Episode 247: Chemical Transfer Within Honey Bee Hives with Angela Encerrado-Manriquez

Jamie

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In this podcast, you'll hear research updates, beekeeping management practices discussed and advice on beekeeping from our resident experts, beekeepers, scientists and other program guests. Join us for today's program. And thank you for listening to Two Bees in a Podcast.

Hello everyone, and welcome to another episode of Two Bees in a Podcast. Today, we are joined by Angela Encerrado-Manriquez, a PhD candidate in the Agricultural Environmental Chemistry Program in the Department of Environmental Toxicology at the University of California, Davis. Angela, thank you so much for joining us on this episode of Two Bees in a Podcast.

Angela Encerrado-Manriquez

Thank you for having me. It's really an honor and a pleasure to be able to share my research with you.

Jamie

Yeah, we're excited to talk with you about this. I actually do a lot of honey bee toxicology work myself. And when I saw the topic, chemical transfer within hives, I know we're speaking about a paper that you and your team published. So, I'm really excited to get into the weeds with you about this topic.

But before we do that, our listeners are going to be very curious how you got interested in conducting honey bee research. How did you find yourself in the honey bee world?

Angela Encerrado-Manriquez

I think it was like destined. So, my dad was a beekeeper, and he was the one that kind of introduced me first to this concept of honey bees and keeping bees in our backyard. And as I grew older, I was like, oh, this is a thing that is happening in my family.

And then he kind of, he's compared it to a second fresh air. And then he started rescuing bees around town when I was in college, and he started doing commercial pollination in our city. And we come from a desert region and from Ciudad Juárez, Chihuahua.

So, if anybody knows El Paso, Texas, you are going to be able to know where. But he started doing a lot of advocacy work and protecting the pollinators and the environment. And I was, at the time, studying chemistry and environmental sciences. And it just ended up speaking to me when I got here to Davis, since it's a very apt region.

I kind of landed in it when I started talking to my current PI, Professor Sascha Nicklisch in Davis. And yeah, I became a mixture of my dad's passions and my mom's passion because she's a chemist. So, I'm like a little mix of both.

Amy

That's awesome. You know, I don't think many people could probably say that. The bees and the chemistry.

So, we brought you on today because you published a paper on enhancing knowledge of chemical exposures and fate in honey bee hives. I guess, can you just tell us a little bit about the background of this project? How did you decide to pursue this project? And yeah, any background information?

Angela Encerrado-Manriquez

Well, this was an idea from my PI, principal investigator. I don't know, a lot of people outside academia don't know that, but my PI, Dr. Sascha Nicklisch in the toxicology department in Davis and Dr. Julia Fine from USCA-ARS.

We started collaborating and we came up with this, a really nice project, we think. And they started with the fact that chemicals in the environment do not exist in a vacuum, meaning that not only bees, but we as humans, we're not exposed to one thing at a time.

So, rather, a conglomeration of things. Like, fragrances have chemicals or when you go outside, there are chemicals floating around. Pests are not just one chemical, but multiple. So, it was the idea of like, in the field with pollinators, there's not just one thing happening to them.

There's a multitude of things in the environment, either environmental pollutants or you also have things that we put in there to make the plants grow better. And these things are also going to interact with the pollinators as they're going through the season. We also started questioning whether sociality honey bee hives would affect the levels of exposure of the different members because we know that not all of them leave the hive the same amount of time, not all of them process the food the same way.

So, we started wondering why it could not be the same for bees as it is for humans. In multiple, in different developmental stages in human, if you have an exposure, you're going to be affected

in a different way. So, babies would have a higher effect of certain chemicals rather than adults, like lead poisoning per se.

So, we started playing with this idea that maybe the younger bees will be more affected than the older bees. And then how could we see or figure out their level of exposure and then figure out how much these chemicals were actually hurting them?

Jamie

I think that's a fantastic strategy because when we hear so much about toxicology or pesticide impacts on bees, it's almost always the toxic part where we get, this compound kills bees or this compound doesn't. But we get very little information, or at least less information about exposure scenarios.

