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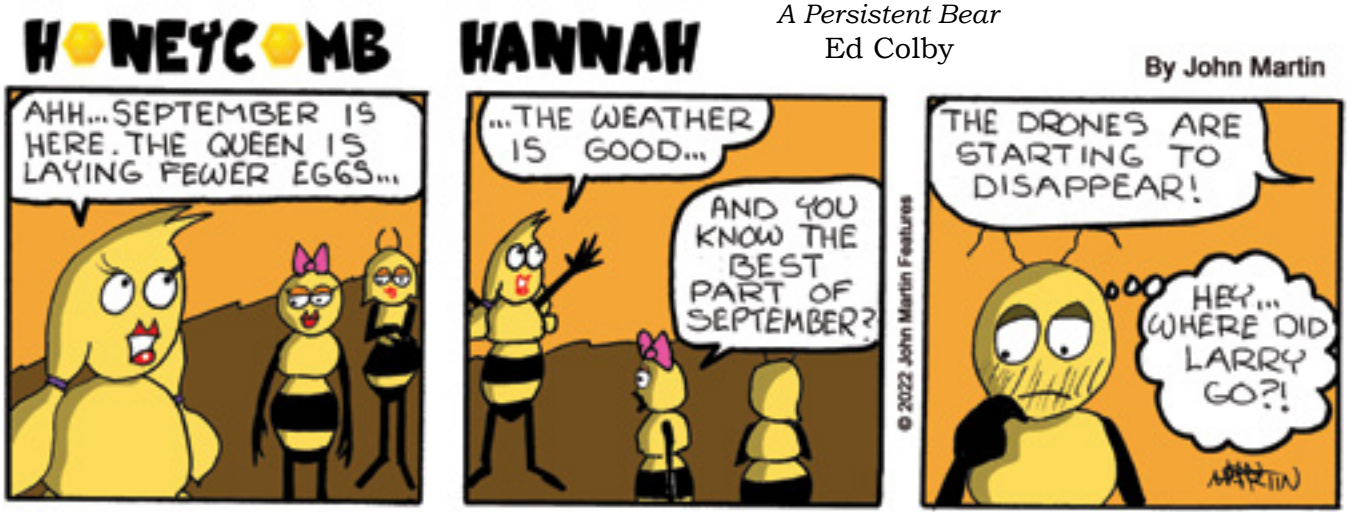

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Queens

Why good queens!

Over the years, especially since 2000, we have seen a lot more problems with queens. As I have observed brood patterns over a lifetime, I see them showing signs of stress.

Fifty years ago, the only reason you would find spotty brood or shotgun brood would have been due to a larva disease like European Foul Brood or American Foul Brood. In the case of AFB, you would have to burn the hive. Today, we are seeing more and more spotty brood patterns, and this is not the result of these diseases. This brood abnormality will show up even if you had a new queen in the Spring. It is suspected that chemical exposure is the culprit. The queens are having a hard time keeping up with their production of viable eggs. We are finding that more and more, the queens need to be replaced each year. If you have the opportunity to replace the queen later in the season it will improve your survival rating for overwintering. Queens have been failing in mid-season as well! What is happening? It looks like there is a good honey flow, but what is really happening is the field bees are making honey but there is no young brood to feed it to. As a result, there is no honey being used for developing bees. Each larva needs a cell of honey and a cell of pollen to reach maturity, but they are not needed for feed, it makes the honey flow look good. When you look at the hive you can assume that it is doing well because of the abundance of honey. When you check the brood chamber, it will be full of fresh honey but no brood. In talking to other beekeepers this past season, the need for queens has been a common occurrence throughout the Spring and Summer and into the Fall.

A good queen is the key to a strong hive. If something goes wrong with her, the hive will start to fail. And yes, mites kill hives! But it is not the immediate direct assault of the mite. Mites can easily be controlled with the many treatments that are now available. If the mites are under control, they will do minimal damage to the hive. The problem arises when agriculture chemicals are added into the mix. The chemicals weaken the bee's immune system. The weakened immune system makes the bees become more susceptible to infections. Then pathogens are introduced into the bee when mites penetrate their exoskeleton to feed. The hive will lose its ability to requeen and survive the problems. This will show up as hives that have difficulty raising a new queen. There are several different ways that this happens: 1) the bees do not realize the problem soon enough, 2) the contamination in the hive is so pronounced that the queen larvae are not viable, 3) the brood is so compromised that an emergency queen cannot be raised successfully, 4) the queen has been so contaminated that she is not laying viable eggs, 5) the queen seems to loose her pheromones and the bees do not recognize her or that she is failing. Any one or a combination of these will compromise the hive.

Over the last several years we have found it necessary to introduce young queens in the Fall. The reason we perceive is that the agricultural insecticides and fungicides are shortening the life of the bees. Insecticides and fungicides shorten the life of worker bees by 28%, as shown by university research studies. The queen is the center of a strong, vibrant and successful hive. With the hive contaminated with these chemicals, they drastically shorten the queen's productive life. Ontario Ministry of Agriculture Food and Rural Affairs (OMAFRA) tested the honey and pollen in the hives in 2012 and 2013. The tests we received back show results with neonics as high as 0.003 parts per million. When we realize the queen eats her weight in food each day at peak production, her retention of these chemical's contaminants affects her longevity and viability. As a result, she will accumulate these chemicals and it will inhibit her ability to lay viable eggs and produce queen pheromones. You will start to see spotty brood or shot gun brood. We try to overcome this problem by replacing the queen when we observe this change as soon as possible. At the very least, this should be done in late Summer or early Fall.

We like to take off the honey as early as possible before the Fall sets in and the drones are all being kicked out. We remove as much honey as possible to remove the trace chemicals that the bees have brought into the hives in the honey. We immediately start to feed a one-to-one sugar syrup to the bees. This accomplishes two things; first, they are fed for Winter and second, because it is a light sugar syrup and it takes time to process it, the bees look on it as a honey flow and the queen goes into a brood rearing mode. This will give you a lot of young bees for Winter. All the old bees will die off before Spring. If you have a good queen, you will see a nice solid brood pattern.

Beekeepers often want queens early in the Spring for expansion or replacement. Instead, try replacing the queens in August or early September to have a young queen ready to go into Winter. There will be a good strong hive in the Spring. We find that a good split started as late as the first week in August will Winter nicely for the following Spring. You can use this nuc for any increases or to recover Winter losses. To overcome some of the problem with getting early queens we start late Summer nucs. Our late nucs are typically a four-frame wood hive with a comb of honey, two frames of brood and a fourth frame, either drawn comb or foundation. You may need to stimulate the nuc by feeding. We like to use all-natural wax and wood as much as possible. To this starter unit, you can put in a queen or a viable queen cell. As the queen starts to lay, check her brood pattern. If all is well, move to the next step. As it starts to fill out, add a second four-frame brood chamber to it. You want it to be pretty well filled with bees and full of honey. In our area we find that with some straw around them, they will winter quite well.

You need to monitor the mite load in your hives at all times. We have started using the CO_2 unit which seems to show good results. When you are finished with the test, the anesthetized bees can be put back in

the hive and they will return to their work within a few minutes. If the mite levels are high, it is important to treat the hive. There are several different treatments. I recommend checking each year with the tech team and OMAFRA for their best recommendations.

If all goes well, you should be ready to get the hives ready for Winter. Remove as many frames of the natural honey as possible. Some beekeepers remove the pollen frames too. You will have to make sure that they have an ample supply of food. Use two-to-one sugar syrup in late Fall until the hive is full. We recommend that the hive be as full as possible with a small patch of open frame at the bottom. Make sure the bees have ample time to turn the sugar syrup into honey before it gets too cold. A single should weigh in the range of 65-70 pounds. Do not feed too late. The bees will not be able to convert the syrup into honey. This will result in high moisture in the hive. The bees will have trouble removing the humidity from the hive and it will inhibit their ability to maintain heat.

The bees need a patch of open comb to start their Winter cluster. It is important to have the bees establish this cluster. The cluster creates heat that warms the honey. The cluster slowly moves onto this warmed honey above and around it to feed.

After all this care and preparation, it is time to pack your bees up for Winter. It is good to put some protection in place to deter mice damage to the hive in the Winter. Wrapping protects the equipment and also helps keep the heat in the hive during cold weather. It is good to have a reduced entrance, but it is just as important to have a top entrance for the hive. The two entrances should face the same direction to prevent a cross breeze. Some insulation, like loose straw, on top of the hive is also a good idea. Most heat is lost through the top.

So now that you have finished, you can start preparing for the next season, looking through bee catalogues and dreaming about the things you want for next season.

Bill
Ferguson Apiaries

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Science

Sent to Ross Conrad

Thank you for your article in *Bee Culture*. My husband and I have been beekeepers each almost 50 years. We have your book on Natural beekeeping. Re: the article: Very well thought out thoughts about "Science". Thanks, Sky Campbell, Athens, GA

P.S. I have been recently dealing with the same kind of science re: glyphosate in my neighborhood. My neighbors are receptive to backing off of Roundup, etc. Here is a quote of mine written to my neighbors: "When I hear someone say they represent 'the actual science" my suspicions are immediately heightened. "It's the science" or "follow the science" has become a rote reply, an automatic response. I think that it is a lazy reply. I think it is sometimes used in an aristocratic fashion to put someone else "down" as being stupid, or in this case, as being misinformation. It is my opinion that the word "science" has been stolen. The word "science" has been baited and switched, similar to what has happened to the word "green". These words lose their original meanings and acquire a meaning suitable to industry."

S Campbell

Ross's Response

Dear Sky,

Thank you for your message. It is always a pleasure to hear from a fellow beekeeper.

Thanks also for your kind words about my recent articles on science. I think you are right about how the word science has been co-opted by those who wish to avoid debate and subtly insult or ridicule others who think differently from them. Good observation!

Thanks again for taking the time to get in touch.

Ross

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Mice

Opened the hive and found that a nest was started in the very upper part of the hive, above the inner cover.

Took off the inner cover and these two were found dead (see photo).

Removed the nest and went back later and nothing else was added.

No more mice ;) No autopsy was performed, so I can't give an accurate cause of death. This hive is thriving.

Terry Smalec
NW Colorado

Not unusual Terry. Depending on how defensive/aggressive the colony is and how many colony members can be recruited to sacrifice their lives, mice can be an easy target confined within the hive. Might be easy to get in but tough to get out.

Jerry

NEXT MONTH

Region 1
- Take alcohol wash mite counts, treat, then mite counts again
- Super for Fall flow, if you have one
- Queenright?
- If no disease, combine weak hives
- Check stores, feed if necessary
- Insulate hives
- Install mouse guards
- Feed if below (approximately) 50 lbs
- The end is near

Region 2
- Continue with *Varroa* management techniques
- Sample to make sure *Varroa* treatments worked
- Colonies queenright?
- Combine weak colonies if no disease/*Varroa*/queen issues
- Check food stores
- Too early to use OA for *Varroa*
- Reduce entrances
- Feed if needed
- Replace any damaged hive bodies

Region 3
- Mite check, treat, mite check again
- Harvest Fall honey
- Put SHB traps in
- Reduce hive size
- Feed through the dearth
- Combine poor colonies if healthy
- Powdered sugar dusting for mite control... 30 days
- Put up wind breaks
- Put mouse guards in
- Stack extracted honey supers with ParaMoth

Region 4
- Winter is coming, put on mouse guards
- Almost too late for mite control
- Feed with 2:1 sugar syrup
- Consolidate brood boxes
- Extract last of Fall honey or leave on for Winter
- Feed if below 50 lbs stored
- Combine weak colonies
- Alcohol roll for mites, treat, sample again

Region 5
- Pull honey
- Check Winter stores
- Feed and treat
- Put SHB traps in
- Mouse guard time
- Prepare Winter hive covers
- Start wrapping hives

Region 6
- Mite check
- Harvest Fall honey
- Feed weak colonies
- Replace old boxes
- Sample for mites, treat
- Remove deadouts, preserve comb if possible
- Feed, feed, feed

Region 7
- Check queen condition
- Sample for mites
- Treat for mites then sample again. Did it work?
- Feed heavy syrup if needed
- Do AFB/EFB check
- Is there enough Winter food stores?
- Use labeled mite treatments ONLY!

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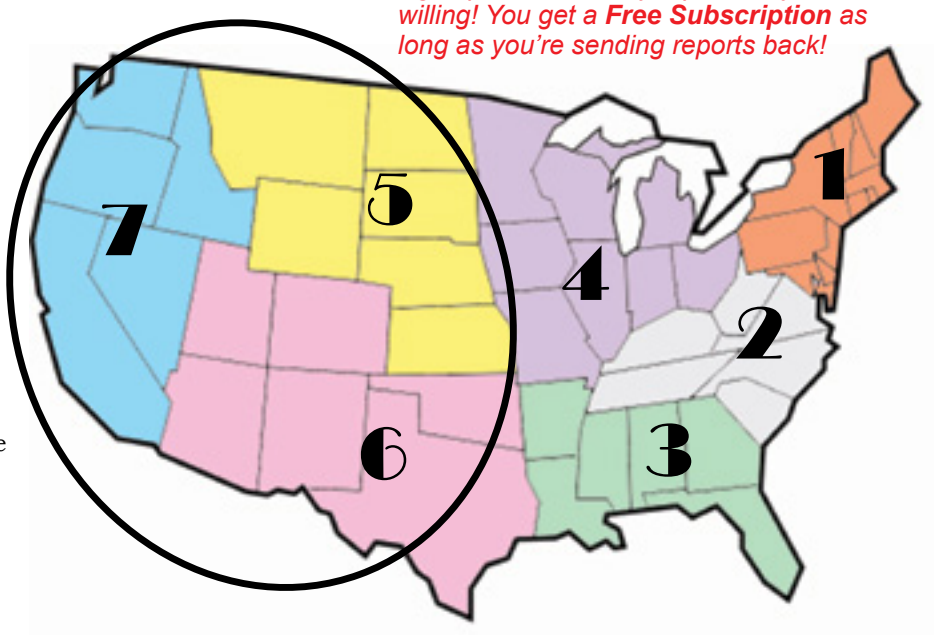


SEPTEMBER – REGIONAL HONEY PRICE REPORT

	REPORTING REGIONS							SUMMARY			History	
	1	2	3	4	5	6	7					
EXTRACTED HONEY PRICES SOLD BULK TO PACKERS OR PROCESSORS								**Range**	**Avg.**	**$/lb**	**Last Month**	**Last Year**
55 Gal. Drum, Light	2.73	2.13	3.40	2.84	2.67	2.80	2.40	2.00-4.00	2.75	2.75	2.65	2.20
55 Gal. Drum, Ambr	2.60	2.19	2.90	2.78	2.50	2.45	2.29	2.00-4.00	2.60	2.60	2.45	2.03
60# Light (retail)	225.58	228.53	192.00	201.88	195.00	193.69	157.40	150.00-330.00	211.88	3.53	219.66	197.62
60# Amber (retail)	223.33	223.04	234.00	208.43	235.00	197.79	222.50	160.00-310.00	218.12	3.64	218.53	197.19
WHOLESALE PRICES SOLD TO STORES OR DISTRIBUTORS IN CASE LOTS												
1/2# 24/case	104.87	114.60	-	87.60	151.20	100.00	-	75.60-200.00	106.17	8.85	95.46	89.37
1# 24/case	171.83	195.94	148.00	123.17	193.30	139.74	144.00	96.00-325.00	162.53	6.77	150.75	131.19
2# 12/case	165.96	264.00	143.00	107.26	-	111.00	156.00	84.00-300.00	152.44	6.35	151.27	121.38
12.oz. Plas. 24/cs	143.49	147.00	98.00	101.48	99.60	113.88	116.87	72.00-250.00	124.25	6.90	118.54	104.27
5# 6/case	172.33	239.40	200.00	118.93	129.90	122.00	-	96.00-330.00	164.41	5.48	153.05	133.84
Quarts 12/case	194.67	212.00	175.00	153.22	171.03	172.23	266.60	100.00-388.80	192.37	5.34	167.04	154.65
Pints 12/case	111.50	146.50	95.67	92.25	98.80	96.00	215.20	60.00-300.00	121.54	6.75	112.05	97.81
RETAIL SHELF PRICES												
1/2#	6.12	6.84	5.59	5.29	6.79	8.00	8.00	2.59-10.00	6.25	12.50	6.12	5.48
12 oz. Plastic	7.73	8.18	7.39	7.29	4.99	9.39	6.17	3.40-16.00	7.52	10.02	7.35	6.94
1# Glass/Plastic	10.06	11.02	10.05	8.77	8.47	10.90	10.00	5.69-20.00	10.00	10.00	9.60	8.65
2# Glass/Plastic	16.87	19.09	18.95	14.48	12.29	15.00	15.50	7.00-36.00	17.25	8.63	16.33	15.78
Pint	11.25	12.54	11.35	12.14	10.04	10.10	14.75	5.00-24.00	11.84	7.89	11.91	10.94
Quart	22.58	23.15	21.56	20.69	17.59	20.80	21.60	10.00-48.00	21.54	7.18	20.86	18.75
5# Glass/Plastic	36.45	41.00	50.88	26.37	22.33	24.25	-	8.50-120.00	34.91	6.98	46.45	30.50
1# Cream	10.80	14.20	9.48	10.67	10.44	-	14.00	6.59-25.00	11.35	11.35	11.38	10.10
1# Cut Comb	15.48	15.06	12.67	14.80	13.00	15.00	16.00	6.00-25.00	14.86	14.86	13.92	13.97
Ross Round	14.10	13.45	15.00	12.00	-	-	14.67	8.00-20.00	13.82	18.43	11.91	10.98
Wholesale Wax (Lt)	9.20	9.63	8.70	7.37	7.25	7.70	7.33	3.00-20.00	8.41	-	8.15	7.21
Wholesale Wax (Dk)	6.79	6.59	9.25	6.57	6.75	4.25	-	3.00-13.00	6.69	-	6.09	6.21
Pollination Fee/Col.	85.00	71.17	87.50	148.33	103.00	-	61.67	6.00-260.00	94.57	-	83.00	93.10

Please note: anywhere within each region that there is a '-' it is because no information was sent to us for that specific item in that region.

They say all politics are local. Lately, there have been a lot of "local politics" in the news and on all the social media outlets. In a similar way, all beekeeping is local. Regardless of your location or the size of your operation, we do the same things. While the timing and scale differ, the tasks are basically the same: split, feed, move, feed, super, extract, feed, move, sort, feed, move, etc. No matter what is going on with the U.S. Bee Industry, the only thing that really matters is how your business is doing. Eventually, what happens at the national level usually affects us at the local or individual level. Here is one example that you might have heard about: On June 22, the U.S. Customs and Border Protection (CBP) announced (via Twitter) that they have begun focused targeting, port of entry reviews, inspections and scientific examinations of raw honey. AHPA has worked toward expanding the presence of CBP at ports of entry to increase the number of honey containers inspected. How does that affect your business? As a result of the work AHPA has been doing, and the recent antidumping ruling, CBP has started to pay more attention to imported honey. This will result in the continued pressure on importers and reduce the amount of low price honey entering the market and maintain the price for raw honey.

The antidumping suit has already resulted in an increase of raw honey prices but, unfortunately, this is just the start of a long process. I don't know how many remember the last antidumping suit 20 something years ago. What I remember most is, that it required a lot of money. It's a long and expensive process, but the AHPA Executive Committee, most commercial beekeepers and I, believe it will be worth the effort and cost. We all know that lawyers are expensive—good lawyers even more so—but good lawyers get results for their clients. The next steps are appealing the parts of the ITC ruling we don't like and defending the parts we do. This will require beekeepers and the businesses that depend on beekeepers to continue to support AHPA and the Antidumping Fund. With the help of our members, many of our long-time industry supporters, and some new supporters, we have received almost enough to pay the initial legal fees.

Continued on page 89...

STUDY HALL

VIRUS

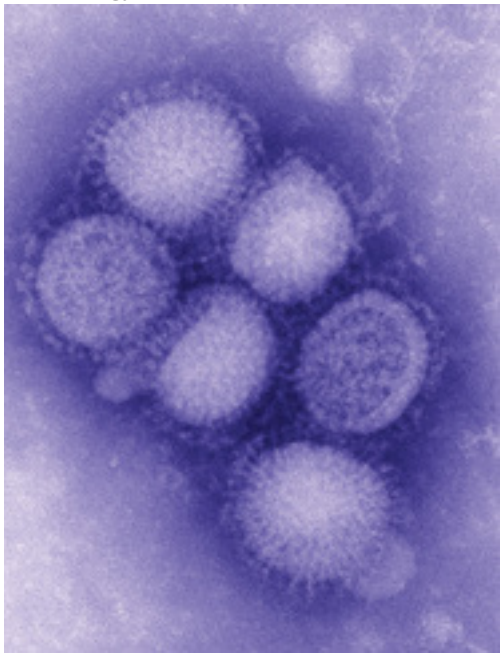
QUESTION

All I hear about are the viruses found in honey bees and how they are hurting or killing them. I never hear about how to control viruses in honey bees. Little masks and vaccines?

Maurice Boudreau

ANSWER

You sound frustrated. And you should be. Honey bees have evolved through time without developing a robust immune system in an individual bee. They were short lived and the resources needed to support a vigorous immune system were not energy efficient. So, the individual honey bee has an immune system but it is the whole colony which has a more comprehensive immune system. Think of a honey bee colony as one organism and the individual bee as a cell in that organism. Cell(s) can be sacrificed individually just like in our bodies until the disease is contained. Remember back in the day when Colony Collapse Disorder (CCD) was in the headlines? Colonies lost population and eventually the hive was mostly empty. I am going to anthropormorphize (give human traits) to honey bees now. That was because individual workers who 'felt sick' left the colony because they 'know' that they might make their sisters sick. They leave the colony and don't return. They do honey bee suicide to protect their sisters and the colony from whatever they may have disease wise. In CCD, the colony dwindles as individual bees leave and do not return. If thousands of bees feel 'sick,' they make this 'individual decision' to leave and after some time there are no bees left in the colony. Voila, CCD.



Over time, researchers determined that the virus load from *Varroa* parasitism was 20-30 mites per hundred bees and the viruses *Varroa* transmit to infect honey bees and make them 'sick' was the CCD mechanism. And another voila, the *Varroa* Virus Legacy.

Currently, there are lots of research projects to see if the honey bee immune system can be enhanced or supported to remove these viruses and their negative health effects. But, nothing yet. Stay tuned.

HYGIENIC BEES

QUESTION

Please explain what capping and re-capping is. Hygienic bees are supposed to be doing it for *Varroa* control.

Devin Schloksky

ANSWER

The *Varroa destructor* parasite of honey bees is something our European genetically evolved honey bees didn't have to deal with and adapt to. But with global connections to everywhere most all pests, parasites and diseases are on the next international or national flight. Remember COVID?

Life finds a way and our survivor honey bees and fantastic honey bee breeders have identified a trait of survivor bees that can potentially be enhanced as part of IPM strategy to deal with *Varroa*. These bees can recognize an odor, a pheromone, emitted from a cell containing a developing bee that sometimes indicates that a *Varroa* foundress mite is in the cell. The bees with this genetic trait will uncap the cell with this odor. The uncapping disrupts the mites reproductive and offspring development and can, of course, then lower *Varroa* mite density in the colony. But, like everything else biologically, this is not a perfect system. Sometime the cells uncapped do not have mites in them and sometimes cells with mites are not uncapped. Soooo, at this moment in time this trait in bees can be part of a 'system approach' to *Varroa* control, as it is not a 'silver bullet' by itself.

SWIMMING POOLS

QUESTION

Is there any truth to the concern that colonies should not be placed within certain distances of swimming pools since if/when a colony swarms, the mass of bees may attempt to access the water, and could represent a hazard to swimmers?

Robert Marley

ANSWER

No.

Short story is honey bees need water for biological reasons and for evaporative cooling of a beehive in hot weather.

Just like pollen or nectar foragers there can be water foragers.

From the Editor, Jerry Hayes

Being able to share any of these with their sisters with taste and odor and direction to this identifiable taste and odor is very important. They have to be able to find it.

If honey bee water foragers are offered distilled water outside of the hive and they get a sample, take it back to the colony and share it with other foragers they hope to recruit, these potential recruits have no idea what this is as it has no taste or odor. Kind of like you with a cold, you can't taste or smell anything. Those cookies are not that attractive even though you can see them sitting on the kitchen counter.

Treated swimming pool water has lots of minerals in it. So it has lots of taste and an odor profile. The sample of this is easy to share with foragers in the colony along with direction and location where it can be found.

Swarms are the reproductive stage of a honey bee colony. They are not food or water foragers. They are looking for a cavity to nest in, not take a swim.

NOSEMA CERANAE

QUESTION

Please advise the latest treatment for Nosema ceranae or direct me to the appropriate source?

Blessings,

Richard J. Woodham

ANSWER

The only known reliable treatment for *Nosema apis* in honey bees is the antibiotic fumagillin, which is derived from *Aspergillus fumigatus* and has been widely used to treat colonies infected with *N. apis* since the 1950s. It is labeled and sold as Fumidil-B usually from most large beekeeping distributors. It may not work as well on *N. cerana*. But, there is not a lot of data on alternative products that show control consistency. Pluses and minuses of course, with fumagillin with collateral damage to the honey bee herself. Kind of like all the commercials on TV for pharmaceutical products showing all the smiling people and then there is the small print at the bottom saying all the terrible things that might happen to you if you take it.

There are other products advertised that may or may not be appropriately approved and labeled that may have some impact. Welcome to managed beekeeping.

APPS FOR BEEKEEPERS

QUESTION

Has there been any reviews by *Bee Culture* on the various apps for record keeping? If yes, then I would be interested in reading that article.

I have spent too much time downloading, testing then deleting apps.

Hope you can help or point me in the right direction.

Thanks,

Glen

ANSWER

No, we have not had a review of apps simply because of what you offer in your email.

But this would be a great question for the 'Study Hall' in *Bee Culture* to ask readers.

Okay beekeepers, what app do you use or not? Let me know your experience at Jerry@BeeCulture.com!

SALT WATER FOR BEES

QUESTION

Would a very weak solution of water and Utah sea salt (no modern pollution) in a dish with a screen under a stone, to prevent drowning ,be worth a try?

ANSWER

We all need to replenish salt and minerals in our human bodies daily especially in Summer when we sweat through all of our clothes underneath our bee suit.

Honey bees don't sweat but they do need some minerals individually and for sharing with their sisters for biological metabolic efficiency.

What you are ultimately talking about is making a small treated swimming pool. Honey bees are attracted to treated swimming pool water because of the minerals and taste and odor profile to share with their sisters. For fun, you can put a sample out for them and if they need it and/or like it, they will come. If they don't then you will know it didn't meet their needs, wants or desires. Let me know how it works out. Take some pictures.

