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SPEAKERS

Amy, Stump The Chump, Jamie, Dr. Margaret Couvillon, Guest

Jamie 00:10
Welcome to Two Bees in a Podcast brought to you by the Honey Bee Research Extension Laboratory at the University of Florida's Institute of Food and Agricultural Sciences. It is our goal to advance the understanding of honey bees and beekeeping, grow the beekeeping community and improve the health of honey bees everywhere. 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, and welcome to another episode of Two Bees in a Podcast. In this episode we'll be interviewing Dr. Margaret Couvillon from Virginia Tech University. She will be talking about the intricacies of the honey bee waggle dance. Then we will do a Five-Minute Management on discussion of various hive types from a historical and practical perspective. And of course, we'll finish today's episode with aquestion-and-answer segment called Stump the Chump. Hello, everyone, and welcome to another episode of Two Bees in a Podcast. Amy, when people find out that I'm a honey bee researcher, almost everybody will tell me the very basic facts that they know about bees. They'll tell you how bees make honey or bees are dying or bees sting. But almost everyone seems to know as well that bees dance. They communicate by dancing. When was the first time you learned about waggle dances, Amy?

Amy 01:55
I guess when I first started beekeeping, you're right.

Jamie 01:58
We are fortunate because we're joined by an expert on the waggle dance, the dance language that bees use to communicate information to one another. That expert is Dr. Margaret Couvillon, who's an assistant professor of pollinator biology and ecology in the Department of Entomology at Virginia Tech University. Margaret, thank you so much for joining us on this episode of Two Bees in a Podcast.

Dr. Margaret Couvillon 02:18
Thank you, Jamie. And Hi, Amy. It's good to be here.

Jamie 02:21
I think we're going to spend a lot of time talking about the waggle dance. I love teaching about it because it's just one of those things that's absolutely fascinating to me, Margaret. But before we get there, since this is your first time on the show, we really like to introduce our listeners to our new guests. So could you tell us a little bit about yourself, you know, your background and bees, bee research, bee schooling, and how you ended up where you are?

Guest 02:44
Absolutely. So, hello everyone. My name is Maggie Couvillon and I'm an assistant professor at Virginia Tech, as Jamie said, and I have a particular interest in honey bee foraging and recruitment, especially the amazing waggle dance. But I actually got into bees a little bit as a lucky accident. So back in 2002, I was an unhappy PhD student in neurobiology. And as part of my studies that first year, we had to do a departmental seminar on a current research topic. And I stumbled across this research paper that had been published recently, and it was from the lab of Gene Robinson. And the paper looked at, oh gosh, it was the differential expression of genes between nurse bees and forager bees. And you know, so it had kind of a neurobiology focus, but it was the background on the honeybees themselves. It just blew me away. I'd never read anything that was so cool. So, I kind of stuck it out in my neurobiology program for another year, but I kind of stayed pretty unhappy. And then in that next year, I was lucky enough to be awarded a fellowship that I could take wherever I wanted. And so I thought, "Well, now's the time," and so I, I left neurobiology, and I went to bee behavioral ecology. I moved overseas to the University of Sheffield. I'd never been there, kind of a move sight unseen. And I joined a bee behavioral ecology research lab that was headed by Professor Francis Ratnieks. And I've never really looked back since.

Amy 04:14
Wow, did you have any honey bee experience before you had read the research paper?

Dr. Margaret Couvillon 04:20
None. I had gone to a small liberal arts college for my undergrad and I had majored in biology and chemistry. And I had kind of this inkling that I really wanted to do animal behavior, but I didn't have the vocabulary to describe what that meant. And that's how I sort of ended up in neurobiology, which does investigate animal behavior, just from a mechanistic side. You know, what are the brain patterns that generate a particular behavior? And what I didn't know is that I wanted to study behavior from an ecology and evolution standpoint, you know, how did these behaviors evolve and what's the adaptive benefit of them? And most importantly, what are they like when the organisms are doing them in the field. It took, you know, it's just as important to find out what you don't like as it is to find out what you do. And so for me the path to bee research was circuitous and had a couple of dead ends in other directions before I actually got where I wanted to be.