And when most people think about honey bee exposure scenarios, they think about the kind of conventional methods where the adults are eating contaminated pollen or nectar, they're being sprayed directly. But in your project, you and your team and your collaborators, you guys talk about the importance of hive social structure and food sharing in chemical transfers. So, can you elaborate on this a bit?

Angela Encerrado-Manriquez

Yeah, I kind of came up with this analogy. So, if it doesn't make sense, you're welcome to not use it. But this is the best way I could come up with to explain it. So, imagine you have a ball and it's covered with paint, and it's fresh paint.

Then you need to pass it around a room full of people. Do you think the person who has the ball first would have the same amount as the person who's going to be in the middle or at the end of that line of people? Or would someone have more paint? And what if somebody has gloves in their hands and their hands don't get stained?

Maybe someone doesn't even interact with the ball and just let others touch it, and once it's clean, they'll interact with it. So, this interaction with the source would depend on the individual. And then this exposure to the paint will also depend on the individual. And this is kind of where sociality plays a big role, especially in honey bees because each species will kind of be different, right?

But in the honey bees, we have the three castes, the drones, the queens, the workers. And then we have the kind of subdivision within the workers that are age dependent and role dependent, right? And these kind of roles they play in the hive were going to change their exposure with the source that is coming from the outside.

Amy

Angela, I'm just thinking about, you know, isn't it so fun working with bees at the individual level?

Angela Encerrado-Manriquez

No, I would agree the babies are the most fun, I would say. The newly emerged bees are my joy and happiness.

Amy

That's awesome. So, what you're describing is talking about peer-to-peer transfer, right, of these chemicals. And so, when you are working at the individual bee level, how do you measure this pesticide transfer?

Angela Encerrado-Manriquez

This is where I think my analytical chemistry background came into full effect. So, during my master's, I studied method development in different matrices under the mentorship of Dr. Wen-Yee Lee in El Paso.

And then I came here with all this chemical knowledge of analytical chemistry, and I knew that there were limitations in the methods that I've learned. So, I went to this talk, and I talked to Dr. Bruce Buchholz in Lawrence Livermore National Lab, and I found this facility that's called the CAMS Facility, accelerator mass spectrometry, which is a fancy term for us being able to measure really, really small amounts of chemicals.

So, one of the main constraints when you measure something in the environment is that first you need to know what you're looking for, then you need to know how you're going to get it out of the matrix or the source that you're going to be looking in.

If I'm looking into pollen or nectar, they have different consistencies and I'm going to probably have to do a different extraction method. And then that extraction is going to lose, you're going to inherently lose some compounds. So, you might not get the full concentration or true exposure.

But with this technique, we were able to kind of see really, really small amounts and measure these like peer-to-peer transfer of how carbon-14 labeled pesticides are going from one bee to the next. And this is an ongoing project, and hopefully I'll be able to publish it soon and you guys will be able to read it.

But yeah, this is one of the ideas of how we can measure peer-to-peer transfer. There are also some systems right now that are measuring interactions between bees inside the hive, which can also help us understand how many bees are in touch with the food before it reaches members of the hive that are going to be more in danger by chemicals. Hopefully that answers the question.

Jamie

So, Angela, I really find this fascinating that you're able to get to that level of detail with regard to peer-to-peer transfers.

So, you mentioned that the automated honey bee monitoring system, right, in modern chemical trace analysis could be useful, but could you tell us a little bit more about how it works and what you actually mean by this?

Angela Encerrado-Manriquez

Yes, of course. With the monitoring system, we're talking more like video recording, behavior recording. There was a point where we were collaborating in this study that had a little barcode on some bees, and then now, with AI, we can probably do individual tracing.

There are these types of systems for other species. I know that some people in labs are using this type of recording device to look at motility of certain species after they apply a pesticide or an exposure.

So, I know these type of things exist. Just like the fact that we need to apply it to a little hive and kind of control which bees interacting with whom. And the barcodes would allow you to look at individual effects because you can see oh, bee one is going to bee two, and then they interacted three times.

