in hindsight, are often one and the same. You'll have time to adopt more worthy pursuits—just avoid fishing as a new hobby (my Angler Eliminator 2.0 will soon make fishing obsolete also). Finally, you'll be pleased to know that 50 cents from each purchase of Beek Terminator 2.0 goes to a benevolence fund for commercial beekeepers displaced by automation.

Stephen Bishop writes humor and keeps bees in Shelby, NC. You can see more of his work at ***misfitfarmer.com****.*

Beek Terminator 2.0

Stephen **Bishop**

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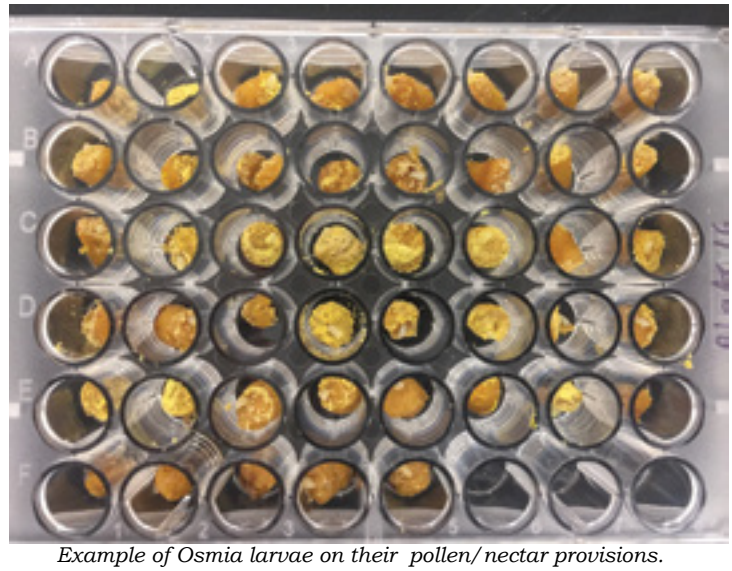
SIZE DOES MATTER

(In Insects)

Courtney **Grula**

Body size is very important in insects. There are many advantages of large body size in solitary bees. Some of these advantages include the ability to fly farther for food, produce more offspring, and a better chance of surviving the winter. Body size is influenced by temperature, nutrition, and nest size. Nutrition is the most influential factor in determining adult body size. The amount of food the mother provides to the larval bee determines how large the bee will grow, and larva that are provided with more food will develop into larger adults. Larval bees are not capable of foraging for their own food, so the food provided to them by their mothers is very important in determining their success as adults. Nest size also influences body size because there is less space for the bee to develop, as well as less space to place food. Bees that nest in larger nest holes produce larger offspring.

My goal as a researcher is to determine how body size impacts performance in two solitary bees, the blue orchard bee and the alfalfa leaf cutting bee. I use food quantity and nest size as ways to manipulate body size in these bees. First, I am able to control body size by manually providing different amounts of food to the larvae (see picture). I remove the larvae and their food



Example of Osmia larvae on their pollen/nectar provisions.

Small and large adult bees as a result of low and high feeding treatments.

Leaf cutting bee nests of differing sizes, made by providing nests of ranges of diameters in the field.

from their nests, and I put the bees into 3 different feeding treatments. One treatment has a small amount of food, the second treatment had the amount food that was provided by the mother, and the third treatment had a large amount of food, in excess of what they would be provided by their mothers. This leads to small, average, and large adult bees. The second way I manipulated body size is in the field, by changing the nest hole diameter size. I used nest holes that ranged from 5 mm-9 mm. This led to bees creating nests of differing sizes, adapting to the size of the hole provided (see picture).

The ability to fly for forage, as well as transport food and nest materials during back to the nest is critical to the success of solitary bees. I measured flight performance using the size-manipulated bees. I measured their metabolic rates while flying to determine the energy efficiency of bee flight as a function of body size. The results showed that bees of differing sizes had equivalent metabolic rates, indicating they were equally metabolically efficient during flight. I also measured the size of different body parts and determined that small bees can carry heavier loads per milligram of body weight. Future studies will measure other performance outcomes based on body size including overwintering success. BC

Courtney Grula is a PhD student of North Dakota State University.

SIX FEET

Designed For All Events

Graham **Kingham**

Inside of claw showing area where taste receptors are located. X200

The six feet of the honey bee are all similar in design and function but each caste has developed specified areas to aid in its lifestyle.

As the feet of all castes of the honey bee have some universal tasks to perform such as locomotion and weight bearing, it is not surprising that they share a common basic design. However, unique functions particular to the queen, worker or drone have also to be accommodated. For these, each caste has specialised features built into its foot design.

The queen uses her feet to advertise her presence in the hive by releasing pheromones through them. The drone has a larger more angular claw than the worker. The worker has taste receptors on her legs and feet. (The drones seem to lack these; however further research might reveal otherwise.)

Sensillae are enervated senses that convey different information depending on their type. (This fact was discovered in 2009 by Lorenzo, who used electrophysiological methods to confirm their presence.)

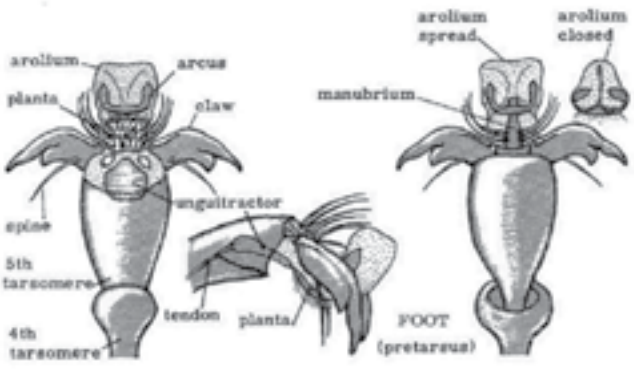
There are high concentrations of taste sensillae on the terminal claw-bearing pretarsus on the forelegs of the worker only.