Jamie 05:15

But you're at Virginia Tech, now. And so you're able to do some honey bee research. So, what is your current academic split there at Virginia Tech?

Dr. Margaret Couvillon 05:22
At Virginia Tech, I have a 70/30 split. I'm 70% research and 30% teaching.

Jamie 05:28
Great.

Amy 05:29
Oh, wow. So you have no extension percentage. That's so funny.

Dr. Margaret Couvillon 05:32
It was a strategic decision from a new department head where he took what was previous a position that did that extension/research teaching split. And he created not one but two jobs from it. So I have the research and the teaching. And then book ended on the other side is my colleague, Dr. James Wilson, and he does extension and teaching. So I have no extension and he has no research.

Amy 05:57
Yeah, that's so awesome. It's always so fun to hear about, you know, the different splits that the faculty have around the nation. So back to honey bee behavior. You know, I feel like that's what people are most attracted to, right? As soon as we start talking about honey bees, of course, Jamie mentioned the stinging, the honey, and just overall, people either being completely obsessed or completely scared of them. But then we start talking about behavior, and people start becoming even more fascinated with honey bees, right? And so one of the many projects that you're working on, and that we're talking about today is the honey bee waggle dance. So you were working to identify the waggle dance as a way of understanding how nest mates communicate with one another about food sources, so about foraging. So before we actually get into your research, can you tell everyone what the waggle dance is?

Dr. Margaret Couvillon 06:48
Sure, so, so at its most simple, the waggle dance is a recruitment behavior. So it's when you have an individual in a group that wants to tell the other individuals to do a particular job or task. So a lot of different organisms do recruitment, you know, ants and wasps and even naked mole rats. But what's really cool and unique about the waggle dances, it's not just a recruitment behavior, but it communicates a location. And so when a bee forager has found a good resource, usually nectar or pollen, she'll come back to the hive, and she communicates to her sisters the distance and the direction from the hive to the resource, and this is the waggle dance. And it's visible to the eye, it can be decoded, which means that, you know, eavesdropping scientists like myself can can recover that distance and direction that's being communicated. And then with that information, we're able to map on the landscape where the bee has collected the good resource.

Amy 07:44

So, I always actually have trouble when I'm trying to explain it. You did a great job explaining it. And when we look at a frame and we see them waggling, I mean, what does that mean when you actually see them waggling?

Dr. Margaret Couvillon 07:57
Right, so when, let's say a bee is out in the landscape, and she's found a good resource, and she comes back to the hive. She notices where the sun is on the horizon, and then what's the angle from that position on the horizon to the resource? So let's say the angle is 270 degrees because that's like nine o'clock on your clock. She'll go inside and she'll recreate that 270-degree angle with straight up standing in for the sun. So when she's waggling her abdomen, her head will be facing to the left it at nine o'clock on the clock, and she's moving her body back and forth, waggling that abdomen, and then at some point, she'll stop and she'll turn and then go back to the beginning, and then she'll repeat waggling her abdomen with her head facing, you know, facing straight to the left at 270. And then she'll stop, and she usually turns in the other direction and comes back to the start. So she'll repeat these waggle portion and then return portions of a variable number of time. But the information is encoded in that middle part where she's waggling her abdomen really quickly.

Jamie 08:59
Amy, it's kind of interesting that you mentioned that it can be a struggle to understand. I just happened to be having breakfast this morning with two of my graduate students, and we were talking about the waggle dance, and we're actually talking about how it's like the most difficult thing for us to teach the undergrads, despite how --

Amy 09:15
It's so hard.

Jamie 09:16
Yeah, despite how we try with videos, with documents, with explaining it.

Amy 09:19
All you can do is like, shake your butt.

