

Summer 2022 | Vol 35 # 3

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Hivelights

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Table of Contents

3 Canadian Honey Council Report ..... Rod Scarlett

5 Regional Reports ..... CHC Directors

11 Special Kids Honey Colouring Section

27 Effect of Parasite Levels and Bee Populations on Winter Mortality and Spring Build-Up of Honey Bee Colonies.....Ernesto Guzman-Novoa, Les Eccles, Paul G. Kelly, Janet Tam, Paul Kozak, Nuria Morfin

33 CFIA Assessment Letter ..... CHC

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Canadian Honey Council Report



Rod Scarlett, Executive Director, CHC

Overwintering losses and spring dwindle in Canada reached historic levels this year. While the final tabulations are not expected to be officially released until mid-July 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 US 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 the Ukraine could 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, pesticides and climate change may ultimately prove to be "real" issue.. ■

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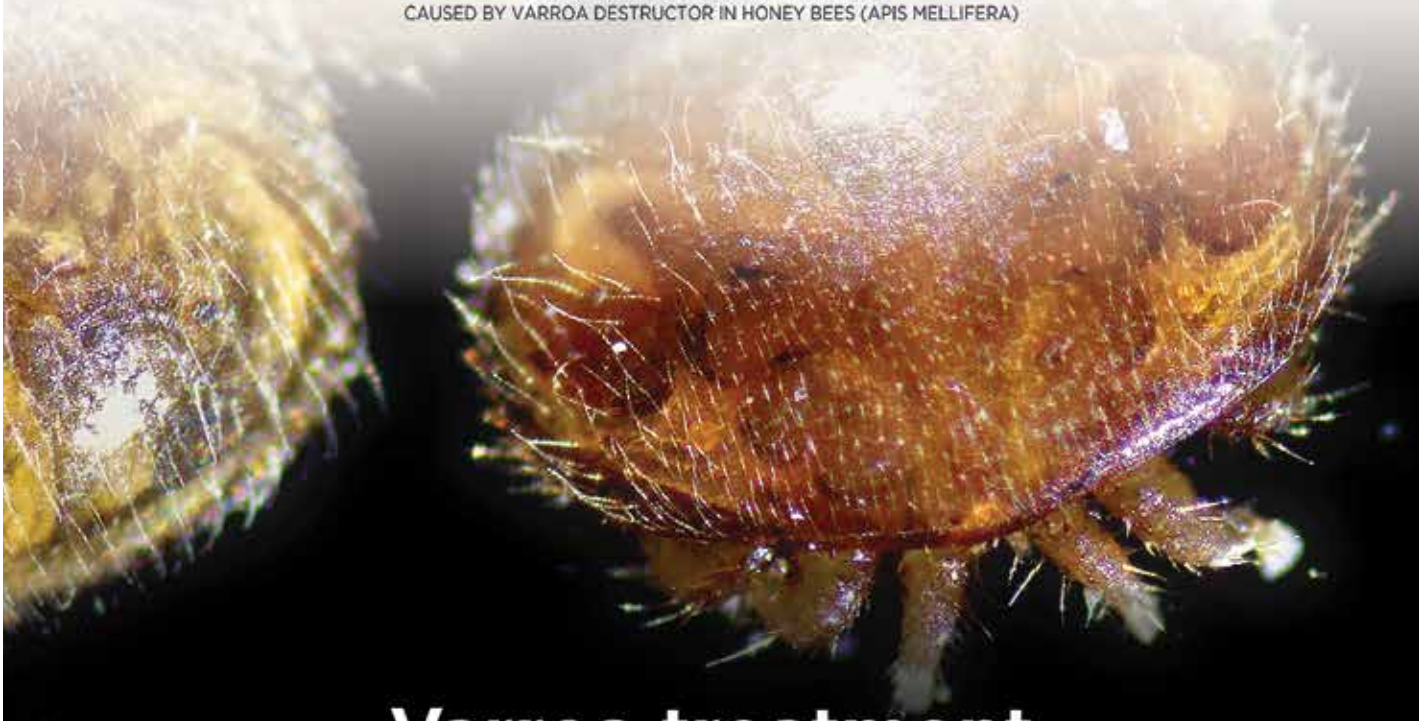

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Regional Reports



Atlantic





Chris Lockhart

Blueberry Pollination has come and gone. Beekeepers saw record prices for their bees this season which is beneficial for everyone who came out of winter with low losses. The down side is a perfect storm of events has occurred. High colony losses in Ontario and Quebec, high blueberry prices, future blueberry land expansion has created a heavy shortage of bees for this season and future seasons. Many fields in New Brunswick this year were short on pollinators. This has left the blueberry industry scrambling to figure out what the future holds for pollination. The demand for colonies to pollinate blueberry fields has always largely been met until this season. Covid has created chaos in the packages world which has affected the entire country. Heavy losses that would typically get filled by offshore packages has fallen very short. It just shows how the fragility of the supply chain can affect several industries. The world seems to be changing and I believe the beekeeping industry needs to evolve with it. Things that we used to count on are no longer there. We as beekeepers are counted on to pollinate crops and support other livelihoods including our own. It may be time for some out of the box thinking and management style changes. The push for more research on varroacides needs to ramp up. As beekeepers we need tools to deal with issues. Without the constant evolution of these new tools the beekeeping rollercoaster is likely to continue.

Québec





Maggie Lamothe Boudreau

Un été qui s'est fait attendre. Le printemps a été froid et pluvieux qui a retardé le développement des ruches affaiblie par le varroa l'été précédent. De plus, très peu de paquet d'abeilles sont arrivé en renfort ce printemps dû au complications occasionnée par les vols d'avions.

Peu de production de miel jusqu'à maintenant avec toute cette pluie peu importe les régions du Québec. La pollinisation du bleuet s'est produite dans les temps et mais les producteurs étaient inquiets concernant la pollinisation des fleurs vu le manque de ruches ainsi que le climat frais et pluvieux qui limitait le vol des abeilles. De fait, encore cette année la production de miel de bleuet a été médiocre. Plusieurs apiculteurs ont pu obtenir un prix de 225$ la ruche pour la pollinisation des bleuets. La production de canneberge se retrouvent dans une situation similaire de manque de ruches pour la pollinisation des fleurs.

La production de reines québécoise a aussi été affectée quelque peu par les pertes de ruches durant l'hivernage et par le climat printanier froid et pluvieux. Certains producteurs de reines ont rapporté une faible production de cellules alors que d'autre un faible accouplement des reines.

En général, les essaimages ont été moins présent cette année sur tout le territoire du Québec.

À l'instar de l'an dernier, il se produit quelques cas de détection du petit coléoptère de la ruche dans le sud du Québec. Le ministère de l'Agriculture et de l'Agroalimentaire du Québec suit le dossier de très près afin de l'éliminer le plus rapidement possible de notre territoire.

Sur ce je vous souhaite un superbe été. Je vous souhaite tout le meilleur pour vos ruches.

.....

A summer that was long overdue. The spring was cold and rainy which delayed the development of the hives weakened by varroa mites the previous summer. In addition, very few packages of bees arrived in reinforcement this spring due to the complications caused by aircraft flights.

Little honey production so far with all this rain regardless of the regions of Quebec. Blueberry pollination occurred on time, but growers were concerned about flower pollination given the lack of hives as well as the cool, rainy climate that limited the flight of bees. In fact, again this year the production of blueberry honey was poor. Many beekeepers were able to obtain a price of $ 225 per hive for the pollination of blueberries. Cranberry production finds itself in a similar situation with a lack of hives for pollination.

Quebec queen production was also somewhat affected by hive losses during wintering and by the cold and rainy spring climate. Some queen producers reported low queen cell production or low queen mating.

In general, swarming was less present this year throughout Quebec.

Like last year, there are a few cases of detection of the small hive beetle in southern Quebec. The Ministère de l'Agriculture et de l'Agroalimentaire du Québec is following the situation very closely in order to eliminate it as quickly as possible from our territory.

On this I wish you a superb summer. I wish all the best for your hives.

Ontario





John Van Alten

Ontario beekeepers have experienced average winter losses just under 50%. There are varying opinions as to why this has happened, but given that most of the rest of the country experienced similar losses we are pretty sure that varroa was a large part of the problem. OBA is encouraging beekeepers to take part in a varroa monitoring campaign to assist in getting data that will help to drive research and solutions to prevent future

▶ pag. 7


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losses of this magnitude. https://www.oahn.ca/resources/varroa-monitoring/

Discussions with Ontario Minister of Agriculture were put on hold because of the election. We hope to be able to meet with the minister again shortly now that the election has happened. We are continuing to work with OMAFRA and Agricorp regarding better coverage and insurance programs for beekeepers. Post-Election.