When a honey bee walks over a glass plate, they sometimes deposit from their feet an oily, colourless secretion that has a low volatility. This secretion seems to affect the behaviour of other workers when deposited at the hive entrance and on flowers. The origin of this pheromone comes from the tarsal gland, also known as the Arnhart gland, situated in the fifth section (*tarsomere)* of each leg and is found in all castes. The method of transmission from the glands to the foot has yet to be conclusively found. The queen produces much more of this secretion than the other castes.

Recent evidence has found that there is another separate gland around the *unguitractor* tendon, which is released at the base of the unguitractor plate on the foot. This tendon acts on the ungues (claws) enabling them to grip.

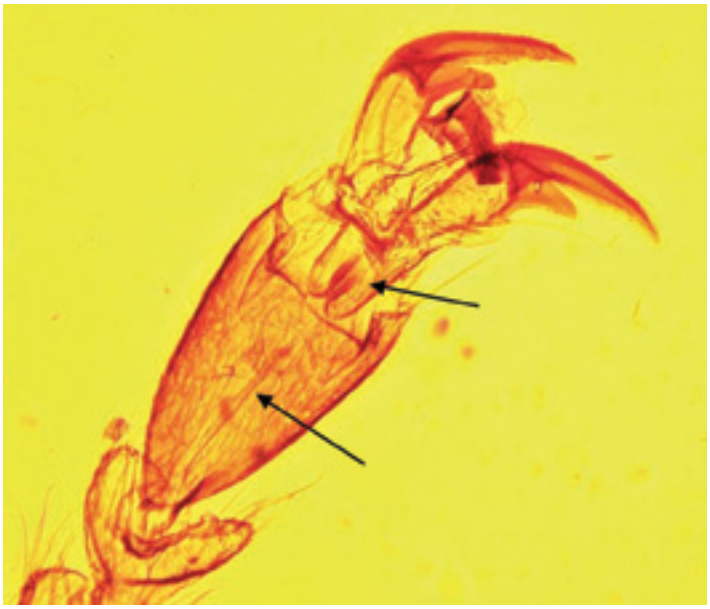
The foot is made up of several working parts known as the *pretarsus*, which is connected to the fifth tarsomere.

Each one of the claws (the ungues) is bi-lobed, consisting of a long curved tapering outer point and a smaller inner one; these are surrounded by stout spines. The claws are hinged via a tendon to the fifth *tarsomere.*



Taken from Dade's book, Anatomy and Dissection of the Honeybee. *Kind permission for use has been obtained from the copyright holder IBRA.*

The unguitractor *tendon passing through the* tarsomeres. *X100.*



The unguitractor *tendon in the pretarsus connecting to the* unguitractor. *X100*

Worker's foot in the normal position with claws exposed, side view. Note the scythe like shaped claw, showing the arolium, *(lobe used for gripping on to smooth surfaces) in resting place on top and at the bottom the* planta *(sole of the foot). X40*

The claws of the worker and the queen are only slightly different in details – although the claws of the queen are much greater in size than those of the worker - but the drone's claws are larger and strikingly different in shape from those of either the worker or the queen, possibly in order to grip the queen during mating.

The *arolium* is a terminal lobe bent upward between the claws and is deeply cleft on its dorsal surface being made of a thick basal stalk whose walls contain a number of *chitinous* plates. It bears five very long, thick, curved bristles projecting posteriorly over the terminal lobe. These act as touch sensors. The ventral side has numerous short thick spines.

When the bee walks on any ordinary surface it uses only its claws for maintaining a foothold, but when it finds itself on a smooth, slippery surface, like glass, the claw are of no use and the *arolium* is provided for such emergencies as this. The terminal lobe of the arolium is pressed down against the smooth surface and its lateral halves are flattened out and adhere by a sticky liquid excreted upon them by glands.

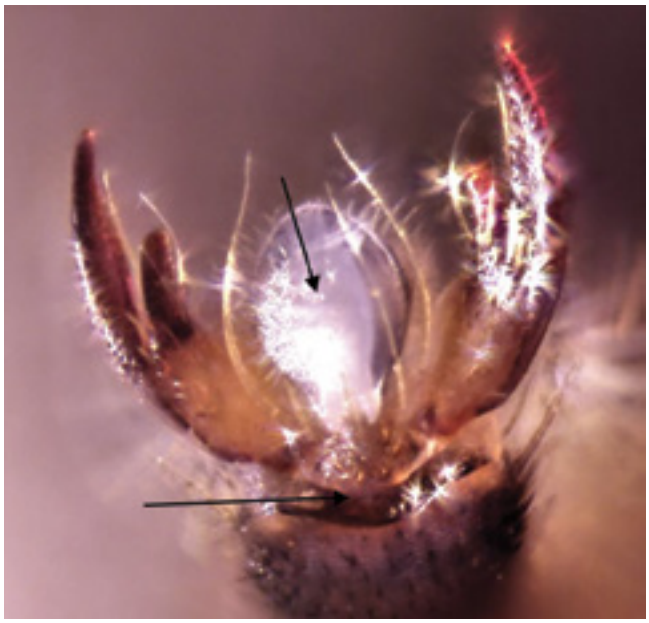
Around the inside base of the *arolium* is a u-shaped band, the *arcus*, which is then joined at the bottom by a small sclerotized plate known as the *planta*, meaning sole of foot, which is covered in spines. This, in turn, is connected to another plate, the *unguitractor*, which has a tendon attached to it.