MITE WASHES

QUESTION

I am not averse to doing mite washes, but I argue that for any apiary above a modest size, the resulting information provides no decision support.

Why? (1) For any given hive, there is a baseline probability that the hive is infested with *Varroa*. (2) If any hive in the apiary is infested, the whole apiary should be treated. The management decision then is just a probability calculation irrespective of what a mite wash would provide.

If the baseline probability of a single hive being infested is 10% (Randy Oliver's estimate, for example), then even for an apiary of six hives the probability that at least one hive is infested is 50% and the whole apiary should be treated on probability grounds alone.

If your personal degree of risk aversion is to not tolerate an apiary chance of 50% but rather only 20%, then you would treat an apiary of three hives.

Mite washes are of genuine value if you are selectively breeding, but not if you deciding whether to put on this or that treatment.

We can now argue whether points (1) and (2) are correct as the rest follows from them.

Dan Geer

Tennessee/Alabama line

ANSWER

https://honeybeehealthcoalition.org/ Have you ever read the Tools for *Varroa* Management Guide or looked at the videos from the Honey Bee Health Coalition?

The reason this was compiled and written is because without sampling, treating if *Varroa* levels require, and then sampling after treatment to see if the treatment actually worked is because *Varroa* counts vary throughout the seasons. If you do not sample in Spring, or Summer or Fall especially when counts are rising, then your location in Tennessee / Alabama and *Varroa* counts will be much different than in Maine, Washington, North Dakota, Missouri etc., etc. It is a big country with lots of seasonal weather variation. And with climate change, weather is all over the board.

We have 30-40% losses every year as documented by BIP. Maybe if there were more beekeepers following the 'Tools for *Varroa* Management Guide,' losses would be less and *Varroa* Bombs much more infrequent.

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Schedule

Friday, Sept. 30

8:00 a.m.: Registration starts
8:30 a.m.: Opening remarks and a short history of the A. I. Root Company
9:00 a.m. - 12:00 p.m.: Speakers
12:00 p.m.: Provided lunch
1:00 p.m. - 3:00 p.m.: Speakers
3:30 p.m.: Q&A panel with speakers
4:25 p.m.: Tours of the A. I. Root Candle Factory
6:00 p.m.: Optional dinner, meet the speakers

Saturday, Oct. 1

8:00 a.m.: Registration starts
9:00 a.m. - 12:00 p.m.: Speakers
12:00 p.m.: Provided lunch
1:00 p.m. - 5:00 p.m.: Speakers
5:00 p.m.: Q&A panel with speakers

Susan Cobey: Internationally known Founder of New World Carniolan program

Jackie Park Burris: Jackie Park-Burris Queens, Inc.

Dorothy Pelanda: Director of the Ohio Department of Agriculture

Barbara Bloetscher: Ohio Department of Agriculture State Entomologist/ Apiarist

Geraldine Wright: Hope Professor of Entomology in the Department of Zoology at University of Oxford, UK

Julianne Grose: Associate Professor in the Department of Microbiology and Molecular Biology at BYU

Nina Bagley: Urban Master Beekeeper

Tammy Horn Potter: Kentucky State Apiarist, author of multiple books

Kim Skyrm: Chief Inspector of the Massachusetts Department of Agricultural Resources.

Tracy Farone: Professor of Biology at Grove City College in Pennsylvania

Maggie Lamothe Boudreau: Commercial Canadian Beekeeper, owner of *Rayons de Miel,* a 350 colony operation raising 4000 Queens a year.

Kathy Summers: Layout and Design for *Bee Culture Magazine* for 30+ years as well as Assistant Editor for the final 10 years.

Anne Marie Fauvel: Bee Informed Partnership (BIP)

She is speaking to represent the women of BIP who are all pictured.

Minding Your Bees And Cues

Honey Time: Part 1

Becky Masterman & Bridget Mendel

When Dr. John sings, *"I been in the right place/But it must have been the wrong time,"* he probably isn't singing about beekeeping, but he sure sounds like a beekeeper griping about missing the nectar flow. We spent part of our Summer asking beekeepers to share their best advice on how to make a great honey crop. The first thing many beekeepers mention is being in the right place. Putting your bee near lots of good forage is key, but the right place won't yield honey with the wrong timing. As Gary Reuter famously sang, "You can't make honey if the supers are in the shed."

Honey production is all about wedging your bees into the space/time continuum exactly right, and that takes practice, and practice takes years. We asked two, fourth generation beekeepers whose family businesses are now powered by the fifth generation what advice they would share with you. "Lessons of bee health and management timing are repeated until they are learned," advised beekeeper and current president of the North Dakota Beekeepers Association, John Miller. Prior to retirement, John led Miller Honey Farms and their million-pounds-plus honey crop each year. His brother, Jay, Vice President of the American Beekeeping Federation and owner of 2J Honey Farms skipped to the punchline by quoting Carl Powers of Powers Apiaries, the biggest honey business around in 1960s, "Do what you should do when you should do it."

Doing what you should do when you should do it takes practice. And part of the practice of beekeeping is being flexible and ready for strange seasons and disagreeable weather patterns. A late Spring, a wet Summer or a dry spell can affect the timing or abundance of nectars, our management choices and ultimately honey production. Though they chewed over weather plenty, none of the beekeepers we talked to had any good tips on negotiating with the weather gods.

Getting good honey also takes investing in the apiary and the surrounding landscape. Dr John sang, *"I took the right road/But I must have took a wrong turn."* We took this lyric to refer to Dr. John's fantasy of working with a commercial beekeeper. Locating beekeepers' well-hidden apiaries is not a problem for the team of multi-talented Bee Informed Partnership (BIP) technicians. The BIP program, in whom many commercial beekeepers invest in to track mites and diseases in their operations, supports honey production by catching health problems while they can still be solved. You can get your supers out of the shed early and onto colonies, but if your bees are dying of mites and viruses they won't fill up.

Beekeepers of all operation sizes emphasized the importance of keeping bees healthy, including monitoring and managing mites for productive bees. Some brought up the importance of new queens. Requeening in Spring is a practice that guarantees "fresh" queens: young, well-mated queens tend to be pretty productive, and more brood production means—you guessed it—a big population just in time for the basswood flow.

When asked to share honey production tips with *Bee Culture* readers, the beekeepers' generous nature and willingness to help each

Supers "not making honey" while in the shed.
Photo Credit: Bridget Mendel

other was evident. We hope you enjoy the following beebliography of honey production wisdom.

Meghan Milbrath, Assistant Professor in Michigan State's Department of Entomology and owner of Sand Hill Bees: *Put on supers early and often.*

James Hillemeyer, owner of L. B. Werks, a honey and pollination business: *Bring your (queen) operation in house. You get bigger honey crops with fresher queens. Time your population increase with the nectar flow.*

Doug Ruby, owner of Ruby's Apiaries, Inc. and commercial beekeeper in Minnesota and Texas: *You need strong bees, good sub soil moisture and temperatures and a little luck.*

Dan Whitney, owner of Whitney Lone Star Queen Co. and Dan's Honey Co., beekeeper in Minnesota and Texas: *You need a strong back, healthy bees and weather a little on the dry side.*

Dave Hackenberg, founder of Hackenberg Apiaries: *You need the right kind of weather and to be on time.*

Gary Honl, former owner of Honl's Bees in Minnesota and Texas: *You need the right location and habitat.*

Dave Schroeder, Past President of the Minnesota Honey Producers Association and beekeeper in Minnesota and Wisconsin: *Make sure there is good bee forage. Don't be afraid to invest with the landowner.*

Bob Sears, beekeeper in Missouri, national bee health advocate: *Requeen every year with good queens, treat for mites, and super early.*

Ryan Lamb, co-owner Lamb's Honey Farm, commercial beekeeper in Texas and North Dakota: *Add an extra pollen patty in the Spring.*

Mark Sundberg, current president of the Minnesota Honey Producers Association, beekeeper in Minnesota and Mississippi, and owner of Sundberg Apiaries, Inc.: *Be in the right place. Location and weather are important. You need good, strong, well fed and healthy hives.*

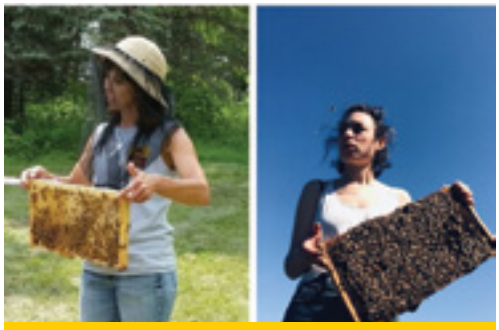
A honey super being filled with fresh nectar, bees working on capping it.
Photo Credit: Rebecca Masterman

Ang Roell, founder of They Keep Bees in Massachusetts: *In our operation we let hives grow up on early flows then initiate a walk-away split. This gives them an extended brood break and they yield a nice honey crop while they're making their new queen. It keeps our apiary genetics diverse and allows us to integrate both IPM & honey production in our queen breeding operation.*

Stay tuned for Part 2 next month where we dive into some of the science behind a good honey crop and tell you why beekeepers are some of the best botanists around.

Acknowledgments

The authors would like to thank Dr. Marla Spivak for helpful edits and suggestions and John Miller for his history lesson on Powers Apiaries.



Becky Masterman led the UMN Bee Squad from 2013-2019. Bridget Mendel joined the Bee Squad in 2013 and has led the program since 2020. Photos of Becky (left) and Bridget (right) looking for their respective hives. If you would like to contact the authors with your own honey production tips or other thoughts, please send an email to **mindingyourbeesandcues@gmail.com**

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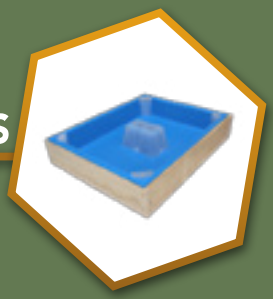

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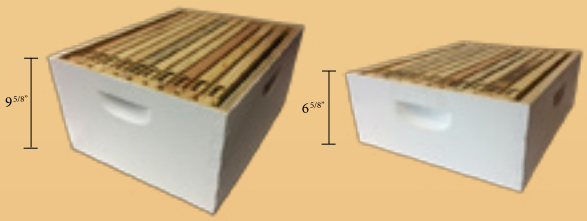

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A Closer Look

Queen Development and Traits

Clarence Collison

Brood pattern is a widely used biomarker.

One of the most widely used biomarkers of queen health is brood pattern—defined as the shape left by the egg-laying behavior of the queen. Because the reproductive capacity of the queen is fundamental for colony growth, the homogeneity of capped brood in a colony is often used as an indication of the quality of the queen (e.g., more continuous brood indicates a better queen) (López-Uribe and Simone-Finstrom 2019).

Failure of the queen is often identified as a leading cause of honey bee colony mortality. However, the factors that can contribute to "queen failure" are poorly defined and often misunderstood. Lee et al. (2019) studied one specific sign attributed to queen failure: poor brood pattern. In 2016 and 2017, they identified pairs of colonies with "good" and "poor" brood patterns in commercial beekeeping operations and used standard metrics to assess queen and colony health. They found no queen quality measures reliably associated with poor-brood colonies. In the second year (2017), they exchanged queens between colony pairs (n=21): a queen from a poor-brood colony was introduced into a good-brood colony and vice versa. They observed that brood patterns of queens originally from poor-brood patterns significantly improved after placement into a good-brood colony after 21 days, suggesting factors other than the queen contributed to brood pattern. Their study challenges the notion that brood pattern alone is sufficient to judge queen quality. Their results emphasize the challenges in determining the root source for problems related to the queen when assessing honey bee colony health. This study will challenge the widespread use of brood patterns as a metric of queen health and raises questions about how colony phenotype influences queen health and reproductive metrics (López-Uribe and Simone-Finstrom 2019).

In honey bee colonies, reproduction is monopolized by the queen while her daughter workers are facultatively sterile. Caste determination is a consequence of environmental conditions during development, during which female larvae may become either queens or workers depending on their larval diet. This bi-potency introduces significant variation in the reproductive potential of queen bees, with queens raised from young worker larvae exhibiting high reproductive potential and queens raised from older worker larvae exhibiting lower reproductive potential. Tarpy et al. (2011) verified that low quality queens are indeed produced from older worker larvae, as measured morphometrically (e.g. body size) and by stored sperm counts. They also showed, for the first time, that low quality queens mate with significantly fewer males, which significantly influences the resultant intra-colony genetic diversity of the worker force of their future colonies.

The age of the brood used for rearing queens has a major impact on the quality of the resulting queens. The best are queens reared from eggs. The aim of the experiment was to investigate whether the age of the eggs affects their acceptance by the rearing colonies. In four series, eggs at the age of zero to 18, 24-42 and 48-66 hours were introduced to five colonies. All colonies in the first and third series had open brood and were one day without queens. The second and fourth series had no open brood and were 10 days without queens. Out of all the 720 introduced eggs, the bees accepted 44.4% for queen rearing. No significant differences were detected between the total number of eggs accepted by the colonies with an open brood – one day after the queens had been removed (43.6%) and colonies without open brood – ten days after the queens had been removed (45.3%). However, significant differences were detected between the acceptance of eggs of different ages. The age of the eggs did not significantly influence their acceptance by rearing colonies with open brood – one day after the queens had been removed. However, the bees significantly accepted the lowest percentage of eggs (25%) after the youngest eggs, zero to 18 holds were introduced, and the bees accepted the highest percentage of eggs (64.2%) after the oldest, 48-66 hours old were introduced into colonies without open brood – ten days after queen removal (Gabka et al. 2011).

The research was conducted at the apiary of the Faculty of Agriculture, Zanjan University in Zanjan, Iran. Queens were reared in 24 *Apis mellifera meda* honey bee rearing colonies. The colonies were assigned to four grafting larvae age groups: one day old larvae, two day

old larvae, three day old larvae and the last group reared emergency queen cells. The groups were divided into the two feeding groups: fed additionally and no feed. The effects of the age of the grafted larvae and the effects of supplemental feeding on nine morphological characteristics of queens were measured. The results showed that the age of the larvae significantly affected the morphological characteristics of reared queens, and thus, their quality. Queens reared from one day old larvae were of the highest quality. These queens were significantly heavier (158.83 mg) and had significantly larger spermatheca (0.99 mm^3) than queens reared from larvae two and three days old. Queens from emergency queen cells were of lower quality than queens reared from one day old larvae. However, queens from emergency queen cells were of higher quality than queens reared from three day old larvae. The supplemental feeding significantly increased most morphological characteristics of the reared queens. The different ages of the larvae did not significantly affect the wing length nor did supplemental feeding affect the wing length (Mahbobi et al. 2012).

Slobodan et al. (2020) investigated the influence of various diets on the quality of queens. Colonies intended for queen cell production were assigned to four groups fed on (1) sugar-only, (2) mix of sugar, honey and fresh pollen, (3) sugar and pollen substitute (FeedBee®) and (4) natural sources. In addition, a fifth group had queen cells obtained naturally, by swarming. Sugar-only diet exerted a significant stimulating effect on the acceptance of queen cells and the weight of newly emerged queens, not affecting mated queens. Among mated queens, those raised by bees fed on the mix of sugar, honey and fresh pollen had significantly larger numbers of ovarioles in comparison with all the others. Their weight was significantly higher than that of the queens from groups given FeedBee® and swarming queens. Compared to the latter, they had significantly wider spermatheca. Given the parameters monitored, FeedBee® proved not to be advantageous for queens.

The honey bee queen, mother of all individuals in the colony, determines the inherited characteristics of the colony. Periodic replacement of old queens by a young and high quality one is an important management practice in the commercial beekeeping industry. Virgin queens' introduction is independent of weight at emergence and genetic relatedness of their receptor worker bees. A total of 243 queens from three genotypes of *Apis mellifera lamarckii*, *A. m. carnica* and *A. m. ligustica* (81 queens of each genotype) were weighed at emergence and allocated into three groups as: light (110-130 mg) 45 queens, medium (140-160 mg) 68 queens, heavy (over 160 mg) 130 queens and introduced into mating nuclei. The weight at emergence was significantly affecting the introduction success. Queens with heavy weight at emergence had the highest number of introduction successes with 103 queens (79.23%). The medium weight at emergence of virgin queens has the highest number of failed queens with 26 queens (38.23%). The number of drone laying queens was approximately the same for all groups. Genotype of introduced queens was highly significant in influencing their acceptance rate. Introducing *A. m. carnica* and *A. m. lamarckii* to nuclei with workers from the same genotype had the highest introduction success (Masry et al. 2015).

Worker honey bees in queenless colonies constructed emergency queen cells on the periphery of the brood area on a comb when ambient temperatures were high, and in the center of the comb when ambient temperatures were low. Queen cells in the center of the hive's broodnest were maintained at significantly higher temperatures and had a greater chance of emerging than queen cells located on the periphery. Temperatures around cells from which queens emerged fluctuated by <10°C, even though ambient temperatures had a range of >25°C. The average temperatures around cells from which queens emerged were 32.3–34.9°C (90.1-94.8°F); lower averages occurred during the Winter trials. Queens took an average of 15.4–17.4 days to develop. The central brood area of a colony had a significantly higher temperature with a narrower range than around any queen cell (DeGrandi-Hoffman et al. 1993).

The productivity and survival of honey bee colonies depend on queen bee health. Colony-level neonicotinoid exposure has negative effects on reproductive fitness of honey bee queens. However, it is unclear if the observed effects are a direct outcome of neonicotinoid toxicity or result from suboptimal care of developing queens by exposed workers. The aim of this study was to evaluate larval survival, reproductive fitness, and histopathology of honey bee queens exposed to incremental doses (0, 5, 50 ng) of the neonicotinoid thiamethoxam (THI) applied directly to individual late larvae (seven days post-oviposition) of queens. The 5-ng dose represents a calculated high environmental level of exposure for honey bee queen larvae. Morphometric evaluation revealed that the total area of mandibular gland epithelium in queens exposed to five and 50 ng THI was reduced by 14% and 25%, respectively. Decreased mandibular gland size may alter pheromone production, which could in part explain previously observed negative effects of THI on the reproductive fitness of queens. They also found that late larval exposure to THI reduced larval and pupal survival and decreased sperm viability in mated queens. These changes may interfere with queen development and reproductive longevity (Kozii et al. 2021).

Rearing techniques are important in producing high quality queens. Queen cell cup size may affect the acceptance rate of grafted larvae and determine the size of the queen, which in turn may influence the quality of the colonies. The present study compared the effect of different queen cell cup sizes (8.0 vs 9.0 mm diameter) on morphometric characteristics of queen honey bees. Six-

ty-five larvae were grafted in each treatment. Larvae transfer was carried out five times, in June and August 2019. Head, thorax and abdomen width of the newly emerged queens were measured using an electronic calliper, and the weight of each of the three segments was recorded using a precision scale. All morphometric traits measured on the accepted larvae were significantly higher in queens raised in larger cell cups, except for head width. Principal Component Analysis on morphometric traits shows higher values on PC1 (58.4% of explained variance) for queens raised in larger cell cups. Highest loadings were found for variables related to weight of the three parts. Among the many factors affecting queen's quality, cell cup size seems to have a positive effect on queens' body parts weights. Increasing the standard diameter of conventional cell cups allows rearing heavier and larger honey bee queens. The grafting period affects morphometric parameters, with higher size and body weight in the last week of June (Mattiello et al. 2022).

During mating flights honey bee queens copulate with about 10-20 drones. A possible explanation why polyandry (females having more than one male mate) has evolved in honey bees is that colonies from single-mated queens are inferior to those from polyandrous queens. It was investigated whether the performance of full and small test colonies would be lower if workers were from queens artificially inseminated with semen from one drone opposed to equal amounts of mixed semen from several drones. Six colonies with queens inseminated with 1 µl semen of a single drone, each of a different father colony, were compared with six colonies where queens had been inseminated with mixed semen of six drones from the same colonies. Colonies with single paternity showed at times lower drone brood production, lower pollen and honey storage, and fewer queen cells, while deviations in the opposite direction were small and not significant. Bee numbers and amount of sealed worker brood were not affected. Three short-time tests were performed involving a total of 75 small bee colonies kept in Kirchhainer mating boxes. Comb building, storage of honey and pollen, and brood rearing were lower in the colonies containing workers of only one patriline. The results support that a group advantage exists in performance of honey bee workers with mixed paternity, which might have promoted the evolution of polyandry in honey bee queens (Fuchs and Schade 1994).

Extreme temperature exposure can reduce stored sperm viability within queen honey bees; however, little is known about how thermal stress may directly impact queen performance or other maternal quality metrics. Here, in a blind field trial, McAfee et al. 2021 recorded laying pattern, queen mass and average callow worker mass before and after exposing queens to a cold temperature (4°C (39.2°F), two hours), hot temperature (42°C (107.6°F), two hours) and hive temperature (33°C (91.4°F), control). They measured sperm viability at experiment termination and investigated potential vertical effects of maternal temperature stress on embryos using proteomics. They found that cold stress, but not heat stress, reduced stored sperm viability; however, found no significant effect of temperature stress on any other recorded metrics (queen mass, average callow worker mass, laying patterns, the egg proteome and queen spermathecal fluid proteome). Previously determined candidate heat and cold stress biomarkers were not differentially expressed in stressed queens, indicating that these markers only have short-term post-stress diagnostic utility. Combined with variable sperm viability responses to temperature stress reported in different studies, these data also suggest that there is substantial variation in temperature tolerance, with respect to impacts on fertility, amongst queens (McAfee et al. 2021).

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OVERWINTERING

Losses in Canada

Rod Scarlett, Canadian Honey Council

Overwintering losses and Spring dwindle in Canada reached historic levels this year. While the final tabulations have not been officially released as of writing this, it appears that about 50% of the honey bees in Canada perished. To put that into context there were 810,000 colonies in Canada going into the Winter of 2021-22, so around 400,000 died. The implication on the pollination and honey production sectors are profound.

In Canada, beekeepers can bring in packaged bees from New Zealand, Australia and Chile to help replenish their stock and this Spring around 40,000 packages did arrive, which is about average in a normal year. However, this year it was only a drop in the bucket compared to the demand. Some commercial operators experienced 60-80% losses and there are very few opportunities to restock from either domestic or import supplies. Blueberry growers, particularly in Eastern Canada, were left scrambling to find enough bees to pollinate their fields which has led to lower than optimal colony numbers. In some circumstances, honey bees were replaced by bumble bees and leafcutter bees. The ramifications are yet to be determined.

We know that the blueberry industry is short of bees, an estimate ranges from 30-80,000 colonies, and this number is expected to grow as blueberry fields mature and new fields are put into production. Unfortunately, there is little or no capacity for maintaining that number of colonies in the regions where blueberries are grown, so operations are going to have to either be expanded or established in suitable areas in Quebec and Ontario.

Nearly two thirds of the bees in Canada are on the prairies, but distance and geography are factors that make pollinating on the east coast difficult for economic success. This is especially true given the very strong price of honey.

Agriculture and Agri-Food Canada formed a Working Group on Honey Bee Sustainability to help address the situation. The Canadian Association of Professional Apiculturalists formed a working group to look at the sustainability issue and the Canadian Honey Council focused on getting CFIA's scientific explanations on why certain issues in a risk assessment have been flagged. The solution to the stock shortage will be a mix of long term and short term options. Certainly, a number of beekeepers are pushing to have the U.S. border open for package exports. Increased access and production of packages from Australia, New Zealand and Chile can be easily achieved but transportation issues always present a concern. It appears that packaged bees from Italy and Ukraine could be available next Spring, and this would help. Increased domestic nuc and queen production should also be a focus and should be promoted going forward.

Needless to say, the industry is facing an uncertain future and there are many paths it could take going forward. No one path represents the perfect solution. And while we concentrate on stock issues, *varroa* control, viruses, pathogens and pesticides; climate change may ultimately prove to be the "real" issue.

Preliminary Report Losses in Canada (2022)

Prepared by **CAPA National Survey Committee and Provincial Apiarists**

Canadian Association of Professional Apiculturists

Preliminary report on Honey Bee Wintering Losses in Canada (2022)

This report presents the **preliminary data** collected by the provinces of Canada regarding honey bee losses for the Winter of 2021-2022. The final data will be published in the annual Statement on honey bee wintering losses in Canada. There may be discrepancies between results in the preliminary and final reports.

Methodology

Beekeepers that owned and operated a specified minimum number of colonies (Table 1) were included in the survey. The survey reported data from full-sized producing honey bee colonies that were wintered in Canada, but not nucleus (partial) colonies. Thus, the information gathered provides a valid assessment of honey bee losses and commercial management practices.

The common definitions of a honey bee colony and a commercially viable honey bee colony in Spring that were used in the survey were as the following:

- Honey Bee Colony: A full-sized honey bee colony either in a single or double brood chamber, not including nucleus colonies (splits).
- Viable Honey Bee Colony in Spring: A honey bee colony that survived winter, with a minimum of four frames with 75% of the comb area covered with bees on both sides on May 1st (British Columbia), May 15th (New Brunswick, Nova Scotia, Ontario, Prince-Edward-Island and Quebec) or May 21st (Alberta, Manitoba, Saskatchewan and Newfoundland and Labrador).

The questionnaire of colony loss and management was provided to producers using various methods of delivery including mail, email, an online survey and a telephone survey; the method of delivery varied by jurisdiction (Table 1). In each province, data were collected and analyzed by the Provincial Apiarist. All reported provincial results were then analyzed and summarized at the national level. The national percent Winter loss was calculated as follows:

Percentage Winter Loss

$$= \left(\frac{\text{Sum of the estimated total colony losses per province in spring 2022}}{\text{Sum of total colonies in operation in each province for 2021}} \right) \times 100$$

Preliminary results

The survey delivery methods, size of beekeeping operations and response rate of beekeepers for each province are presented in Table 1. It is important to note that the total number of colonies operated in a province reported by this survey may vary slightly from Statistics Canada official numbers. In some provinces, the data collection periods for the provincial database and the Statistics Canada report are done at different times of year. This can result in minor discrepancies between the official Statistics Canada total number of colonies and this survey's total reported colonies per province.