Jamie 09:21
Maybe that's why I'm failing, I'm not actually dancing for them, but we've admitted that it's difficult to teach. And Maggie you're spot on. I mean there's -- it's such a really fascinating behavior, but it's been studied a while, right? The individual, Karl von Frisch, who helped decode it, he won a Nobel Prize for it, but you specifically study this behavior as well. Can you tell us about your research related to honey bee communication through the waggle dance, what you're actually looking for, and what are some of the new contributions you're making to this topic?

Dr. Margaret Couvillon 09:52

Yeah, so it's a lot of fun to actually work in an area that has been studied before by so many people, especially, like you said, Karl von Frisch and, you know, we truly get to stand on the shoulders of greatness with a lot of our work. But there's still so much that we don't know about the waggle dance. And so one of the less explored areas is how we can develop it as a tool to help the bees themselves. So the research in my lab wants to understand when and where pollinators, especially bees, collect their food in the landscape. And we hope that ultimately, our research can lead to recommendations that can help the well-being of the pollinators in the future. One of the largest projects we have going on is using the waggle dance, this behavior where the bee is communicating a distance and a direction. What's important to realize is that not every forager who's out there on a flower is going to come back to the hive and do a dance, it's only the ones who are working the best resources at any given time. So when we work with waggle dances, we're not looking at all the forage in the landscape, but only what the bees have evaluated to be the best at any given time. So right now at Virginia Tech, we have an ongoing study in three different landscapes across Virginia. And each one of these landscapes differs in, sort of, the main features. And in each landscape, we've put three observation hives, and then for two years, starting in 2018, we let all three observation hives just go about their business, right, they come and go, they forage freely in the landscape, these three different landscapes. And we video recorded the dances that they do when they return to the hive. And then after the fact, we take these videos, and we can find the waggle dances and extract the distance in the direction that the bees were communicating, and then use that information to understand how the bees are collecting their food in the existing landscape. It tells you where there's good places for them to get food. Conversely, where there's bad places where they're not getting food, times of year when it's easier or times of year when it's more difficult, and how the interaction of landscape will impact both of these.

Amy 12:05
So when we're talking about the the actual forager that comes back and does the waggle, she'll go ahead and do the waggle dance. Right? And you said she does that a couple of times. Do the other sisters take that and start sharing that information as well? Or, you know, what does that look like? And do the -- do the workers kind of do the same waggle dance? Have you have you looked at that?

Dr. Margaret Couvillon 12:29
We haven't looked specifically at that. But some other researchers have done some really valuable work looking at the interaction between the information flow within the hive, in addition to kind of, you know, an individual -- an individual bee's private experience. So when a bee dances, it's an independent decision. Your forager will decide whether or not she dances and sort of her audience is a little secondary to it. But the bees that are following the dance then have their own choice they need to make. Do they themselves go check out this resource, or will they do something else? So if one of these dance followers has a previous memory of another valuable resource, she may choose to keep going back to that place that she herself knows before she checks out something new. And she might follow dances just so that she has updated information about what the rest of the landscape looks like. But a bee can also choose to go ahead and try to check out that advertised resource, the resource that the dancer is communicating. She may or may not find it. If she does find it, and it also is valuable to her, she may come back and choose to do a dance as well. So when you have, say, a really good

resource in the landscape, you can have a situation where several bees are advertising it simultaneously. And that will show up in our data, you know, as a really hot spot for that particular period of time.

Jamie 13:49
So there's, the scientist in me is really welling up here with lots of questions and notes. I'm trying to keep up but there's so much I want to ask. I'm going to maybe ask this very first one. I was intrigued about, not all worker bees end up dancing for the resource that they're -- that they are foraging on themselves. And I'm wondering -- this may not even be known -- but I'm wondering what would -- what threshold has to be triggered for a worker to dance or not? I mean, what, what cues are they saying this is worth dancing for or this isn't?