Honey bee colonies have gone east for blue berry pollination. Preliminary numbers would indicate only half of the required colonies were sent. Beekeepers I have spoken to are indicating that they hope to have most of their hive numbers back up before winter. Given the high price of honey right now, I hope that the rest of our season will be favourable for a reasonable honey crop. This will certainly help to alleviate the financial hit beekeepers have endured this spring.

Our tech transfer team is busy gathering the necessary data to apply for the label amendment to register the use of oxalic acid/ glycerin as a mid season treatment for varroa. Hopefully this can be fast tracked to add to our ability to control this mite and the associated viruses.

Manitoba



Osee Podolsky

Spring was tough in Manitoba, not just for beekeepers but for farmers as well with significant amounts of acres unseeded or drowned out from the rain. Spring dwindle persisted through May and into June. The bees overall never seemed to really want to accel. Cool weather with cold nighttime lows, compounded with the copious amounts of rain put significant strain on already weak colonies. These weather conditions proved to be ideal for Nosema spores to flourish. The KRTP tested multiple operations around the province and found high to extremely high levels of Nosema, some tests cresting over 18 million spores. These hive health conditions caused an extremely slow hive buildup, combined with the already high overwinter losses Manitoba is expected to only have around 40% of our typical hive numbers for the 2022 season.

At this point I'm sure we are all tired of hearing the same stories and are worn out from trying to keep our spirits up. So, at the expense of my own integrity and pride I'll share a few of our less than stellar moments over the years, I hope at least one of you can relate as we can't always be perfect.

Flash back to years past, we were on our first night of moving bees out of the wintering building in the spring. My brothers and I had just recently got our licenses and we were "the A-team" ready to move bees all night until sunup and be heroes. Fast forward to about 4:00am and several cups of coffee. My brother pulls into the beeyards and I'm ready to start unloading his truck. I notice he has and entire row of pallets missing off the back. He proceeds to begin unstrapping the truck and I ask him why he has a part load. To which he looks at the back of the truck, back to me and says, "well I'm pretty sure I left with a full load". After unloading and leaving the yard we confirm that yes indeed he did leave with a full load, 24 singles in a nice pile at the Stop sign only 2 miles from the beeyards.

Another spring we were moving out the bees from our wintering building, and one of our employees calls on the radio that he can't unload the truck at the beeyard. My father responds and asks, "what's the problem", our employee responds, "because there's bees here already". I can hear my fathers blood boiling as his voice cracks over the radio "who would have the audacity to put bees in our beeyard, inside our own bear fence" to which our employee responds, "that would be us, it looks like we forgot this yard last fall" my father bursts out laughing over the radio "That would make a lot of sense".

This fall while moving our bees into our winter building from our holding yards we ended up getting caught in the blizzard which brought our first snow fall. It wasn't particularly cold, but the wind was strong, and the snow was coming down hard. We're almost done only a half dozen or so truck loads left to go. At this point the 5500's are chained up, the 3 Ton is chained up, the Hummer Bee is resembling more of a snow plow than a forklift at this point, and the drifts are nearing 2 ½ feet deep. It is becoming a mess with empty trucks getting stuck trying to get across the field to the bees. But fear not I have a plan, I load up my brother in one of the 5500's with a full load of double for traction. And I tell him "I need you to bust paths through the drifts in the rows and across the field before the drifts firm up". This is one of those moments I wish I would have recorded. I remember all of us just standing there in awe, jaws on the floor, as we see my brother barreling across the field with 80 doubles, blasting through snow drifts like he's the captain of an Alaskan King Crab fishing boat. Windshield wipers flying back and forth, snow drifts exploding in all directions, snow flying over the cab, on top of the load of bees, but he was still full steam ahead. That will be a story told for years to come.

I hope some of you got some enjoyment out of the adventures at Podolski Honey Farms. And I hope with the late crops your bees get those extra few weeks to build up, and we all get a good honey crop with the bees that we are able to run season.

Saskatchewan



Jake Berg

I realized I've talked about this before and to some it may seem that I'm beating a dead horse, but I think we can all agree that we have bee health concerns across Canada. We also have a stock replacement conundrum of where we can safely acquire replacement stock from. With higher than normal winter mortality this spring and all of the talk about needing packages from the Mainland US to replenish Canadian bee stock, it has really made me rethink the overall safety of bringing in bees from other countries and what can be done to mitigate that risk. I realize that the Canadian bee keeping industry needs to grow and must have the opportunity to do so, but it must be done in a manner that does not put your neighbouring beekeeper at unacceptably high risk. This brings me back to sourcing replacement stock from within; whether that be from your own farm, locally or from Canadian replacement stock. I feel this is the safest option although this business model may not fit all beekeepers and at the end of the day the question remains; what is a level of risk that benefits the beekeeping industry as a whole. We need to balance the safety within and ease of growth from importing bees. In the end, the conundrum remains.

Finally, we've seen a bit of somewhat normal weather in Saskatchewan. The bees have finally turned the corner and have started to grow. Although, by the time you read this, nucing and splitting season should be well done. I hope you've had the right weather and bees to start the rebuilding process from the losses that were sustained across the country this spring.

Alberta

Summer is finally here. After a cold drawn out spring, we did have a nice late May and June. It is always amazing how bees can build up when they get on a good dandelion flow. On our farm the last cells

▶ pag. 9

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Curtis Miedema

went into the nucs this week and supers are stacking up in anticipation for the honey crop. It is a busy but exciting time to see everything coming together. Hives have started to move into hybrid canola pollination which seems to be right on time. Reports around the area sound like many beekeepers were able to split their hives and build back most of their losses. Overall, I think hive numbers will be lower this year across the province and were still hoping to have more options for stock replacement next spring. I hope everyone has a safe summer and makes lots of honey.

Alberta



Ron Greidanus

This spring has been the toughest and most heartbreaking spring for way too many beekeepers across Canada. Of the approximate 800 000 hives across Canada, more than 320 000 hives were dead or not viable this spring. How do we rebuild after losses like this? Here in Alberta, 310 000 hives were registered with the province, of those hives, this spring revealed 161 000 dead or non-viable hives. Some producers in the province went from 10 000 hives to 2000 hives. How do you feed your family and pay the bills with losses like that?

Let's do the math. If a beekeeper winters 100 hives, and 90 survive, to regain 100 producing colonies, the producer needs to split from the remaining 90 to re-establish what was lost. This is easily accomplished.

Now if that producer only has 75 hives survive, the producer will need to split at least 25 of the remaining 75 to re-establish the 100 producing colonies. This is still relatively easy and feasible as likely of the 75, one third will be weak, one third average and one third strong.

For Arguments sake, lets say that only 66 of the original 100 will survive. To regain 100 producing colonies, the producer needs to make 34 splits. If we return to the 1/3 rule (1/3 weak, 1/3 average, 1/3 strong) this becomes increasingly difficult, though mathematically simple, in reality it is somewhat more dubious as to whether it can be done without affecting production.

If only 50 hives remain alive in the spring, the producer will have to split every remaining hive to re establish the 100 colonies that were originally wintered. This, although within the realm of possibility, is way outside the realm of practicality. There are going to be economic consequences.

The take home lesson for us is this: Less than 25% winter loss is recoverable without the influx of any external sources of bees and growing the operation is possible. With more than 33% winter loss, recovery can not happen without either serious economic consequences or accessing external sources of bees to replace lost colonies.

We as Canadian Beekeepers do not operate in a bubble. We operate in a niche market that supports other producers of Agricultural commodities. For the most part, we as producers are somewhat oblivious to the benefits we provide to other commodities. Our bees increase the yield of apples in orchards. Our bees represent 80% of the yield from a Hybrid Canola Seed field. Without our colonies, we would not have a strong blueberry industry, or cranberries, or raspberries, peaches, pumpkins, or mustard. That is nothing to say about all the farmers on whose land we have our bee locations who appreciate the bump in flax seed yield, canola yield, buckwheat yield or the extension of life that the bees bring to a hayfield.