Table 1. Survey parameters and honey bee colony mortality (2021-2022) by province

Province	Total number of colonies operated in 2021	Estimated number of colonies lost based on the estimated provincial Winter loss	Type of data collection	Number of beekeepers targeted by survey	Number of respondents (% of participation)	Size of beekeeping operations targeted by survey (# colonies)	Number of respondents' colonies that were wintered in Fall 2021	Number of respondents' colonies that were alive and viable in Spring 2022	Percentage of surveyed colonies as a proportion of the total number of colonies in the province	Provincial Winter Loss including Non-viable Colonies
Newfoundland and Labrador	700	153	Email	12	11 (92%)	20	596	466	85%	21.8%
Prince Edward Island	6,800	3,527	Email	50	20 (40%)	1	5,294	2,548	78%	51.9%
Nova Scotia	27,115	4,130	Email	41	15 (37%)	50	17,613	14,930	65%	15.2%
New Brunswick	13,250	2,621	Email, mail, telephone	31	22 (71%)	50	10,408	8,349	79%	19.8%
Quebec	55,974	27,504	Online	130	79 (61%)	50	48,611	24,725	87%	49.1%
Ontario	102,328	48,374	Online, telephone	203	94 (46%)	50	32,240	16,999	32%	47.3%
Manitoba	114,837	65,687	Email, online	178	65 (37%)	50	71,492	30,614	62%	57.2%
Saskatchewan	115,000	39,724	Online	341	99 (29%)	50	45,833	30,001	40%	34.5%
Alberta	319,922	161,511	Online	182	83 (46%)	100	189,448	93,806	59%	50.5%
British Columbia	62,000	19,931	Online	262	106 (40%)	25	24,024	16,301	39%	32.1%
CANADA	817,926	373,163		1,430	594 (42%)		445,559	238,739	54%	45.6%

Only 5% of Beekeepers Belong to Associations

John Miller

I have previously written about why we attend bee meetings. I missed bee meetings.

Last week I attended the Minnesota Honey Producers Summer meeting in St. Cloud, MN.

The meeting has usually been well attended. This year, the crowd was lighter, and older.

The thought again occurred to me: meetings have changed; and meetings have not changed.

I always leave meetings with more questions than answers. This meeting was no different.

Here are my questions upon reflection.

How do we leverage the expanding body of work young researchers are discovering?

These researchers are tech savvy – and firmly connected with the bee environment.

North Dakota & Minnesota BIP Tech Team Leader Nelson Williams sees thousands of hives operated by many beekeepers in a single season. He sees what works – and does not work. Tech teams are valuable. I want to know more about what Nelson Williams sees, hears, smells, scans and samples in bee yards. We know COVID virus has multiple variants. Nelson knows about Deformed Wing Virus – A... and DWV – B. Is there a C variant? Probably.

I want to know what motivates young beekeepers to attend (or avoid) bee meetings.

Why do bee associations, especially now, represent only about 5% of beekeepers?

The 5% do the heavy lifting in these groups, populating the non-profit boards, writing the letters, donating the money. What about the beekeepers who do not associate with bee groups. The 95% represents a lot of talent. Are the clubs and associations offering enough value to attract some of the 95%? It's a big opportunity!

When will we see more of Johnathon Snow's Nosema Protease Inhibitor work? For those of us who spend the price of a very good truck on Nosema control – to attend an Inhibitor presentation is worth more than the price of a very good truck.

Why do flat-petal flowers harbor more diseases than (for example) clover shaped blossoms?

How do we best move towards State & Local Pollination Ambassadors to tell the very relevant story of Bees & Habitat & Forage & Carbon Capture & Wildlife & Soil Health & Erosion Control & Well Being?

Does Grace Kunkel's work on a bee repellent have enormous commercial potential to reduce pesticide bee kills?

Tree resins collected by bees becomes propolis. What is the anti-microbial shelf life of propolis? Does it last forever? Does it come in a pill? Should I be eating propolis?

What is ankle-biting bee behavior as a defense against *Varroa destructor*? Where can I get some of these ankle-biter bees?

Andy Card and Ryan/Mike Lamb are doing some remarkable Darwinian beekeeping.

Their work covers hundreds of hives, repeatedly testing the hive's performance, scientifically. Backyard/Hobbyist beekeepers are dis-served by trying treatment free beekeeping.

The sample(s) are too small, a single season too short, the queen lines too murky.

Where can I learn more about Andy Card & Ryan Lamb selection process & results?

Marla Spivak conducts some remarkable work with six different queen lines on a 7,500 acre tract of land in Minnesota. The Queen lines are POL; Saskatraz; Washington State University; Caucasian, Russian, Hilo. I want to know more about this important work.

Kim Flottum once famously called California almond pollination a 400 mile-long bee yard.

North Dakota is now a 350 mile-wide bee yard overrun by nearly 1,000,000 beehives. There are more beehives than grasshoppers in North Dakota. Many of these imported hives are dumped on resident ND beekeeper operations. ND beekeepers consider an anti-dumping measure.

How will that be agreed on? In a bee meeting. Probably in the halls. Beekeepers are clique-ish. We are territorial. As newcomers attend their first bee meeting – us old duffers should assign ourselves the job of welcoming first timers. We were once new-bees too, right?

Q3 & Q4 are the season for State Beekeeper Meetings. The programs for 2022 meetings are now pretty well locked up. Six months ago leadership was fretting over the Fall meetings. Competition for the best presentations, the best data, the tools to help our business thrive is back. Most state and club leaders seek the membership's program priorities. Will beekeepers in 2022, who haven't been to a meeting in two years, return to changed meetings & presentations? Will the food get worse? Can it?

Beekeeping is not what it was 10 years ago. 40% annual losses are in the past for many outfits. 40% losses are not acceptable if you're in this for real – and your kids – or the buyers of your life's work won't accept – or pay for – 40% annual losses. How do you get to 10% losses? Go to a few good meetings this Fall. It will become clear: Thriving outfits have *Varroa* numbers under control in August.

It's September. What are we doing this week to get ready for five months from now – because it's no longer six months from February 15, 2023. That's the date, in North America when the national bee supply bottoms out, annually. It is also the date when demand for bees in North America peaks, annually. It's been that way for decades. Can we do better? Hope to see you in a meeting *(like* Bee Culture's *own meeting this September / October: Beeing Diverse: Inspiring Leaders in Beekeeping. Find out more on page 14 of this issue or online at* **https://www.beeculture.com/beeing-diverse-inspiring-leaders-in-beekeeping/***).* Let's Connect.

JRM

Are Your Colonies Ready to Overwinter?

Successfully overwintering your colonies can be a complicated task. From large commercial operations to backyard hives, beekeepers need to prepare for wintering in the heat of the summer. Seasoned beekeeper, Tom Nolan shares his key steps to getting bees ready for winter—so you can be cracking into stronger, healthier colonies in the spring!

1. MONITOR MITE LEVELS

Determining your colonies' mite counts is critical to inform if you should treat before the winter brood is produced. Ideally, mite counts should be performed monthly. Use a simple alcohol wash, sampling from a frame with older larva (just before capping) to get the best example of a hive's mite count. The typical threshold to prompt treatment is 1-3% infestation—about 3 to 9 mites in a sample of 300 bees.

2. TREAT FOR VARROA MITES

Flexibility is key for fall treatment. *Mite Away Quick Strips™ (MAQS)* and *Formic Pro™* allow you to treat at the end of the honey flow (2-3 brood cycles before Queen goes off-lay), while the last super is still on. The ready-to-use strips make for easy application and quick treatment periods. *MAQS* and *Formic Pro* are all-natural products made with formic acid, killing Varroa mites in the dispersal phase (phoretic) that are found on adult bees and mites under the brood cap, where they reproduce.

3. ENSURE PROPER FEED

Providing your colonies with ample feed stores is essential to keep honey bees healthy over winter. You should commence feeding after your last honey pull, in late summer or early fall. There are a variety of feeders available, 2:1 liquid sucrose in a bucket top feeder is a tried-and-true method for overwintering. Remember: do not feed during *Formic Pro* or *MAQS* treatment period and ensure hives are well-fed before winter wrapping.

4. WRAP YOUR HIVES WELL

Bee Cozy™ Winter Hive Wraps prevent unnecessary heat loss, conserving feed stores over the winter and assisting your bees to brood up faster—so you can split earlier in the spring and be ready for the honey flow. Wrap once temperatures are consistently below cluster point (50°F/10°C), and remove when temperatures are consistently above cluster point and the possibility of snap freezes have passed.

Watch How-To Videos at youtube.com/NODApiaryProducts

Tom Nolan is the Founder and Past President of the *Urban Toronto Beekeepers Association* and lead Sales Representative for *NOD Apiary Products*. His personal mission: to ensure the sustainability of honey bee health. Tom shares his enthusiasm for honey bees by educating beekeepers on best management practices, Varroa control, swarm catching and by volunteering at an organic farm—all while running his successful beekeeping operation: *Hivetown Honey.*

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New(ish) Beekeeper Column

Off the Wahl Beekeeping

HARVESTING HONEY

Richard Wahl

The Fruits of Their Labors:

As the Summer months turn to Fall, it might be time to consider how much honey to take from our hives. This can be just as daunting a decision and challenging a job as deciding to manage bees in the first place. The common suggestion here in SE Michigan is to leave a range of 70 to 100 pounds of honey in the hive to get the bees through our very erratic Michigan Winters. The range will vary depending on a variety of factors. Will you use insulation under the outer cover and or an insulation blanket of some type around the hive? Will you be feeding dry sugar or using a candy board through the Winter? Is your hive site protected from the chilling north and west Winter winds? Each of these factors will determine whether your hives can remain on the lighter side or should fall to the heavier side of the amount of honey to be left for the bees.

A fully capped nine frame honey super with all frames ready for uncapping as are three more honey supers below sitting above a queen excluder and two deeps.

A first consideration is to have an idea as to approximately how much honey might be stored in the various sized supers. In each case that follows, I will be referring to ten frame Langstroth units. Obviously if you are working with eight frame units the weights will be lighter. This is not the honey weight itself as it includes the weight of the super box with all the frames and wax comb. A shallow ten frame super full of honey can weigh near 40 pounds if all the cells in the ten frames are filled and capped. This is especially true if the beekeeper is in a second season and is using nine drawn comb refilled frames. A medium ten frame super will weigh between 40 to 50 pounds while a deep super can weigh up to 90 pounds. It is common practice here in SE Michigan to use ten (or eight) new frames the first year. Once those frames have been neatly uncapped and extracted, the re-useable drawn comb frames can be reduced to nine in a honey super, equally spaced in the ten-frame unit, and the bees will draw them out a bit farther in their second and subsequent use. This makes uncapping a bit easier as the comb is slightly wider than the frame it sits in. It also results in a bit more honey that is stored in a nine frame super rather than a ten-frame due to the bees drawing out previously used frames a bit farther. Some beekeepers use eight frame supers that can also be reduced to seven frames in like manner, but I have only worked with nine or ten frame supers. Most bee equipment catalogues sell nine-unit frame spacers (orange) or seven unit (blue) plastic frame spacer tools to set previously drawn comb frames at equal spacing across the super. If a more refined weight measure is desired, the purchase of a suitcase scale is a convenient tool. Basic suitcase scales can be found on the internet from various sources often for under or around $10.00 in both digital and dial measurement readouts. A variety of creative ways can be found to connect the suitcase scale hook to the hive bottom. The suitcase scale hook can be attached to the super handle or to the bottom of the super and one side lifted to take a weight reading. With that weight recorded do the same on the opposite side and add the two readings together. Although not exact it will give a very close approximation of the weight of your hive or super. This is a good way to check how much honey is left in the supers for the bees food source over Winter. My normal practice is to use two deep supers and add medium honey supers above them as needed over the Summer. The honey supers are removed in late Summer to early Fall for honey extraction. Any Fall nectar flow is left for the bees to backfill the deeps for their Winter supply. Because of the added weight of ten frame deeps, some beekeepers use three medium supers for their bottom brood chambers instead of two deep supers with equal success. Also there are some who swear by the single deep overwintering method which may require more care with insulation and feeding considerations.

Queen Excluders, Yes or No:

It is up to the beekeeper as to whether or not to use queen excluders as there are pluses and minuses either way. For the first six or seven years of my beekeeping experience, I did not use queen excluders. On occasion the queen would move up into a honey super and start laying eggs which would eventually become brood and emerge. If this occurred later in the season extracting honey from frames with brood became problematic and those frames were better left with the hive. Once the queen was found in a lower deep a full honey super could be placed below the super that had some brood and as the brood emerged it was unlikely the queen would cross the full honey super and re-lay in

those upper honey super frames again. The bees would normally backfill empty honey super brood cells with honey which could then go through the normal extraction process. I do not use an excluder if the honey super frames are new with no drawn comb. I have found that the bees tend to fill the brood deeps with nectar/honey a bit sooner when a queen excluder is present. Previously used drawn comb frames above the excluder seem to draw the bees up into the honey super sooner than when undrawn comb frames are used above an excluder. During several Summers when I had only two or three hives, I could add as many as five honey supers above the two deeps and expect near all to be filled if I did not do any extracting until Fall. Since those Summers, I began using queen excluders and found that it seems to slow the movement to fill honey supers. Another reason may be that rather than maintaining two or three hives, I have gone to seven to nine hives each Summer. Since there are more bees competing for the pollen and nectar in the same area, I seldom find a need to add more than three honey supers above any hive's two deeps, although in this most recent Summer I already have two hives with three honey supers near fully capped and needing a fourth super among two of my eight hives. Any splits made from overwintered hives starting out as nucs or ten frame single deeps, before adding a second deep or the later added honey supers, will take longer for the bees to fill out.

Removing Bees and Honey Supers:

Once the frames in a honey super are over 85% filled with capped honey, the frames can be considered ready for extraction. If there are small, uncapped areas on some frames, a good shake of the frame can determine if the uncapped nectar is in near enough a honey state for extraction. If nectar drips out, it has not been cured to low enough water content and should be left for the bees. A small percentage of uncapped extracted honey when mixed with all the remaining extracted capped honey will not affect the desired 20% or below water content of the honey. Any water content too far above 18% could cause the extracted honey to ferment at a later time. If there is a concern about exact water content a refractometer found for sale in most bee catalogues can be purchased to measure the exact percent of water content. Once I find a honey super capped and ready for extraction, I like to employ a bee escape board for a day or two before removing the honey super. This requires an extra step in manipulating the honey supers, but I find it a good way to eliminate nearly all of the bees from the honey super. Although not efficient for the commercial beekeeper, it is quite amenable for the hobby beekeeper. Determine a day or two in advance of the extraction date which time the honey super(s) will be removed. Remove the inner cover and set it and the honey super aside for a moment. Place the bee escape board with the screened maze down on top of other hive honey supers or brood supers and below the honey super(s) to be extracted. I like to use a spacer below the bee escape board to provide room for the bees to exit below. This could simply be an empty frameless honey super if a shorter spacer is not available, as it will only remain on the hive for a day or two. Place the honey super(s) above the escape board. Just on top of the honey super to be extracted, I place a white paper towel over the frames with a nice sprinkling of almond extract. For some reason the bees do not like the aroma of standard baking almond extract and will exit the escape board more quickly when the almond extract is used. The paper towels do not need to be soaked; a nice sprinkling of the almond extract across most area of towel is sufficient. Of course, one could purchase the more expensive fume board and a liquid bee chaser sold in any of the beekeeping catalogues. Place the outer cover directly over the paper towel on the top honey super. Leave the inner cover off for the day or two while the escape board is on. There should be no top entrance for the bees to get back into the honey super once they exit through the escape board below. For a single honey super, most bees will have exited within a day. If set below two supers, it will take several days for most bees to exit the honey supers. I have not used an escape board below more than two honey supers at a time. If left below a single honey super for two days, I rarely find more than three or four bees remaining in the honey super come time for removal. If by chance there is any brood in the honey super, the bees will not leave the brood, regardless the liquid chaser used. When ready to remove the honey super, have two outer covers nearby. Quickly set the honey super into an upside down outer cover and place another outer cover over the honey super to keep other curious bees out of your near empty of bees honey super. With multiple escape boards, more honey supers from several hives can quickly be added to the stack, always covering the top one with the second inverted outer cover. I set the covers and honey supers on a two wheeled hand cart that can easily be moved to my extraction site. If one moves quickly, any remaining bees can be brushed off frames once supers are removed from the immediate hive area.

Bee escape board.

Slightly moistened paper towel with almond extract.

My extractor ready for use.

Honey Extraction:

I have a variable motorized extractor mounted on a 4 x 4 wooden pallet. The extractor can hold six medium frames or three deep frames. I normally move my extractor into a warm greenhouse which keeps the honey flow going even on cool Fall days. I have also extracted in my garage. In both cases, I throw a tarp over the extraction area floor to be able to catch any honey drips or overflows making after extraction cleanup easier. To help stabilize the extractor, I place two cement blocks for additional weight on the pallet. I have to admit that on occasion I have not tightly closed the extraction tray faucet or honey catching bucket faucet tightly, and have had leaks onto the tarp. There has also been an occasion where the screens sitting on the bucket became clogged with wax or the honey flow from the extractor was too fast and honey flowed over the screen lip edges when not watched carefully. I always have a second five-gallon bucket on hand as it is hard to judge just how much each honey super will produce. Once the honey has flowed out of the extractor, through the double screen and into the five gallon bucket, when nearly full, it goes to my kitchen counter for bottling. A multi drawer kitchen cabinet with the second drawer pulled out holds a cookie sheet that bottles can be set on at just the right height to be filled from the bucket. In addition to the bucket of honey, to collect even more, I line the inner tank of my uncapping tub with grade 60 cheesecloth. When left to sit in the closed covered uncapping tray overnight, additional honey drains through the cheesecloth and into the bottom of the uncapping tray. The double layer of grade 60 cheesecloth works just as well as the bucket screens. The additional honey in the extracting tub can be added to the five-gallon buckets for later bottling.

Extraction tub and inner tray lined with cheesecloth.

Bottling and Selling:

This is the fun part. Seeing dozens of pounds of honey sitting in containers on the kitchen counter, glimmering in the sun and ready to be labeled is an enjoyable sight. I can usually make a good estimate as to how much honey I will be able to bottle based on the number of hives I have and how strong they are in late Spring. Based on those estimates, I order containers as early in the season as possible since some companies will run out of bottling containers as the late Summer/ early Fall honey extraction process intensifies in our area. Any extra containers can always be used in the next season. I have designed my own color labels, which I print out on standard postal address label sheets, and then peel and attach to the various jars that I use. I have always included the Michigan Department of Agriculture label requirement which allows me to legally sell my honey in retail stores under their cottage industry rules. Check your own state or country department of agriculture cottage industry rules to meet retail labeling requirements in your jurisdiction area. I have only used the retail market once when COVID-19 shut all intra-personal activities down; no craft shows, church bazaars or farm markets where I could sell my honey. I adjust my price per pound annually based on the current market demand, send out a price flyer to regular customers and am usually sold out by our Thanksgiving or Christmas holidays simply by word of mouth endorsements. Overall, it has been a fun adventure. Your experience may vary based on your local market demand, environmental conditions, experience or state of your hives. Enjoy the adventure and you will find it does not take long to start covering the cost of your time, investment and equipment.

Bucket of honey which is being bottled for later sales.

Purdue University is excited to announce a new beekeeping curriculum for young people! Three manuals, along with a facilitator's guide, are available for youth interested in learning about honey bees and beekeeping.

The introductory guide, **Learning About Beekeeping,** is geared to elementary school students. It covers the basics of beekeeping: types of bees, the honey and wax they produce, plants that attract bees and beekeeping equipment. Youth are not required to have any bees but will prepare to set up and take care of their own hive. *Product code: 4-H-1057-W*

The second book, **Working with Honey Bees**, guides youth to acquire a colony of bees and learn how to care for their hive throughout the year. This manual includes basic beekeeping operations that result in the production of extracted, chunk or cut comb honey. *Product code 4-H-1058-W*

Advanced Beekeeping is for youth who have knowledge and experience in the basic care of a beehive. Topics focus on managing honey bee colonies, including increasing the number of colonies and splitting colonies, taking care of queens and requeening, seasonal management, troubleshooting the colony, using honey bees in pollination and keeping records. *Product code 4-H-1059-W*

The **4-H Beekeeping Curriculum Facilitator's Guide** complements the three youth manuals and provides guidance for the adult mentor helping a young person learn more about beekeeping through hands-on, educational experiences. It includes information on experiential learning, youth development and the Next Generation Science Standards, as well as answers to questions asked in the youth manuals. *Product code 4-H-1060-W*

PDFs of all four manuals may be downloaded for free from The Education Store, Purdue University, **https://mdc.itap.purdue.edu/**. Enter a product code or "beekeeping" in the Search box.

Our new beekeeping manuals are now online:
https://mdc.itap.purdue.edu/item.asp?Item_Number=4-H-1057-W
https://mdc.itap.purdue.edu/item.asp?Item_Number=4-H-1058-W
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Indiana 4-H Beekeeping Curriculum

Beekeeping with Youth

BIP Bits:

Honey Bee Hygienic Behavior(s) and Testing

Anne Marie Fauvel & Robert Snyder, Bee Informed Partnership

Who doesn't like a feel-good story? Good news is often scarce these days, so at Bee Informed Partnership (BIP), we thought it would be a good time to highlight some of the more uplifting trends in our work with the beekeeping industry. The results from working with queen breeders and our decade of data on honey bee hygienic behavior is good news.

The Hygienic Testing – Freeze Kill Brood (FKB) process: choose a frame of brood (left) of the right age i.e. the purple eye stage (center), gently twist in the PVC pipe and seal (right). Photo credit: Bee Informed Partnership

Social Immunity

Social immunity, the collective effort to defend against invading pathogens for the benefit of the community/society, commonly occurs in most social insects, such as ants, termites, and of course, honey bees. Honey bees exhibit several behaviors used to maintain and protect the health of the entire colony.

Success Strategies

To be successful, a pathogen needs to 1) move in, 2) become established 3) multiply and spread throughout a colony. Therefore, a successful social immunity needs to 1) avoid, 2) reduce and 3) eliminate the pathogen to keep the community healthy.

Honey bees have a fascinating and complex social health care system which works both to prevent (avoid and reduce) diseases and infections before they establish in the nest and also to kill or sacrifice their own to eliminate the pathogens from the nest.

An ounce of prevention is worth a pound of cure

Honey bees have a number of behavioral and chemical tools in their toolkits to prevent pest and pathogen invasion. These include grooming one another to clean their bodies, injecting venom into their enemies to paralyze them, and producing antimicrobial secretions to keep unwanted microbes at bay. Honey bees also maintain beneficial microbial communities in their guts and in the colony's bee bread stores to maintain healthy digestion. Honey bees also collect propolis, sticky plant resins possessing antimicrobial properties. By coating the colony's interior with propolis it forms a protective envelope that discourages unwanted microbial growth.

When all else fails – Hygienic Behavior

Inevitably, pathogens will manage to evade the preventative measures used by some honey bee colonies. They become established and begin to spread. Once the pathogen takes over the nest, honey bees engage in a series of behaviors, collectively referred to as "hygienic behavior," aimed at sacrificing their own in an attempt to eliminate the pathogen load. Hygienic behavior includes 1) the ability to detect a pathogen in the nest, 2) uncapping the developing pupae and 3) removing the affected individual to eliminate the invader.

All honey bees perform hygienic duties, but those that do so in early infestation stages are better at fighting diseases overall. In other words, bees that detect an invader when fewer individuals are infected will have less work to do to remove and succeed against the intruder than those who detect it later.

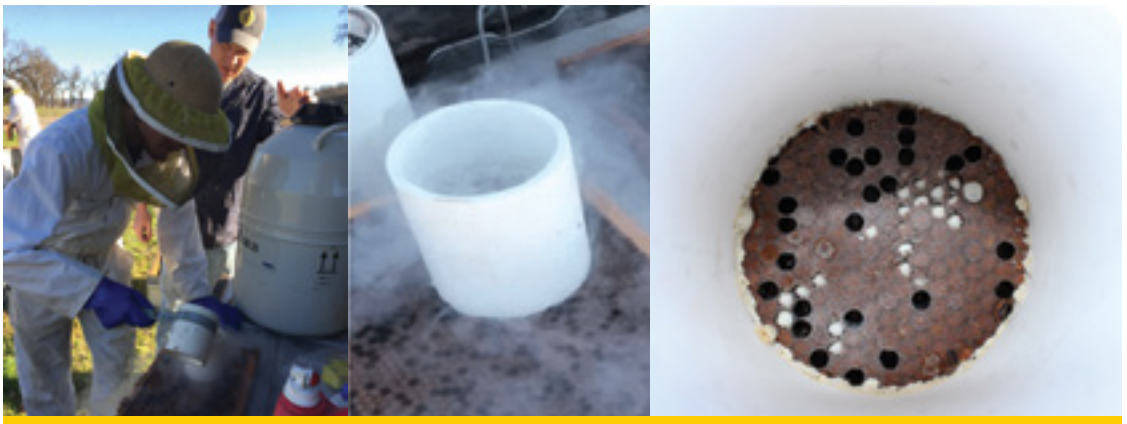
Honey Bees guard the entrance of the colony (left) and use propolis (right) to prevent diseases and pathogens from entering and establishing in their nest. Photo credit: Bee Informed Partnership

Testing & Scoring Honey Bees' Hygienic Behavior

We use the freeze kill brood assay (FKB) to test and score bees' hygienic behavior. To perform the FKB assay, we gently press a section of three inch diameter PVC pipe into a solid patch of capped brood of the

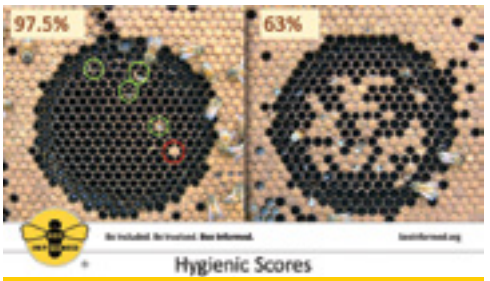
purple eye stage (approximately 160 cells of 17-19 day old brood). Once the PVC pipe is sealed in place, we pour 10oz of liquid nitrogen into it effectively freeze killing the section of brood inside the pipe. After the liquid nitrogen has evaporated, we count the number of empty cells (#empties at 0hr) and let the brood section thaw enough to gently remove the tube, and return the frame to the colony for 24 hours. It is during this time that the worker bees, in theory, should detect the dead brood under the capping and start cleaning it out. This is the behavior the test attempts to quantify. After 24 hours, we pull the test frame back out and count the number of uncapped cells and partially removed brood (#partials at 24hrs) and the number of completely empty cells (#empties at 24hrs). With a bit of simple math, we generate two types of scores, a strict percentage score of the cells completely removed only and a more generous percentage score of cells uncapped, partially and completely removed.

It is reasonable to think that colonies that consistently remove 95% or more of the freeze-killed brood in 24 hours are also more likely to remove diseases and mite infested brood cell early and quickly. In fact, Spivak et Reuter (2001) identified a decreased incidence of pathogens, especially to American Foulbrood and Chalkbrood diseases when honey bee colonies scored 95% or better on the FKB assay.