But it will be more like a video recording. And then the modern chemical trace analysis techniques. This is where the AMS kind of comes in and it's just kind of using the tools that are already available in the analytical chemistry world because sometimes fields in science are very disconnected.

And there's things that can be applied to answering questions in entomology or environmental toxicology that are, right now, exclusive for other areas. And they're not exclusive, it’s just the knowledge needs to be brought into these areas and so we can use them to answer these challenging questions. Yeah, hope this answers the question.

Amy

That's really awesome. I mean, I assume you have videos of them. Is that something that you share in your publication or in the additional supplemental materials?

Angela Encerrado-Manriquez

For the tracing, we didn't. Since we're working with Lawrence Livermore National Labs, I was very limited on what I could do over there because it is national lab. This is a future project of getting the system set up with the recordings, but we need to get approval.

We have done recordings on the ones that are not exposed to radio label chemicals that are here in Davis. And I know Dr. Julia Fine does some recordings of the bees, and they have systems in place. I just haven't done it with the AMS because I need just approval from a lot of people and I just haven't got it done.

Amy

That's fair. All right. So, I want to talk a little bit about which bees get exposed most to the compounds. Did you find that there are queens, workers, or drones? Maybe the age of the bee, and which stage is most vulnerable?

Angela Encerrado-Manriquez

This is an upcoming project, but so far, we've seen that workers are very resilient to chemical exposure and they kind of take the hit for the hive, which is something that has already been put out by other researchers in the field, right?

There was also this idea that the workers can sacrifice themselves for the good of the hive and then the queens are never exposed. That's not what we're seeing. They're still exposed and members of the hive are still exposed. But the heat is taken by workers. So, a cool thing about this technique is I can look at individual workers and individual organs and then eggs and stuff like that.

So, the analytical chemistry perspective is pretty cool. But then we can see that there is no homogeneity across how much a worker gets exposed versus another worker.

And we can kind of start making educated guesses, like, is this homogeneity because they decided to randomly interact with the nectar? Or is this because they will sacrifice and then the other ones will be able to get a cleaner diet or a cleaner source feeding? So yeah, we're seeing pretty interesting things, but so far, it's like the workers are taking the hit.

Jamie

So, I think about all of this, right? And I'm sitting here thinking about our listeners around the world saying, OK, we're understanding better this peer-to-peer transfer, but is there anything that we could do to mitigate this movement of pesticides within a honey bee colony?

I mean, maybe you're not studying that yet, maybe that's a long-term goal, but do you have any thoughts on this idea?

Angela Encerrado-Manriquez

Yes, I have. Sometimes, it's not about so much like mitigating peer-to-peer transfer because we don't want to kind of mess up the system that the honey bees have of working their hive. It's

mostly understanding that within this super organism, we can find endpoints and we can find storage sites and we can find vulnerable sites, and then we can create strategies to kind of take those endpoints out of the hive and then prevent further exposures.

One of these great examples that people are already doing, they're replacing wax every certain time, but it's like with the idea that we have found chemicals in wax, but how much does it really end up in wax is a question we're trying to answer. And how much would it diffuse from wax into the diet?

Or is it kind of kept in there? Because it's a really valid issue. So, these questions will be kind of informing those strategies that are already in place like the wax changing or even requeening and how effective they are and if we can come up with other strategies targeting these endpoints, the storage sites or these vulnerable places in the hive.

Amy

So, Angela, you kind of just discussed this a little bit, but, ultimately from an applied perspective, how does this research or how can this research help beekeepers?

Angela Encerrado-Manriquez

Well, I will acknowledge that there's still a lot of research to be done, and I'm pretty confident that Dr. Nicklisch and Julia Fine are going to keep going with this project. I'm only a PhD student and eventually will graduate, but I think my research feels very fundamental, but it can help, hopefully, understand if the steps we're taking to protect the hives are going to be steps that are actually going to protect the hive or are steps that are costing money to beekeepers.