If our industry, not just in Alberta, but also in the rest of Canada, remains anemic and stagnant, we will become irrelevant and be replaced by something else. To survive and thrive our industry needs to adapt and grow. To have stagnant numbers is to go backwards. Just as with inflation, if the number of producing colonies in your operation are not increasing, your losing ground.

Apis Melifera is an introduced species in Canada. It is not native here. The species is able to thrive in Canada and produces more kilo's of honey per colony, in Canada, than anywhere else in the world. The only hiccup is our harsh winter – as long as the colony is healthy, the colony can survive. As we are all witness to this spring, its not a matter of 'IF' you will have a wreck – its 'WHEN'. The harsh reality that is spelled out this spring is that Canada neither has the stock available to replace winterloss, nor does it have the stock available to grow the hive count in the country. We are completely dependant on importation of package bees from other international sources to remain viable. And those sources that are currently permitted are insufficient to meet demand.

310 000 hives registered in the province of Alberta in 2021, 161 000 hives not viable this spring. (I will not mention the nucs that Alberta producers made to offset winterlosses that are not registered – I have no idea what the number is but its in the thousands.) How are producers supposed to replace all those dead- Nucleous hives, splits and packages. The reality is that it can not be done in one year. The net result is that honey yield will be affected this year. Alberta is anticipating a significantly lower than average yield this summer.

I have championed re-establishing a mutually beneficial relationship with our friends, Allies and neighbours in the United States and I make no apology for it. If the Canadian beekeeper wants to have a hope of growing their business and meeting the ever increasing demand for honey and pollination services, Canada needs more hives. Here in Alberta, 400 000 colonies is not enough. The largest source of replacement stock, as well as the most environmentally friendly and I will argue, the safest is found in California after the Almond blossom.

Take blueberry pollination as an example. This year, the country is short at least 10 000 hives on the eastern seaboard and likely as much on the west coast as well. Blueberry growers are using leaf cutter bees and bumble bees instead and lowering stocking rates. If Canadian producers had greater access to package bees, hives could be started and split into nucleous hives which could be wintered specifically for blueberry pollination – I am not proposing one package creates one hive that is used for pollination: I am proposing one package starts one hive that is split into three, wintered and then two of those are sent to pollination.

If Canada had a growing population of hives, this would lend stability to honey prices.

As an aside, I do not anticipate that we will see $3 per pound honey stick around for very long. Get it while you can because the reality in North America is this: 50% of the population was living pay cheque to pay cheque in 2021. Now that everything has gone up by 6 %; 50% of the population must cut back on expenses. Honey is a 'B' list grocery item. Mom and Dad will need to make some hard choices at the grocery store. The per capita disappearance rate of honey in Canada and the US is going to decrease – and the world is still awash in honey that costs less than $3 per pound.

The relatively stagnant number of hives in Canada lends itself very well to the ten year boom bust price cycle that the beekeeping industry has been in for the past 50 years. In that 50 years Canada has ceased to be one of the top 10 honey producing countries – I am not sure if we are even in the top 15. The law of supply and demand states that Canada – not just Alberta – needs an every growing supply of hives to meet the global Honey demand and domestic pollination demands. We owe it to Canada to grow.

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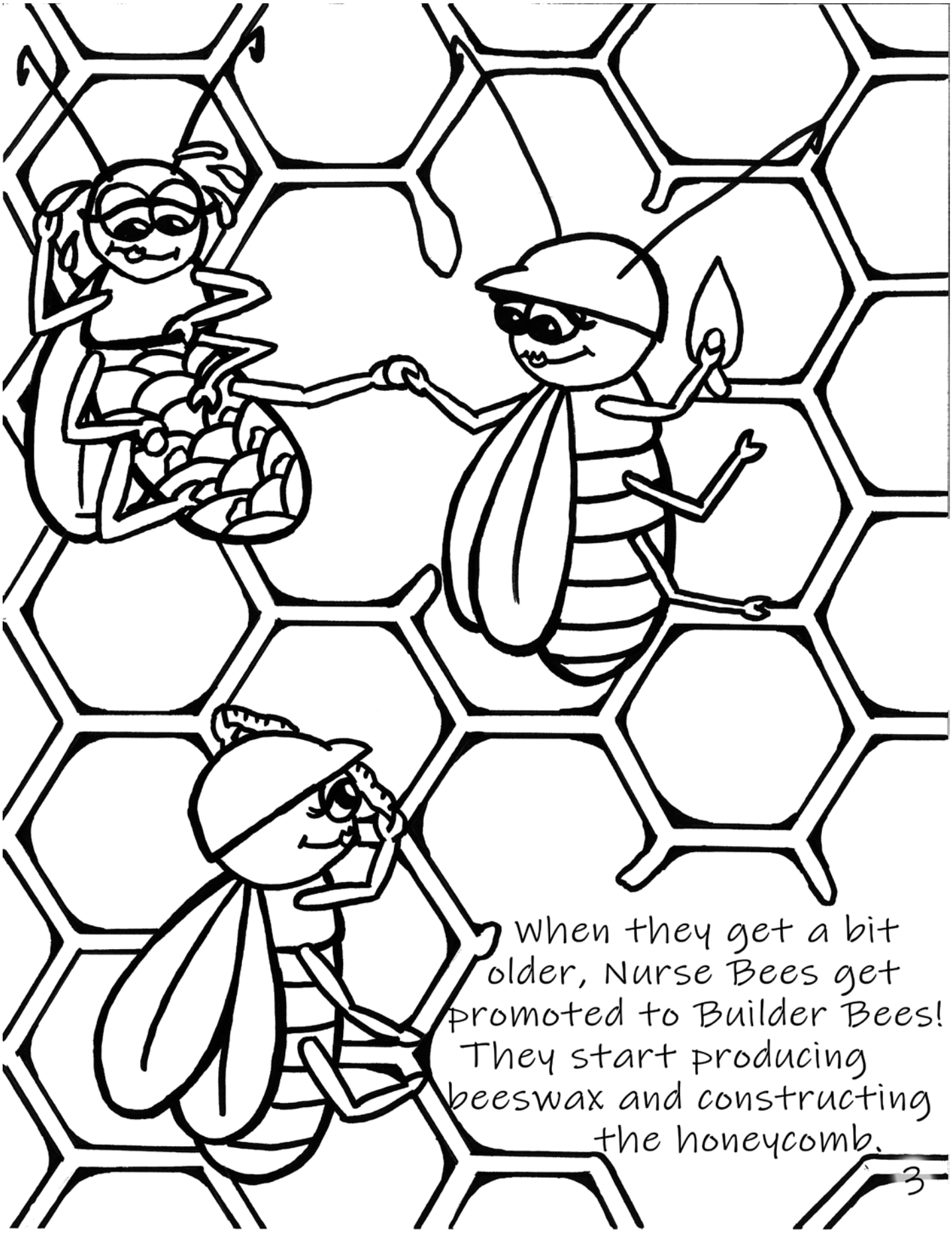
the Canadian Honey Council
July 2022