The arolium on the outside of the foot is connected by the *manubrium* meaning a handle; this is a plate bearing five or six long bristles.

When the bee lands on a surface, the tendons are pulled by muscles in the femur and tibia; these act on the unguitractor plate, which in turn draws on the

Drone's claw side view, much more angular in shape. X40

Long bristles that act as sensors. X40



Worker's foot outside front view, showing bi lode claws and arolium *in a relaxed state on top and the manubrium. X40*

Underside of foot showing spines right, arcus centre *and* unguitractor *plate top. X40*

membrane of the foot. The leverage on the claws flexes them downwards to grip onto the surface.

If the claws cannot grip then they continue to flex and spread sideways. This action is triggered by the long bristles on top of the foot which act as sensors. The traction on the unguitractor plate is then transmitted to the planta plate, which acts on the arcus (an elastic u-shaped plate). This in turn pulls the arolium down and it spreads out to grip the smooth surface. BC

All pictures by G Kingham

(Source: Dade, Snodgrass, Snell, Goodman. The pretarsus of the honey bee doi.org/ 10.26496bjz.2017.

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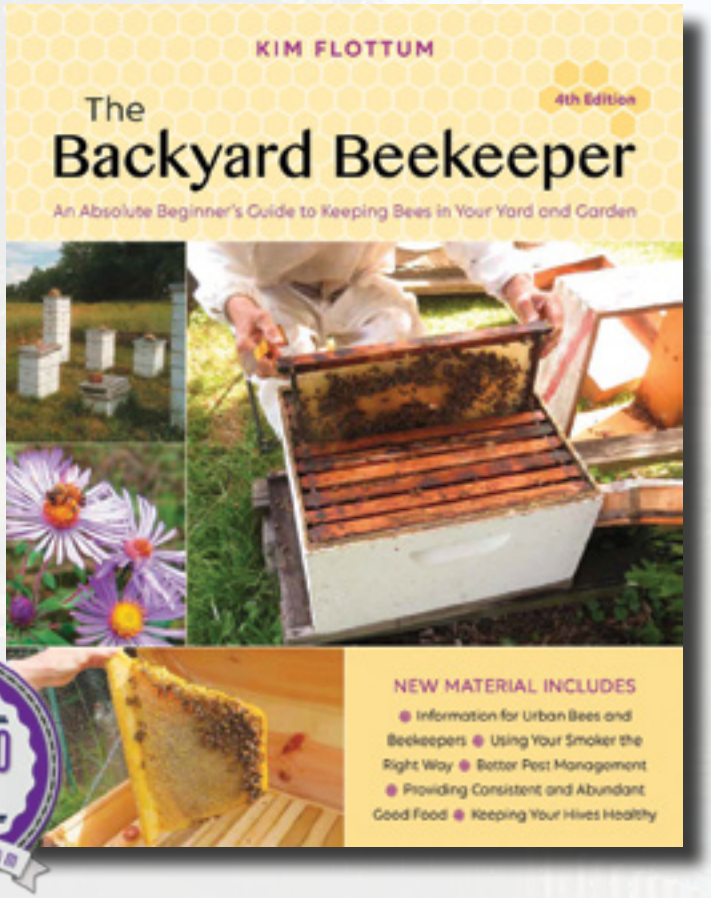

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New Honey Bee Pests In North America

Paul **Kozak** & Gard **Otis**

A Guide To Asian Hornets That Affect Honey Bees

2019 will be remembered as a significant year for new honey bee pests in North America, as two species of Asian giant hornets were reported and confirmed for the first time in the province of British Columbia, Canada, and across the border in Washington State, USA.

What are hornets?

First, what are "true hornets?" Hornets constitute a taxonomic category of wasps in the genus *Vespa*. They live in relatively large colonies composed of a queen and between a hundred to a few thousand workers, depending on the species. The workers forage for meat, typically preying upon other insects or carrion that they feed to their larvae, as well as rotting fruit, tree sap, and other sugary substances that serve as sources of energy for the adults. Hornets build their nests either suspended above the ground or in a cavity in the ground, and are surrounded by a papery envelope made from wood fibers. Colonies are initiated by single overwintered queens in early Spring. The number of workers increases exponentially over the summer, peaking in early Fall. At that time, colonies switch from rearing worker wasps to rearing new queens and males that emerge and mate. Only young mated queens overwinter in a hibernation-like state in a protected location for the winter. Their colonies in most cases expire by the onset of Winter. The species survives through the overwintered queens that emerge the following Spring and initiate the next cycle of nests. This annual cycle will be familiar to most as it is similar to our native species of social wasps – the paper wasps, yellowjackets, and bald-faced hornet.

All of the species of "true hornets" (members of the genus *Vespa)* are endemic (native) to Eurasia and northern Africa; none are native to North America. A few species are considered serious predators of European honey bees, the type of bee managed by beekeepers in North America. Because of their potential seriousness to managed honey bees, two species of Asian hornets, *Vespa mandarinia* and *Vespa velutina*, have garnered attention due to their presence in North America and Europe, respectively. Two additional species, *Vespa soror* and *Vespa simillima,* are a potential concern to beekeepers in North America should they be introduced and become established here.

Figure 1. The two species of Asian giant hornets, Vespa mandarinia (left; 18 Sept. 2019, Nanaimo, B.C.; photo courtesy of the Washington State Department of Agriculture) and Vespa soror (right; 10 May 2019, Vancouver, B.C.; courtesy of Paul van Westendorp, Provincial Apiculturist, British Columbia). Note the exceptionally wide head and lengthened side of the head capsule behind the eyes that is characteristic of these two closely related "sister" species.