I think requeening is one that comes to my mind very often because there's still so many unknowns about the queen and how she gets exposed, how much she gets exposed, if she gets exposed, can she get rid of the chemicals. So can I say kind of clarity on is requeening necessary?

And when is requeening necessary? It's one that I can hope that my research can start making these questions and inform guidelines on how and when to requeen or how and when to change wax frames, stuff like this.

Jamie

Well, you just said a second ago that you're only a PhD student, but there's no such thing. You are a scientist making contributions to the beekeeping world and the health of bees. Even if you think this is more kind of fundamental research, it can have long term application.

And I'm curious, I know that you work in someone's lab at the moment, but what are some of those big next steps? Where do you see this research heading? What do you see as big research needs in this space?

Angela Encerrado-Manriquez

I guess I am a researcher, right? A lot of years in this.

Jamie

That's right. That's right.

Angela Encerrado-Manriquez

I think it's kind of making these collaborations with other fields. It's a big area that I'm seeing and really help bee research because it’s not isolated, but there's so many techniques and so many things that you could apply to answer the questions and get so much information about the hive.

And this is just me nerding out about analytical chemistry, but there's so many tools. So, I think, for example, AMS can be still optimized, and it could be a technique for people to understand big hive environments and how you can trace chemicals from a little egg all the way to the worker at the end.

You can really understand how multiple chemicals behave in that environment, how one single chemical behaves, how miticides are going to behave in the environment, and if they're really going to be spread throughout the whole hive. That is one. Also understanding small amounts of chemicals and then how they're going to affect the behavior or how they're going to affect colony health.

Because a lot of studies sometimes try to use really harsh concentrations just to see an effect, and they're not really environmentally relevant. Also, it’s because the technique that they're using needs a high concentration for you to see it.

With AMS, you can see, I think, what is this size for AMS… pretty low. Well, I cannot find it, but in our future paper you can probably find it, but that's another thing. And then, this chemical combination is something that I know Dr. Nicklisch is pretty interested in, I'm also pretty interested in, and I hope the lab keeps working on it.

And it's kind of figuring out chemical combinations that are going to affect either specific protein or specific enzymes that are in charge of detoxification. Because as we know, chemicals are in an existing vacuum and trying to just assess the toxicity from one single chemical exposure, it's not really going to tell us all the answers we're looking for.

So, kind of saying, OK, if in the field they are going to apply these three chemicals, we should probably apply them every, I don't know, in this time frame. So, then bees don't have an accumulation of chemicals or maybe we need to replace the wax. Yeah, I think that's it. That's the way that this research is going.

Amy

Angela, I think the work that you do is really awesome. I'm wondering, you know, has your mom been involved with the chemistry piece of your research at all?

Angela Encerrado-Manriquez

She was more involved when I was doing my master's in chemistry, but she's always been – I send her my publications and then we discuss other research and yeah, she's very much on top of what I'm doing, and we can have little arguments and things. So, yes, she's in there, definitely.

Amy

And with your dad and the beekeeping part of it, is he understanding all the ins and outs of research? I assume you're communicating what you're doing with him as well.

Angela Encerrado-Manriquez

My dad unfortunately passed away in 2020, so I really wish – I think he'll be really happy that I'm kind of continuing into the bee world. But yeah, I got to share with him when I first got to Davis and started thinking about this project. And he was really excited to meet the campus. He never unfortunately got the chance to, but I'm sure he'll be really happy about it.

Amy

I'm sure he's very, very proud of you. Well, thank you so much for joining us today. We look forward to seeing what future research you're going to be conducting and your contribution to the honey bee world. Good luck with everything.

Stump the Chump

It's everybody's favorite game show, Stump the Chump.

Amy

All right, welcome back to the question-and-answer segment. Jamie, the first question that I have for you, so, you know, we all get busy.

Many of us are hobbyist beekeepers. We are not checking our hives every day. We don't have time to go through our hives all the time. And so, I guess when life starts to get busy, first of all, this is a two-part question. 1A, how often do you need to go into a colony?