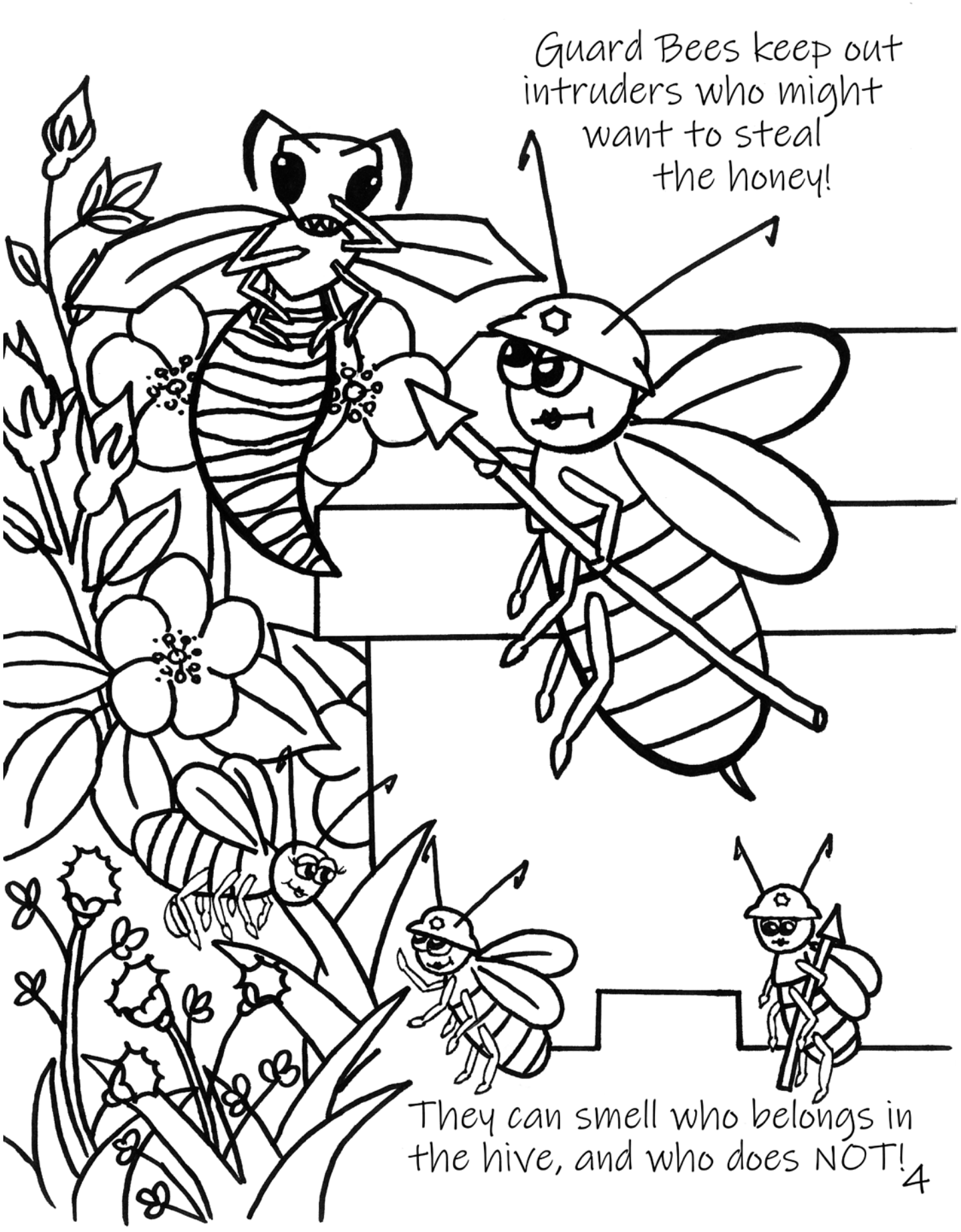

Hi! I'm the Queen Bee.
I'm the mother of all the bees in the hive
Come inside and meet all my children!

All my daughters are WORKER BEES. Their first job after they hatch is to be a NURSE BEE. This Nurse Bee is feeding pollen to the baby LARVAE.

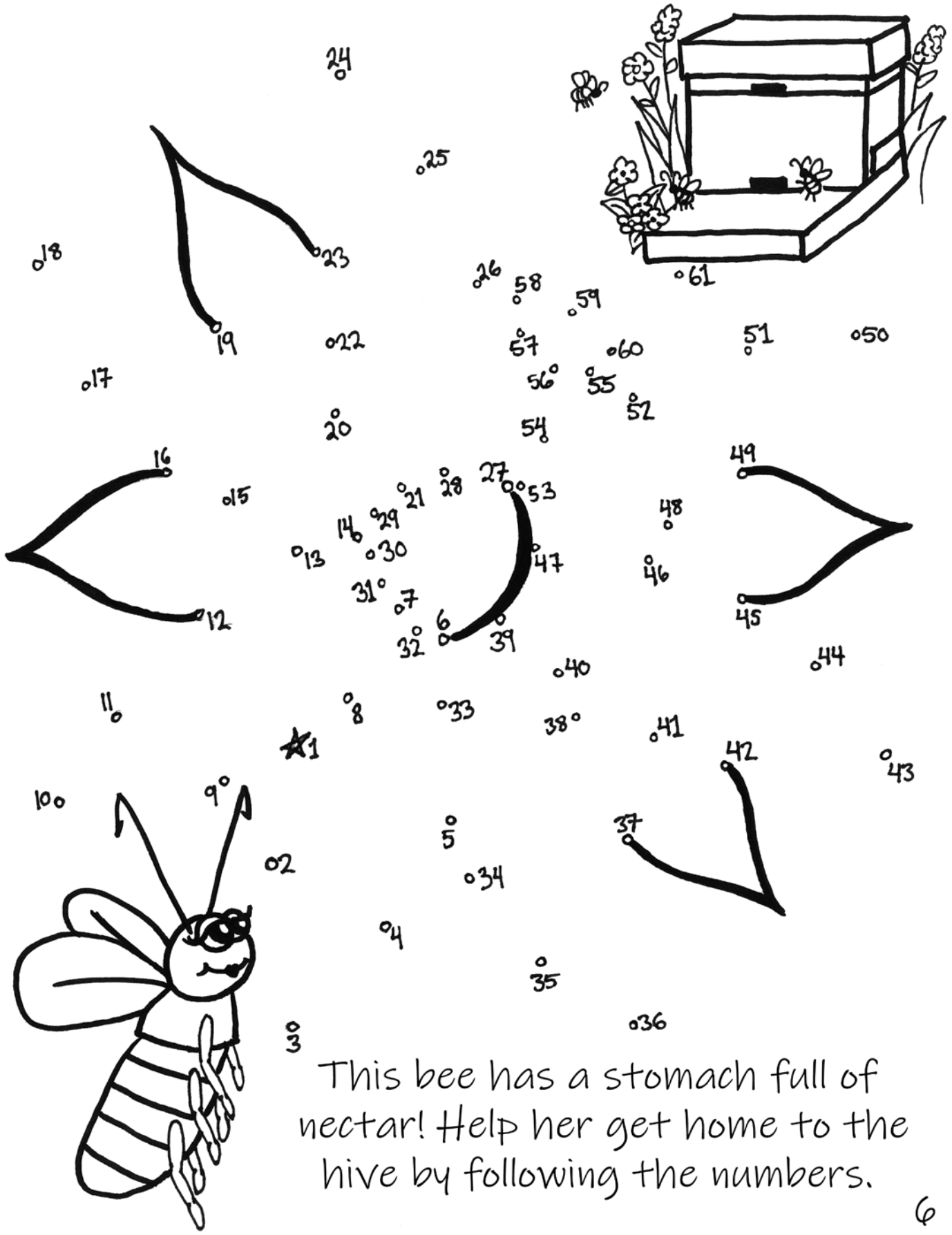




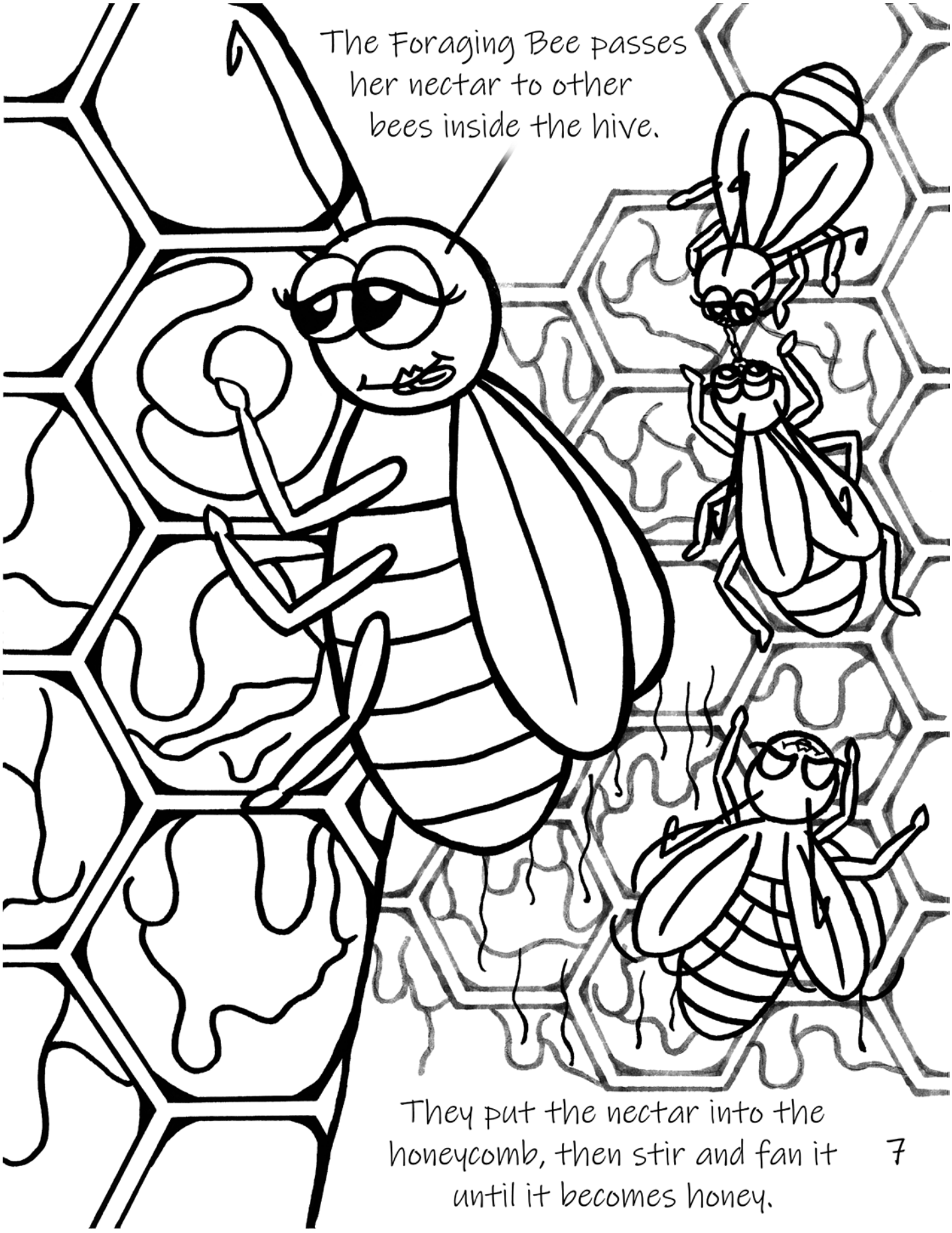
When they get a bit older, Nurse Bees get promoted to Builder Bees! They start producing beeswax and constructing the honeycomb.