Dr. Margaret Couvillon 14:22
Oh, that's an excellent question. At its most simple, the cue is looking at the benefit of the resource that she's advertising offset by the cost to collect that resource. But the interesting thing is that proportion, that fraction of, sort of, benefit to cost will change based on, for example, time of year. So it may be a time of year where there's less food that's available. It might just need to have marginally beneficial forage to trigger a worker coming back and doing a dance.

Jamie 14:55
So they'll lower their standards when the resources aren't quite as good in the environment.

Dr. Margaret Couvillon 14:59
We all do it. And then conversely, when it's the time of year when there's a lot of forage that's around, it has to be an exceptionally beneficial resource before the bee will choose to do the dance. One of the most obvious metrics, one that we can measure, is the sweetness of nectar. And bees are so sensitive to sweetness. And they've evolved to maximize that as one of the things that are measured. You know, if it's sweeter, it has more calories. And so, you know, if they have to fly slightly further, it's offset by this sweeter resource. And that's something that we can also exploit in the field a little bit. So you know, let's say, when we want to train bees to feeders, we really need to target a time of year when there's less resources available, because bees will always prefer to go to the flowers and not the artificial feeders. So we have to make sure that their thresholds are pretty low. And then we can get them very interested in the feeders and accomplish our experiment.

Amy 15:55
Every time I speak to anyone that does research on honey bees, I just, they're just so amazing. It is unbelievable, you know, all the stuff that they can do. But so I was just wondering, you know, out of the foragers that go out, what percentage of foragers dance, and is that percentage steady over time? Or is that, you know, I'm sure that's kind of based on resources as well.

Dr. Margaret Couvillon 16:17

I think you're right. I think it's based on resources, and so it will then fluctuate across time. If it's a time of year when, let's say, they have a real need for pollen, and it's a day that's suitable for pollen collection, you know, not too wet, not too windy, you'll probably see a lot of different dances that are for pollen, but the ratio of that will change when the hive starts rearing less brood quite so actively.

Amy 16:38
Is there -- so is there a different dance for pollen versus nectar that has been found? Or right now, it's just the resources overall?

Dr. Margaret Couvillon 16:47
That's an excellent question and one that actually stumped von Frisch himself back in the day.

Jamie 16:51
Oh, Amy, you're about to get your Nobel Prize, here we go. Or Maggie, I'm not sure who's going to get it, but maybe you guys can split it.

Dr. Margaret Couvillon 17:00
Oh, Amy asked a good question. We'll let her have the award.

Amy 17:03
I'm willing to share.

Jamie 17:05
Oh, good. Generous, generous you are.

Dr. Margaret Couvillon 17:07
So, it is all the same dance, for pollen, for nectar, actually, for any resource. There was an interesting story a couple of years ago where bee keepers in France were suddenly intrigued because there -- they found, in their frames, some green and blue and brown honey. You know, we've all seen different color pollen in the frames, but actually the honey was these really vivid colors. And what they found was that there was a candy factory that was within the foraging range of the bees. And the candy factory was making M&Ms and there was some sugary dyed water runoff from the factory that the bees had found, and I'm sure that was sufficient in July, which is when they were finding this particular peculiar honey crop. it was sufficient to trigger dances that probably had massive recruitment going to this dyed water. And so the bees were making honey from this candy runoff and it actually didn't officially pass, sort of, the French government's definition of honey. So it all had to be thrown away. But I guess all to say that anytime there's a resource that's valuable, the bees will dance for it. That's -- and it will be the same dance, this is true for pollen. This is true for nectar. This is true for if they're collecting honeydew, you know, the really sweet secretions that comes off of aphids. And it's even the same dance when they're hunting for a new nest site. It just will not be happening within the hive, but instead will be happening on the backs of their sisters when the swarm is clustering nearby, but it's all the same dance.