How often should you go and check a hive? And let's say that you don't have much time. What is the bare minimum you feel like needs to be done when someone is going through a colony?

Jamie

Good things to consider because all of us were going to have to go into our colonies throughout the year. And I do get that question a lot from new beekeepers. I even wrote it an article for the American Bee Journal years ago about the time commitment associated with keeping bees for this very reason. My general recommendation is during production season, and I consider that spring.

So that would be maybe the four or six weeks leading up to the major nectar flow and through the major nectar flow. I usually work my colonies once a week to once every 10 days. And that's because of the way that I try to practice swarm control requires me to go in that often.

I want to make sure the colonies are queen right, all of that stuff. So, I will go in every seven to 10 days through production season. In summer, that slows down. I will often go every three to four weeks because mainly they're on cruise control at that point. If they've made it to summer strong, the honey flow is over.

I just want to make sure the diseases and pests are under control. That makes it where I only have to go in probably once every three to four weeks. When fall comes around, I kind of keep up that three to four week strategy. And then usually when winter rolls around, I don't go into them at all.

Here in Florida where I currently live, usually starting the week of Thanksgiving is when I will start kind of thinking about winter and my winter maintenance. And for us here in Florida, of course, anywhere in the US, that's the fourth Thursday every November for those of you listening around the world, that's when the American Thanksgiving is.

And it's that time that I start considering my colonies in the winter mode. And during winter, I don't even go into my colonies. I will go and hoist my colonies once a month. I hoist them from behind just to make sure that they have enough food. To put all of that in your 1A question answer, I usually go every seven to 10 days in spring during production season.

You know, once every three to four weeks in summer in the early fall, and then not again throughout winter. As long as everything's OK. Which bleeds down into your 1B question.

Amy

Hold on, hold on, hold on. Before we get to 1B, what is hoisting?

Jamie

Hoisting. What I do is, as we all know, the Langstroth hive has handles around the walls of every box. And what I'll do is I'll go to the bottommost box and for my hives that would be a deep brood box. I'll go to the back of that box and in that back handle, I'll grab the handle and rock the hive forward towards the entrance with the one hand.

And that's a way for me to gauge the weight of the colony and the weight of the food stores in that hive. So, I call it the hoist test. And that allows me to know how much food they had and it tells me whether or not they need to be fed. And during winter, I'm not really managing for queens and all that other stuff because I've closed the colonies down.

I'm really just checking to make sure that they have enough food to survive winter. To pivot then to your 1B, what am I doing? What's the bare minimum that I recommend when I go into a colony, I always look for a handful of things. Is there evidence that they have sufficient food?

So, when I go into a colony, that's always in my mind. And those of you who listen to the podcast long enough know that my standard colony configuration is a deep brood box, a metal bound queen excluder, and a medium super of honey. That's my bare minimum hive size. And so, when I go into my colonies, if I see that medium super full of honey or if it's very heavy to take off before I go into the brood box, I know that they've got enough food.

If they don't have a lot of food, I know that I need to feed them. So, I'm thinking food. When I get into that brood box, I'm thinking two things. Is there evidence that the queen is good? She's laying well, she's a good quality queen, good brood pattern, etc. That's number one.

And number two, is there evidence that Varroa is running wild in my colonies? And I'm looking for deformed wings. I'm looking for spotty brood patterns. I'm looking for mites on bees, those sorts of things. So, I'm thinking food, queens, Varroa. Go figure, Amy.

Right? And that's what we talk about all the time, kind of the big three. Food, queens, Varroa. Food, queens, Varroa. Now, my eye is trained enough to where when I'm in the brood nest, I do notice things like small hive beetles and I do notice things like dying brood or I'm not necessarily going and looking for European foulbrood or American foulbrood or chalkbrood, but my eye is just trained to look for it.

But by and large, I would argue that if you go in looking for three things, food, queens, and Varroa. Food, queens, and Varroa. That will solve most of your problems. And if you're looking for Varroa specifically, that causes you to look at the brood and then the brood nest. And at that point, you'll notice any other things that might be a problem.