Guard Bees keep out intruders who might want to steal the honey!
They can smell who belongs in the hive, and who does NOT!

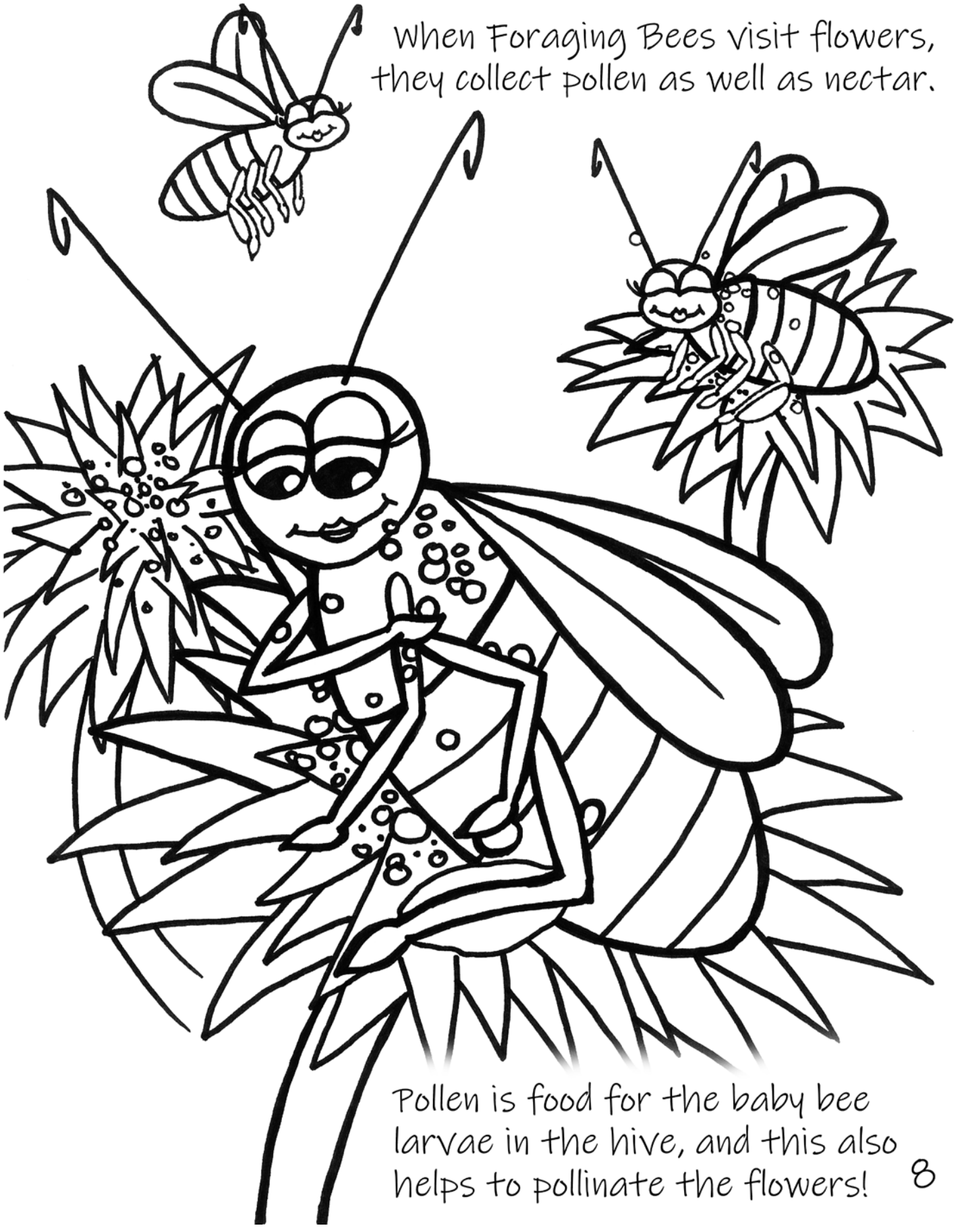

Foraging Bees drink nectar from the flowers.
She'll take it back to the hive to transform it into honey!