The Hygienic Testing – Freeze Kill Brood (FKB) process continued: pour the liquid nitrogen into the sealed PVC pipe portion (left), let the liquid nitrogen evaporate and freeze the brood section (center), count the empty and partially uncapped cells post liquid nitrogen pour (right). Photo credit: Bee Informed Partnership

The Hygienic Testing – Freeze Kill Brood (FKB) process continued: let the frame thaw out to remove the PVC pipe without damage and replace the labeled frame into the original colony for 24 hours. Photo Credit: Rob Snyder, Bee Informed Partnership



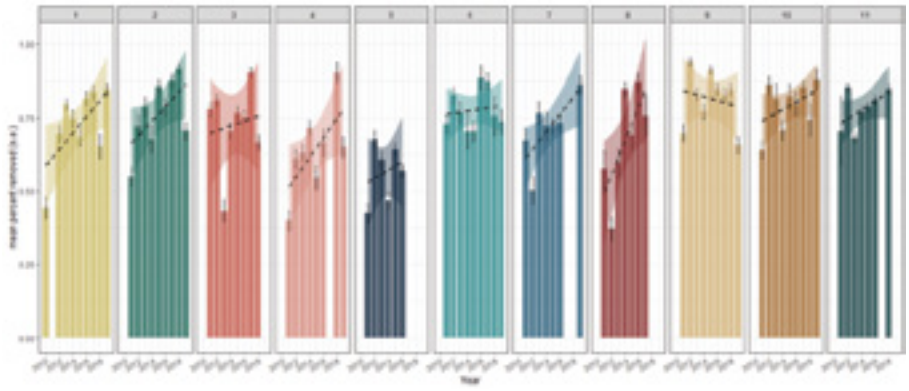
The Hygienic Testing – Freeze Kill Brood (FKB) process continued: return after 24 hours to count the empty and partially empty cells to calculate hygienic scores. Photo Credit: Bee Informed Partnership

A Decade of Hygienic Behavior Testing Data

BIP's Tech Transfer Team was established in Northern California in 2010, in response to Queen Breeders requesting assistance in testing for hygienic behavior in their honey bee stock to improve their queen breeding stock selection. BIP has been performing hygienic behavior testing with some of the most important queen producers in the U.S. for the past decade. In Figure 1, you can see the hygienic score trends for 11 queen producers who participated in the BIP hygienic testing program for at least five years.

Some efforts in the beekeeping industry seem to make a difference. The Northern California queen breeders using hygienic testing for only a few years, have effectively selected and bred more hygienic stock to distribute to the rest of the country, helping to fend off some of the seemingly endless threats to honey bee colonies. Sometimes, there really is good news.

Figure 1. Mean Hygienic Scores for each year (2010-2020) represented in each bar for 11 queen breeding operations (each color is a different operation). Notice the increased mean for 10 out of 11 operations – number of colonies tested > 4000



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To Insulate or Not To Insulate

How important is hive insulation really?

This is the time of year when beekeepers throughout North America start preparing their colonies for Winter. Many beekeepers believe that bee hives should be insulated during Winter. The thinking is that the bees need help retaining heat inside the hive in order to survive the cold since wild bees that survive harsh Winters are often found in hollow trees with thick walls that provide more insulation than our typically thin-walled bee hives. This all sounds reasonable as long as you don't consider the issue too closely. First, let's take a look at how the bees prepare for Winter.

Unlike solitary native bees that hibernate, the Western or European honey bee (*Apis mellifera*) has evolved to be able to thermoregulate the hive interior in order to survive extreme cold weather. Research has demonstrated that a honey bee cluster must maintain a temperature within a range of about 90°F-97°F (32°C-36°C) to ensure brood survival (Heinrich 1981). Just like humans, during extreme cold temperatures honey bees rely on several heating strategies to thermoregulate their dwellings at the optimum temperature.

Efficiency first

Our heating bills can be greatly reduced with the well-placed application of caulk or weather stripping around windows, doors, plumbing pipes and other cracks in a building's envelope where air leaks through. For larger gaps we often use spray foam insulation. Weatherizing a home for optimum efficiency provides the biggest bang for the buck when it comes to cold weather comfort. In a similar manner, bees will gather the resins from deciduous trees (e.g. cottonwood, poplar, birch and beech) and form it into propolis. The propolis is used it to plug up cracks and holes where air and light passes into and out of the nest cavity. This often includes adding propolis around the entrance to reduce the size of the opening to cut down on drafts and make it easier to defend.

Insulation on-demand

To most effectively conserve heat and maintain the brood nest temperature, bees will start to cluster around the brood area when the ambient temperature drops down to around 57°F (14°C). They position themselves in layers with the outside layer of bees oriented inward toward the middle of the cluster. This outer layer of bees will clump together tightly locking their legs forming a mantle-like shell surrounding the queen and the rest of the bees that are located in the interior of the cluster. Acting like the insulation layer of a building envelope, the mantle of bees retains the heat produced by the heater bees. In addition, the body hairs of the mantle bees interlock with their neighbors helping to trap the heat produced within the cluster enhancing the efficiency of the insulating effect.

Fueling heat generation

The center of the cluster is the warmest and safest area where the queen lays eggs and maintains the brood nest. Within and around the brood nest are heater bees. Just as we stack up our cordwood or have our fuel tank filled during the warm season so we can burn the fuel and produce heat in Winter, bees gather nectar during the Summer, store it as honey and burn these carbohydrate calories during Winter to help fuel heat generation. Heater bees generate body heat by flexing their thoracic flight muscles (endothermic heating) much like the human body will create heat by shivering. Along with heater bees there may be fanning bees that help to move the warm air around depending on the temperature and how tight the cluster is.

Ventilation and temperature control

The bees maintain porous air channels to help regulate the warmth, humidity and CO2 levels within the cluster. When temperatures drop further, the cluster will contract, becoming tighter and more compact. This action will close up unneeded porous ventilation channels.

A healthy colony that stays dry and has access to plenty of honey does not need a well insulated hive in order to thrive. Bees have been insulating their Winter cluster long before beekeepers came along.

Thus, the honey bee provides an excellent example of what we all should do during Winter, get together with those closest to us and snuggle. They also are smart about how they heat their home by focusing the energy demands of heating only in the area they are occupying rather than trying and keep the entire interior of their hive cavity warm. This mimics how one might maintain comfortable temperatures in a home with a heating ventilation and air conditioning (HVAC) system designed with zones that minimize heat in areas such as utility rooms and other places that have lower temperature requirements than the rest of the building.

The center of the Winter cluster serves as the central heating system for the colony. Worker bees take turns performing endothermic heating, fanning and serving as mantle bees rotating in and out of the various roles. Human beings utilize a centralized control system such as a thermostat that monitors the room temperature and turns on the heat

when the temperature drops below a certain level. Unlike us humans that tend to rely on a centralized control-system, the bees employ a decentralized control system. This decentralized system relies on each honey bee's individual assessment of what is needed (heating, fanning, shielding) based on the immediate local temperature and humidity. Unlike humans, bees do not rely on a single temperature point to respond, but utilize the experience of multiple and redundant individual bee's which allows for rapid resolution of any disturbance or change to in-hive environmental conditions. This means that increased genetic diversity in a queen's offspring through high levels of multiple mating creates more stable brood nest temperatures. Diverse colonies sired by numerous males increases the genetically determined diversity in worker bee's temperature response thresholds. This modulates the hive-ventilating behavior of individual workers, helping to prevent extreme colony-level responses to temperature swings (Jones et. al. 2004).

Hive insulation

Now let's get back to the question of how important beekeeper applied hive insulation really is.

While not easy to pin down precisely, it appears that softwoods such as pine have an insulation value of R-1.00 to 1.25 per inch (USDA 2007). While some equipment manufacturers make a big deal out of the extra insulating value of the thicker lumber they use to make their hive bodies, the thermal difference between a ¾-inch thick board used to manufacture most modern hives and thicker lumber is so minimal that insulation claims are more marketing hype than potential benefit to the bees. Other equipment manufacturers and suppliers provide equipment made from Styrofoam, or offer insulating blankets for wrapping hives in Winter. These products provide significant extra insulating value and can have a noticeable impact on the temperature of the hive's interior. I won't deny that under some unique circumstances such increased hive insulation may be beneficial, but the reality is that it is much more likely that beekeeper efforts to super insulate hives are more harmful than helpful.

Since there is always an entrance opening that allows cold air to enter the hive, the interior of a hive surrounding the cluster will eventually grow cold during long stretches of low temperature weather. However, as long as a colony is healthy with a large population of bees, stays dry and has access to fuel (honey), the bees are able to compensate for the cold by thermoregulating the interior of the cluster as described above. Hive insulation only acts to slow down how quickly the ambient interior temperature around the cluster of the hive will cool down.

Unfortunately this also works in reverse. When there is a Winter thaw and temperatures increase during the day, the temperature modulating effect of hive insulation slows down the speed with which the interior warms up allowing the bees to break their cluster and go on important cleansing flights. Unlike the decentralized insulation created by the mantle bees in the cluster, beekeeper applied insulation does not respond to rapid and dramatic temperature shifts and can be detrimental for overwintering bees. Heavily insulated hives can also delay a colonies population growth in Spring.

In warm climates where Winter temperatures are not so extreme and ambient temperatures surrounding the cluster inside the hive do not get excessively low, hive insulation may not create much of a problem, but then the insulation is also not really needed. Unfortunately, in northern climates where one would assume that increased hive insulation would be most beneficial and temperature extremes swing widely and sometimes rapidly, the delay in hive warming during a Winter thaw can prove devastating to a colony.

So is insulation a necessary hive component for Winter? I would argue that except perhaps in some unique circumstances, the answer most of the time is no. Just make sure the three primary factors are met. 1) The bees are healthy with a large population. This means that mites are under control and disease issues are not a factor. 2) Colonies should be heavy with plenty of honey. There should not be a lot of unused empty space, undrawn foundation or empty combs in the hive and the honey stores should be concentrated primarily in an area of the hive that the bees will be able to access easily. 3) The bees are able to stay dry. Not only does this mean that the hive covers are secured so they will not accidentally come off, but condensation that naturally builds up in the hive will not freeze above the cluster only to drip down on the bees during a thaw. As I have outlined in the book *Natural Beekeeping,* pay attention to these three factors and the bees will be able to keep themselves warm and comfortable all Winter. After seeing thousands of colonies housed in standard Langstroth hives with no extra hive insulation successfully over-winter in Vermont, despite temperatures that can get down to 15°F to 20°F below zero (-26°C to -29°C) during Winter, it has convinced me that the effort spent super insulating hives is probably a waste of time, money and resources.

Ross Conrad is the author of *Natural Beekeeping: Revised and Expanded 2nd Edition*, and *The Land of Milk and Honey: A history of beekeeping in Vermont.*

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Hive insulation above the inner cover can help keep a colony from getting wet during a Winter thaw. Materials such as straw and burlap will absorb some of the moisture above the cluster, while rigid foam insulation simply prevents the water from freezing, allowing the moisture to be vented from the hive, provided there is adequate air flow.

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Impact of UV-Induced Blue Fluorescence Entrances

Introduction

Swarm traps (bait hives) are a simple tool used to capture honey bee swarms. Swarming is a natural process that occurs when a colony of bees splits its population and leaves the colony in search of a new home. Swarm traps are useful for both recapturing swarms from the beekeeper's apiary or collecting feral (wild) bees. Swarms typically occur from successfully overwintered colonies and are therefore desirable for beekeepers to collect. Traps are typically baited with a solution to mimic the Nasonov pheromone, or other scents to help attract scout bees [2]. In this study, I examine if color can also be an important attractant for swarm traps. Studies [3-8] have shown that honey bees show a strong attraction to ultraviolet blue. Honey bees have trichromatic vision with ultraviolet, blue, and green photoreceptors in their compound eyes. Here I examine the effectiveness of using swarm traps with UV-induced blue fluorescence entrances. To do this, I collected comparative data on both the number of bees visiting/scouting the swarm trap, and the success rates on capturing swarms for the test (UV-blue) and control (white) entrances.

	Scout Bee Activity Logged	Swarm Captures Logged
Year 1 - 2020		
Location 1	X	X
Location 2		X
Location 3		X
Year 2 - 2021 (traps swapped)		
Location 1	X	X
Location 2		X
Location 3		X

Table 1. Types of data logged at each location over the two-year period.

Figure 1. A swarm trap with UV-reactive blue entrance used in the study.

Methods and Materials

The study was conducted from May-August in 2020 and 2021 during typical swarming season in Western New York. The swarm traps were designed using data from research done by Tom Seeley [1]. Swarm traps measured 17" tall, 8.5" wide and 19" deep to give a cavity volume of 1.59 cubic ft.

The entrance hole was 1.25" (3.2 cm). The traps contained five plastic frames: four undrawn, and one partially drawn with comb. The traps were painted brown to mimic tree bark color. Traps were baited weekly with a commercial swarm lure attractant spray. The trap entrances were 3D printed in a UV-reactive blue (test) filament, and a standard (non-UV) white filament (control). The UV-reactive blue filament glows bright blue under UV-light. Swarm traps were hung eight to 10 feet high in a tree bordering a honey bee forage location such as an open field.

In year one (Table 1), three geographically distant locations were chosen for data collection. All locations were setup with two traps, one test and one control, approximately 200 feet apart. At location one, scout bee interest at each trap was logged by counting the number of bees active around the trap for a duration of one minute. This count was done almost daily, or as weather permitted. Time of recording was between 11:30am-4:00pm. Traps were also monitored for successful swarm capture. Locations two and three were only monitored weekly for swarm capture success.

In year two (Table 1), the same three locations were chosen for data collection. Locations were in an identical setup to year one; however, swarm trap entrances were swapped from their year one tree location. Traps were swapped in order to determine if tree location preference could be a determining factor in swarm interest/trap selection. Location one scout bee interest was again logged

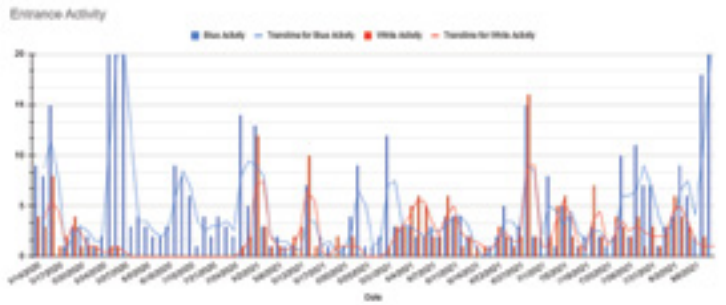

Figure 2. Number of bees counted scouting around the trap in a one-minute interval for both entrance types over the two-year study period. Blue entrance swarm captures (2) can be observed when entrance activity data peaks at/over 20 bees.

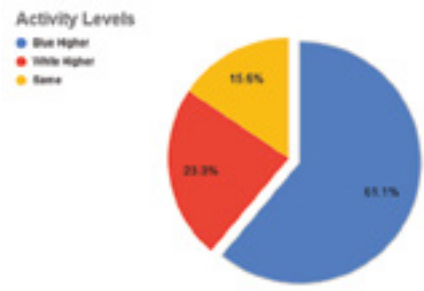

Figure 3. Comparison of activity levels at the blue and white entrances. This chart shows how often the entrances had the same or a higher number of scout bee interest for each day of recorded data.

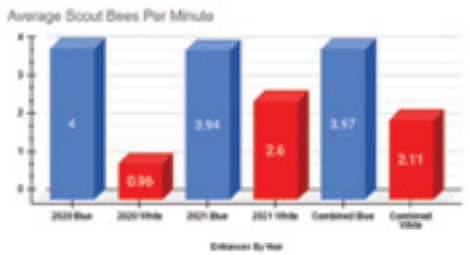

Figure 4. Average number of bees per minute over all data logged for 2020, 2021 and both years combined.

	Swarm Captured	Trap Selected
Year 1 - 2020		
Location 1	Yes	Blue
Location 2	Yes	Blue
Location 3	Yes	Blue
Year 2 - 2021 (traps swapped)		
Location 1	Yes	Blue
Location 2	No	-
Location 3	Yes	Blue

Table 2. Swarm activity at each location and swarm trap selected.

by counting the number of bees active around the traps for a one-minute duration and monitored for swarm capture success. Locations two and three were only monitored weekly for swarm capture success.

Results

Over the course of the study, a total of 90 days of scout bee activity data were logged (Figure 2). In the event that a swarm was confirmed as captured, scout activity data was logged but not included in the calculation of the average number of scout bee activity, as activity was monitored at over 20 bees per minute. Out of the 90 days of logged activity, the blue entrance had more scout bees 55 times, or 61.1% (Figure 3). The white entrance had a higher number of bees 21 times, or 23.3% (Figure 3). In total, blue had the same or a higher number of scout bees 76.67% of the time data was logged (Figure 3). In year one the blue entrance averaged four scout bees per minute, while white averaged 0.96 bees (Figure 4). In year two the blue entrance averaged 3.94 bees per minute, while white averaged 2.6 (Figure 4). The two-year combined average was 3.97 bees for blue, and 2.11 for white (Figure 4). The blue entrance showed an 88.2% increase in overall average scout bee activity over the white control entrance.

Over the two-year period of the study, a total of five swarms were captured (Table 2). In year one, each of the three locations had a successful swarm capture (Table 2). Each of the three swarms were captured in the blue entrance, for a 100% blue success rate (Table 2). In year two, two of the three locations were successful in capturing swarms (Table 2). Each of the two swarms were also captured in the blue entrance, for a 100% blue success rate (Table 2). Overall, blue was the selected swarm trap five out of five (100%) times.

Discussion

Results from this study suggest that honey bees show an increased attraction to the UV-reactive blue entrance. This increased attraction was most predominately shown in the increased average number of bees observed, as well as the frequency in which more bees were observed at the blue entrance comparatively to the white control entrance. This reaction was not entirely surprising due to previous research showing honey bees preference for UV-blue color [3-8]. It is also interesting that this preference was learned to be innate, and not learned from any previous foraging experience [8]. This color preference was found to be true even when bees were taught to expect a low reward as compared to other colors with a high reward [8]. It is hypothesized that this color preference is somehow encoded into the brain of the honey bee [8]. This study suggests that this color preference is evident even in scouting behavior, when no immediate rewards are expected. As most research regarding honey bee's preference for UV-blue is found in foraging selection, this preference for swarm scout bees is somewhat of a revelation.

Finally, it remains to be asked how this color preference results in increased swarm capture success. This study revealed that when swarms were captured, they chose the blue entrance 100% of the time. This preference persisted even in year two when blue and white swarm traps were swapped to determine potential location bias. Once the swarm trap was discovered by a scout bee, it is possible that the location was able to be more easily discovered by additional scout bees due to the fluorescent nature of the entrance. Given that both the blue (test) and control (white) traps were identical in all other features, this seems to be the best explanation for the increase in scout activity and swarm selection rate. Swarm decision-making is known to be a democratic process [9], so the increased number of scout bees able to quickly find and relay the message to the swarm about the potential site should increase the odds of the swarm selecting that site.

Brian Fleischmann

on Honey Bee Swarm Traps

Conclusion

This study revealed that UV-reactive blue swarm trap entrances nearly doubled the number of scout bees observed over the control. In addition, swarms chose the UV-blue entrance traps over the control white trap 100% of the time. This study demonstrates that visual stimuli are an important consideration in swarm trap attraction and selection.

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At the **Regeneron International Science and Engineering Fair** *(ISEF), the world's largest science competition for pre-collegiate students, Iowa native* ***Amara Orth*** *won a $1,000 award in the Animal Sciences category as well as a $1,500 First Award from the Acoustical Society of America. The purpose of the Acoustical Society of America (ASA) is to generate, disseminate and promote the knowledge and practical applications of acoustics. In addition, Amara's school will be awarded $200, and her mentor will be awarded $500. Amara was also a finalist in the* **2022 Regeneron Science Talent Search**, *the nation's oldest and most prestigious competition for high school seniors. You can see her project booth at the Regeneron International Science and Engineering Fair here:* **https://projectboard.world/isef/finalist-booth/amara-orth---council-bluffs-ia**. *Amara's mother, Carol Fassbinder-Orth, an alum of the Science Talent Search, inspired Amara to enter the competition. With husband Brian Orth, Carol runs Bountiful Blossoms Bee Company – selling artisan honey and beeswax products, as well as cut and dry flowers grown sustainably on their 23-acre family farm.*

Beekeeping runs in my family. My grandparents, uncles and cousins own about 3,000 colonies of bees, and I live on a honey bee farm in Glenwood, Iowa. Since a very young age, I have been concerned with honey bee health and that has led me to try to find ways to predict colony loss before it happens. I have taken this family endeavor as an opportunity to engage in meaningful environmental research, as global ecosystem health is important to me. I independently do science fair research projects on my family's honey bees as a way to address environmental problems. My projects have focused on the effects of land use on bee health and bee health monitoring.

From 2018-2020, I researched the impacts of land use on an antimicrobial substance in bees called propolis. I found that a high density of cropland results in lower quality propolis in the hive, as evidenced by lower antimicrobial effects and lower chemical diversity. This work was recently published in the journal *Insects* (**Orth et al., 2022**). In 2019, I studied pollen composition in store brand honey and honey from beekeepers from over 30 counties in

Regeneron International Science and Engineering Fair

Aparna Paul,
Society for Science &
Amara Orth

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Iowa. This project helped participating beekeepers understand how agricultural crops impact floral sources of honey. It also inspired me to start a nonprofit organization called *Bee Analyzed*, where beekeepers send me honey samples for pollen analysis.

My most recent project focuses on predicting colony health using a machine learning computer model called Hidden Markov Models. I trained this model to be able to recognize differences between the vibroacoustics (sounds and vibrations) of different honey bee hives. The model uses these differences to be able to predict the hive's health state with 92% accuracy. My project would allow beekeepers to accurately predict the health of their hives and intervene sooner to hopefully prevent colony decline.

Because of COVID-19, I had to come up with a project that would allow me to complete my work at home and wouldn't take very many materials. Almost two years ago, I worked on a vibroacoustics project where I recorded the bee noises using a shotgun microphone. However, I was only able to compare the spectrograms (a depiction of sound frequencies as they vary with time) and didn't understand or know how to interpret the data and the shotgun microphone picked up too much background noise, no matter what I tried to devise to minimize noise. I had read about people using machine learning to interpret whale and submarine sounds, but I hadn't considered it before because I hadn't had much coding experience. After doing a lot of research and learning different coding languages (Python, C, MATLAB), I found that the Hidden Markov Models (HMMs) used within Matlab would be the best fit for me because it allows you to train the model using very specific audio examples. HMMs were developed over 30 years ago for human language processing and have been used for different types of animal sound quantification since then.

I hope to publish this work so beekeepers around the world can use simple tools to monitor their colonies' health. Through my experiences with my family's colonies, the potential impact of better health detection systems is great. In recent years, it has become common for us to lose about half of our collective colonies. I have seen that one week you may visit your colonies and check on them and notice that the colony sounds a little different or seems a bit off, but nothing measurable appears wrong. The next week, the colony is dead, and its honey is being robbed by nearby hives; the process of collapse happens that fast! My model detects problems before the colony is dead and being robbed of its stores. This early warning system may allow a beekeeper to re-queen a hive, give it an antibiotic, a miticide or a feed supplement to prevent collapse. This system has the potential to mitigate colony decline on a global scale. The ideal next step would be to house the computing software on a publicly accessible platform that would reduce the computing knowledge barriers and allow for easier usage for the general public.

This past March, I got the opportunity to compete in the Regeneron Science Talent Search in Washington, D.C. to present my research and compete for the top prize of $250,000. The Regeneron Science Talent Search, a program of Society for Science since 1942, is the nation's oldest and most prestigious science and math competition for high school seniors. Each year, nearly 2,000 student entrants submit original research in critically important scientific fields of study and are judged by leading experts in their fields. Unique among high school competitions in the U.S. and around the world, the Regeneron Science Talent Search focuses on identifying, inspiring and engaging the nation's most promising young scientists who are creating the ideas that could solve society's most urgent challenges. I placed 9th and won a $50,000 award. I was excited to represent my state, family and beekeepers in this competition!

Outside of beekeeping and science fairs, I play defense on the varsity soccer team at my high school, and I like hiking and cooking. This Fall, I am majoring in Earth Systems at Stanford University. In the future, I would like to do ecosystem research.

To Beekeep or Not to Beekeep?

Stephen Bishop

I suspect you normally don't read *Bee Culture* for existential ponderings, but before you skip over this article for more practical beekeeping advice, I want you to think, right now, what you would do if you just found eleven colonies dead in your beeyard? I can tell you what I would do: I would shake out the bee corpses, stack up the dead hives on the back of my truck, de-glove in the cab and then stiff arm the steering wheel, causing the horn to emit a long existential honk. Maybe you would act more gracefully and skip the horn honking, but I bet you would still find that existential question creeping into your head—what is all this beekeeping stuff for? It's a question I've asked myself many times over the years.

Beekeeping is not for the faint of heart—or faint of mind either. A beekeeper who is "keeping bees to help save the bees" is a beekeeper who has yet to wrestle with the harsh reality that most beginning beekeepers will kill more bees than they will ever help save. The beekeepers who reload and return to the beeyard, despite the despair of dead outs, may eventually tilt their cosmic scales back toward bee savior, but, on average, I wonder how many hives die before a beginning beekeeper actually becomes proficient enough to save bees—that is to keep bees from drowning under the virus load of *varroa*. It probably took me thirty dead outs over five years before something finally clicked and I started overwintering hives successfully and my hive numbers started multiplying.

Now, I'm in my tenth year of beekeeping, at least if you count the first five years which were mostly me killing bees. Sure, I could say it was *varroa* that killed them or pesticides or small hive beetles or poor nutrition or extraterrestrial bee snatchers or whatever the excuse de vogue at the time was (at the time, I think I just lumped all these excuses into a singular catch-all excuse called Colony Collapse Disorder). But the truth is my hives died because, first and foremost, I didn't listen. I didn't listen to the advice of seasoned beekeepers because I thought I knew more than they did. I didn't listen until, finally, enough cognitive dissonance erupted between my bee savior desire and my bee killer despair that I finally asked the great existential beekeeping question—"To beekeep, or not to beekeep?"

I chose to beekeep and not beekill—that is, to get serious about beekeeping, which is really the only way to keep bees now.

In fact, to be honest, I think the term *hobby beekeeping* is an oxymoron. Think about it this way: suppose you took up some other hobby for pleasure and relaxation. Let's say fishing. You could just dig a few worms, buy a cheap Zebco and basic tackle, and then go catch bream or sunfish to your heart's delight. And if by chance you didn't catch any, well, a bad day's fishing is still better than a good day's work.