The Asian Giant Hornets (AGHs), *Vespa mandarinia* and *Vespa soror*

Vespa mandarinia is native to temperate regions of Asia, including northern India, large parts of China, and Japan. The "southern Asian Giant Hornet" *Vespa soror* inhabits somewhat warmer regions of Asia including Hong Kong and most of Vietnam (see Figures 1 & 2). These two species are very closely related and their natural histories are nearly identical. New queens that have mated with a single male overwinter and initiate nests in spring on their own, usually in a cavity in the ground, although they may chose to occupy a hollow in a tree. During the Summer worker hornets predominantly forage for caterpillars and large web-building spiders, carrion, and other insects such as individual bees. However, in late summer and fall, when the hornets have large food requirements due to the large numbers of larvae that need to be fed, they begin to focus group attacks on social insect colonies. At that time, if a foraging AGH locates an active honey bee colony in a hive, it catches bees singly at first. Then after perceiving some cue, she may return to her nest to recruit her nestmates. Over the span of a few hours 20+ hornets congregate at the hive. In the case of *Apis mellifera*, the hornets then collectively attack the bees at the hive entrance, killing all the adult worker bees with their huge mandibles over the span of a few hours. The hornets occupy the hive for many days afterwards, foraging on honey bee brood and honey.

These two hornet species can be identified by their exceptionally wide heads, the wide edge of the head behind the eyes (Fig. 1) and their very large size: 40-50+ mm (up to two inches) in body length and 76 mm (three inch) wingspan. Along with their large size, they have a long stinger and large venom sac. Although their venom is not the most toxic compared to other wasps and bees, because of the amount of venom delivered when they sting, these hornets pose a serious hazard to humans, domestic animals, and livestock. They can kill humans who have stepped on a nest or who experience an anaphylactic reaction to the venom. Additionally, once AGHs successfully take over a colony of honey bees, the hornets in the bee hive become as aggressive as they would be at their own nest as they defend the food resource (bee larvae and pupae). At this time they pose a serious risk to beekeepers.

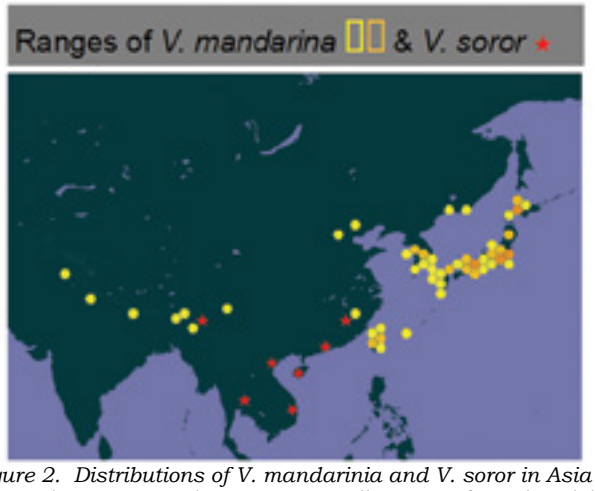

*Figure 2. Distributions of V. mandarinia and V. soror in Asia where these two species occur naturally. (Maps from the Global Biodiversity Information Facility, Copenhagen, Denmark [**www.gbif.org**, accessed 14 May 2019]).*

The reports of *Vespa mandarinia* and *Vespa soror* in the Pacific Northwest in 2019 (described below) were the first confirmations of these "Asian giant hornets" outside of Asia. The climate to the west of the Coast Range, Cascade Mountains and Sierra Nevada should be suitable for populations of these two giant Asian hornet species to develop there. Both species should also be able to survive in parts of eastern North America, with *V. mandarinia* in cooler regions than *V. soror*.

The name "Asian Giant Hornet" has been informally assigned to *Vespa mandarinia*. That choice of name is unfortunate because it obscures the fact that there is another AGH, *Vespa soror*, that is similar in all respects, including its attacks on honey bee colonies. Hopefully official common names will be designated for all of the hornets described here to avoid confusion in the future.

The "Bee Hawking" Asian Hornets, Vespa velutina* and *Vespa simillima

Vespa velutina, the "yellow-legged hornet", is another species endemic to Asia, including parts of India, Pakistan, Vietnam and Indonesia. It too has a closely related and extremely similar "sister" species, the "yellow hornet", *Vespa simillima*, that inhabits somewhat cooler regions of Japan and far eastern Russia. These are large wasps by current North American standards, but much smaller than the "giant Asian hornets" described above. These hornets are often first detected by beekeepers because of their distinctive foraging behaviour at bee hives. Individual hornets hover conspicuously at the entrances of bee hives and catch returning forager bees (Figure 3). Once a yellow-legged hornet discovers a hive, it returns repeatedly to catch bees. Their predation on individual bees can weaken colonies and increase winter mortality. Moreover, colonies that are the focus of extended hornet predation experience "foraging paralysis:" worker bees become confined to their nests by hornets hovering nearby. The reduction in foraging can severely reduce honey production, even resulting in colony starvation. In parts of France, these hornets have caused the deaths of a large percentage of managed honey bee colonies.

Vespa velutina has become well established over much of western Europe. It was first detected in southwestern France, where it is believed to have arrived accidently via overwintering queens (or possibly nests) in pottery imported from Asia. Since its introduction in 2004, this hornet has expanded its range rapidly. It now inhabits nearly all of France and Belgium as well as the neighbouring countries of Spain, Portugal, Italy, Germany, the Netherlands, and the United Kingdom. It is has a high probability of surviving in the eastern USA from New York City to Oklahoma and south, and possibly northward into the Great Lakes region. If introduced to western North America, it could likely establish a population west of the mountains from Vancouver, B.C., to San Francisco and into the Central Valley of California.