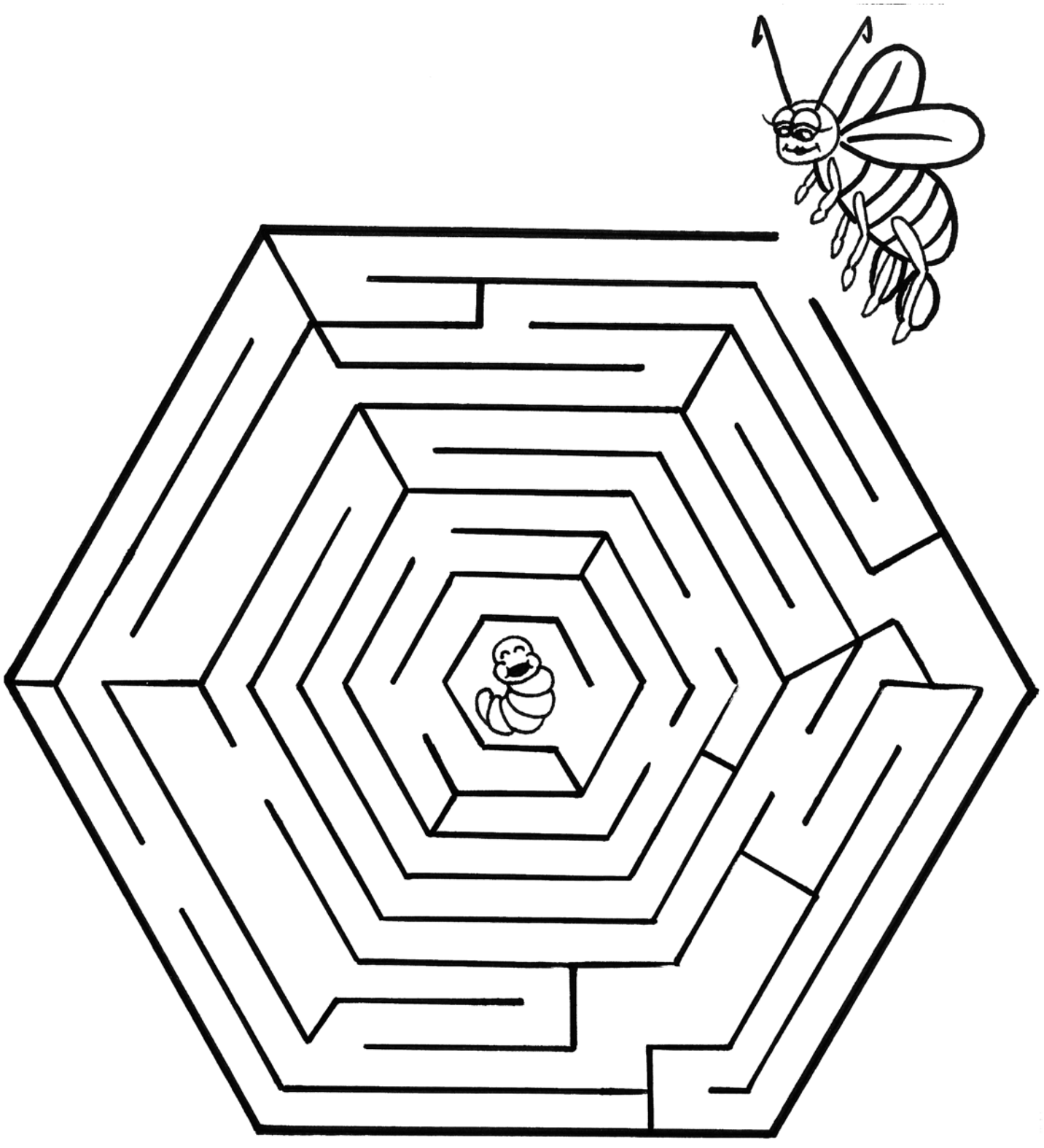


This bee has a stomach full of nectar! Help her get home to the hive by following the numbers.



They put the nectar into the honeycomb, then stir and fan it until it becomes honey.


When Foraging Bees visit flowers,
they collect pollen as well as nectar.
Pollen is food for the baby bee
larvae in the hive, and this also
helps to pollinate the flowers!



Find a path to help this Foraging Bee
get the pollen to the hungry larva!

The male bees are called Drones.
They never do any work!
All they do is eat honey
and try to mate
with an unmated
Queen Bee.

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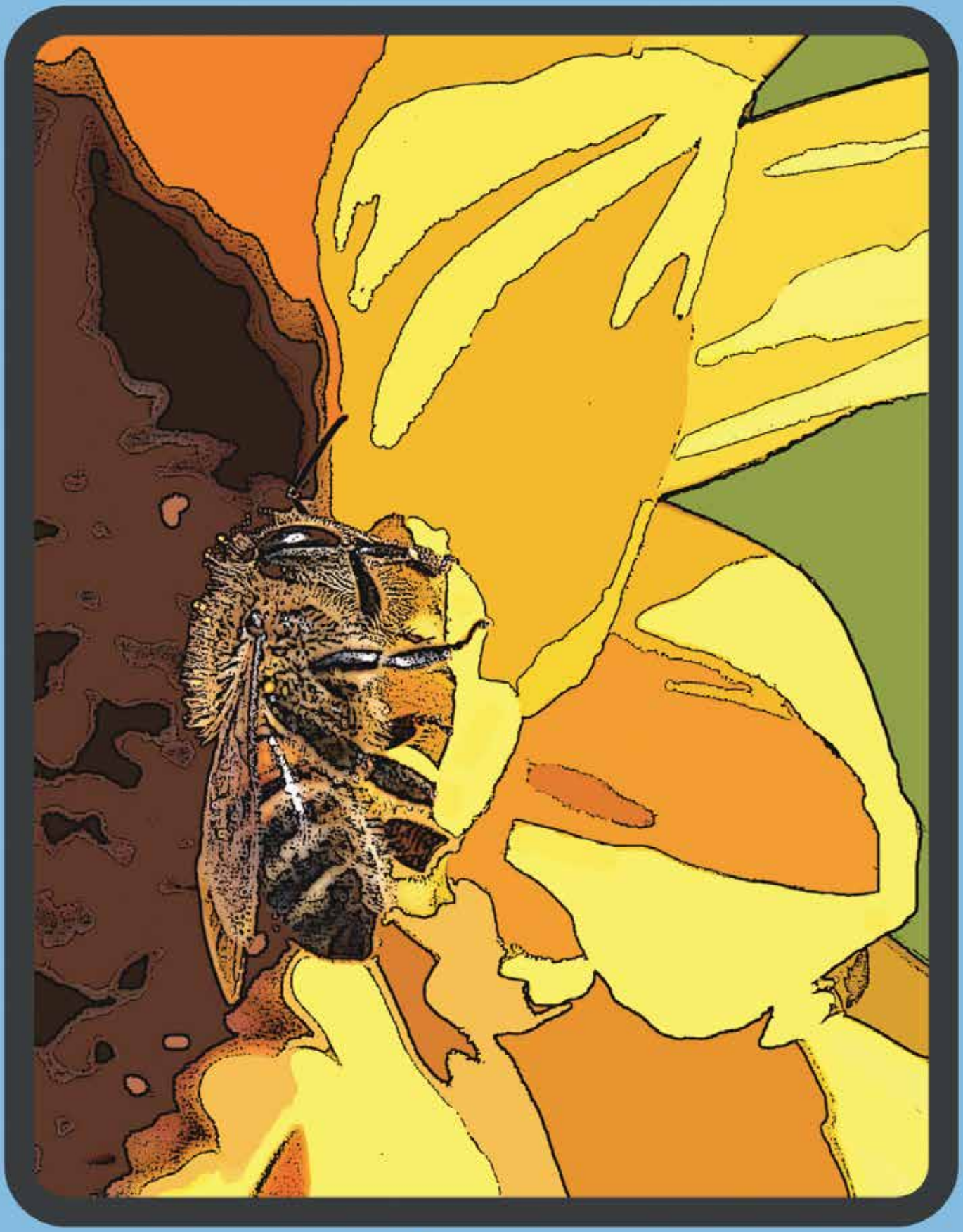

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Effect of Parasite Levels and Bee Populations on Winter Mortality and Spring Build-Up of Honey Bee Colonies

Ernesto Guzman-Novoa[1], Les Eccles[2], Paul G. Kelly[1], Janet Tam[1], Paul Kozak[3], Nuria Morfin[4]
[1]School of Environmental Sciences, University of Guelph, [2]Ontario Beekeepers' Association Technology Transfer Program, [3]Ontario Ministry of Agriculture, Food and Rural Affairs, [4]British Columbia Technology Transfer Program.

Introduction

Beekeepers, crop growers, authorities, scientists and the general public are all concerned and alarmed about the massive die-offs of honey bee colonies that have occurred during recent years in Canada and around the world. This 2021-2022 winter, Canadian beekeepers lost about 45% of their colonies, which is the highest estimated rate of winter colony losses registered in Canada in the last 20 years. This rate is three times higher than the expected rate for winter loss during average years, and represents more than 370,000 colonies with an approximate value of $250.00 per unit. Therefore, the direct loss for the industry is at least 92 million dollars. If we add the potential agricultural-related losses for lack of sufficient pollinators as a result of less and weaker colonies, as well as those for expected lower honey yields, the indirect losses in agricultural products could easily be six times the above figure, exceeding 550 million dollars in a single year. However, despite the current dramatic situation for the beekeeping industry, excessive winter colony losses are not new to Canada. The country has experienced yearly losses above 30% since the winter of 2006-2007 and losses documented at regional or provincial levels have often been higher than the national average, depending on the region and year [1]. The causes of high mortality rates of honey bee colonies during winter have not been well established. It is suspected that the main culprits of these losses include varroa mite infestations, viral infections, climatic effects, starvation, pesticides and queen failures.

In Ontario, the Ministry of Agriculture, Food and Rural Affairs (OMAFRA) granted funding in 2008 for research on the causes behind the mortality of over-wintered colonies in the province. Part of this funding was assigned to our research team at the University of Guelph. In this report, we include results of a field study [2] and a survey that were conducted to obtain information on colony losses. The goal was to investigate the relative impact of factors that are suspected causes of winter colony mortality. Among theses factors, we studied colony management practices, food stores, parasite levels, and colony strength. Additionally, we analysed the relative impact of the above factors on spring colony development. While viruses and pesticides were not included in the design of these studies, the results are still crucial in understanding primary drivers of colony losses. Here we present a summary of the main results of those studies that in our opinion, are still very relevant to explain part of the losses suffered in Canada this past winter.