To fish, you don't have to buy high-priced fishing gear, subscribe to *Field and Stream*, and join BassResource, the most popular bass fishing forum on the web. Of course, you could and many fishermen do. But even if you did—and this is the point—you still wouldn't have to build your own farm pond and become an expert in farm pond management and ichthyological parasites to keep your bass from going belly up every Winter.

I say that in jest, but I would now like to say something serious to any aspiring hobby beekeepers who may be reading this. What follows is basically all the beekeeping wisdom I've learned in ten years distilled in one paragraph. It's what I wished I would have listened to ten years ago when I first started. So, drum roll please, here goes my attempt to write something serious for once:

If you're seriously trying to beekeep, the next three months are incredibly important. Usually beekeepers (myself included) get really excited about bees in the Spring. As Spring progresses toward Summer, some of that excitement fades because, let's face it, working hives is hard work. Harvesting honey during the dog days of Summer is even harder work. Once your honey is in jars or buckets or barrels, you feel like you've accomplished your goal and take a well-deserved rest. Wrong. At least here in NC, mid- to late Summer is the most crucial time in beekeeping. Often there is a severe Summer dearth of nectar and pollen. Couple this with exploding *varroa* levels, and you've got a recipe for a dwindling hive. So, by the time October rolls around, you may only have a few frames of sickly bees, which is not what you want going into Winter. Though that hive will likely die during a February arctic freeze, it was really lost in those late Summer months.

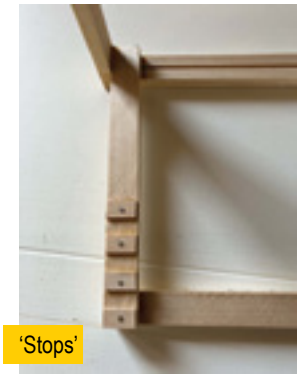
So my advice is this: steel yourself for the upcoming dog days of Summer and invest in a bee jacket with good wicking technology. If needed, treat for mites and feed your bees. Taking good care of your bees is a lot cheaper than buying new bees each year—or talking to a psychologist because of existential beekeeping despair.

Stephen Bishop writes humor and keeps bees in Shelby, NC. You can follow his blog at ***misfitfarmer.com*** *or follow him on Twitter @themisfitfarmer*

MAKE A FRAME HOLDER

Felix Puccio

Material and finished frame holder



'Stops'

(1) strap cut in half

(1) support cut in half

⅜" removed

Steel hanger

I recently was asked by my mentor to send photos of my failing bee hive to help her diagnosis its progress. Since I found it most challenging to photograph the frames while working alone, I decided to construct a **Frame Holder** utilizing wood from two deep frames,10 x ¾ inch #16 gauge steel strap, (4) #4 ¾ inch wood screws, (20) brads and glue. The project took one hour to construct and proved to be most valuable in photographing the frames of my hive as shown in the hive photo. Note that four stops, see photo, are provided so the bee frame can be positioned at the desired angle.

Materials

1. (2) wood deep frames
2. 10" x ¾" #16 gauge steel strap
3. (20) ¾" brads
4. (4) #4 ¾" wood screws
5. wood glue

Instructions

Construct one frame completely. Remove ⅜ inch from frame supports & cut one support in half. The steel strap is sawed in half and each half is hook bent into a hanger, see photo, utilizing a bench vise. Two supporting holes are drilled in each hanger (see photos). Glue and brad as shown in 'finished frame holder'.

Beekeeping Critical Thoughts – Bee Hive Comb

Earl Hoffman

- Please let me share some critical thoughts on supers, hive frames and comb
- As I shared before, there are windows of opportunity to achieve desired results
- Let me suggest some ideas to consider during your next comb encounter
- Drawn comb is your golden treasure, that allows the beekeeper to manage the hives
- Without drawn comb, you have nothing, nowhere to store nectar, pollen or lay eggs
- A plastic or wood frame and a foundation material is worthless to the honey bees
- Please let me discuss some ideas on bait comb, comb creation and types of foundation
- If you place an empty super with new frames on top of a healthy hive, it will not draw comb
- The wax workers can be active because of a honey flow or heavy sugar feeding
- If the temperature is too cold, no new wax. If the temperature is too hot, no new wax
- If you give bees new wax foundation during a dearth, they remove the wax many times
- Using a Spring swarm can be an easy way to get foundation drawn into fresh comb frames
- Bees move wax as they see fit, why create more when they can just move it?
- Many supers hold either 10 or eight frames; always start with a full super of frames
- You can remove one of the frames later once it is drawn, to help hive inspections
- Running nine frames in a 10-frame box or seven frames in an eight-frame box reduces queen damage
- I suggest placing drawn comb in the middle of the foundation frames to bait the bees
- One or two frames of older drawn comb will encourage the bees to work up into the super
- Consider swapping new foundation down and older drawn comb up, a few frames at a time
- Yes, I know that the bees sometimes create ladder comb between the frames, but that's OK.
- Wax foundation with wire supports, is challenging and time consuming to install
- Plastic frame foundation comes in lots of colors and sizes: some good, some not so good
- Plastic comes in black, white, yellow, green and other colors.
- Black color makes looking at eggs and larva easier, yellow helps with honey grading
- Green color is used on frames that are drone cell size; they are either deep or medium
- Over the years, I have had some plastic foundation that the bees refuse to work.
- No matter how much fresh, pure bees wax I placed on the plastic foundation, it was a no go
- I also have white plastic frames that the bees go to like a magnet; the cells are perfect
- The only real solution to working with plastic foundation, is coat it with lots of beeswax
- The issue with full plastic frames is the ears break and some frames do not fit extractors
- The other thought I suggest is combs need to be rotated out of the hive every two to four years
- Old combs are a reservoir of chemicals because chemicals are attracted to lipids (fatty acids)
- I suggest that a cadence be created so that some new comb creation happens every year
- Also, the other thought that you may have already had, is to mark the year on the top bar
- In summary, I repeat, timing is everything in beekeeping; too late and it's not happening
- I suggest that each Spring, during hive management, you consider creating new drawn comb
- Either feed, feed, feed sugar water or time your new wax creation during a nectar flow
- Brood comb frames need to be created, not just the honey combs
- Weak hives will not draw comb, best to give the foundation to a super strong hive
- Look for the spots of white new wax on the top bars during a nectar flow; that is your signal
- During your bee journey, please consider making new honey bee comb your next priority!

Bees and Women

Nina Bagley

Elizabeth Eliza Douglas

Elizabeth "Lizzie" Eliza Douglas was born in Gorham Cumberland, Maine, in September 1844. Lizzie's father, Freedom Douglas, and mother, Elizabeth Ann Knight Douglas, had nine children. Records show that Douglas's relatives arrived in Gorham Cumberland, Maine sometime around 1790. Gorham Cumberland village during the 1800s consisted of several inns, blacksmiths, tanneries and shops. The local school was a one-room brick schoolhouse. The first train depot was built in 1850, connecting the rest of New England. I'm not sure how Lizzie met her husband Charles B. Cotton. They were married in 1862 in Portland, Maine. She was seventeen. Mr. Cotton was twenty-five years old. The 1800s census shows Charles B. Cotton's occupations as a teacher, agriculture and farmer; he could read and write. Charles's grandfather was the first tanner in Gorham. Records also showed his uncle John Cotton was accused of being insane because of his peculiar religious outbreaks during church services calling the pastor a liar.

Lizzie Cotton had eight children from 1863 to 1881. My curiosity about Lizzie started when I found her online book, *The Controllable Bee Hive*, in the University of Maine's Library. (*The Controllable Bee Hive and New System of Bee Management,* 1887, Annual Circular, Lizzie E. Cotton. **https://digitalcommons.library.umaine.edu**) As I was reading the book, which was a quick read, the information was interesting.

Chapters include: Swarming Controlled, Bees Wintered Safely, No Loss From The Bee Moth, Honey in Glass Boxes, Movable Comb Frames and No Stings. She was assertive and adamant about using her bee plan. She came across as very confident! She advertised her book and a controllable bee hive in the bee journals. Lizzie would make the sale but not ship the goods. Worst of all, the bee folk hardly received a refund! The swindled bee folk had no problem writing to *Gleanings in Bee Culture*, *American Bee Journal* and *Prairie Farmer* that Lizzie Cotton was a fraud! She was accused of honey adulteration, being a swindler and a fraud of the male gender. ("Naughty Lizzie Cotton.")

My question was how could a homemaker have the time to write two books and swindle bee folk? Wives in the 1800's typically gave birth about every other year from marriage until their childbearing ability ended. I wonder if it was her husband's idea to write *Controllable Bee Hive* and use his wife to sell the book? Perhaps Charles B. Cotton inherited the sickness his uncle John Cotton had? I know he married Lizzie in 1862, so he was home and not fighting in the Civil War.

I couldn't find any records of Charles serving in the Civil War. I'm speculating that some health issue might have prevented him from serving. I'm giving Lizzie Cotton the benefit of the doubt that she obeyed her husband and didn't question him about business. I'm unsure what Lizzie's education was; I couldn't find much. I did find in the 1870s census she's listed as a housewife and can read and write. I can only collect facts and go with my feelings and research in telling Lizzie Cottons' story.

Lizzie wrote two books: in 1880, *Beekeeping for Profit*, and in 1883 *The Controllable Bee Hive*.

A. I. Root, *Gleanings* 1881: "The Controllable bee hive book was well done. The only fault was that the book cost a dollar and was only 128 pages and thin, whereas you could get other books with more pages for 50 cents. I know that not everybody agrees with me in pricing books according to size, but for Mrs. Cottons' good and the book's sales may increase. I would suggest that it be sold cheaper or added more to it.

People are in the habit of getting a pretty good-sized book for a dollar, and I feel they will be disappointed, I believe: Mrs. Cotton is an earnest, hard-working woman, and I wish to see her succeed. I'm willing to sell her book if she permits me. I'm satisfied that she has seen her mistakes and is ready to correct them."

Lizzie Cotton's recipe for Feed: according to A. I. Root, feeding the bees using her recipe, she claimed she got 350 pounds of honey from one bee hive, which she sold for 35 cents a pound using her so-called controllable hive, which A. I. Root said was similar to Jasper Hazen and Mr. Quinby's controllable hives. Lizzie Cotton was being accused of honey adulteration, because she fed her bees sugar water.

Lizzie Cottons' recipe that she sold for $10.00: "Two, eight pounds of coffee, crushed sugar, add two quarts of soft water, and whites of two eggs: bring to the boiling point over a stove fire, being very careful not to burn it. Skim off carefully all scum or sediment that rises so that the feed, when cool, will be clear, about the consistency of the new honey."

Mr. A. I. Root: "I confess it is a little hard to see how one is trying to do right should charge $10.00 for such a recipe but at the same time, I do not know, but it is the best recipe I have ever found. You know how I have talked about selling recipes in these years past. Although this is an excellent bee-feed, whether you use the eggs to clarify it or not, I should hardly like to endorse the following, which we find in Mrs. C's book."

Lizzie Cotton was the most scorned woman beekeeper during the 1800s. It's not sure how long she kept bees. In her book, she claims thirty years. Or was it Mr. Cotton who kept the bees and wrote the book? That would make more sense to me. After all, he was a teacher at one time.

American Bee Journal 1882: "Lizzie E. Cotton! Ah, Lizzie! You cruel siren that wishes to advertise her remarkable "New System" of Bee-

keeping in the Farmer. Well, Lizzie, you can't do it. The bee folks say you are a fraud. Lizzie, they go so far as to say you are a confident man. She advertises a hive that is useless crap. When sent money, she usually sends nothing in return. Her "book" only exists in advertisement or imagination. Mr. A. I. Root sent her a dollar for the same book years ago and has her letter of acknowledgment, and a later one promising the book as soon as published, yet the book fails to appear."

American Bee Journal 1882: "A beekeeper in this neighborhood called on the lady soon after her purchase. She ascertained that the queen was worthless and advised her to send immediately for another queen, which Mrs. Cotton promised should be shipped about the 25th of July, but it has not made its appearance. Now that the bees have died, the poor woman has nothing left for her $23.52 but one "controllable beehive" and Mrs. C's famous book on bee culture, with her photograph on the first flyleaf. What a boon!" (The lady referred to is Miss Lovina Ewing, West Berkshire, VT.)

The Western Rural says: "Lizzie Cotton is advertising his bee knowledge in some agricultural papers. Lizzie is a fraud of the male gender and newspaper office that does not know it holds a great deal of stupidity."

An advertisement about practical beekeeping by Lizzie Cotton appeared in *Farm and Fireside* Springfield, Ohio, 1879. Mr. A. I. Root read it. He contacted the newspaper, stating, "Mrs. Cotton has the disagreeable habit of making no return for money sent her, though she often makes fair promises."

Mr. A. I. Root advised the newspaper "that Lizzie Cotton had a habit of not paying her bills, and the newspapers should shun her." Mr. A. I. Root trusted Mrs. Cotton because she was a woman. After all, she represented herself as a woman and would write so handsomely and feminine when sending her advertisements to the newspapers: but her handwriting looked masculine when it came time to pay the bills." It gets conflicting to me! Did Mr. Cotton persuade her to write to the newspapers? We need to remember women had no rights during the 1800s. They were considered helpmates, so perhaps she kept silent because the repercussions could be worse for her and the children. The temperance movement was going on in the 1800s. Maybe Charles Cotton drank; who knows. It appears from A. I. Root's accounts the masculine handwriting probably was Mr. Cotton.

February *Gleanings* 1881, A. I. Root: "An excellent picture of Mrs. Cotton given as the frontispiece of the book; and if one takes a good look at the face of the author (which by the way is by no means an unprepossessing one), it is with a feeling of sadness that the bee folk spent so much energy at least in part, in a mistaken direction."

The bee folk were very harsh and judgmental towards Lizzie Cotton. A few of Mrs. Cottons' friends came to her defense, but that doesn't mean they weren't aware of what was happening. Mrs. Cotton had me perplexed and convinced that Mr. Cotton might be behind the swindling. I put myself in her shoes. It wasn't uncommon for women to marry men they weren't in love with, and arranged marriages were ordinary. Women were to take care of the home, cook, clean, have children and obey their husbands. In 1886, Mrs. Cotton's daughter Carrie died from a tumor, and her parents died the same year. The heartbreak and grief she must have felt. How could one focus on the business of bees?

Thinking I finished Lizzie Cotton's story, I came across this article for the *American Bee Journal*: Mrs. Cotton's Transactions by A. P Fletcher.

Mr. Fletcher wrote an article in the *American Bee Journal* on Lizzie Cotton's frauds. He remained in the northern part of the state for the Winter and did not have the *American Bee Journal* so he couldn't read the responses to his article on Lizzie Cotton's actions until he returned home. "Regarding Mr. R. E. Holmes offer to pay $5 to you or anyone who will furnish proof of Mrs. Cotton's swindling, I would like to know what he means. Have not you, and has he not ample evidence from many sources, that she practices swindling right along?" He continues to say his friend sent for the "so-called sample controllable hive. It was a roughly made basswood thing only six inches deep and six by 10 inches inside. What is this but fraud? I can cite several." He says that A. I. Root can furnish ample proof, and the lady in Berkshire received returns for her $20 refund in the sum of a hive and handful of bees on five frames. "Mr. Holmes needs to take my word for it. Hundreds of others have received the same doubt. I think Mr. Holmes ought not to uphold Mrs. Cotton's fraudulent transactions in the eyes of so many of her defrauded customers all over the land." So it looks like A. P. Fletcher was calling Mr. Holmes out. "For conscience's sake, how many more instances does he ask you to prove before he is ready to come down with his $5?" Now Mr. Holmes pretended to know all about Mrs. Cotton. When asked about her, Mr. Fletcher found that Mr. Holmes had never seen her or even been at her place.

"Mr. Holmes said she did not send me that little beehive to swindle me, but she did it because she did not know any better; that she was as ignorant as a "horse-block" and that the "old man" had been through bankruptcy and didn't amount to anything."

After reading the article Mr. Fletcher wrote, I felt he answered some of the questions I had about Mrs. Cotton. Maybe she was as dumb as horse block, and perhaps she wasn't. Maybe Mr. Fletcher was right; Lizzie Cotton swindled right along. I would hate to think that's the case.

Lizzie Cotton in 1910, at age 64, was living in West Brook City Ward 1, 4, 5, Cumberland, Maine. She ran a boarding house for the last twenty years of her life in Westbrook while her husband lived at the family farm in Gorham; it appears they were separated. Lizzie Cotton had eight boarders, including her three sons. Charles Cotton died in an asylum in Portland, Maine in 1915 from senility.

I'm going with my intuition on this; after all, Mrs. Cotton did say her husband didn't amount to much, so maybe the right hand didn't know what the left hand was doing, or perhaps it did! Mrs. Cotton died in 1917 from kidney complications. I'm guessing she had Bright's disease, which could be why her eyes looked dark and sunken. I'm going to say when she said she was ignorant as a horse block, it's because she married Charles B. Cotton.

Nina M. Bagley
Columbus, Ohio

IS IT GETTING HARDER TO FIND EGGS? THIS CLEAR VEIL MAY HELP

Frank Linton

My eyesight is not what it used to be. How about yours?

These days, it is easier for me to see my veil than to see through it. Yuck!

When I'm inspecting a colony I want to see eggs, larvae, bees and whatever else might be there. I do not want to see that black mesh.

Fortunately I have found a fairly simple solution; I replaced the mesh in my veil with a flexible, clear plastic panel. See figures 1 – 3.

Actually, I didn't do it myself. My partner, using a seam ripper, carefully removed the front panel of the veil (the largest panel), taking care not to tear the fabric. Then, with the front panel as a guide, she cut a piece of plastic the same size. Finally, using her sturdy machine, she sewed the plastic panel into the veil. She said it required only basic sewing skills.

Want to buy one ready-made? Sorry, you are out of luck. The material cost is low, under $25, but someone will have to do the sewing. I was able to find only one alternative version online, here: **https://backyardhive.com**; it is significantly more expensive.

This modified veil can be combined with a magnifying headset, such as those sold for queen grafting, to improve one's vision even more.

There is, too, another alternative: taking on a helper with twice your eyesight, half your age, and none of your experience. The solitary (and elderly) beekeeper may be a cliché, but beekeeping is much more enjoyable with a companion.

Frank Linton, an EAS-certified Master Beekeeper, runs the website **https://BeekeepingWithDisabilities.com**. He can be reached at **fnlinton@gmail.com**

Figure 1. Folding square bee veil.

Figure 2. Flexible heavy plastic tablecloth material.

Figure 3. Modified veil: Clear plastic replaces the front mesh panel.

VITELLOGENIN

Ed Erwin

The Miracle Molecule

Credit for this article goes primarily to Randy Oliver and his non-profit organization **Scientific-Beekeeping.com**. Randy started beekeeping as a hobby around 1966, and then went on to get university degrees in biology sciences, specializing in entomology. I highly recommend using Randy's website as a resource, and while you're there, contribute to his organization.

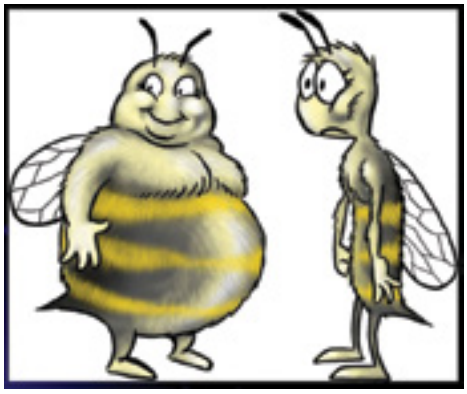
Randy wrote two articles in 2007 about vitellogenin which prompted me to try to understand and summarize the benefits of vitellogenin in honey bees.

If you're like me, you've probably never heard of vitellogenin and its benefits, but it is critical to the survival of honey bees. You will soon learn the benefits. Vitellogenin molecules are deposited in fat bodies in the head and abdomen of the bees and act as a lipoprotein storage reservoir. This primarily occurs in the form of the compound called "vitellogenin." Its main component is protein (91%) with a bit of sugar (glycol, 2%) and fat (lipo, 7%). As we know, pollen is a valuable resource of protein for honey bees and research has shown that bees are genetically biased to collect pollen containing high levels of vitellogenin. Bees also collect pollen from a variety of plants. The selection and variety of pollen gathered is vital because the pollen varies in its composition of amino acids, which are the building blocks for protein. When pollen is unavailable, or the availability is low, the nurse bees in the bee colony have use of a reserve of vitellogenin to sustain the young and secrete brood food. Foragers are only fed enough protein to keep them working to collect nectar and pollen. Vitellogenin also enhances the immune system and increases the lifespan – particularly in the queen and Winter fat bees.

We've all heard of Winter bees, royal jelly and the length of time a queen can live. It is the molecule vitellogenin that makes this phenomenon possible. This stored up protein reserve also allow the nurse bees to secrete brood food in the spring – even in the absence of new pollen.

During the first three days of both the queen and worker bee's life ,they are fed royal jelly. The worker larvae are subsequently fed a mixture of royal jelly, pollen and honey. Royal jelly is a lipid-rich mixture obtained from pollen, produced in the mandibular glands, and a clear, protein-rich secretion from the hypopharyngeal glands. Both glands are located in the head of the nurse bees. Thereafter, the worker larvae receive a mixture of nectar from the honey sac (or honey stomach) and a jelly protein from the hypopharyngeal gland – known as "bee milk." This glandular – secreted milk is the perfect food for young bees.

In order to produce a queen bee, the larva is continuously fed a secreted jelly substance from both the mandibular and hypopharyngeal glands of the worker bee. This secretion has a higher sugar content and vitamins that are different from the worker food – and is known as royal jelly. When the larva is in the cell and continuously fed substantial amounts of royal jelly, it triggers the development of queen anatomy. When the queen emerges, she will have fully developed ovaries needed to lay eggs as well as a developed spermatheca *(undeveloped in worker bees)* needed to fertilize eggs. During the queen's entire life, she is fed large quantities of royal jelly by the nurse bees. This nutritional substance is necessary since the mated queen is laying nearly her body weight in eggs every day during peak colony buildup.



Every beekeeper should understand that the main nutrition of the colony comes from pollen collected from various plant sources by the foraging bees. Pollen provides the necessary nutrients bees need for growth and health such as protein, lipids (fats), minerals, sterols and vitamins. Foraging bees gather between 30 to 100 pounds of pollen each year.

Pollen dearth

Pollen collection by foraging bees is triggered by released brood pheromones and the amount of pollen stored in the hive and the jelly fed to the foragers by nurse bees. Interestingly, brood pheromones are released by the brood and allow the brood to regulate and control the actions of the nurse bees. Sounds backwards, but it's true: the brood controls the workers. As experienced this Spring, the rain washed away much of the pollen in the plants and the nurse bees were forced to use the vitellogenin stores. Studies have shown that when the protein levels drop, the nurse bees will give preference to feeding the older larvae close to being capped. If the protein levels drop lower, eggs and middle-aged larvae will be cannibalized. The cannibalized brood will be converted into protein.

Fat Bees/Winter Bees

Research has theorized that the Fat Bees or Winter bees evolved as the European honey bees moved into climates of colder weather. It's the buildup of vitellogenin protein energy reserves that allows the European honey bees to live through the Winter months, or even longer with no pollen resources. The European honey bee has also evolved to store honey which is their carbohydrate energy source. Conversely, the African honey bee, or Africanized honey bees as it's known

in the Americas, strategically search for new food resources rather than storing honey. This lack of storage hinders their progress northward to colder climates.

Because the queen fertilizes eggs to become fat bees and they survive scarce resources, fat bees have been considered a separate caste. The general view of the caste system is a "physically distinct individual or group of individuals specialized to perform certain functions in the colony." Due to their physical difference with their fat bodies, and because they perform specific functions in the colony during the Winter, they can be considered a separate caste.

Varroa Destructor

For decades, we have believed that the parasitic mite *Varroa Destructor* consumed the bees hemolymph like a tick consumes blood. Research led by Dr. Samuel Ramsey, Department of Entomology, University of Maryland, determined that *varroa* actually feed on the vitellogenin in bees' fat bodies and is their primary source of sustenance, not on the hemolymph. As previously mentioned, vitellogenin molecules are deposited in fat bodies in the head and abdomen of the bees and act as a protein storage reservoir. The *varroa* will attach itself to the bee in a location to gain the best access to the tissue with the vitellogenin – usually the membrane between segments of the metasoma. To support the idea of *varroa* accessing the fat bodies is the research that *varroa* possess attributes associated with feeding on semisolid tissue; they lack essential adaptations associated with hemolymph feeding.

In summary, this magical molecule allows house bees to retain protein in their bodies in the form of vitellogenin. Vitellogenin gives an extra resource to nurse bees and queens allowing them to live longer and make it through periods of limited pollen availability – what specialization!

Poor Boy's Honey Extractor

Leonard Riepenhoff

Full frame solar ovens can extract six to eight pounds of honey (two medium frames full of capped honey) or several frames partially full of capped honey, and you can **bottle the honey in the same day** when the temperature is 80 degrees or warmer and the sun is shining on the solar oven. A reflector will be helpful on cooler days. A piece of shiny aluminum foil, a mirror or shiny piece of metal reflecting behind the oven will work (see photo). I suggest, in order to avoid spillage, the honey container below is larger than necessary to hold the honey and wax.

Solar ovens eliminate the use of any mechanical or electric devices. Uncapping is not necessary. The frames with capped honey are placed in a super and then set on top of the solar oven, after removing the top lens from the solar oven, and repositioning it on top of the super with the frames with capped honey. As the honey warms it liquefies and drips down into the container below where it cools. When the temperature in the oven gets warmer, the wax melts and it runs down into the same container with the honey and floats on top and solidifies when it cools. Then the wax is easily removed for other projects such as making candles etc. The honey can then be poured into containers. **The frames may then be replaced in a honey super without any further care**. Caution, on a hot day the plastic foundation frames should be removed soon after they are empty. Leaving them in too long may warp the plastic foundations.

I use a foundationless frame by altering the top bar of a **wedge top bar** frame, see photo of different ways to alter the top bar that work. I rub the bottom of the protruding bar with bee's wax prior to installing the frame in a honey super. Installing foundationless frames between frames with a plastic foundation or between drawn frames in a honey super every other frame has worked well for me. I use wax foundations in my brooder supers, not in my honey supers. True this isn't the most efficient way to get maximum honey, as the bees consume about six to eight pounds of honey for each pound of wax built, however there is less than a pound of wax in 10 medium frames.

True, the bees must then rebuild the wax combs; however young bees about eight to 14 days old produce wax whether they want to or not and look for a useful place to use it. Finding a place helps prevent swarming and avoids wax deposits where unneeded. To see more pictures, visit "CraigsList"/ honey extractors.

Using a full frame solar oven avoids using a hand crank or electric honey extractor and reduces the cleanup time dramatically. The average colony produces about 30 pounds of honey annually, more than enough for most needs.