A queen of *Vespa simillima* was collected years ago near Victoria, British Columbia, in August of 1977. Fortunately there have been no subsequent records of this species in North America. If introduced, the yellow hornet is expected to inhabit cooler regions further north of those described for *V. velutina*.

Figure 3. The Yellow-legged Hornet, Vespa *velutina, hovering in front of a beehive in France, awaiting incoming foragers. Photos courtesy of Quentin Rome/Muséum national d'Histoire naturelle, Paris, France.*

Asian hornets confirmed in North America in 2019 and 2020

Several observations of giant Asian hornets were made in North America during the 2019 beekeeping season. Because there has been some confusion surrounding these reports, we have summarized them here.

The first report was last May, when a huge hornet was caught near the Vancouver (B.C.) harbor. It was initially identified by Dr. Jun-ichi Kojima of Japan as *Vespa ducalis*, but later was confirmed to be a queen of *Vespa soror* by Dr. Kojima, Dr. Graham Thurston of the Canadian Food Inspection Agency, and Dr. Lien T.P. Nguyen, a wasp specialist in Vietnam. There have been no subsequent reports nor evidence of any nests of this species having been established anywhere in North America.

In mid August, three large hornets were collected in Nanaimo, B.C., on Vancouver Island. They were identified as the Asian Giant Hornet, *Vespa mandarinia*. Following an intensive search of the area, a nest containing about 200 worker hornets was located in Robin's Park, Nanaimo. It was destroyed on 18 September. DNA evidence suggests that nest was founded by a queen from Japan.

In late Fall of 2019, a photograph of *Vespa mandarinia* was taken by a resident of White Rock, B.C., close to the border with Washington State. Nearby in Washington state, two *V. mandarinia* hornets were reported near Blaine, Washington; DNA analyses suggest they likely originated from South Korea. Additionally, there were two reports of suspicious bee kills that may have been caused by AGHs in Washington State (near the communities of Custer and Clearbrook), but the cause of those bee kills could not be confirmed.

Extensive plans to monitor for and eradicate Asian hornets this year have been developed and are being enacted. Local beekeepers are networking with federal, provincial and local agencies to report sightings. In Washington, members of the public have volunteered to monitor hornet traps from mid-Summer into the Fall. At the federal level, both the U.S. Department of Agriculture and the Canadian Food Inspection Agency have prepared risk assessments as well as monitoring programs.

Figure 4. Various hornet traps and entrance protectors currently used in Japan. (Images courtesy of Dr. Masami Sasaki.)

*Figure 5. The European hornet (*Vespa crabro*; above) and bald-faced hornet (*Dolichovespula maculata*; below) should not be mistaken for any of the Asian hornet species. Photos courtesy of Stephen A. Marshall.*

Already, as of early June, three AGH specimens, at least two of which were overwintered queens, have been collected. The first was on 15 May in Langley Township, BC, approximately 10 km (six miles) from the 2019 reports in White Rock and Blaine. The second was a dead hornet found on 27 May near Custer, WA, not far from one of the unverified reports from 2019. On 6 June, a third hornet was killed near Bellingham, WA, 24 km (16 miles) from the Custer report. Interestingly, a bee colony in Blaine was killed by *Vespa mandarinia h*ornets in 2019; the beekeeper had kept two hornet specimens that he submitted to state officials in early June, 2020. Residents of Washington state have reported several hundred additional "AGHs", but all of those so far have been identified as other species.

The presence of AGHs in British Columbia and Washington State this Spring, some of which have been confirmed to be mated queens, indicates that at least one hornet colony, and more likely two or more, produced new queens last Fall. These few hornets ***do not*** yet indicate that *Vespa mandarinia* has successfully established a sustainable population in the Pacific Northwest. That will depend on a number of factors: the numbers of queens that established nests in 2019, the genetic diversity of those queens, and the ability of the hornets to adapt to their new environment which will become evident from their success at establishing nests over the next couple of years. Survey results over the Summer and Fall of 2020 will provide a much clearer picture of the AGH population.

The rest of North America

To date, there have been no confirmed cases of any species of Asian hornets anywhere in North America outside of the few locations in B.C. and Washington reviewed above. Beekeepers do not need to worry about moving Asian hornets with their hives as the hornets do not live in honey bee colonies. However, hornet queens wintering in various types of freight and packing material could be transported to North America from Asia (all four species reviewed here) or from Europe (in the case of the yellow-legged hornet). Once established in North America, they could be easily moved across the continent in the same way.

If any of these species becomes established, it will be very difficult to eradicate it. As a case in point, efforts to eradicate or reduce the rate of spread of the yellow-legged hornet in Europe have been expensive and largely ineffective. All four of these Asian hornet species have the potential to seriously affect honey bee populations and honey production should they become established in North America. In Japan, beekeepers who manage *Apis mellifera* colonies must install traps and "protectors" at hive entrances (Fig. 4) to capture *Vespa mandarinia* hornets attracted to the bee colonies. Traps and other protective devices suitable for North American beekeeping may become a standard part of beekeeping in the future if *V. mandarinia* or *V. soror* do become successfully established here. There is no effective trap or hive protector for yellow-legged hornets.

Another introduced Vespa species has been in North America a long time

North America has another introduced species of *Vespa* – the European hornet, *Vespa crabro*. Native to Europe, it was accidentally introduced to New York State more than 160 years ago. Today it is widely distributed over the northeastern portion of the U.S. as well as parts of southern Canada. It is a large wasp (25-35 mm) and consequently rather intimidating in appearance (Fig. 5) – but much smaller than the Asian giant hornets. However, it rarely stings people or attacks honey bees. In recent years, both beekeepers and members of the general public have frequently reported European hornet as Asian giant hornets. Additionally, the bald-faced hornet,

Dolichovespula maculata (Fig. 5), not a true hornet (it is classified a different genus), is also regularly mistaken as an Asian hornet species.