Methods

For the survey, a questionnaire was developed and distributed among registered beekeepers in the province. The questionnaire contained questions related to factors that could affect colony survivorship and development. With regards to the field and laboratory study [2], and in order to associate potential causes of mortality with colony condition and survivorship, more than 400 colonies located in different beekeeping regions across the province were evaluated and sampled during fall, spring and summer. We analysed the samples collected from the colonies for tracheal mites, varroa mites and Nosema spp. The colonies were evaluated for food stores by weighting the hives and subtracting the weight of the equipment, and for worker population by estimating the number of frames covered with bees. Colony die-offs were recorded in the spring and the data were subjected to statistical analyses.

▶ pag. 29

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Results and Discussion

Survey results

A total of 191 beekeepers responded to the questionnaire. These beekeepers managed nearly 30,000 colonies and had a mean colony winter loss of 32.5%. The percent colony mortality associated to specific fall management practices that beekeepers responding to the questionnaire followed are shown in Table 1.

Table 1. Percent honey bee colony mortality (± standard errors) according to the type of fall management followed by beekeepers that responded a questionnaire on winter colony mortality. *P*<0.05 is significant.

Management	Yes	No	*P*
Hive wrapping	30.0 ±3.4	47.7 ±10.8	<0.05
Sucrose feeding	34.0 ±3.7	35.7 ±8.4	0.912
Protein supplement	35.1 ±5.8	34.1 ±4.1	0.888
AFB treatment	33.8 ±0.2	33.7 ±0.7	0.989
Nosema treatment	33.9 ±3.8	34.9 ±6.1	0.894
Varroa treatment	23.9 ±3.3	56.0 ±13.6	<0.05

The results presented in Table 1 show that the two management practices that had a significant impact on colony mortality were wrapping the hives and treating against varroa mites. Apparently, whether the bees were fed with sucrose or any other carbohydrate source (eg. honey) did not significantly influence colony mortality. The same occurred for colonies that were fed protein supplements or that were treated against nosema disease. Therefore, wrapping hives and treating against varroa mites seem to be critical factors to reduce winter mortality rates of honey bee colonies. More studies are still needed to show the value of feeding colonies protein supplements during fall management.

Field and laboratory results

The field and laboratory study on colony mortality yielded interesting results too. Out of 408 colonies evaluated and sampled in the fall, 111 (27.2%) were dead the following spring. The conditions from 408 colonies for different factors that presumably affect winter colony survivorship are presented in Table 2. Colonies lost more than 40% of their bees and food stores during the winter. The infestation rate of varroa mites decreased during the winter, likely as a consequence of low reproduction for lack of sufficient bee brood. Conversely, Nosema spp. infection levels increased 316 fold. This dramatic increase in Nosema spores probably resulted from the fact that when colonies begin to grow in the spring, young bees become infected as they clean contaminated comb cells for the queen to lay eggs. The fall conditions of colonies that were dead or alive the following spring are shown in Table 3.

Table 2. Mean honey bee colony condition (± standard errors) for different factors that presumably affect winter colony survivorship during fall and spring.

Variable	Fall	Spring
No. frames covered with bees	7.4 ±0.1	4.3. ±0.2
Estimated food stores (Kg)	23.6 ±0.4	12.5 ±0.5
% Bees infested with varroa mites	5.1 ±0.5	3.1 ±0.6
No. *Nosema* spp. spores/bee	9,804 ±4,688	3,108,199 ±327,722
% Bees infested with tracheal mites	1.0 ±0.4	0.8 ±0.2

Table 3. Mean honey bee colony condition (± standard errors) for different factors that presumably affect winter colony survivorship during fall for 408 colonies that were dead or alive the following spring. P<0.05 is significant.

Variable	Dead	Alive	P
No. frames covered with bees	5.9 ±0.2	8.0 ±0.1	<0.0001
Estimated food stores (Kg)	19.0 ±0.9	25.4 ±0.5	<0.0001
% Bees with varroa mites	11.1 ±1.5	2.9 ±0.2	<0.0001
No. *Nosema* spp. spores/bee	18,018 ±14,923	6,734 ±3,238	0.2847
% Bees with tracheal mites	3.1 ±1.3	0.2 ±0.1	<0.01

Results suggest that several of the variables studied had an effect on colony mortality. Varroa mite infestation appears to be the most damaging factor, followed by weak populations and limited food stores in colonies, whereas nosema disease was the least damaging factor. It is relevant to underscore that the surviving colonies showed mean fall varroa infestation levels lower than 3%. Additionally, their bees covered 8 frames per colony on average. This information may be very valuable when assessing fall colony conditions. Beekeepers will likely significantly reduce their colony losses by making sure that varroa mite levels are lower than 3% and that the adult bee population of their colonies covers more than 7 frames in each hive by early fall. This off course requires a monitoring program for varroa mite levels and the assessment of bee populations, which not all beekeepers may be doing.

The effect of parasites on colony spring build-up can be inferred from Table 4. Varroa mites and nosema disease restrained colony development significantly. Healthy colonies had 15% more bees than parasitized colonies. Tracheal mite infestations did not seem to have affected the development of colonies. Studies previously conducted by our group demonstrated that high varroa mite infestations (>5%) and Nosema ceranae infections above 1 million spores/bee significantly reduce honey production [3,4]. It thus seems important to monitor and control varroa mites and nosema disease in the spring if parasitism is above treatment thresholds. When managing risk and long-term survival of colonies, beekeepers should be aware that varroa mite levels will always be increasing throughout the active beekeeping season. With that in mind, the spring is an important opportunity for beekeepers to manage mite levels by lowering them to limit their population growth and damage to honey bees occurring later in the season.

Table 4. Mean number of frames covered with bees per colony (± standard errors) during summer for 208 colonies that were diagnosed as positive or negative to nosema disease, varroa mites and tracheal mites, during the previous spring. The number of frames covered with bees was used as a measure of colony build-up. P<0.05 is significant.

Parasite	Positive	Negative	P
Varroa mites	15.8 ±0.9	18.2 ±0.6	<0.05
Nosema disease	16.5 ±0.6	19.0 ±0.9	<0.05
Tracheal mites	16.9 ±1.0	17.3 ±0.5	0.8297

Importance of mite levels and colony population in early fall

Based on preliminary analyses of unpublished data on winter colony mortality, colony populations and varroa mite levels of several years, we found that a ratio between number of frames covered by bees and

▶ pag. 31

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% adult bee infestation by varroa mites in early fall, could be used as an indicator of treatment threshold. The treatment threshold ratio is around 2.5. In other words, ratios lower than 2.5 should trigger treatment, whereas above 2.5, colonies can better cope with mite infestations and may not require treatment. Populous colonies can withstand higher mite rates than weak colonies. For example, a colony with 10 frames of bees could withstand 4% mite infestation, whereas a colony with 5 frames of bees, could only withstand 2% mite infestation. If possible, beekeepers should evaluate a few colonies in each apiary for mite levels and populations by the end of August or early September, and then, treat accordingly.

Importance of monitoring and timely mite treatment

Reports on the 2021-2022 winter mortality of honey bee colonies from several provinces suggest that apparently conditions in spring and summer of 2021 favoured varroa mite populations to grow faster than in average years, and colonies ended up having high rates of mite infestations by the end of the season. If beekeepers treated late, then even if the treatment killed most of the mites, the health of the winter bees was already compromised as most of them were damaged by being fed on by varroa mites, and therefore, they did not live as long as they should have lived. A study from Rob Currie's lab demonstrated the importance of early mite treatment to increase honey yields and colony survivorship [5]. The recommendation from that study, under the conditions for the Canadian prairies, is that colonies should be treated in the spring if mite levels in adult bees are at 2% or higher, and/or in late August-early September, when mite levels are <4% in adult bees, to reduce winter colony losses. Therefore, it is important that beekeepers monitor mite levels early enough to be able to apply timely treatments before the mites cause damage to summer and winter bees.

Conclusions and recommendations

Varroa mites and weak over-wintered colonies, in that order, appear to be the two most important factors associated to winter colony mortality. Additionally, high levels of nosema disease and mites are associated with poor spring colony build-up and honey yields.

Ultimately, there are no guarantees that all colonies will survive winter. However, successful beekeepers must focus their management practices on the highest risk points. Basically, control what we know is a problem (mites and weak colonies). There are other stressors such as viruses, other pathogens, and pesticides that may be influencing losses further. Therefore, beekeepers may want to manage their risk even further below the levels outlined. Lastly, these data and recommendations are from Ontario, and all regions of North America (including different parts of Canada) have their own unique conditions and pest and disease patterns. Thus, manage appropriate to your region and keep up to date with the advisory from your regional apicultural researchers (University) and extension specialists (Technology Transfer Programs and Provincial Apiary Programs).