Jamie 17:07
So, Maggie, you're killing because I keep scrambling to write questions down and unfortunately, I'm getting lost in what I want to ask you now. So a couple things quickly came up. You know, can bees get duped? If it's the same dance that's communicating nectar versus pollen, and this bee is a pollen forager, can she be duped while watching a dance that's occurring for nectar, fly to it and be confused about the resource? I feel like I've got a working hypothesis in my head about this, but how do they control -- how does the one receiving information discern what is being danced about?

Dr. Margaret Couvillon 19:15
There's a lot of cues that are coming from the dancer, not just the vector. So while she dances, the scent of what she was on will come off her body and very importantly, while she dances, you'll often see the dancer engage in prophylaxis with the dance followers. So it's like she's saying, "This is where it is, and this is what it tastes like." So I think in terms of nectar foraging, and probably at times of year when they need to forage for water as well, I think the dance receivers will know what it is that they are looking for.

Guest 19:49
So, I want to follow up with one more question, and then I'm going to have to quit being super-nerd because I've got so many questions I want to ask you but one, another thing that came to mind is going back to these dancing bees, you were talking about only a subcomponent of the bees actually dance. Amy asked about what percent -- is there a steady percent? So they're not thinking back to this. Is there any genetic component to dancing? Are there dancing Patra lines, Patra lines whose offspring are more likely to engage in this dancing behavior? Or is it truly randomized based on the threshold of resource that the bee is experiencing in terms of quality?

Dr. Margaret Couvillon 20:26
I'm gonna actually answer that in two ways. So one is, you know, as you know, there is a genetic component to a bee's sucrose sensitivity. So you can have some bees that are very sensitive to how sweet something is, you can have some bees that are less sensitive, so the resource has to be even sweeter for them to detect that it's sweet. And it's sweetness is something that the bees value in their decision whether or not to dance, then it stands to reason that there will be also a genetic component in, sort of, the propensity to dance. And you know, nectar foragers tend to need very sweet resources to trigger dances, pollen foragers, not as sweet, because pollen, which is just barely sweet, is rewarding for them in itself. And then in terms of your question about sort of, like, who is dancing with whom, and you know, how does it all work at maybe the colony level? There's an interesting thing that we've looked at in the past few years kind of fundamental science adjacent to our more applied work. We're interested in the individual calibrations and also information flow in the hive. So you know, let's look at just distance: So, what we found is that there's a lot of individual difference in how bees communicate distance. So you have three bees, and they're all foraging at one kilometer, and there'll be a little bit of variation that's stable for that individual in the way that they communicate that distance. And we're interested in kind of the the individual differences in how they communicate distance, and then does that impact to whom they dance? And then importantly, the dance receiver, are they

successful in finding the resource? When recruitment is successful, is it because the dancer and the dance receiver happened to be speaking a more similar language than when it's not successful? So that's something that we're looking at right now in my lab as well.

Amy 21:44
So, it's funny when you were talking about the M&M factory, I actually just got a call two days ago from someone who had a rooftop bar. And there were so many bees hanging around this rooftop bar and they're like, "What do we do? You know, we've got all this syrup hanging around for our mixed drinks, and yada, yada. And how do we get rid of these bees? Or how do we get them to not come around?" And so I was just thinking about like the bees bringing, you know, like a whiskey sour like, back to their colony or something, you know, crazy like that.

Dr. Margaret Couvillon 22:43
Mildly intoxicated.

Amy 22:47
Okay, so...