So put all of this together, spring, you know, every seven to 10 days, summer usually three to four weeks, fall, three to four weeks, early fall, and then winter will only go and hoist the

colonies once a month. When I go into my colonies, it's food, queens, Varroa. Food, queens, Varroa. Food, queens, Varroa. That's the bare minimum I do and look for when I assess a colony.

Amy

Well, there you have it. Jamie, I need to make fun of you for a second because here people know that we are at the University of Florida right now. We are based here in Gainesville, FL and the Gainesville area. Beekeepers gave you an award.

Jamie

They did, yes.

Amy

They gave you an award, and you are beekeeper of the year.

Jamie

Yes, it was very humbling. I love it. I did speak to the Gainesville Area Bee Club. I know that we released these podcasts much later than we record them, but it was last week and they gave me beekeeper of the year. So, I'm very humbled and honored. It's very nice. First time they've ever done it.

My kids were making fun of me about it, like, Dad, you're a terrible beekeeper now. If they only knew. Like, guys, I've got perfectly healthy colonies now. But I was very honored. And I think a lot of it had to do with the fact that our listeners now know that I'll be leaving the University of Florida soon and going to University of Georgia. So, it's just been really nice to interact with beekeepers and see how much they've cared about our program here at UF. And it was just very nice. It was very kind.

Amy

Very nice. They sent me a picture afterwards with a nice prom, I guess, like they called it a prom background.

Jamie

Oh yeah, they had a sweet – they did. It was really, it was cute. They had one of those fancy backgrounds and I got to stand in front of it and hold my plaque. I was humbled and honored to have received that from them.

Amy

That's hilarious. In that first question, 1A and 1B, all I could think was like, this is why he made beekeeper of the year everyone.

Jamie

I know a lot about bees, even if I can't keep them myself. Right? Take that, children.

Amy

That's hilarious. OK, so on to the second question.

Jamie

Yeah. Before I get in trouble.

Amy

So, OK, we have talked about this quite a bit. We talk about clipping queens. And again, you know, it's one of those things where you ask 10 beekeepers a question and you end up with 35 different answers, right? And so clipping queens is one of them. And so, let's talk about clipped queens again, you know, just the idea behind it. And then what happens to them when they try to swarm?

Jamie

Amy, I'm going to have to tell you a story which prompted this question. And again, it kind of goes back to what I just said with the previous question. I'm in the process of relocating from, you know, where I live here in Florida to relocating close to Athens, GA, which is where the University of Georgia is. And as a result, I had to move my bees recently.

So, I've gone ahead and moved my bees, my bee colonies up to Georgia in preparation for that. I had a colony in my backyard here in Florida. And for those of you who are listening to this, we're recording this kind of late April 2026. About a month ago, I had gone into my colony, and we were on the precipice kind of a swarm season down here in Florida.

And I was thinking to myself, OK, I definitely have to start going into these colonies weekly. I've got swarm cells, they're clearly there. I need to do something about this. Well, it worked out such that I could not go into my colony for like two weeks. And I remember going, I was walking back to my colony.

I'm like, man, it's swarm season. It's been two weeks. It's swarm season, it's been two weeks. I wouldn't be surprised if I get up there and find a swarm underneath my hive. And I've talked about this before on the podcast. I'm like, I wouldn't be surprised, I wouldn't be surprised. I walked down to my colony.

There's weird activity, and I look, there's bees swarming in the other hive, and then I look underneath the hive stand and there's this big swarm sitting there. And the reason I knew this would happen, Amy, number one, it's swarm season and it's been 2 weeks since I'd seen it.

An Equal Opportunity Institution.

So, I knew they were going to try to swarm. But number 2, it all comes down to your question. clipped queens. I knew that I clipped my queens, and I knew that my queens can't fly. And as a result, I knew that if my colony tried to swarm, that my queen was going to try to take to the air and that she would be unsuccessful.

And I've talked about this again on the podcast time and time and time again, and I've seen it so many times in my own operation that the moment I walked down there, my prediction had come true. And I knew that that swarm was a swarm that tried to leave my hive, that the queen was clipped.