Based on the above, the following recommendations are suggested for beekeeping management practices:

Spring:

1. Treat against varroa mites in the spring if infestation levels exceed 2% in adult bees or 6-8 mites on sticky boards. Consider the risk of not treating as varroa mite levels can get out of control and may be more difficult to manage later in the season. Lower Varroa levels may still warrant a treatment and can be an opportunity to use a different miticide as it is important that beekeepers rotate different treatments to delay the onset of *Varroa* becoming resistant to the active ingredients in miticides.
2. Continue to monitor *Varroa* levels on a proportion of your colonies throughout the season.
3. Treat against nosema disease, particularly early in the spring, if infection levels exceed 1,000,000 spores per bee.
4. Disinfect equipment with acetic acid or other authorized treatment to eliminate Nosema spores from hive combs (source of infection for young bees in the spring). Equipment disinfection is probably much more effective than antibiotic treatments to control nosema disease in honey bee colonies.

Summer:

1. Treat in a timely manner (August or early September) if sampling for *Varroa* dictates.
2. Treat against varroa mites and monitor mite infestations before and after late season treatments to ensure that the treatment used is effective (mites have developed resistance against some miticides and re-infestation of mites from nearby colonies may occur). You should have 3% or lower mite infestation rate on adult bees based on alcohol washes in early fall. Alternatively, a 3% adult bee infestation rate is equivalent to about 9-12 mites/day on sticky boards. Another way to determine treatment thresholds is by dividing the number of frames covered by bees by the % mite infestation rate of adult bees in late summer or early fall. If the ratio is 2.5 or lower, treatment is recommended.



Fig. 1. Varroa destructor mite on adult bee. The varroa mite is considered the main culprit of winter colony losses. Photo by R. Anguiano-Baez.

▶ pag. 32

Fall:

1. Over-winter strong colonies. Colonies should have >7 frames covered by bees. If they are weak, it is better to unite colonies.
2. Provide sufficient sugar syrup or honey in the fall to your bees.
3. Wrap hives with insulating material in the fall if you are not currently doing this.



Fig 2. Monitoring mite levels using alcohol washes allows timely treatment. Photo by P. Kozak.



Fig 4. Hive wrapping reduces colony losses. Photo by P. G. Kelley.



Fig 3. Treatments can be applied in Spring and Fall, depending on mite levels. Photo by N. Morfin.

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June 1, 2022

Dr. Siddika Methani
President,
Canadian Food Inspection Agency

As you are no doubt aware, the Canadian beekeeping industry experienced devastating overwintering losses exceeding 60% in some provinces and an expected national average loss of around 50%. As a result, there has been a number of inquiries regarding risk assessments and their evaluations. While the Canadian Honey Council is in full agreement that science must be the tool in determining risk, we are unsure how that determination is made. To put this into context, we have drafted some questions and scenarios seeking clarification.

Regarding small hive beetle, when the original risk assessment was done for the U.S. packaged bees (we also assume for parts of Australia and perhaps other risk assessments) the situation was quite different. In 2014, Ontario had quarantine zones in effect that limited bee movement. In later years, subsequent incursions in Quebec and B.C. were dealt with by eradication. Over time the quarantine zones were eliminated and bees from Ontario can currently move into Quebec, New Brunswick and some of the western provinces if the inspection protocols are followed and the small hive beetle risk is deemed acceptable. The enforcement of provincial legislation prohibits Ontario bees from entering Nova Scotia and Prince Edward Island.

Using the information posted by the Canadian Association of Professional Apiculturalists, the timeline of events concerning small hive beetle are as follows:

2014 - No SHB found in QC in 2014 although it had been found in the province in 2011. SHB Quarantine area in ON is maintained

2015 - SHB found in the Fraser Valley in BC. SHB also found in QC & ON. ON is reporting that it will be transitioning to a strategy for SHB that focuses more on management and traceability. Regulatory responses to SHB will be based on severity of infestation and adherence to established BMPs.

2016 - Only one SHB in the BC. SHB inspection protocol 2016 supported by Western provinces. Status in QC is similar to 2015. Addition SHB finds outside the SHB quarantine zone in ON. The Apiary Program in ON continues to work with beekeepers on movement plans, and biosecurity practices to mitigate the spread of SHB.

2017 - One SHB adult found in BC near US border. Two SHB adults were found in Peace River Region of AB. The operation imported 512 bee colonies from ON without the proper written permission (permit). - As a result, a quarantine area was established. Quarantine is extended until October 1, 2018. If the SHB is not found in next year, the quarantine zone may be reduced. Addition SHB finds outside the SHB quarantine zone in ON. SHB status in QC was similar to 2016. SHB was found in NB for the first time in 2017, near colonies imported from ON.

2018 - No SHB detected in BC or AB. SHB status in QC is similar to 2017 with the addition of CFIA detected a SHB adult in a queen cage from California. SHB in ON is tracked by location rather than colonies. Lab testing is used to confirm SHB infestation in a new location. Yards that have been confirmed positive in previous years are typically not sampled for SHB. SHB overwintering in NB indoors was confirmed in 2018.

2019 - SHB find in ON, QC and NB are similar to 2018.

2020- Similar to 2019

2021 - Similar to 2020

During discussions with CFIA officials when the first instances of small hive beetle appeared in Canada, CFIA was indicating that as long as control mechanisms were in place, Canada would not have to declare small hive beetle endemic. If this is still the case, does CFIA consider provincial regulatory oversight a control mechanism? What prevents CFIA from declaring small hive Beetle endemic today? And if not, under what circumstances does CFIA notify international authorities and trading partners that small beetle is endemic in Canada and what implication does that have on risk assessments already completed?

In discussions at the recently formed federal Working Group on Honey Bee Sustainability, participants were informed by CFIA that they had not received any new information that would force the re-evaluation of a risk or provide cause for a new risk assessment, particularly as it concerns the US packaged bees. What is confusing for beekeepers is understanding what constitutes enough change in the science to warrant risk assessment re-evaluations? When looking

▶ pag. 35

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at Resistant American Foulbrood, the National Honey Bee Survey launched in 2014 found 4.9% of the AFB positive culture samples in Alberta tested positive for rAFB. That same year Tylosin was registered in Canada to provide an additional tool to address AFB. In 2021 Lincomycin was also registered for AFB control in Canada.

Moving on to Amitraz resistance, in 2012 Apivar was granted full registration and no resistant varroa were reported anywhere in Canada according to CAPA. By 2016 there was some reporting of efficacy concerns in some provinces but further testing was needed. In 2017 more provinces indicating concerns over the efficacy of Apivar and variability of control in the field. In 2020, there was further reporting of resistance testing indicating Apivar is still effective but the efficacy can be variable. The question arises as to whether a reduction in efficacy equates to resistance? At which point would CFIA believe there is resistance in Canadian stock or has US surveillance and reporting indicated a change in the dynamics?

With regards to Africanized Honey Bees (AHB), in 2014, based on a Canadian genetic survey, the DNA of bees is mostly "European" but there is some "African" genes. Regardless, Canadian bees are classified as not "Africanized". In 2015, a new test for detecting AHBs was devised that is very accurate and reliable however, its costs were too high for mass adoption ($750 to $1000/colony). In 2017, the NBDC National Survey found AHB genetics in its tests using the mitochondrial test only (not in conjunction with a morphological test). Dr. Ernesto Guzman also blindly tested the bees and confirmed the results that the samples were AHB positive. Dr. Amro Zayed also tested for AHB nuclear DNA and found no AHB positive. The conclusion was that the proportion of ancestry is low. When does the CFIA consider Canadian stock partially Africanized? Does the importation of queens from northern California have any impact on the degree of Africanization? How effective does a protocol put in place by an exporting country have to be in response to an assessed risk? Does it need to be 80% effective, 90% or 100%.

The Canadian Honey Council supports the Canadian Food Inspection Agency and its reliance on science and not outside opinions. The ability to understand how CFIA draws its conclusions would provide the industry with an important context and provides us with research opportunities and examination of potential protocols. By explaining the scientific rationale, it helps clarify outstanding issues in the beekeeping sector.

If you should need any clarification or require further information, please do not hesitate to contact me.

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