Guest 22:48
Yeah, then watch the dances. I'll go back to being quiet. Amy, your turn. Part of it is exactly like you said, it's this weird and wonderful behavior, that's for some people, the gateway into honey bee biology, right? There's no going back once you find out how cool honeybees are. And it's a crazy thing, you know, an insect is communicating a vector. So I think, just for itself, it's important for beekeepers to understand what a waggle dance is and broadly how it works, because if there's ever something that you can fall in love with, it's this behavior. But I think I mean, from a more applied perspective, the information from the waggle dance can be used to inform management practices, you know, to let us help them in a more targeted way. So let me give you an example. I had mentioned that not every forager is going to dance, it's only the ones that are working the best resources at any given time. And then on top of that, because bees are so smart with this kind of benefit-to-cost ratio, they're not going to recruit their sisters to something far away if there is ample and good resources nearby. So we can look at the distance that the bees communicate as a proxy for food availability. When a dancer is communicating for farther away resources, that means that there's less available nearby. And we can sort of track communicated distance across the seasons and in different landscapes and just sort of see, you know, what's going on with the resource availability at a landscape scale. And there's literally no other way to get these kinds of data, like a landscape level look at what's available for the bees. If you have an ecologist that's walking transects, I mean, I think you know, the foraging range of a bee can go, I mean, it gosh, in its most simple, let's say 314 square kilometers, and imagine how long it would take an ecologist to walk transects across that landscape and then do it, repeatedly, for the entire foraging season, you know, March to October. But when we study waggle dances, we don't have to have the ecologist work so hard because the bee is doing the hard work for us. So that's why we think that these data that we get from decoding waggle dances can be broadly applicable in many different settings, you know, and for many different people, from farmers, to beekeepers, to

stakeholders, to landowners, anyone that wants to help look after the health and well-being of honey bees, part of it is knowing how and when they get their food and conversely, when is it harder for them to get their food? So, why is it important for beekeepers to understand the waggle dance? Of course, we love this behavior. We love to see the behavior just because it just stands out so much on a frame, right? And so why is it important for beekeepers to understand this communication? Maggie, in the most basic sense, what part of the dance is coding for distance. We were just talking about applicability to beekeepers, and maybe beekeepers don't necessarily have to watch the direction or the intensity or what have you. But if they knew just very simply what part's coding for distance, they could probably while working a hive, get some very rough guess-timates of, you know, how far away the bees are having to go to collect resources.

Dr. Margaret Couvillon 26:01
Distance is encoded in the duration of the waggle run. So that portion of the dance where she's waggling her abdomen very quickly from side to side while her head is pointed in a particular direction, that's called the waggle run. And it's a linear relationship. So broadly, how many seconds she waggles her body before she stops and turns around and returns back to the beginning to usually start another waggle run, so how many seconds that waggle portion is will be how far away she has gone. Each second of dance that you see is about 750 meters of flight. So if you see a bee waggling her body for about two seconds, and then she stops and goes back to the start, and then she waggles again for two seconds and stops and goes back to the start, she is communicating a distance of about one and a half kilometers. So the percent foragers that are dancing at any given time will change, will fluctuate depending on availability and need. But in general, I think it would be anywhere between, let's say 10 to 20% of foragers will be coming back and dancing. The rest are actively engaged in foraging, but will not be doing recruitment.

Jamie 27:08
I do have a quick question about that, though. I am curious, how long will a bee spend engaged in dancing? Is that a pretty steady thing? They do it 5 minutes, 10 minutes, I mean, because while they're dancing, they're not foraging, right? So what length of time is a standard dancer, is there a standard length of time?

Dr. Margaret Couvillon 27:25
There's not a standard length of time, and it varies depending on the quality of the resource, which is also a moving target. So if it's a time of year where a particular resource is really highly valued, the bee will dance for longer, she'll repeat that waggle run where the distance and direction are encoded, she'll repeat that more times than a resource that she's maybe only medium excited about. Now, this is the work of Tom Seeley. And it's, it's cool because it means not only is it a signal that has the distance and the direction, but it also has a little bit -- the bee's perception of the reward. For very highly valued rewards, man, she'll just repeat that distance and direction, you know, potentially up to 100 times and that can take several minutes. But if it's, you know, a regular old resource, it's good enough to trigger a dance, perhaps not so good that it blows her tiny mind, then she may be able to just repeat it, you know, five to 15 times.

Amy 28:20
So you've kind of told us about some of the research that you're doing in the lab and what is the current status of your research on the waggle dance?