She fell to the ground, and she crawled back onto the hive stand and the swarm settled there with her. And Amy, if I've said it once, I've said it 1000 times. More often than not, they'll crawl back into the nest and try again tomorrow and crawl back into the nest and try again tomorrow.

If they don't do that, they'll say, we have swarmed, we're going to sit here until we can leave. And that's what they had done. They were just sitting underneath the hive from which they came. They would not go back in. They're like, we swarmed, we're no longer part of this colony.

But because my queen was clipped, I didn't lose a bee, and I was able to hive that swarm. And then I had two colonies instead of one. Had I put that swarm back into that hive, they would have tried again, and tried again, and tried again until they ultimately do away with the queen and swarmed with the first virgin queen to emerge.

So, I got two for the price of one just because I clipped my queens. It's not swarm control, it's swarm insurance. And I knew before I even walked down the hill what I was likely to find. And that's exactly what I found. That clipped queen in a swarm underneath my hive. That's what happens when they try to swarm.

Amy

I have so many follow up questions on that though. So, at one point, so you mentioned, let's say they keep trying over and over and over and then they just decide, you know what, we're going to leave the queen. We're going to go off with a virgin queen somewhere else. Like, at what point would that happen?

Jamie

That's a good question. I'd love to do some research on this, so I'm going to give you my anecdotal experience. In my anecdotal experience, there was a time in my younger beekeeping days I would have just gathered up that swarm and put it back into its original colony.

The problem I have found over the years is once a colony has issued a swarm, they will not stop until that urge is satisfied. So, putting her and that swarm back into the nest, they're just going to swarm again tomorrow.

Collecting it again and putting it back into the nest, they're just going to swarm again tomorrow. Every colony seems to have a different threshold for that. Like, in a lot of my colonies that swarm would have just gone back into the nest. But there is a point past which they will no longer do that.

That swarm will consider itself to have swarmed. Now, some colonies might do it after the first swarm. There may be no way that that swarm goes back into the nest. Some colonies that might take three or four or five times of the queen and the swarm crawling back in before they say, we've tried it, we're failing.

But at some point, every colony seems to reach a threshold that the queen is lost, and they will swarm with the first virgin to emerge. And notice how careful I am to say the queen is lost. I don't know with certainty if she just simply fails to make it back into the nest and they're like, we're done with you.

My sneaky suspicion is that they are actually killing her and going off with the first virgin to emerge after that, so I'm really careful to talk about it. I'll say she's lost because I don't know for sure if they just leave her on the ground after one of their unsuccessful swarms or if they kill her when she's back in the nest saying hey, there's something wrong with you.

But regardless, I just know that if I fix it and fix it and fix it and fix it, at some point I lose my old queen and they just take off with the first queen that can fly. And so, that's why I say putting that swarm back in there doesn't really solve the problem. They're going to keep trying.

So, I always just hive that swarm. If I want to combine it back with the original colony later, that's fine, but it can't be instant. And so, in this case, I just gathered her and put her back in the hive. So, it seems to be colony dependent, that threshold. The number of times they try before they say enough's enough, we're going with the next queen.

Amy

So, then, Jamie, the other follow up question I was thinking about while you were, you know, talking about the situation that your bees were in is you went a couple of weeks without going out there. You saw what you kind of expected to happen. Let's say, you didn't have time and you didn't go out there. What do you think would have happened to that swarm of bees?

Jamie

An Equal Opportunity Institution.

Good question. So, what I've seen in my experience is occasionally the swarm will just set up residence there. I kid you not. I've seen comb built by swarms underneath their original hive. And that's because they're like, this is just going to be the place that we live now.

I happen to use screened bottom boards. So sometimes when the swarms go underneath the hive, there's still a lot of contact between this form and their original nest mates through the screen. And what I suspect happens is, a lot of time, the swarm will essentially, I use human, you know, anthropomorphisms.