Reporting observations of giant hornets

Unfamiliar species should be reported to authorities because such observations are often the way in which exotic pests are discovered and tracked. Beekeepers and other stakeholders should remain vigilant for new pests and diseases of honey bees that may be introduced to North America, such as the large wasps reviewed here, *Tropilaelaps* mites, and other pests. By being able to identify these potential pest species and being aware of their current distribution, biology, and habits, we become better prepared should we encounter a novel species. Photographs and specimens are especially important because it is impossible to confirm the presence of an Asian hornet or other exotic species without good evidence that can be confirmed by a trained specialist. In the case of hornets, you may submit your report to your local apiary inspector or apiary program, to the agency or ministry responsible for invasive species, or to an extension entomologist, depending on your home state or province and the reporting framework in place.

We all have a role to play in protecting our beekeeping industry by reporting our sightings to local, state/provincial, or federal agriculture personnel. Citizen scientists will undoubtedly play an important role in tracking the spread of Asian hornets in North America. We can all agree on one thing in this time of uncertainty – we do not want any of these species of Asian hornets to become established in North America! BC

Acknowledgements

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Gardening For Bees

Ettamarie **Peterson**

Part of Sonoma County Beekeepers Association exhibit at the 2015 Sonoma County Fair.

In 1875, renown American botanist Luther Burbank said about Sonoma County, CA, "I firmly believe, from what I have seen, that this is the chosen spot of all this earth as far as Nature is concerned." The climate of the county varies from the cool, much damper Pacific Coast to extremely hot and dry inland areas and a combination of the two in many parts. Over the years beekeepers have been happy with the abundance of native and non-native plants that can grow in the county.

In 2015 the Sonoma County Beekeepers' Association's president was Cheryl Verreto who was also a certified Master Gardener. She was brave enough to sign the association up to have a major garden display in the Hall of Flowers at the Sonoma County Fair. Taking this on was a major task requiring a partnership with a landscape firm and the commitment of many other garden enthusiasts in the association. The goal was to educate the public about honey bees and all the lovely flowers that can feed them in this climate. As Cheryl told me, "Yes, I headed up and organized the Hall of Flowers fair exhibit for SCBA. It was the first project of the group. We hadn't formally organized but all the players were a part of it. Our entry wasn't as the Gardening for Bees club but as SCBA. I think that is what bonded the group as we all worked hard on planning and working the fair. Yes, my Master Gardener experience went into play. We assured a large variety of bee plants were displayed and each of them marked with both common and scientific names. I was so proud to be a part of that exhibit and honored to win 1st prize in our division."

The 2019 leader Ellen Sherron says the garden group started off in the spring of 2016. The Gardening Program currently has 248 people on the mailing list via Wild Apricot. Our current total member count of SCBA is 491, so G4B has the interest of half the membership!

They are learning about propagation techniques and what plants they are able to grow reliably.

Other beekeeper associations would benefit from learning about what this fabulous group is doing and might want to start a group in their area. Providing forage for bees is key to pollinator health.

The group recently set formal goals that state, "The goal of the SCBA Gardening Program, known internally as the Gardening for Bees group or G4B, is to nurture abundant pollinator habitat across Sonoma County. Towards this end, we:

- Educate our members and community on best practices for healthy pollinator habitat.
- Propagate and share a diverse crop of bee-forage plants that bloom in all seasons of the year.
- Cultivate, plant and maintain vibrant gardens at home and in our community to feed our bees and other pollinators.

Healthy, abundant, pesticide-free gardens are of critical importance to the future of both pollinators and people. Our Gardening Program stands as an integral part of a strong and sustainable Sonoma County Beekeepers Association."

Ellen Sherron tells me it has been blessed with smart, enthusiastic, loyal volunteers. All are part of the "Core group – folks that have served major roles." They meet regularly or email to make decisions about how to proceed.

For several years Alice Ford-Sala has written a plant-of-the-month column for the association's newsletter. The column is so well written and helpful that two other associations in California have her send it to them for their newsletters. She describes plants by their botanical names and families as well as the common names. If they are used for more than nectar and/or pollen, she tells us how they are beneficial to humans as dyes or medicine. Her column gives advice as to when, where and how to plant them. Since the Gardening for Bees group has been formed she has taken on more roles. She attends propagation workshops, helps with planning, speaks to other organizations and organizes field trip for the group. She has shared her plant knowledge with the cluster groups. Sonoma County Beekeepers Association members are spread out over a large geographical area so they have formed smaller groups they call clusters. There are five clusters to cover North, South, East, West and Central areas of the county. They meet once a month at members' homes on set Saturdays.

For educational field trips the gardening for bees members have gone to Singing Frog Farms, LynMar winery/gardens and Cal Flora Nursery. There usually is a sign up with a certain number that can go such as 15 to 20 people. These are Sonoma County businesses. Singing Frog Farm was such a great,

educational trip that they have been twice. (See www.singingfrogfarm.com to see why!) The group has gone to each other's gardens and plan to do more of this in the future.

Stevie Lazo, the group's treasurer reported that for the year 2018 they nearly doubled the profit from the year before. She said, "I still can't believe we made this much money for SCBA, just by digging up volunteers (plants, not people) and dividing our overgrown plants. Besides the financial benefit to SCBA, those of us who attend propagation workshops have a lot of fun and get to take home any plants we want. We've all expanded our repertoire of what plants we grow, and our bees are benefitting from more and better forage. We were able to give a lot of plants away last year – to fire victims (In 2017 and 2018 thousands of acres were burned in Sonoma County.) and a couple of community pollinator gardens."