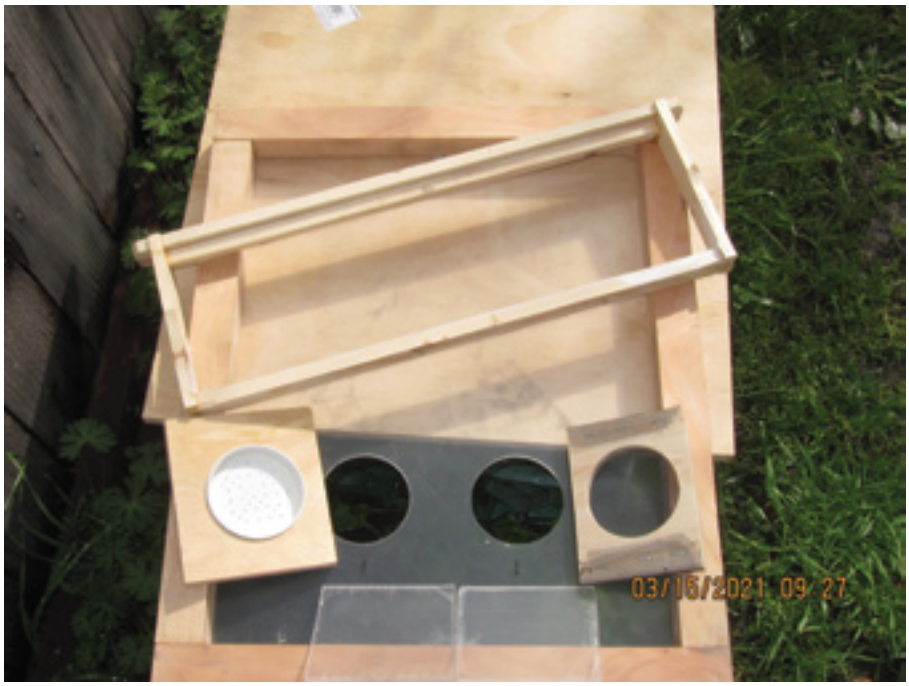
Using foundationless frames also provides you with an easy way to package comb honey. I purchase small plastic containers from the Dollar store, they come with lids and have 10 in a package, just a nice size to sell or give to friends.

If you built the dual pane inner cover shown in the November 2021 *Bee Culture* issue on page 80, some of those parts can be used with your solar oven.

This is a hobby beekeepers dream come true.

Leonard Riepenhoff

In the apiary division at the **Sonoma County Harvest Fair in** Santa Rosa, Ca., Leonard's honey won the "**best of show"** trophy three years in a row.



Varietal

"Too many beekeepers fail to realize that the selling of a crop is fully as important as its production. The business part of beekeeping has been sadly neglected. No set rule can be given as to how a man shall dispose of his crop, but it does seem like very poor business management to send away a crop of honey to some commission merchant, and then sit around all Winter, when good wages might be made selling honey direct to consumers, or to retail dealers."

W.Z. Hutchinson
Advanced Bee Culture (1905)

One of the more fruitful approaches that we have taken with our honey production is offering varietals. Since our farm employs only myself and my wife Ella, we must obtain the highest return on investment (ROI) possible to compensate for the long, hot days spent in the outyards in addition to the toll that all of the heavy lifting takes on our backs. Many of you are likely in a similar situation, launching your beekeeping enterprise while still working an off-farm job, and paying for your startup with revenue generated from the latter. Since the first several years of any agricultural enterprise typically operates in the red, as you scrape together the funds to purchase equipment and supplies, you are likely not in a position to take on a crew of workers. Although it is more labor intensive, the demand for varietal honey is most certainly there and commands a premium price. Saaaawwweeeeett, right?

Varietal is a term that is typically found within the wine trade and refers to a wine comprised of a single, known grape variety. As it pertains to honey production, varietal can refer to the specific location where the honey was harvested from, or if harvested from a predominantly seeded agricultural area where the producer is certain of the crop being grown, can refer to the plant nectar that the honey is comprised of. To complicate that matter further, the same plant nectars can differ annually by region depending upon the areas' temperatures and rainfall amount.

For us, varietal pertains to our apiary locations and the seasons in which it is harvested. Since each location is in a different region with their own variety of "wild" plants growing seasonally, we cannot decisively identify all of the floral sources that our bees visit and hoard within their hives. This variety of plant nectars result in a subtle nuance of colors and unique flavors in the honeys that we harvest from our different beeyards. The additional effort that is needed to offer varietal honey doesn't just stop with the seasonal collection of supers from multiple apiaries, but also extends throughout the process of extraction and jarring. The harvested supers are stored, extracted

the Spice of Hive

Jeff Kennedy

and jarred separately by location and season. Over the years, we have come to expect certain types of honey from certain apiaries and our customers will often request specific varietals based upon the season and apiary location.

The Proof is in the Honey

Some of you might have lost interest as soon as I mentioned performing multiple harvests per season, but it is quite rewarding when you do a side-by-side comparison and tasting of the finished product. Additionally, you get to revel in all of the positive feedback that your customers voluntarily shower you with. Growing up in a household that never purchased honey, I was surprised by the volume of positive feedback that we received immediately after we began offering our honey for sale. When lifelong connoisseurs of the sweet nectar started weighing in, stating things like "your honey is pure ambrosia," it was clear that we must be doing something right, as the majority of all the other commercially available honey is highly adulterated, consisting of non-descript colors and flavors that consumers have grown accustomed to. When you offer a genuine, raw and minimally processed product, folks take notice to its quality and are obliged to shell out more for your craft.

The distinct colors, viscosity, flavors and aromas of varietal honeys all come down to where our bees forage. In the United States, there are over three hundred different types of honey that originate from different floral sources. Some varietals even smell of the floral source to which they derived from. Their color spectrums can range from nearly clear to a dark brown, and flavors can vary from delectably mild to distinctively bold. As a general rule, the lighter-colored a honey is, the milder in flavor it will be. As you approach the darker-colored varietals, you will start to notice a more robust zest on the tongue.

Honey is commercially produced in every state, with certain types of honey deriving from specific floral sources that only grow in certain regions. Clover honey, the most widely harvested varietal in the U.S., has a pleasing, mild taste and varies in color from nearly clear to amber depending upon the source of clover. Wildflower honey, another common varietal, is a broad term describing honey from miscellaneous and undefined floral sources. Some of the other widespread floral sources that comprise the bulk of the honey crop harvested during the Spring and Summer months are hard maples, numerous fruit trees and shrubs, dandelions, basswood, buckwheat, and alfalfa. Fall flows are not guar-

anteed but when they do occur, are highly prized by the beekeeper as they help to lessen the burden of Fall feeding. During bumper years, however, the industrious beekeeper can reap one last harvest of their crop which results in a distinct honey deriving from our native aster and goldenrod families of flowers.

Another varietal that has received a lot of buzz in recent years, although not in the typical sense that honey is used, is Manuka honey harvested in New Zealand. This particular honey's antibacterial properties are potent enough for it to be considered as an effective wound dressing. To pick at the scab a little further, there are a number of acids that are present within honey such as formic, citric and gluconic. Gluconic is the dominant acid, and is produced by the action of bee enzymes on some of the glucose molecules within the honey. The acidity boosts the antibacterial properties of honey, as most bacteria thrive in neutral conditions. Hydrogen peroxide is also produced by the production of gluconic acid, further inhibiting the growth of bacteria.

Honey Prices & Consumption on the Rise

In recent months, reports of honey shortages worldwide in conjunction with the ongoing efforts of the American Honey Producers Association (AHPA), have resulted in a gradual rise in domestic honey prices. Thanks to the AHPA, the testing of imported honey is now mandated and has directly impacted the volume of questionable "honey" that is now being imported into the U.S. Less honey means higher price yields for reputable honey producers here in the states whom no longer need to compete with so much of the illegal dumping of questionable honey from Argentina, Brazil, India and Vietnam.

In early 2020, the price paid to U.S. honey producers ranged from $1.50 – $1.80 per pound, but over the last several months has risen to the $2.30 – $2.50 mark on average. These prices are representative of wholesale, bulk or barrel prices which doesn't incur the additional expense of individual jars, labels and marketing to retail outlets. Our current wholesale pricing for a one pound (16 oz.), shelf ready jar of varietal honey is $12. The shops that we supply retail our honey for $18 – $20 a jar and their customers anxiously await its return each season. Despite increasing our production incrementally each season, we can never produce enough honey to meet the customer demand.

If that weren't good enough news, the National Honey Board Consumer Attitudes & Usage Study for 2021 reported significant upticks in honey usage over the past year. Data from the study cited multiple reasons as to why consumers selected honey as their most preferred sweetener. Some of the participant's reasons for consuming honey included that it was 'natural,' 'good for the environment,' 'organic,' 'a source of antioxidants' and 'flavorful.' This growing demand for honey in the United States was further confirmed by data taken from the USDA Sugar and Sweeteners Outlook which reported that 571 million pounds of honey was consumed in 2020, a rise of about eight percent from the previous year.

It is important for beekeepers to know what a gold mine of resources we have in our hives, provided by our amazing honey bees. If we know the value of the six resources in the bee hive and communicate this to the public, we can create markets for other hive resources, beyond just honey, plus elevate the status and importance of the honey bee to mankind.

So, Just What is Propolis?

Propolis is that substance we beekeepers love to hate. It makes our hive inspections more difficult and it coats our hive tools, gloves and suits. Typically, we beekeepers throw it away after scraping it out of our way. But in the rest of the world, beekeepers harvest, save and sell propolis and value-added propolis products, for use as a prized natural medicine!

What does the rest of the world know that we don't know? Propolis, also called bee glue, is tree resin, collected by the bees from the trees. This resin helps protect tree buds from contracting bacterial, viral or fungal infections. The honey bees collect this resin from tree buds and bark, particularly poplars and evergreens. They bring this stiff, sticky, orangey-brown substance back to the hive in their leg baskets and mix it with beeswax. The bees coat the inside of the hive with propolis to seal up cracks, insulate and disinfect the hive.[1]

In a naturally occurring bee hive (as in a tree hole), the bees coat the entire interior walls with a thick coating of propolis, creating what researchers are now calling the "propolis envelope." Propolis protects the health of the hive and kills many kinds of bacteria, viruses, molds and fungi.[2] In research done by Marla Spivak and her assistants, they have found that the propolis envelope reduces the presence of chalkbrood and American foulbrood in the hive. (Simone-Finstrom and Spivak, 2012; Borba and Spivak, 2017).[3] They have also found that the mouth parts of bees in a hive with a propolis envelope have more beneficial microbes than in hives without the propolis envelope.[4]

Propolis' color, smell and components differ depending on the environment, plants, weather, soil and continent: but, all propolis has many of the same basic compounds. Several of these compounds have been proven in research done over 70 years to have beneficial medicinal effects for humans as well.[6]

The History of Propolis for Human Health

Historical literature has shown that propolis has been used for centuries by man, for its medicinal and health benefits. Its use can be traced back to early Egyptian times, where it was used for embalming. Ancient Roman soldiers used it as a tonic before battle, and to treat wounds.[4] Propolis has been part of folk medicine practices all over the world for centuries. Propolis' popularity and the research on its effectiveness grew during the 1900's, especially after WWII. In Europe it is referred to as "Russian Penicillin" and was used by our GI's overseas, during World War II.[7] Propolis is now used widely throughout the world to treat illness and as a health supplement. You will find propolis products in pharmacies in Mexico, Europe, Russia, China, Japan and countries in South America.

Propolis – the "Gold" in the Hive

According to decades of research found on the National Institute of Health website (**nih.gov**), propolis is proven to have antibiotic, antiviral and antifungal properties. It is also antioxidant, anti-inflammatory and is an analgesic (relieves pain).[8] Hundreds of research studies on the National Institute of Health website show propolis as a successful treatment for a wide variety of illnesses and health conditions, from mild to serious. In my reading of these research studies over the last ten years, I have found over 85 different illnesses and health conditions that show medical improvement with propolis use.

Propolis studies done with human subjects have shown its effectiveness for adult and child health issues. A study done in Israel in 2004 showed that an herbal extract of echinacea, propolis and vitamin C is beneficial for the prevention of respiratory tract infections in children. This was a randomized, double-blind, placebo-controlled study, with four hundred thirty children, aged one to five years old. Results in children taking the herbal extract containing propolis, showed a 50% reduction of upper respiratory infections, a 68% reduction in ear infections, a 66% reduction in pneumonia and a 60% reduction in tonsillitis![9]

Another study done in 2010, in Italy, showed the effectiveness of a propolis and zinc solution in preventing acute ear infections in children. Children in the study were one to five years old, with a history of recurrent ear infections. The propolis and zinc solution taken orally, reduced the incidence of ear infections by 32%.[10]

Propolis was shown to help prevent recurrent urinary tract infections in a 2011 study done in France. This study used a combination of propolis and cranberry juice. 340 mg. with 2% propolis tincture taken once daily protected against recurrent UTIs.[11]

An incredible study on wound healing was carried out in Poland in the 1970's. This study showed amazing healing of poor and chronic non-healing wounds using 2.5% propolis ointment. 100 different patients from infants to the elderly with six different kinds of wounds were treated. Before and after pictures were shown and 87% of the wounds showed significant improvement or complete healing.[12]

Another phenomenal study was one showing that women with endometriosis infertility can increase their chances of becoming pregnant

Propolis

from 20% to 60%, if they take 1000 mg of propolis a day.[13] Other human research has been carried out using propolis successfully to treat: warts,[14] shingles,[15] periodontal disease,[16] common cold[17] and genital herpes.[19]

Propolis studies on animals have shown its effectiveness for treating staphylococcus, streptococcus[19], candida,[20] MRSA[21] and influenza.[22] Animal studies using propolis show promise for treatment of congestive heart failure,[23] psoriasis,[24] gout,[25] pancreatitis,[26] colon cancerous tumor growth,[27] hair loss,[28] liver damage,[29] breast cancer[30] and many other ailments.

Lab research in vitro (outside the body, as in a petri dish), is currently showing promise for the use of propolis to treat cancer cells,[31] myco-bacterial lung infections including TB,[32] radiation treatment protection,[33] gastrointestinal issues,[34] diabetes,[35] tissue inflammation,[36] boosting the immune system[37] and acting as an antioxidant.[38] In 2020, several studies came out showing that propolis kills coronavirus![39,40]

Propolis Power for Health and Wellness

Bee propolis can be used in many forms, both orally and topically, to enhance health and wellness. It can be made or purchased for use: raw, powdered, in tinctures or infusions, in toothpaste and mouthwash and as an ingredient in topical creams and balms. Propolis can be used as a daily supplement and preventative to support good health and prevent illness. It can also be used orally during times of illness, as a natural remedy. Topically, it is effective for many skin conditions from bug bites, rashes and poison ivy to infected incisions and wounds.

Uses for Propolis

My family and friends have used propolis oils and alcohol tinctures for over ten years with success for just about every common family illness. We have used propolis successfully for: colds, viruses, bronchitis, pneumonia, IBS, acid reflux, sore throats, laryngitis, canker sores, gum infections, toothaches and prevention. A daily dose is used by some of my family members with chronic conditions that make them more susceptible to illness. One family member who is a smoker and asthmatic, used to have bronchitis or pneumonia six to seven times every Winter, for about 15 years. Since taking propolis daily for the last eight years, he has only had bronchitis twice! We have used a propolis/saline solution sprayed in the nose for sinus congestion and infection and propolis oil drops in the ear for earaches and infection (it numbs the pain almost immediately, too).

We have applied Propolis oil, tincture or salve **topically** with success for: cuts, bug bites, rashes, poison ivy, diaper rash, pain and inflammation, acne, eczema, warts, age spots, shingles rash, psoriasis, yeast infections and wounds. Improvement is seen within 24 hours, typically. One example: a person who used to require 20 days of steroids to get rid of poison ivy, can now treat it topically with propolis oil or tincture and it is gone in five days. It lightens age spots over a month or so, and gives pain relief to shingles rash. Some people get arthritis pain relief by rubbing the oil into the skin at the pain site. Propolis oil or tincture will reduce the swelling and pain from a bee sting if applied immediately.

We keep a bottle of it in our hive inspection kit! We have also used propolis successfully on pets and farm animals and there is even research to prove it! Propolis can be used with animals, both orally and topically for things like: urinary tract infections, ear infections, ear mites, hot spots and skin issues, sore joints, pecking sores and frost-bit combs and feet (chickens) and upper respiratory infections.

Make Your Own

Beekeepers! You can make tinctures, oils, creams and other homemade products for yourselves and your families, to capitalize on the amazing properties of propolis. Doing so is perfectly legal for personal use. Go to **fao.org**, (the United Nations

Food and Agriculture Organization website) and search **"Value Added Products from Beekeeping."** You will find an online booklet full of information about all the hive resources, including how to harvest, clean and make products from bee resources. The How-To for cleaning propolis and for making propolis infusions in oils or alcohol is in this publication. For topical use and for killing bacteria, viruses, fungi, molds and yeast, the dosages used in these research studies have been 2%-4% propolis. We make a 10% solution just to be sure it is enough. Research for treating pain and more serious and systemic illnesses shows dosages of 900 – 1200 mg a day. To get 1000 mg a day, one would need to take .8 of a teaspoon or 4 ml.

A word of warning! Making it to sell is much more complicated. Legally, oral propolis must be marketed as a dietary supplement, under FDA food regulations and MADE IN AN FDA / ODA CERTIFIED PRODUCTION SPACE – NOT YOUR HOME OR HONEY HOUSE! It is recommended that one does much research before embarking on this path. All food laws, from using a certified manufacturing place, specific procedures, arduous documentation, detailed labeling, careful wording, on label and advertising, etc., must be followed.

Save Your Propolis

The final message – Save Your Propolis! Don't throw it away! If you are not interested in making batches of propolis oil or tincture for your family's health, know that there is a growing market for raw propolis. Finding a buyer for propolis can bring

Jeannie Saum

The Gold in Your Hive

you another income stream from your beekeeping. Since beekeepers usually spend the Winter scraping and cleaning up spare equipment, one might as well make some money for the effort! (You can contact me at **beepothecary@gmail.com** for more information.) And save some of it to make propolis products for your family's wellness! Your honey bees can help you stay well!

Footnotes

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Emily Harbury, LVT

Beekeeping 101

New Bee

A photograph of a rear foot of a bear. Photo by Amy Massey, taken at the city hall park in Leavenworth, WA.

What makes a person a beekeeper versus someone who simply has bees, or as I call them, a bee-haver? Both categories share a fascination with the honey bee species, but once you delve into them, the differences become more apparent.

I define a beekeeper as: a person who takes an involved management style to protect the health and well-being of their hives. Their management includes **integrated pest management (IPM), active predator prevention, knowledgeable and seasonally appropriate hive handling and continued pursuit of their own education of best practices. A good beekeeper works to educate the general public on the value of backyard beekeeping.**

A bee-haver, on the other hand, is a person who keeps bees but does the bare minimum or nothing to promote a healthy hive. Many have been misled by false claims that bees will take care of themselves with little interference. In the past, these hives may have remained healthy and produced a crop of honey despite the haver's ignorance or neglect. These days, however, diseases, predation and collapse will plague these hives, and new bees will need to be purchased almost every year. Lax bee management allows parasites to grow and spread, causing damage to otherwise healthy hives.

The days of beehives remaining healthy without thoughtful care are

gone. Some challenges beekeepers now face include the introduction and proliferation of the *varroa* mite, the invasion of the giant Asian hornet, the infective longevity of American Foulbrood disease, as well as growing resistance to the drugs we've used to combat disease and predators. These challenges combined with fewer people able to keep backyard beehives due to small lot sizes and city ordinance laws, have put beekeeping as a hobby and industry in jeopardy.

I could write a whole paper on each challenge beekeepers face, but I will try to capture the essence of what being a beekeeper entails.

Integrated pest management (IPM) uses a variety of pest management techniques that focus on pest prevention, pest reduction and the elimination of conditions that lead to pest infestations. IPM simply means (1) don't attract pests, (2) keep them out and (3) get rid of them with the safest, most effective methods. IPM is essential for a healthy hive, or at least one that can survive Winter. *Varroa* mites are one of the biggest threats to the hive. There are many IPM protocols to choose from depending on your situation. Options include a rotating cycle of oxalic acid, formic pro or thymol products along with implementing drone comb frames in the Summer. Some people have success only using essential oils and drone comb frame protocol. With any of these protocols you'll have to keep track of the extent of the *varroa* mite population or the success of your IPM with frequent, thorough inspections.

Mite counts in the Summer/Fall are essential to gauge the overall health of your hive. High mite count is a huge factor contributing to Winter death and catching it early will help you choose what products to treat it with. However, repeated exposure to the same product can lead to the mites developing resistance to certain products.

High mite counts also lead to queen death, deformed wing virus or a weakened hive vulnerable to other infesting pests. A weak hive may fail and collapse or abscond. If the hive collapses, bees from healthy hives will come rob it, unwittingly exposing themselves and their healthy hives to mites still residing in the collapsed hive.

Frequent inspections are imperative for a keeper to monitor the overall health of their hives and evaluating their management strategies. Whether a hive is preparing to swarm and needs to be split or a second brood box added. You cannot know what the hive needs unless you observe and investigate. Asking questions as you learn beekeeping will also help you manage each hive successfully. In the Summer, inspecting your hive every seven to 10 days is ideal.

Predator prevention is another necessary action to protect your beehives and safeguard your neighbors. I live in a suburban setting where bears roam, but I didn't think they would breech my fence nor saunter past my barking dogs. I was wrong. A bear went right over my fence while my dogs slept soundly knocking my hives over so he could eat delicious brood. This was an expensive lesson against complacency. Not only were my hives damaged, but now the bear knew about hives and could become a threat to the other local beekeepers in my area. I may have created a potential nuisance bear. A fed bear is a dead bear. Learn from my mistake and put up a bear fence before a bear feeds on your hive. Taking a "let's see what happens" attitude risks your own hives, your neighbor's hives and the future of that bear. After that incident I quickly erected a highly electrified double bear fence, started playing talk radio in the bee yard at night, and have had no visits from bears since that moment five years ago.

Any person with bees becomes a spokesperson for all beekeepers. Public awareness and outreach should be in the forefront of every keeper's mind when deciding where to put their hives. Consider your bees' flight path. Flight path is the entrance of the hive where your bees will be leaving and entering. This path can get very busy during the Summer months as hundreds of bees come and go throughout a nice Summer day. If the hive decides to swarm, thousands of bees will pour out of that opening all at once. Position your hive where the public doesn't have access to it: out of sight, out of mind. Vandals have been known to tip over beehives just for the reckless thrill of literally stirring the hornets' nest.

Keeping your hives out of sight and away from pedestrian walkways will also help define a flight path for your bees. Keep in mind if there are negative reports to the city lawmakers, this will lead to tightened city ordinance laws. The benefits of being a spokesperson for beekeepers is that your neighbors will think of you if they come across a swarm and call you. Free bees are always a sweet happenstance.

This article is aimed at the newly christened beekeeper with the goal of informing the new or prospective beekeepers of the tasks and knowledge required to become a responsible beekeeper. Joining my local beekeeping club was one of the most beneficial things I did when I was just starting out. The beekeeping industry is always changing, and this will help you keep on top of things like the ever-shifting management strategies in response to invasive species like the giant Asian hornet and the more resistant *varroa* mite species. Or feed directives that require veterinary approval to obtain antibiotics or other prescription medications. Keeping your mind open and free of bias and allowing yourself to accept fault will be key to your success when faced with any problem in your hives. YouTube videos and online articles will only get you so far and may steer you in a totally unhelpful direction. By joining a club, you gain access to a hive mind. The majority of members will be helpful and eager to share information, and you will make lifelong friends.

A drone comb frame that shows the damage bear claws can do. Photo by Emily Harbury.

Bee Culture®
The Magazine of American Beekeeping

Booklist 2022

FIRST TIME BEEKEEPING

Kim Flottum **$20.00**

SKU: X230

This absolute beginner's guide for first-time beekeepers will teach you how to set up and care for your first colonies, from choosing a location for your new bee colonies through natural bee care and harvesting beehive products.

WORK I KNEW I MUST

Tammy Horn Potter **$20.00**

SKU: X228

Jane Cole's "Reminiscence of Forty-One Years of Factory Life" and selections from A.I. Root's "An Eyewitness Account of Early American Beekeeping."

QUEENSPOTTING

Hilary Kearney **$21.95**

SKU: X226

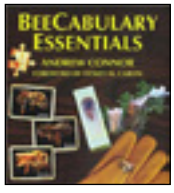
At the heart of every bee hive is a queen bee. In *QueenSpotting*, experienced beekeeper and professional "swarm catcher" Hilary Kearney challenges readers to "spot the queen" with 48 fold-out visual puzzles — vivid up-close photos of the queen hidden among her many subjects.

NATURAL BEEKEEPING

Ross Conrad **$35.00**

SKU: X220

Whether you are a novice looking to get started with bees, an experienced apiculturist looking for ideas to develop an integrated pest-management approach, or someone who wants to sell honey at a premium price, this is the book you've been waiting for.



BEECABULARY ESSENTIALS

Andrew Connor **$36.00**

SKU: X225

If you are curious or confused about honey bees or starting a bee hive, this book has all the special terminology about bees and beekeeping. Here is the answer to your need for short and concise definitions of the vocabulary of beekeeping.

BEEKEEPER'S LAB

Kim Lehman **$20.00**

SKU: X222

Beekeeping's popularity as a hobby continues to skyrocket. *Beekeeper's Lab* gives you 52 bee-inspired labs to do all year long, and are accessible enough to share with the family.

IN BUSINESS WITH BEES

Kim Flottum **$26.00**

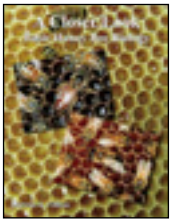
SKU: X223

This book takes serious beekeepers past the beginning stages and learning curves and offers practical, useful advice to move your passion into a part-time or full-time career with measurable results. This **beekeeping business how-to guide** offers all of the in-depth advice you need, in one place.

AN EYEWITNESS ACCOUNT OF EARLY AMERICAN BEEKEEPING: THE AUTOBIOGRAPHY OF A.I. ROOT

SKU: X1 **$10.00**

Explore the birth of Modern Beekeeping from the perspective of Amos Ives Root. Beekeeping, Beekeepers, and a Profound Religious Conviction are all engaged. The first of many things we still do today!

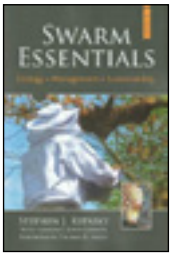


A CLOSER LOOK - BASIC HONEY BEE BIOLOGY

Clarence H. Collison **$15.00**

SKU: X219

Collison has collected much relevant biology in one place, updating our knowledge of what makes bees so interesting and distinctive organisms. Suitable for master beekeeper programs, college-level courses and general knowledge beekeeping.