Dr. Margaret Couvillon 28:29
Well, you've probably heard that it's harder now for insects to collect food in the landscape, and the good news is that a lot of people really want to help feed hungry bees. But before we can do that, we need to know two things. First, we want to understand how the bees are collecting their food in the existing landscapes. Before you can help them out, you need to know when it's hard for them. And the second question is when we find out how the honeybees are collecting their food in the landscape, is this information useful, for example, for other non-Apis bees, say kind of what's the general applicability of the information we're getting from the waggle dance. So, like I mentioned, for the past two years, we've been studying honey bee foraging across three different landscapes in Virginia. We've decoded 12,000+, waggle dances across these three landscapes, you know, somewhere between 3 and 4000 per landscape. And we're currently looking at each landscape as a standalone and just trying to understand honey bee foraging dynamics in these three landscapes and the landscapes differ in their manmade features. We're studying it in Blacksburg, of course, because that's where we're located at Virginia Tech. And then the surrounding areas around our bee lab are kind of a mixed use landscape. So there's the suburban area of Blacksburg. There's also some forested areas, there's a little bit of row crops, and there's some pasture lands. One of our other field sites is in Tidewater, that's in southeast Virginia, and Tidewater is where the bees are located. It's the center for row crops research. These are things like cotton, corn, soybeans and peanuts -- crops that you're maybe thinking, "Oh, wait a minute, those are, those are largely wind or self-pollinated," and that's true. But that's actually what's so interesting about it, because these crops still do, of course, produce pollen, and some actually even have extra floral nectaries and produce nectar. And so the resource is there and the pollinators visit them even though the work of the pollinator isn't as necessary from the plant perspective. So we just sort of want to understand the foraging dynamics there. And then our third landscape is in Winchester, which is in Northern Virginia. And it's set up at a research center that's in -- plunked down in the middle of, kind of, apple orchards and other value added commodities. And we wanted to then look at foraging dynamics in a landscape where the honeybee work is very valued and is very necessary, you know, contributing to the seed set and the fruit crop. But what happens if the bee is located there, the beehive is located there for the full foraging season, you know, it's not moved in and move back out, we wanted to understand how do they continue to collect their food once the bloom is over. So we're finishing up that portion of the project. And we're also going to, after we look at each as a standalone, we'll be comparing across them to see if there's some common trends in time and space about where it is good or not good for bees to collect food. And then in our next stage of the project, we're going to take that information that the honeybees gave us, and we'll experimentally test it against other pollinators. So our hypothesis is where the honeybees have indicated good and bad, and time and space for collecting their food, will also be good and bad, and time and space for non-Apis bees or the rest of our pollinators. And, you know, where it's good, we expect there to be kind of abundant, diverse and productive, non-Apis, you know, native bee communities, and then the reverse situation as well. So

we're just starting that phase of the project. We're finishing up the phase of the project where we are looking at honey bee foraging dynamics and these three unique landscapes, and then we get to tie it all together in the next few years.

Jamie 32:10
Maggie, that's great. Your research sounds really exciting. It also ties in with some great applicability. You know, people can use this information, and I really look forward to seeing where it all goes in the future. I thank you so much for joining us on this podcast with all the information that you've shared with us on the waggle dance.

Guest 32:24
It's been my pleasure, Jamie. Thank you, Amy. I really enjoyed talking to you. I'm always happy to talk about bees.

Jamie 32:31
Well, we certainly look forward to seeing where the research goes in the future. We'll have you on in the future when you got some of these questions answered and can share the information with the beekeepers listening in. Everybody, that was Dr. Maggie Couvillon, who's the Assistant Professor of pollinator biology and ecology in the Department of Entomology at Virginia Tech University.

32:52
Have questions or comments? Don't forget to like and follow us on Facebook, Instagram and Twitter @UFhoneybeelab.

Amy 33:04
All right, in today's Five-Minute Management, we're going to talk about the history, different practicalities of hive types. And Jamie, I will let you go ahead and start. I'm gonna put the timer on.