What makes Gardening for Bees such a vital part of the whole association is that it functions to educate about pollinator plants and pollinator gardens giving informational talks and mailings to general membership, having propagation workshops to learn and get hand's-on experience suppling plants and in-person assistance to SCBA's School Pollinator Garden Program. They join projects with community organizations to build pollinator gardens, participate in county fairs such as Sonoma County Fair and the Gravenstein Apple Fair. Each SCBA meeting starts officially at 7 p.m. but for an hour before each meeting the building is open so members can socialize, have refreshments, talk to their cluster leaders and peruse the plant table and view a wonderful slide show of what flowers are in bloom that month. All of this takes a lot of input so the Garden for Bees group puts their members to work.

In 2018 Ellen Sherron stated that the goals for that year were to have better plant-tracking procedures. In past propagation workshops, people brought a lot of plant materials from their gardens. A few people start cutting them up and potting them into 4" or 1-gallon pots. She wanted to make sure any plant material propagated is bee-friendly and is identified accurately. Every year she has created an Excel list of the plants propagated. That year notes were added on how they propagated the plant (seed, volunteer, divisions, cuttings), as well as growing notes. This helped to make sure they have plants to sell from April through November. Preparing all the labels and getting them on the plants sold is a major task. Large informative ID tags are also on display when the plants are sold. They've come up with a relatively streamlined system for turning out the labels. A new brochure has been produced to educate the public on planting for bees. For additional reference, here is a link to the pamphlet: **https://sonomabees.org/resources/Documents/Gardening%20Program/G4B-brochure-2020-final.pdf.**

Proud of our blue ribbon at the 2015 Sonoma County Fair.

There's been a lot of interest in G4B participation in educating school children in the value of pollinator gardens. A few volunteers each year go into schools to talk to the students. It is great to provide plant materials and help in planting these gardens. Some schools have been given starter garden kits and worked with members of the group.

The latest helpful thing that happened in the group was getting a greenhouse to do the propagation. It was an abandoned greenhouse that needed a lot of work to get it in good shape. The groups' enthusiasm and hard work brought the greenhouse back to life. Luckily the group work needed to do this was done before the shelter in place edicts started. It is a huge building and it is easy enough to have a few members work at the same time maintaining the proper social distance. The plant sales that had been happening at the association meetings have been organized to be serve-yourself plant stands in front of some of the Garden for Bees members homes. The SCBA members are notified via the internet where and when these sales are. It has been a success.

I think Luther Burbank would be pleased to see how this group of beekeepers is contributing to the abundance of beautiful plants growing in Sonoma County. The plants are not only feeding the honey bees but a lot of pollinators and some are even feeding people. I hope their forming this group inspires other associations to do the same. BC

Close up of how the Gardening for Bees displays the plants for sale at monthly general meetings.

Telling The Bees –

Carl Edward Webb

Carl Edward Webb passed way Monday, July 6, 2020. He fought cancer for 15 years.

Carl proudly served our country in WWII in the European Theater, as did several members of his family. It was in Germany that he met his first wife, Traudel and they were married until her death in 1996.

After leaving the service, he received his Batchelor degree from the University of North Carolina in Forest Management. Carl worked in Africa with the Uniroyal Rubber Company. After returning from Africa he worked for the U.S. Forest Service for over 30 years.

Upon retiring, he began keeping bees full time.

In 1998 he married Virginia and they expanded their beekeeping business to over 600 hives. Carl served as the President of the Georgia Beekeepers Association in 2000 and 2001. He and Virginia became charter members of the Russian Bee Breeders Association, an organization that he was proud to be apart.

The funeral was held July 9. Both at Whitfield's Funeral Home in Demorest.

Memorials can be made to the following beekeeping organizations that Carl and Virginia support .

Georgia Beekeepers Assoc.
Paul Berry, Treasurer
In Memory of Carl Webb
1210 Box Springs Rd.
Box Springs, GA 31801

Russian Honey Bee Breeders Assoc., Inc.
Austin Smith, Treasurer
In Memory of Carl Webb
Smith Honey Farm
18 Honey Farm Lane
Petal, MS 39465

Summer Time Recipes

Shana **Archibald**

Pecan Crumble

- 4 granny smith (or honeycrisp) apples
- 1/4 cup honey
- 1/4 cup cold butter
- 1/2 cup shredded coconut
- 3 teaspoons cinnamon
- 1/4 teaspoon sea salt
- 1 cup chopped pecans

Preheat oven to 375°F. Grease a 6X9 casserole dish with butter and set aside.

Cut the apples in half, remove the core with a melon baller or similar tool. I like to use my metal measuring spoons.

Combine all topping ingredients except the pecans in a food processor and pulse until combined well.

Add coarsely chopped pecans towards the end and pulse a few times until evenly combined.

Spoon two to three tablespoons of pecan crumble onto the apple halves.

Bake for 40 minutes or until apples are tender but not mushy.

Remove apples, top with scoop of vanilla ice cream (or any ice cream of your choosing) and drizzle with salted caramel sauce. (Optional)

Kielbasa Kabobs

- 3 14-oz Kielbasas (Cut into 2" chunks)
- 2 Yellow peppers
- 2 Red peppers
- 1 Pineapple

Balsamic Honey Glaze

- ½ cup Honey
- 1/3 cup Balsamic Vinegar
- ¼ tsp Fresh ground pepper
- ¼ teaspoon Salt

Balsamic Honey Glaze

Prepare glaze by combining all ingredients in a small bowl, then set aside.

Kielbasa Kabobs

Chop peppers into 1-2" squares.

Prepare pineapple by cutting off the exterior skin, top, and bottom, so only the flesh remains. Cut pineapple into 1-2" chunks, discarding the core.