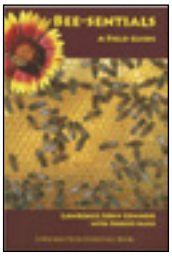


SWARM ESSENTIALS

Stephen J. Repasky **$25.00**

SKU: X213

Swarming is perhaps the most powerful instinct beekeepers encounter while working with bees. Swarm Essentials outlines the ramifications of swarming behavior, the benefits of swarming, proven swarm management techniques, and how to recover and even prosper from a swarming event.



BEE-SENTIALS - A FIELD GUIDE

Lawrence John Connor **$20.00**

SKU: X210

A basic beekeeping book you have been looking for with some 'meat on it's bones' for continued study by any beekeeper. This a book focused on compassionate animal husbandry. There is a strong 'natural' focus for beekeepers who want to avoid or minimize pesticides and reduce stress on the bees.

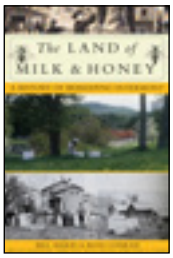
THE JOYS OF BEEKEEPING

Richard Taylor **$18.50**

SKU: X37

A wonderful book in which Richard Taylor develops his philosophy to life and more importantly to beekeeping in a readable and thoroughly delightful way.

all books can be ordered online at Store.BeeCulture.com/Books



THE LAND OF MILK & HONEY

Bill Mares & Ross Conrad **$30.00**

SKU: X229

This book is a must read for anyone interested in how bees and beekeeping got to where they are today in Vermont and the US. The Land of Milk and Honey provides a powerful testament of the state's oversized leadership to protect our nation's pollinators and challenges other states to write their own beekeeping histories.

THE BEEKEEPER'S PROBLEM SOLVER

James E. Tew **$20.00**

SKU: X198

Getting the basics right is essential, and this demands a solid appreciation of important areas such as hive management, breed choice, and health requirements.

ABC AND XYZ OF BEE CULTURE

SKU: X5-42 **$74.99**

42nd Edition of ABC & XYZ of Bee Culture Since 1877 Leading the Way to Successful Beekeeping. Over 800 pages packed with information. Hundreds of color photos and illustrations . A mix of reference, the how and why things are done and a history of how beekeeping got where it is today! A MUST for every beekeeper.

1926 HONEY PLANTS OF NORTH AMERICA

John H. Lovell **$12.50**

SKU: X74P

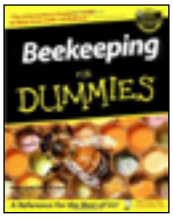
A reprint of the original Honey Plants book, published by A.I. Root. Nearly 1,000 plants, 408 pages, paperback. Measure 6" x 9". Black and white.

THE BACKYARD BEEKEEPER

Kim Flottum **$25.00**

SKU: X141

The Backyard Beekeeper, now in its 4th edition, makes the time-honored and complex tradition of beekeeping an enjoyable and accessible backyard pastime that will appeal to urban and rural beekeepers of all skill levels.

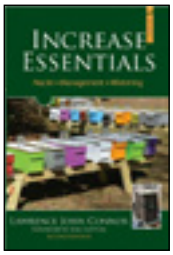


BEEKEEPING FOR DUMMIES

Howland Blackiston **$25.00**

SKU: X98

In this easy-to-follow guide, Howland Blackiston, one of the nation's most respected authorities on the subject, takes the mystery (and the sting) out of beekeeping.



INCREASE ESSENTIALS

Lawrence John Connor **$25.00**

SKU: X163

This book explains why and how beekeepers can use increase nuclei to solve problems in the beeyard and use them to winter colonies and provide a reliable source of fresh bees, locally acclimatized queens, replacement hives and colonies for operational growth or sale.

THE NEW STARTING RIGHT WITH BEES

Kim Flottum & Kathy Summers

SKU: X84 **$10.00**

This book's primary intent is a learning tool for beginning beekeepers, but it is an exceptional source of information for anyone interested in the fascinating world of honey bees.

WHAT DO YOU KNOW?

Clarence H. Collison **$25.00**

SKU: X2

A comprehensive study guide for every beekeeper, at any level. Test yourself to see what you already know, and what you need to know. Everything you've ever wanted to know about Honey Bees, Beekeeping, Beekeepers and the world they inhabit.

BEE SEX ESSENTIALS

Lawrence John Connor **$20.00**

SKU: X165

This is another book in the Essential Series by Larry Connor regarding the management of honey bee production. It covers drones, queens, the mating process, colony genetics & more.

QUEEN REARING ESSENTIALS

Lawrence John Connor **$22.00**

SKU: X177

In this post-Varroa, post-Colony Collapse Syndrome era, beekeepers everywhere are developing localized, mite-resistant bee stocks. Key to this is their ability to raise queen cells and queens.

THE HONEY CONNOISSEUR

C. Marina Marchese & Kim Flottum

SKU: X181 **$25.00**

The Honey Connoisseur teaches consumers everything they need to know about how to taste, select, and use a diverse selection of honeys. The authors introduce the concept of terroir and the notion that soil, weather, and other natural phenomena can affect the taste of honey.

An Easier Way to

A large swarm shaken into the collection container with bees beginning to collect on the screen panels.

A decade or so ago I decided there had to be a better way to collect swarms than using an old cardboard box like I had done for many years. It seems that no matter how efficient I thought I was, I was never able to please the person who gave me a call about a swarm of bees collected from their property. I would return home thinking I had done a great job only to receive another call informing me that I left a million or so bees and I needed to come back and get them.

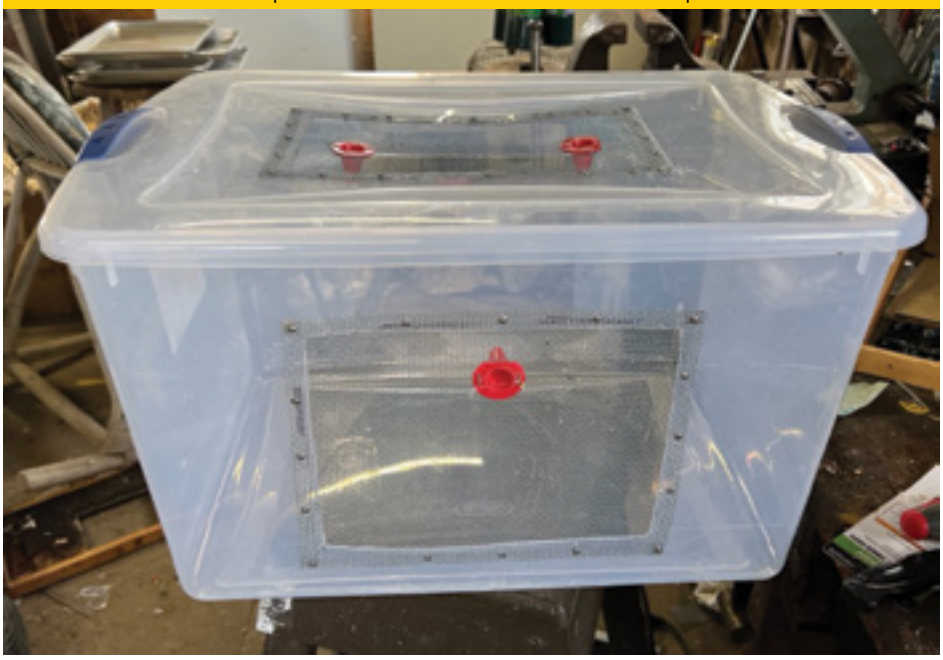
So, I started experimenting with different methods of shaking the swarms into various containers. Some were more efficient than others but none collected all the bees. Anyone who has collected a swarm knows that after the initial shaking of the bees that there are lots of confused bees flying around with many returning to the limb from whence they were originally located.

I eventually decided I needed some kind of one-way entrance on the collection box. Since I had used pollen traps to collect fresh pollen for my queen rearing cell starter/builders, I was familiar with the small red funnel shaped conical bee escapes that the traps used and decided to give them a try.

My favorite size and type of container, medium sized with latches for the lid.

Most of my life I have not been lucky enough to come up with solutions on the first try but this was one of the very rare occasions where I did. I had been installing a #8 mesh screen panel or two on the storage tubs I used as collection boxes to help with ventilation when I transported the collected swarms to their new homes. My first inclination was to place one of the cones close to the screen which was moderately successful to enticing the flying bees inside, but some still hung out on the screen as I waited for the bees to settle down. I then moved the cones to the screen panels. This worked extremely well as I would shake the swarm in the container, replace the lid and sit the container on the ground in a shady spot as near the original spot where the swarm had collected as was possible. I would then leave the container in this spot until late afternoon or after sunset. By this time the swarm had settled down and around 99% or so of the bees had moved inside the box with the queen ready to be moved to their new home in one of my apiaries.

Finished product with cones inserted/attached to screen panels.



The key to success with these containers is to shake the bulk of the swarm, which includes the queen, into the container. To accomplish this, the swarm needs to be settled down in a tight cluster awaiting the scout bees to bring back info on a new home.

The cost of building this device is around $20, which in today's world of beekeeping is a huge bargain. I use #8 mesh screen most of the time but have used aluminum window screen for the panels. There are many choices for containers and the one pictured in the construction photos is a 66-quart capacity which is a little larger than I normally use, but lately there has been a shortage of these storage tubs. I prefer the type that also use a latch type cov-

er closure that keeps the lid secure during moving and transport.

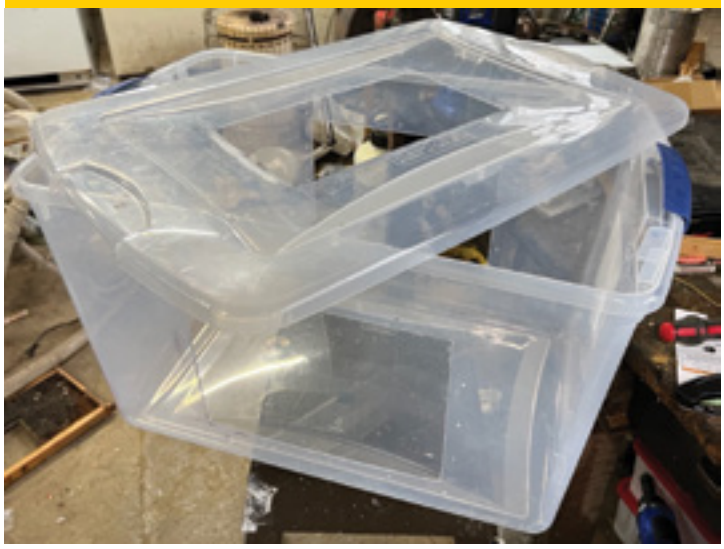
Some of the tubs have holes hidden around and under the latches that bees can pass through, so be sure to check for these and plug them up. The tubs have a shelf life with some lasting considerably longer than others, so I employ reusable fasteners when attaching the screen panels so I can reuse them. My preferred fasteners are #4 x ¼" SS sheet metal screws I buy from a marine hardware supplier for about $.03 each. I have used pop rivets, hot melt glue, wire stitching, staples and cap screws and nuts, but settled on the sheet metal screws being careful not to over torque them when screwing them into the plastic containers. The ¼" screws protrude out a little inside the container so I apply a dab of silicone caulk to them to cover the sharp edges and help hold them in place.

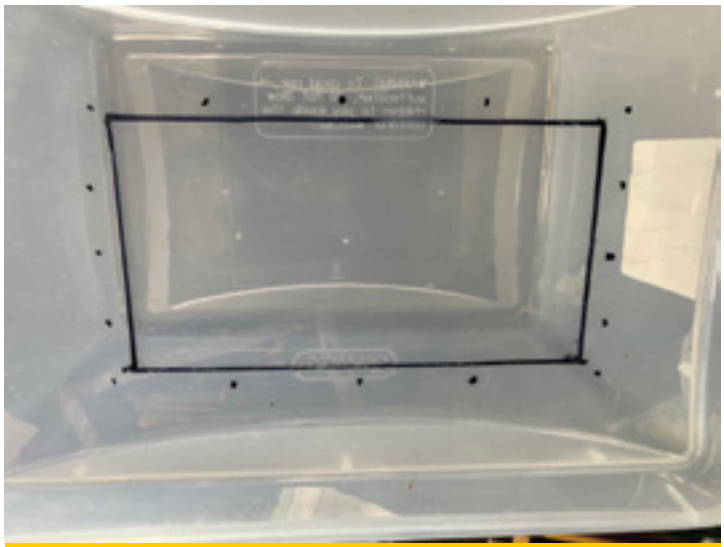
The screen panels are large enough to allow the bees to collect on them while providing ventilation but not so large that the cutout they cover jeopardizes the strength or integrity of the container. I fasten the cones to the screens with ⅜" staples from a manual stapler and bend the protruding ends over to secure the cones to the screens.

The photos of the construction are basically self-explanatory and I believe every beekeeper needs one or two of these devices. Once swarm season begins, I carry one or two of these collectors in my truck the entire season and have given away many. You can let the bees sit overnight in the container, but be advised that bees are persistant, and if you let them sit too long, they will figure out how to get back out through the escapes.

I believe it is very important for beekeepers to always answer swarm calls as it reinforces the public's opinion that we truly care about honey bees and their welfare. This piece of equipment makes answering the call a little easier and more successful.

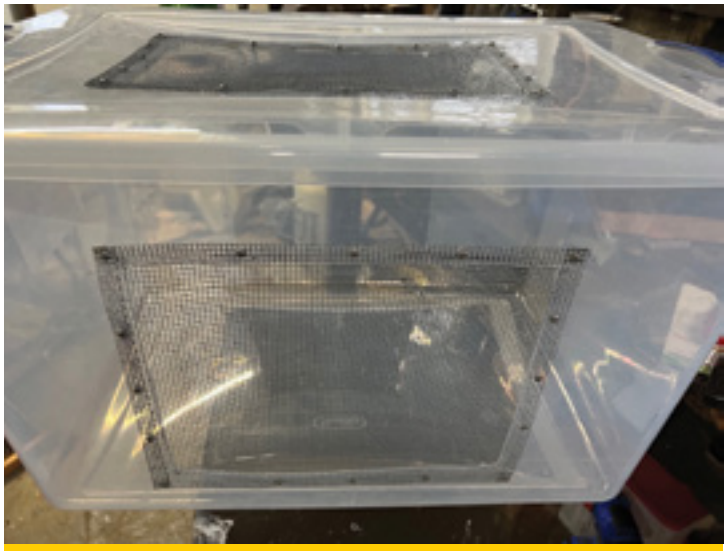
Cutouts finished ready to apply screen panels





I use a template to mark the area I will cut out for the mesh panels. If you plan to pre-drill holes for fasteners, it's advisable that you do so before cutting out the panels.

By late afternoon the bees have settled down and moved through the conical escapes into the container reforming the cluster with the queen.



Mesh panels attached.

John Benham

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Off the Wahl Beekeeping

TIP OF THE MONTH

Richard Wahl

Bucket tilter with small riser.

Many hobby beekeepers strain their honey into five-gallon buckets with a bottom faucet for later bottling. Allowed to sit for a day or two, any bubbles and even very small bits of wax, will float to the top. When sitting flat on a counter surface there will be a point where those surface bubbles or wax begin to flow through the bucket faucet and into the honey jars. This honey "foam" does not affect the honey contents of the jar but does not have the most appealing appearance when sitting on the top of the honey. In order to get all but the last pound or two out of the bucket without surface foam I have used a tilting platform before the honey surface reaches the top of the bucket faucet opening. We reserve the last jar or two from the bucket for ourselves and all the jars for sale are free of this surface foam resulting in the top of the honey appearing as clear as the rest of the jar.

Bucket tilting platform pieces.

Needed for assembly:

- Two 1 ft. x 1 ft. pieces of ¾ inch plywood
- A two-foot-long piece 1½ inch x ¾ inch pine board
- A two-foot-long piece of 3½ inch x ¾ inch pine board
- Wood glue
- Two dozen ¾ inch brads
- Two 2½ inch utility hinges with flat head screws
- Four 2-inch wood screws
- One basic cabinet handle (optional)

To make this tilting bucket platform, I purchased a two foot by two-foot piece of ¾ inch plywood from a local big box store. They often carry sizes smaller than the standard four by eight-foot sheets. I cut this two by two-foot sheet exactly in half in both directions resulting in four, one by one foot pieces which is just perfect to make two of these tilting platforms. The remaining instructions result in one tilting platform. I then found a two-foot piece of 1½ inch x ¾ inch pine board in my scrap box from which I cut the corner angle holders and the one-foot-long smaller riser. From the two-foot 1½ x ¾ inch board cut two pieces with 45° angles at both ends with the long side measuring 4½ inches. These get screwed to the top one by one foot plywood board as front bucket braces. The wood screws will need to be counter sunk a bit to get a good grab on the plywood. A bit of good wood glue will also help secure them on the bucket platform corners. Cut the remaining piece to a one-foot length and this becomes the smaller riser.

A two-foot piece of 3½ inch x ¾ inch pine board, also left over from another project, was used to make the spacer cleats and the wider riser. Cut a one-foot length from the 3½ x ¾ inch board and this will be the taller riser. The remaining one-foot-long piece will need to be ripped into seven one-foot-long pieces just under ⅜-inch-wide strips to use as spacers on the upper and lower pieces of one by one foot plywood. Two of these spacers are brad nailed and glued to the bottom front and rear edges of the top plywood platform. The remaining five pieces are glued and brad nailed to the top of the underlying plywood piece with the first spaced 2½ inches in from the front. Since board widths can vary slightly from piece to piece, use the 3½ inch wide riser as the spacer when nailing each subsequent spacer strip on the bottom board. If you are using new wood, you might wish to let it dry out completely for a month or two as there will be some shrinkage which will hinder a tight fit when using the riser at a later date. Hinges are fastened to the top and

bottom plywood pieces to make the top movable while still attached to the bottom piece.

Hinges and angled bucket supports.

Bucket tilter in use with large riser.

A basic cabinet handle can be added to the rear of the top plywood square to aid in tilting the top board (see photos on previous page).

As the exiting honey reaches the top of the faucet, begin tilting the bucket by moving the riser nearer to the front spacers. Initially the smaller riser can be used until much less of the honey in the bucket remains. If tilting the bucket too far with the taller riser too soon, the bucket may tip as its center of gravity is shifted too far forward for the degree of tilt being used. Using this tilting board, all but the last pound or two of honey can be removed from the bucket without the surface foam ending up in the top of one of your honey jars.

And those second two pieces of plywood were easily made into a second tilting board which was given to a beekeeper friend.

Richard Wahl
Richmond, Michigan

Peter Somers

The Problem to the

When you ask ten beekeepers and get one answer, something is wrong. Most seem to agree that Winter condensation kills colonies. The warning survives on speculation and hearsay rather than direct observation. Water and heat are critical Winter resources. Ventilating the hive to remove moisture may do more to reduce Winter survival than promote it.

A Dry Bee is a Dead Bee

Honey bees originated in the tropical latitudes and are highly dependent upon humidity for their survival. Like most insects, their large surface to body ratio promotes water loss. Outside their native habitat, bees live their life engaged in a perpetual battle against desiccation. Inside the hive, they prefer 75% relative humidity (Ellis, 2008). Honey bees breathe only twice per minute to retain water, which they cannot do when they are dead. Expect to find wet or moldy bees upon failure of the hive's internal air and water pump that is the Winter cluster.

Without moisture in the hive during Winter, the colony would die of starvation. Bees need water to dilute honey for intake through the proboscis and all other phases of digestion. High humidity is also associated with a decline in mite reproduction (Kraus, 1997). When the queen resumes laying in mid-Winter, water is critical for producing the brood food. Larvae do not hatch from cracked eggs but emerge from a membrane that dissolves in water. Maximum egg viability occurs at 95% relative humidity (Doull, 1976) and serves as evolutionary evidence of the colony's dependence on environmental moisture. Silk cocoons embedded in the wax transforms comb into a moisture sink that supports brood development (Ellis, 2010). The higher water content of hygroscopic brood comb is the preferred clustering surface for overwintering bees. Still, rapid evaporation in the heated core threatens the interior bees with dehydration (Omholt, 1987). Watch them fly straight to the ground on a warm Winter day and perform low-level foraging flights in a desperate search for water.

"Beekeepers often go to great measure to avoid moisture buildup in the hive during Winter. One should do so with caution..." – R Oliver, ***scientificbeekeeping.com***

Moisture Management in the Tree Hive

Dumping heat and moisture would be uncharacteristic of an insect well-recognized for maximizing the utility of its resources. Honey bees have been evolving mostly in the humid confines of a well-insulated tree cavity having only a single point of entry. Workers fill cracks and seal the walls with a thin layer of propolis (Seeley, 1976). Although the colony makes no attempt to heat the interior space, an insulated hive stays warmer than the outside air (Stabentheiner, 2003).

Heat and moisture escape the cluster and rise toward the hive ceiling. Finding no exit or cold enough surface for water to condense, the current gets deflected outwards and back downwards into cooler air below. The movement from hot to cold is a matter of natural law that passively circulates the inside air during Winter. As the flow reaches colder regions of the hive, water condenses along the walls or below the cluster before falling to the floor. Air is exchanged through the entrance. Condensation releases heat that remains inside the hive and helps warm the interior (Oliver, 2016). This lowers cluster metabolism, expressed as a decline in food consumption and water production.

"With good insulation and a low nest ceiling, no condensation would occur on the ceiling, but the moisture would descend as vapor and condense on the floor or leave the nest through the lower entrance." – K Toomemaa, Determining amount of water condensed above... the Winter cluster 2012

... In the Managed Hive

The typical uninsulated and unmodified Langstroth hive is cold and wet. Adding upper ventilation allows some moisture to escape, resulting in a cold hive that is less wet. Wrapping insulation around a ventilated hive still allows heat to escape, so condensation in the upper hive may still be a problem. Enter the moisture quilt.

A permeable layer of woodchips above the cluster will shield the bees from any water that condenses on the ceiling and drips back down. It will also reveal the poor insulative value of woodchips, because rising humidity must pass through these layers to carry moisture to the top of the hive. Ventilation holes in the quilt box may keep the upper layer of chips cold enough for water to condense even before vapor reaches the ceiling.

Solution of Winter Moisture

Whether water condenses on the hive ceiling or the quilt itself, water is condensing inside the hive and above the cluster. This is a symptom of a larger problem: The hive is too cold. Thin pine walls and layers of woodchips do little to prevent the loss of heat (Mitchell, 2016). Upper ventilation makes matters worse by encapsulating the bees in a continuous draft of cold, dry air. As the colony works harder to stay warm, the rise in metabolism results in higher levels of both food consumption and water production. The beekeeper's solution for removing moisture from the hive has the unfortunate consequence of adding it.

Note that water production may increase if population declines, as each bee works harder to stay warm. If such a colony dies, it dies wet.

"Many of the arguments given to back up any recommendations for providing more and more top-ventilation are based on reasoned considerations or anthropomorphic thinking rather than on sharp-eyed observations of bee behavior." – B Möbus, Rethinking our ideas about the... cluster 1998

Conflict Resolution

To manage hive moisture, bees rely on insulation to conserve heat while the beekeeper relies on ventilation to remove heat. These two methods are incompatible and result in the colony and their keeper working against each other during the deadliest time of year. As beekeepers well know, trying to impose one's will on a colony of honey bees is a complete waste of time. In this case, it is also unnecessary. Bees have developed a superior system for managing moisture, because it prevents condensation above the cluster without removing heat. It is up to the beekeeper to recognize this and adopt the method so that teamwork is restored.

"The other important role of the insulation is the avoiding of excessive moisture inside the hive. It has been shown that under steady outside conditions condensation does not increase even when the ventilation is restricted, so long as the proportion of heat passing through the walls of the nest cavity is negligible." – K.Toomemaa, Winter Mortality of Honey Bee Colonies: Reducing the... Factors 2016

Wet Bees Happen Anyway

The irony in this debate is that the Winter cluster gets wet from condensation as a matter of normal occurrence, and there isn't anything a moisture quilt or upper ventilation can do to prevent it.

In the heated core, water evaporates rapidly and dehydrates the interior bees. Moving outward, temperature declines across a steep gradient causing relative humidity to sharply rise, such that conditions near the cluster surface are unfavorable for water to evaporate (Omholt, 1987). Heater bees in the insulating shell prevent the temperature from dropping below 50°F to avoid chill coma (Free, 1960), but this may be low enough to cause the vapor they produce to condense directly on the bodies of bees (Oliver, 2016).

Condensation in the vicinity of the cluster surface gives interior bees access to water and prepares honey for digestion by diluting nearby stores. Cold death temperature hovers around the freezing point for both a wet and dry bee (Free, 1960). Drowning aside, a wet bee only dies if she gets too cold. But she will lose heat faster than a dry bee and is at greater risk of becoming immobilized in a chill coma. Torpid bees can remain comatose for nearly two days but must eventually be warmed back up, or fall from the comb and die (Stabentheiner, 2003). The picture to the right (by Randy Oliver) reveals chilled bees in the periphery unable to fly away with the interior bees when smoke is puffed across the cluster.

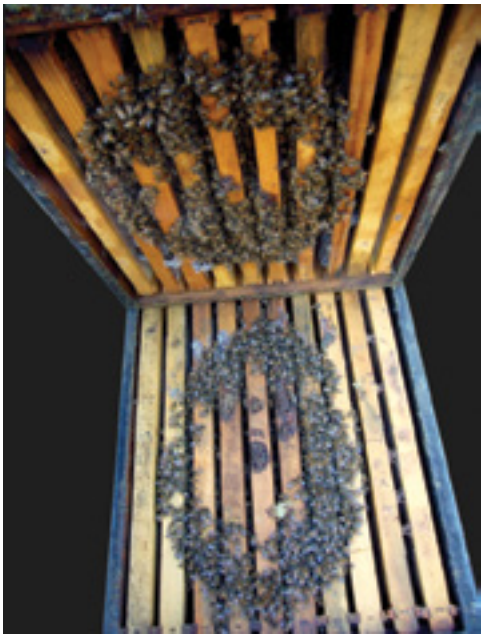
"We'd expect much of the metabolic water from the core to condense upon the cool comb or upon the bodies of bees in the shell... Much of this water vapor will condense within the cool outer shell of bees..." – Randy Oliver, ***scientificbeekeeping.com***

Reduce Moisture at the Source

To reduce moisture, reduce metabolism. Prevention is key, and that is where upper ventilation fails. The lowest metabolic rate for a honey bee occurs in a chill coma somewhere below 50°F. Operators of indoor wintering facilities set the thermostat around 41°F. At this temperature, every bee in the cluster can remain at rest and still avoid chill coma, provided the insulating shell maximizes its density (Heinrich, 1981). CO_2 levels rise and oxygen declines, inducing a quiet stillness that puts the colony into a state of semi-hibernation while broodless in early Winter (Van Nerum, 1997). It is a survival tactic characterized by the absolute minimum of both food consumption and water production. Any disturbance, including ventilation, must be avoided.