They'll just kind of give up and go back into the nest. The queen is lost in the process, and they'll swarm again. So, my guess is if I'd given them another week, I wouldn't have even noticed it because that swarm would have gone back into the nest. The queen would have been killed probably, and they would have swarmed with the first queen to emerge.

And so that's my suspicion. But I knew that I was kind of in that window that they would have been in swarming mode and not fix it mode. And so, I saw what I thought was a possibility to see. It was just waiting right there for me to grab.

Amy

Sounds awesome. This is an extra long Q&A. Today, we had 1A, 1B, 2A, 2B, 2C and now we're on three. So, the last question that we have for today, we've kind of discussed this in a past Q&A, but I wanted to bring it up again, is just the different types of foraging bees.

You know, they have different roles. What are the different roles that they have? I guess, how do they kind of decide who does what?

Jamie

Yeah, when a bee leaves the nest, she's going to collect one of four different things. That is a worker bee. She's going to collect either nectar, that's for the purpose of producing honey, right? Or they're going to collect pollen which they convert to bee bread, or they eat straight up, which we know they used to produce brood amongst other things.

So, nectar and pollen, we all know those two things. They will also collect tree saps and resins, which they will use as propolis, right? And they will collect water which they use for thermoregulation purposes. Now, there's pretty good evidence that what a bee is, is what she is.

So, she won't necessarily be a nectar forager today and a pollen forager tomorrow and a water forager the next day. Whatever the need of the colony is at the time that she decides to move into that foraging stage, that's what she will remain throughout her foraging lifetime.

So, for example, if she's like, OK, today's the day that I'm a forager, you know, whoever most compellingly, for lack of a better term, recruits her to a job, be it a pollen forager or a resin

forager or a nectar forager or so forth, that's what she ends up doing. And as you can imagine, there's greater demand for pollen and nectar foragers, so the majority of the worker bees will find themselves foraging for those two things.

But in summer, you'll see the demand for water foraging go up and, therefore, slightly more bees than at other times of the year will become water foragers. And that's what they'll do. They won't toggle back and forth between foraging for different things. And within honey bees, you'll even get kind of flower constancy.

So, when we pivot specifically to pollen and nectar foragers, whatever they're foraging on tends to be what they will forage own throughout their lives. So, for example, let's just say here in Florida, the bees have been moved to pollinate watermelon and gallberries blooming in the bushes as well.

If a bee was recruited as a watermelon pollen forager, that's what she will forage. Even if she encounters other blooms of other plant species while she's out, she's there to collect watermelon pollen and that's just what she's going to do.

If she was recruited first, as you know, a gallberry nectar forager, that's what she's going to do. Even if she flies by saw Palmetto that's also blooming. So, you don't only get type specific recruitment where they'll just be water foragers or resin foragers or pollen foragers or nectar foragers.

You also get within the pollen and nectar foraging, you get this kind of flower constancy where they'll be specific species of flower foragers. Remarkable. Remarkable.

Amy

Yeah, seriously. OK, wait, what about the bees who are coming while I'm extracting honey? What forager bees are those?

Jamie

Those are robbers that tend to stay in that behavior as well. So, you have to watch out for those girls, yeah.

Amy

Definitely. Very cool. I don't remember exactly which episode we talked about the different jobs of the foragers, but it was very memorable in the sense of, you know, knowing what bees do when they come back from foraging, right? Like, remember when we found out that propolis, they just basically put it into a mound and then they shift it around. That’s so cool. So crazy.

Jamie

Crazy. Bees are so cool.

Amy

I know. They really are.

Jamie

We have the best subject of study of anybody in the world. I can't imagine people want to study anything else.

Amy

I know, seriously. Well, thank you listeners for listening. And don't forget to send us questions. We love questions, we love follow-up questions. We love our ideas being challenged. So, send them our way. We can handle them. We enjoy it and we hope you keep listening. Thanks for supporting our podcast.

Hey everyone, thanks for listening today. We would like to give an extra special thank you to our podcast coordinator, Jeffrey Carmichael. Without his hard work, Two Bees in a Podcast would not be possible.

Jamie

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