Add ingredients to skewers, alternating kielbasa, red pepper, pineapple, then yellow pepper. Repeat until all ingredients have been used.

If using a charcoal grill, light briquets in a chimney starter and pour the hot coal out over 1 half of the grill, leaving the other side empty.

Lightly oil grill grate with a paper towel to prevent sticking, then lay the kabobs on the grill in a straight line.

Periodically rotate kabobs from front to back, to ensure they cook evenly. Turn the kabobs as needed to allow each side to cook. and periodically brush with glaze, reserving some for the end.

Kabobs are done when kielbasa is heated through and starting to blacken slightly.

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**.

♦MAINE♦

EAS 2020 has that was to be held August 3-7 in Orono at the University of Maine has been cancelled.

For more information visit **www.eastern-apiculture.org/confereces/eas-2020.html**. Watch these pages for details.

♦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.

August 15th - Speaker Sam Comfort

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♦

August 22

Principles & Practices of Biodynamic Beekeeping - Part IV: Fall & Winter Learn about successful overwintering, including how to consolidate hive space, wrapping, feeding and more. Classes take place at Spikenard Honeybee Sanctuary in Floyd, VA. website: **www.spikenardfarm.org** contact: **info@spikenardfarm.org** or 540-745-2153

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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Coming back from the Flat Tops, an oncoming driver flashed his lights. "Deer?" I wondered. What I encountered instead were two black pug dogs, trotting next to each other, in the right hand lane, right where they should be. The closer one had a smirk on his mug, or maybe a guilty look. His sidekick had a chicken in her mouth.

The other night the gal Marilyn and I watched the legendary Gene Killion's video on comb honey production. His every move pure grace, Gene's a joy to watch, and an inspiration. You might enjoy Olympic skating. I'll take Gene laying down white smoke and shaking bees off a comb.

He shows how to split two strong colonies into two strong halves and two weak halves, with the old queens in the weak halves, leaving the strong halves temporarily queenless. He moves the weak halves to another location in the bee yard, so that foragers will abandon them and return to the strong halves, still in their original locations.

He makes sure that both strong halves contain plenty of brood and nectar. Then he puts a section comb honey super over each strong colony – or a queen excluder and a super of cut comb foundation. Three to five days later he returns to remove queen cells in the strong halves. On day eight he checks again for queen cells, and pops in new caged queens. Gene lets the bees release the queens on their own, by eating through the candy plug.

Now he has two powerful colonies, confined to single-deep supers, *headed by new queens that won't swarm*, ready to make comb honey. The no-swarming part confounds me. In a honey flow, how are you going to keep even a young queen from swarming, if she's crowded? But that's what Gene says, and he's the guru.

How about the weak halves of those splits, with the old queens, that he moved to the side and were abandoned by their foragers? He combines them and turns them into a regular double-deep colony.

So Gene splits two hives into three – two very strong singles for comb honey production, and one double-deep. This is magic, no?

Warning! I learned all this from a video. I've never produced comb honey. Don't try this without going to the source, OK?

Back on the farm, a hospital administrator dropped by to pick up a nuc. I showed her how to do a sugar shake test for *Varroa* mites. She had a lot of questions. Then she said, "Oh, my God! What's this?" On a hive cover, with a Magic Marker I'd scribbled, "Liver, kidneys, no dialysis."

I'd taken a call in the beeyard from someone who'd given me a cancer update on a friend. As I listened, out of the corner of my eye I caught a glimpse of the unwelcome stranger in the hoody, with the scythe. He comes around, and sometimes he leaves, but he always comes back.

In Colorado, you need a license to drive a car but not to keep bees. A few days ago, at the beginning of June, a kid from Telluride called. He said he'd pay "whatever I need to" for a nuc. I asked how much he knew about bees. "Nothing," he said, "but I'm willing to learn."

"Good," I said. "If you'll show me evidence you've completed the online nine-hour Beekeeping 101 course from Penn State, I'll sell you a nuc."

"Wow!" he said. "I'm on it!"

I admire the kid's spunk. This is the kind of enthusiasm you need if you're going to succeed in an endeavor at which so many beginners fail.

Novice beekeepers need a foundation on which to increase their knowledge and gain practical experience. Don't try to cowboy this. Short of working for a commercial beekeeper, a course taught by a competent teacher is the best way to start. A class put on by Penn State qualifies as "competent."

You might find a mentor, sure, and I hope you do, but be wary of the blind leading the blind. And while there is good information online, the Internet is also a dumping ground for bad advice. Be wary.

You need to be able to open your hive and have some basic idea what's going on inside. Just the other day a local gentleman called saying he wanted a nuc. He said he had a thriving hive until 10 days ago, when suddenly all the bees died, inside the hive. We didn't have a dandelion honey flow this year, and I've never fed so much syrup to keep my bees alive. I asked him if his bees starved. He said he didn't know.

A caller from Colorado's Eastern Slope reported that his bees were doing fine until a Spring frost finished them off. I told him I'd never heard of such a thing. But I did hear a rumor of a nectar dearth in his neighborhood.

To successfully keep bees, you need training, and you need passion, or at least commitment. Riding my bicycle down our county road, I ran into a friend to whom I sold a couple of nucs last year. I inquired if her little darlings were getting enough to eat. She said she thought so. I got the impression she hasn't popped a hive cover since November when I showed her how to do an oxalic acid dribble treatment for mites. She's busy! We're all busy. But maybe we shouldn't all be beekeepers.

Ed **Colby**

Beginner

In the July issue I mistakenly attached the name of Ed Simon as the author of Bottom Board. That was human error on my part. It really was written by Ed Colby. I apologize to both Eds.

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