It is true the cluster insulates itself, but the closer the surrounding air is to 41°F, the lower the bees' metabolic rate. Although not as reliable as the indoor space, an insulated hive that is sealed at the top represents a practical alternative for the hobbyist beekeeper.

Note that ventilation of an indoor wintering facility circulates the air outside the hive, which obviously happens naturally outdoors. Also note that increasing hive ventilation in the above scenario is of little use to a cluster packed so tightly that CO_2 barely escapes. It just creates a



cold draft of outside air that cools the outer layers and forces those bees to engage in heat production. The result is more moisture in the hive, the very thing ventilation is meant to reduce.

"One of the major sources of mortality in honey bees is overwintering. Successful overwintering is achieved in large part by occupying a suitable nest." –B Heinrich, The mechanisms and energies of honey bee swarm temperature regulation. 1981

Honey bees have not evolved in a cold, dry, well-ventilated hive. Instead, nature has selected for colonies that nest in the humid confines of a poorly ventilated but well-insulated tree cavity. The advantages include a two-dimensional approach to moisture management that impacts both where and how much condensation occurs. Closing the vents and insulating the hive should not be considered in the context of colony comfort but as the catalyst for a multifaced and holistic impact on colony health that increases Winter survival.

"It is widely known that the lower the metabolic rate of wintering bees and the associated food consumption, as well as the temperature of the Winter cluster, the deeper is the bees' dormancy status, the smaller is the exhaustion of the organism and accordingly the more successful is the overwintering." – K Toomemaa, Winter Mortality of Bee Colonies: Reducing the... Factors 2016

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Going Places with Balloon Flower

Alyssum Flowers

A true blue champion in the garden is balloon flower or Chinese bellflower, *Platycodon grandiflorus,* a two foot tall clump forming perennial with shiny green, pointed leaves and upright growth habit ending with multiple clusters of bell-like flowers. Similar to other species in the Family Campanulaceae, the cheerful swollen buds open like a cup with five pointed petals exposing yellow pollen tubes inside. Children (of any age) like to pinch the buds, making them pop open. This perennial can add color and charm to rock gardens, borders, butterfly gardens or seeded in large areas.

Native to Eastern Asia, Korea and Siberia, balloon flower grows well in Hardiness Zones four to nine, in moist but well drained soils, although it can tolerate clay soil. It blooms abundantly in full sun or dappled shade from mid-Summer through Fall and is relatively pest free. It is also deer resistant! Removing the dead flowers before they develop seeds will prolong the blooming period. Butterflies, honey bees and solitary bees are especially attracted to balloon flowers, and being long lived, this beauty will continue to bring smiles and color to your landscape.

To propagate this gem, plant seeds in early Spring in a cold frame or carefully dig and cut the lower stem of non-flowering stems with at least one root attached, and pot until it becomes established. The roots are fleshy and delicate so it is important to water well before cutting into the root mass.

"Sentimental Blue" is a favorite cultivar with deep blue flowers on compact, bushy stems reaching only six to 12 inches. You can see it in the A.I. Root garden in front of the administration building. Other colors are now available, including a light pink, white with pink etching or white with blue streaks, to enhance the color and interest of your garden.

P. *grandiflorus* "Fairy Snow"
https://www.witsendgardens.com/platycodon-balloon-flower

P. *grandiflorus* "Popstar Pink"
https://www.witsendgardens.com/platycodon-balloon-flower

Platycodon grandiflorus "Sentimental blue"
https://www.waltersgardens.com/variety.php?ID=PLASB

P. *grandiflorus* "Sentimental Blue" Notice the buds! https://www.missouribotanicalgarden.org/PlantFinder/FullImageDisplay.aspx?documentid=3416

Platycodon is a fun and attractive dependable feature for any garden. It blends well with other perennials and will flower at a time when others have stopped. For best effect, plant a mass of them instead of one or two and plant in clumps vs. a straight line. You will enjoy the results for a long time.

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https://www.waltersgardens.com/variety.php?ID=PLASB

https://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=252975&isprofile=0&

https://plants.ces.ncsu.edu/plants/platycodon-grandiflorus/

https://www.witsendgardens.com/platycodon-balloon-flower

Continued from page 11...

Unfortunately, not every beekeeper or business who will benefit from the increased honey prices has helped. Your donation to the AHPA Antidumping Fund is a legal fee that is tax deductible as a business expense. Please send your donation to AHPA today.

In other politics, APHIS has still not decided on whether to release two non-native insects that will control/feed on tallow trees. Apparently, they have determined that they need more information before they can make a decision. If your bee business relies on tallow in any way, I encourage you to document it as well as you can. AHPA will need to collect information on how important tallow really is to your business. We need to demonstrate to AHPIS what we already know. Tallow is the single most important nectar and pollen source for my business, and others, and we need ways to prove it.

That's enough politics for now. Let's talk about the AHPA Convention. This year we will be meeting at the gorgeous La Paloma Resort & Spa in Tucson, AZ, from November 29 – December 3, 2022. We have a great set of speakers and activities. The thing I am most excited about is the AHPA Golf Tournament on Tuesday, November 29th. I know not everyone plays golf, but I know several who do. This is your chance to play golf on a Jack Nicklaus designed course in late November. The weather will be great, and you have a chance to win your choice of a Hummerbee or Bobcat beekeeping forklift. All you have to do is sign up for the tournament, **AHPA Antidumping Fund Golf Tournament (perfectgolfevent.com)** and win the hole in one contest! All proceeds of the tournament will go to the antidumping fund. I am excited to take full advantage of the amenities available and give attendees the opportunity to play golf in November.

Steven Coy
Vice President America Honey Producers Association

COMBINING COLONIES

A common procedure, but without clearly defined boundaries

"Hey, just combine them"

Combining colonies is a common procedure. As beekeepers, we do it all the time. Yes, we do it and we freely tell other beekeepers to do it. *"Hey, just combine them."* Recently, in another piece I was writing, I made the following comment, *"Any colonies that don't take the new queens (or are weak) should probably be combined with another colony."* I was writing this statement in support of Fall Management protocols. As is so often the case, I made no recommendations as to how small the sickly *"combinee"* should be, nor did I make any reference to the population size and condition of the larger colony, the *"combiner."* This fluidity is what I am exploring in this rambling article. *Combining colonies* is a very relaxed management recommendation.

Figure 1. The upper, weaker colony will be combined with the lower, stronger colony.

Not a natural procedure

Wild colonies die all the time. *(At this point, I tried to find a generalized citation for just how often wild nests die. One was not readily available. Imidacloprids, water availability, and* varroa *predation were some of the reasons that feral colonies died. So, I will just leave it at, "Wild colonies die all the time.")* Colonies do not *combine* in nature; the weak colonies just *die* – or at least languish until they do die.[1] Robbing from more populous colonies is normally the coup de grâce for undersized colonies.

In beekeeping manipulations, we do these *oddities* all the time. Beekeepers collectively call these manipulations *"colony management."* A wild colony does not go searching for a new queen outside its own colony. They always grow their own from their own brood.

In our human world, beekeepers show up in the bee yard with a caged queen – that has never been part of the colony to which she is about to be *"introduced."* We then try to coerce the colony to accept this interloper. Or could I say be that the foreign queen is to be "*combined"* with the queenless colony? After the required introduction time, the queen is amalgamated (or combined) with the colony. The acceptance of a foreign queen is as unnatural as two feral, weakened colonies deciding to combine their meager resources, and become one. That's not going to happen. They are both going to die before Winter's end.

Beekeepers, when I think about it, bee management, in general, is just a long list of *"oddities"* that we do for (or to) our bees that they would never do for (or to) themselves. For example, wild colonies do not live in apiaries (groups), they don't swap or share brood, they don't add more space when their cavity is filled (supering) and they are not crazy about straight, standardized combs. So, no – combining colonies is not something that happens in nature, but it is something that happens in bee management – and it's an old, useful procedure.

[1]If this were a live presentation, I would expect a competent questioner to ask, "Do bees from dying colonies ever drift to more populous colonies?" That would be a good question, and I would not have a ready answer. I would most likely respond, "Probably, but I don't know for sure."

"Hey, just combine them" – *again*

Think about it. What are we actually accomplishing when we combine a weak colony with a stronger colony? Bottom line – we are giving the stronger colony the problem that we probably caused in the first place.

When considering laying workers, let's look at this situation from the perspective of the stronger colony. Out of the clear, blue sky, in ways that would never happen in nature, a functional and staid colony suddenly has ten frames added to it – with some of the frames containing laying worker brood, and supported by a cadre of old, physically depleted workers. Within the hive, I have no idea how the bees sort this mess out, but I do have some guesses.

Figure 2. A newspaper sheet used to combine two colonies.

A series of assumptions

In ways unknown to me, I assume that healthy worker bees, from the receiving colony, perceive the laying worker eggs and brood and either eat or otherwise remove the haploid brood from the combined colony nest. I also assume that the adult laying workers most likely die of old age or from internal colony abuse. Until their death, any eggs that they may have continued to lay,

will be – once again – destroyed by healthy worker bees. The undersized drones really have very little hope of any kind of success (I assume). In general, the undersized drones are just going to die[2].

So yes, as bee colony managers, we all know that a *"suitably strong"* combiner colony can contain and clean up the failed situation. But... was the receiver colony improved or advanced by having to spend its time and energy getting this situation under control? I think not.

I speculate that two or three things happened in this laying worker scenario: (1) We beekeepers did not have to watch the bees from the smaller colony die, (2) we got our deep hive body back with ten frames all nicely cleared out and ready for reuse, and (3) the stronger colony protected the laying worker combs from wax moths. I speculate that rarely is the stronger colony made even stronger by the addition of a laying worker colony or any weakened colony for that matter.

Figure 3. Newsprint being removed 24 hours later.

What caused the weakness?

It is important to the beekeeper manager that they know the reason for the smaller colony weakness. For instance, during this past Spring season, I had a beautiful colony that seemingly would not stop swarming. While I got two swarms from that colony, I don't know how many others got away. But by the time the swarming impulse waned, the once-beautiful colony was only a weakened shadow of its former self. Presently, I have no plans for combining this colony with another, but I know why this unit is now a smaller colony.

Queens age and their output declines. The season passes and worker population declines some. There are many reasons why a colony will be less than what it was just a few months ago. Don't feel pressure to combine just because the colony's population fluctuates some.

Please consider this – Important

Do not combine colonies that are diseased. Be able to recognize American foulbrood (AFB). Isn't it ironic that beekeeper transmission is the main way AFB spreads? Thankfully, AFB is reasonably rare, but stunningly persistent. Make a major effort not to spread this disease – or any other – within your bee yard. If you are uncertain about any disease or another in-hive pest, gather more information or get the opinion of others.

Though off the subject, a comment on making splits is pertinent at this point. Do not make splits or take bees for colony increase from colonies that are diseased. Both combining colonies and splitting colonies are two common times that beekeepers can spread diseases in their apiary.

The timing

If you are combining colonies, the chances are excellent that a major nectar (or pollen flow) is ***not*** ongoing. Before a flow begins and during a flow, beekeepers would be in the *"give the weak colony a chance"* mode. As the food-gathering time passes and it becomes clearer that the colony is not going to thrive, then the concept of combining them with another colony becomes the standard option. So, what else is timely at this point? Robbing behavior.

In previous articles, I have seemingly had robbing behavior epiphanies, and I waxed long and then even longer in some of my earlier articles[3]. But based on my thoughts on robbing, if there is no flow ongoing, I can assure you that foragers from large colonies are not just sitting in the hive awaiting the day when once again flowers abound. Nope – they will be nosing around neighboring colonies checking their defenses.

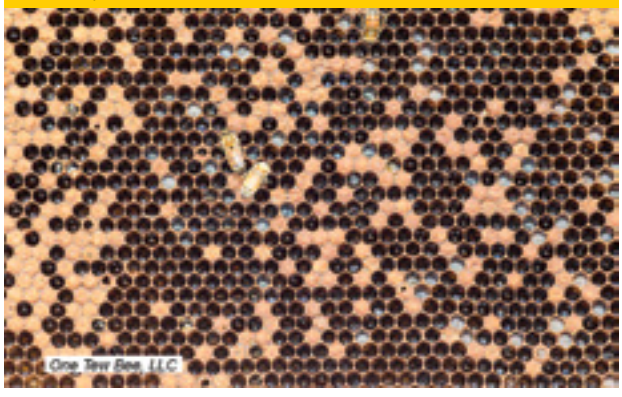
At this point, let's say that you begin the combining process. No flow is occurring, and you are opening two colonies – one very weak – and causing defensive confusion in both colonies. This situation would entice robbers to check out the confusion at the combined colonies. In the bright light of harsh reality, many times we would not be heartbroken to have the smaller colony robbed and killed. Its fate was sealed anyway, but we most likely did not want the healthier of the pair to also be attacked. That's the colony that deserves our worry.

What to do? In a perfect world, we would move the colonies to a different yard. Then there is the reality of moving two colonies at least three miles away and the related problems that are associated with moving colonies. That is a different article. All this effort – all of this typing – all of this thought – is for a small bee colony that is actually nearly dead already. It's what we do. We're bee ***keepers,*** not bee killers.

Colony combining techniques

Shake the bees out of the equipment

Figure 4. A colony with a brood pattern like this should be destroyed – not combined. This frame has American foulbrood.



The combining technique typically varies with the population of remaining bees in the dying colony. If there are only a few – maybe 200 to 300 bees – many beekeepers just shake them out of the equipment near another colony. They may or may not find their way into

[2]In past articles in which I discussed laying workers, I postulated that these puny drones were the last effort of the laying worker colony to dispense its genetic strain into the greater gene pool. Regardless, these undersized drones – last effort or not – do not stand much of a chance for success.

[3]Tew, James E. 2021. Robbing is a normal way of bee life. *Bee Culture Magazine*. March 2021. Pp 90-92

the nearby colony. We knew that would happen when we used this technique.

Newsprint sheet barrier

If – for whatever reason – there are more bees – maybe a thousand or more – a simple sheet of newspaper atop the stronger colony of the two is enough of a confusion barrier to seemingly distract the bees as they remove it from the combined hives. A few slits or a few punched holes through the newsprint is supposed to inspire the bees to remove it more quickly. The weaker colony is put on top of the lower, stronger colony. As per the title of this article, this is not a precise procedure.

***A puzzlement**... I wonder what happens between two opposing bees as they penetrate the newspaper and greet one another for the first time. Do they both smell and taste like newsprint? Do some newly introduced bees actually confront each other in an aggressive manner and beekeepers just do not see it? Rather, are the bees being combined defeated and placid? It does appear, that as newspaper is removed, the bees begin to amicably coexist. It's a puzzlement to me that a simple piece of paper is enough to alter fundamental innate bee behavior. However, it appears that it does.*

Smoke

Use smoke on both colonies. After removing the queen, if she is still present, shake the bees from the weaker colony onto the open top bars of the larger colony. Use appropriate smoke the entire time. Close the colony and remove the now empty equipment from the area. Then, hope for the best.

Sugar syrup

Use thin scented sugar syrup in the same manner as smoke. Spritz both colonies. Remove the queen from the weaker colony and while spritzing the scene, shake the combined bees onto the top bars of the stronger colony. Then, maybe another spray or two and close the colony up. Again, it is important to remove the empty equipment from the area.

Confinement

Using a package bee funnel, shake equal quantities of bees from both colonies into a package cage. Feed the combined bees enough to keep them alive for a few hours. Shake the bees back onto the top bars of the stronger parent colony. What you were trying to accomplish with this procedure was to have the foreign bees have the odor of the colony with which they were being combined.

When releasing the bees, maybe use a bit of smoke or some sugar syrup, but this step is not required. Close them up, and again, hope for a bit of good luck. To me, this process seems like a lot of work, but the procedure is in your management tool box if the need arises.

Everything is a variable

When using this concept of uniting colonies, there are numerous variables. For instance, how many small colonies do you have to combine? Are they tiny colonies or do they have respectable populations? Maybe you raised some queens, and you now have depleted nucs that need to be emptied. Maybe you picked up small swarms that did not grow to a suitable size. I'm speculating. I really don't know why you have these small colonies, but you do have them.

Experienced beekeepers have indicated that they like to leave their good colonies alone and only perform combining procedures using "average" colonies as the receiving colony. Possibly, the average colony is helped by the additional bees. The management point is – do not disrupt your best colonies with these combination procedures. Also important, do not take excessive amounts of brood from good colonies to subsize combined colonies. Always remember that you are essentially working with dying bees.

One quirk without a category in this article

There is a situation when bee colonies – in a way – do combine themselves. Many years ago, when the Africanized honey bees (AHB) invasion was a major beekeeping issue, scientists reported that small swarms – headed either by mated or unmated AHB queens – would alite on a bee hive and invade the European stock within the hive. The invading bees would usurp the colony's European queen and take over the colony. Were these colonies combining or were the European colonies simply being invaded? I am not aware of any recent reports of this happening, but just so you know...

In most instances

After thinking and writing on this subject, I sense that in most instances, when I have combined colonies, I was really just trying to get rid of the aged bees and get my empty equipment back. Additionally, I was trying to keep wax moths from overtaking the unprotected combs. I can't think of a single instance when I ever combined a colony and then truly believed that I had a stronger colony because of the combination procedure.

Figure 5. Frayed pieces of newspaper in front of colonies being combined.

This process seems to be a very useful way to eliminate bee colonies that simply did not make the grade. When keeping bees, you win some and you lose some. Combining bee colonies is simply a management tool. Use it when you need it. The bees will sort things out.

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https://youtu.be/9CtYY-zyx9Q

Honey Zucchini Bread

Fay Jarrett

Ingredients

- ☐ 2 cups shredded zucchini
- ☐ 1 pint fresh blueberries
- ☐ 1 cup vegetable oil
- ☐ 1 tablespoon vanilla extract
- ☐ ½ cup & 2 tablespoons honey
- ☐ 3 cups all-purpose flour
- ☐ 1 cup powdered sugar
- ☐ 1 tablespoon lemon juice
- ☐ 1 tablespoon half & half cream
- ☐ 3 eggs
- ☐ 1 teaspoon salt
- ☐ 1 teaspoon baking powder
- ☐ ¼ teaspoon baking soda

Directions for Bread

Step 1

Preheat your oven to 350°F. Lightly grease either 2 large loaf pans or 4 mini loaf pans.

Step 2

In a large bowl, beat together eggs, oil, vanilla and honey. Fold in the zucchini. Beat in the flour, salt, baking powder and baking soda. Gently fold in blueberries. Pour into the prepared loaf pans.

Step 3

Bake for 50 minutes or until a toothpick comes out clean. Cool for 20 minutes and transfer to wire racks to cool completely.

Note: With honey, the bread will be a bit heavier and may take a little longer to bake.

Directions for Lemon Glaze

Step 1

Whisk together powdered sugar, lemon juice and cream.

Step 2

Drizzle on top of cooled bread.

CALENDAR

♦INDIANA♦

The Beekeepers of Indiana are holding their Fall Conference and Workshops on Friday, October 28-Saturday, October 29, 2022. The location is Terre Haute Convention Center in Terre Haute, Indiana.

Jamie Ellis from the University of Florida and Sam Comfort from Anarchy Apiary will be our Plenary Speakers.

Some breakout sessions include: Producing Comb Honey and Splitting Hives. Hands-on workshops include: Building Hive Equipment, Wax Rendering, How to Make Beeswax Soap and the return of a favorite: Making Candy Boards.

Big hits from last year will be returning: the Smoker Contest and the Honey Show. Rules can be found on the website.

Cost per member is $40 and non-members is $50. All children 15 and under may register for $25. Registration is required to attend both days and participate in any events. Juice and coffee will be available Saturday morning and your registration includes an Italian Buffet Lunch.

More information about the agenda, workshops, directions, links for hotels, etc. are available on the website at **https://indianabeekeeper.com/events/fall_conference**

♦KANSAS♦

Kansas Honey Producers Association Fall 2022 Conference will be held in Salina, KS at Courtyard by Marriott on November 4 and 5, 2022.

Speakers include: Katie Lee, Randy Oliver and many more.

See **www.kansashoneyproducers.org** for more information.

♦MISSOURI♦

Missouri State Beekeepers Association is having their Annual Fall Conference in Cape Girardeau, MO on October 14-15, 2022.

Featured speakers include Dr. David Tarpy – North Carolina State University, Kamon Reynolds – Tennessee YouTube beekeeping instructor, and virtual speaker Dr. Heather Mattilia – Wellesley College Massachusetts, Associate Professor of Biological Studies.

An option to participate virtually is available. Non-members can register for the webinar and become a member for a $10 annual membership fee. Members will receive an email with the Zoom link prior to the conference.

More information can be found at: **https://mostatebeekeepers.org/october-14-15-fall-conference-in-cape-girardeau/**

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Contact Jen Manis to place an ad: Jen@BeeCulture.com

♦NEBRASKA♦

Omaha Bee Club is hosting their second annual Bee Convention on Saturday, October 15, 2022.

With 16 presentations and demonstrations, spacious vendor spaces and a silent auction there is something for all beekeepers.

Go to **www.OmahaBeeClub.com** for more information and to sign up.

♦OKLAHOMA♦

Oklahoma State Beekeepers Association will be holding their annual Fall Conference on October 29th at the Will Rogers Garden Center in Oklahoma City.

Our headline speaker is going to be Randy McCaffery the 628DirtRooster.

Check out **www.SoonerBees.org** for more information and a list of activities.Contact Pat Tickel at **president@soonerbees.org** for more information.

♦TEXAS♦

Texas Beekeepers Association will be holding their Annual Convention on November 3-5, 2022 at the Mayborn Convention Center.

Their conference includes renowned keynote speakers, interactive classes, industry updates, legislative updates, and annual membership meetings.

To register visit: **https://texasbeekeepers.org/** or for more information contact Dodie Stillman at **vp@texasbeekeepers.org**

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Image Contest - Hive Insulation

We've started an image gallery! This month, we want to see any and all pictures you have of **Hive Insulation**. Please make sure that your image is nice and big! We may pick your image for the gallery, or you have the chance to get on the cover! So get creative.

How To Submit:

Email your images to **Emma@BeeCulture.com**
Use the subject "**Image Gallery**"
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- Your mailing address
- Your renewal code (if you know it)

If your image is chosen:

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For the Cover:
You will get twelve months added to your current subscription.

That bear keeps coming around. She hasn't gotten past the fence around the bee yard, yet. But she's intrigued.

First she left a tuft from her lovely blonde coat on a barb on the strand of wire above a solar-electrified, four-foot-high, woven-wire fence. See photo.

The barbed wire operates in two ways: First, bears hate it. (I hate it, too. That stuff will bite you!) Second, it's connected to the ground rod in the fence charging system. If Ms. Bruin puts a paw on the barbed wire above the electric fence and then touches the fence with another paw, she forms part of an electrical circuit from hot to ground, which for her is not so good.

Today the fence was pushed down, as if she'd tried to go over it but then changed her mind.

She destroyed a couple of hives in this yard last Fall. I had to raise hell with the local wildlife officer to get the $260 per hive compensation to which I am entitled under Colorado law. Some bureaucrat in the chain of command said no, based on a technicality, and I had to make a stink to get these public servants to actually read the statute and see things my way.

The gal Marilyn says we never do anything fun, so last week I took her to some primitive hot springs over by the dump. That's where we met Madison, a engaging young woman finishing up her PhD dissertation on ants at the University of California Riverside. Imagine my surprise when she informed us that she'd been hired by the brilliant and charismatic Dr. Samuel "Sammy" Ramsey at the University of Colorado to study honey bee parasites. Ramsey first got the scientific bee community's attention when he discovered that *Varroa* mites feed on bee fat bodies, not bee blood. Now he's doing groundbreaking research in Thailand on tropilaelaps honey bee mites, and Madison gets to go with him. Lucky girl!

There she was, – Madison Sankovitz – sitting in a pool of stinky water by the dump, and we got to meet her! She just landed a dream job and still has her whole life in front of her. I felt a twinge of envy.

I write to you in July. My little darlings got off to a pathetically slow start. Strong colonies did all right and made some honey off dandelions and the first cutting of alfalfa. These were hives that never got divided in April. I split most colonies in the Spring. Always have. This cuts the mite load in half, creates new hives, and dramatically reduces a colony's inclination to swarm.

But I no longer send bees to California to pollinate the almonds, so they're not bustin' out of their boxes in late March like they used to. Now when I divide my hives, or pull nucs out of them, I'm working with generally weaker colonies. When my splits got on May's dandelion honey flow, most simply weren't strong enough to get much benefit from it. Meanwhile, those colonies that had been too weak to divide, but were still stronger than my splits, exploded with honey and population increase.

So I found, side by side in the same yard, powerful colonies with old queens that prospered, and weak ones, many with new queens, that struggled to get going. The rich thrived, while the poor barely made the rent.

I grappled with this at 3 a.m. the other night. I turned ideas in my head, occasionally dozing off, but always coming back to my problem – how do I produce strong Spring colonies with new queens that won't swarm? Because too-strong Spring colonies headed by old queens will surely swarm. And while swarming might be the bees' way to generate new colonies, it's not the beekeeper way.

Finding and replacing old queens in strong colonies is a project. Then you have to get that powerful colony to accept a new monarch and not kill her. I'm not saying you can't do it, but I'm looking for a better way to get new queens to head strong colonies. It has to be easy, or I'm not interested.

I pondered Gene Killion's 1950s recipe for making single-story comb honey hives. You confine a new queen to one brood box below a queen excluder and fill that box with brood and bees. You give those bees no space to expand their brood nest and nothing to do with their time but go up through the honey excluder and make comb honey. That new queen, crammed into one brood box with all her brood nest partners, will not swarm, Gene repeatedly assures us.

I've seen this work. Just this Summer I watched one-story colonies fill super after super with comb honey.

Why not try this for extracted honey production as well? It's a proven comb honey producer. A restricted brood nest ought to help reduce *Varroa* mite increase, and in my limited experience, I've not had runaway mite numbers in single-brood-chamber comb honey colonies. One obvious downside: Come Fall, you'd have to figure out how to overwinter these single-story hives.

When I headed out of town at 6 a.m. after my restless night of mental hive manipulations, I still had bees on the brain. About 7:30, my mind cleared. I had it all figured out. EC

Ed Colby

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