Jamie 33:17
Great, Amy, thanks. So this is one of those topics that we could talk about for a very long time. But the fact that we've got to get it done in five minutes means I'm going to try to scoot as quickly as possible. I guess the important -- the first important thing to know with regard to the hive styles is originally beekeepers didn't really keep bees in hives. So we do have evidence from the Egyptian pyramids and some other finds in the Middle East that people were putting bees in clay pots for a very long time. In Europe, people didn't follow that system. Very, very early on, they actually would say, "Bees are nesting in this tree, in this hollow cavity. This is my tree! I claim this tree, this is my hive." So from there, the Europeans, you know, who started managing colonies heavily, would move bees into, what we would call here in the states, log gums. They would go from owning, quote, a tree, with a beehive in it, to sectioning out that piece of the tree that has the hive in it and then they would manage that small piece of trunk as a hive. In the states, at least in Florida, we've called those hives gum hives, but some people call them log hives and the reason they call them gum hives is because, at least in Florida, these bees early on, were nesting in Eucalyptus trees that were from Australia and the Australians call

eucalyptus tree gum trees. And so gum hives because they were bees nesting in these eucalyptus trees. But more appropriately, they're called log hives. Now the downside of log hives is you cannot really manage those bees. You're really just keeping bees in that little cavity for the purpose of going into that hive and getting honey once or twice a year. There's no management allowed from those log hives and the Europeans would start moving bees into things like skeps. Skeps are like baskets turned upside down, straw or wheat baskets turned upside down, and they are bell-shaped. Usually, they would put bees or swarms of bees into these skeps. And like the log hives, or the gum hives, the bees weren't really manageable, and if you think about it from the perspective of a skep, in order to get the honey that's stored above the bees, you have to go through the bottom of the skep to do that. And so it was very destructive to the colony. You had to go through all the combs to get to the honey that was at the top, and it was just not really a good way to manage bees. And so both the log hives, the gum hives, and the skeps, they're not really ways to manage colonies, but they're the early ancestors of the hives that we manage now. I will say, before moving on from those two types of hives, that they're actually illegal to keep in many states in the US because they're not manageable. You cannot inspect those colonies for things such as American foul brood, so they're not legal to keep in a lot of areas. So transitioning from there, lots of beekeepers around the world started experimenting with different styles of hives to try to get combs built in some sort of movable frames, right? The ability to remove a comb from a hive. I'm not going to go over all those hive styles because there's literally dozens of dozens and dozens, if not hundreds. But what ultimately was born, at least from the American perspective, is something we call the Langstroth hive. The Langstroth hive is a movable frame hive. Lorenzo Lorraine Langstroth figured out how to get bees to build on these wooden frames, was able to space them out appropriately so that these frames could be removed from the box. And now, the world over, there's lots of iterations of this. For example, in the UK, they have the English Standard hive. In Germany, they have their own hive styles, but all of them are based loosely on this idea that we can manage bees in a box and coerce them to build their combs within a frame that we can then take in and out. And once that introduced management into our beekeeping operations, then people started to do things like manage for pests and diseases, manage to have colonies super strong, manage the queen, manage nutrition etc. Now, there are a lot of different movable frame hives these days. A lot of people are using Warré hive or Kenyan top bar hives or long box hives. But some of these hive configurations, like the Kenyan top bar hive, rely on the bees to make the combs themselves. There's no foundation added, whereas others like the Langstroth, long box hive or Warré how there's some others, you allow the bees to build comb on foundation. But the Langstroth hive, and the various iterations like it, are the most popular hive styles around the world. Now, a lot of beekeepers in a lot of areas around the world where it's difficult to get resources don't like Langstroth hives and its derivatives. They like things like top bar hives, because there's less equipment necessary to make them. So, really anything you put bees in, as long as you can remove the frames, it's something that's allowable and requires different styles of management but can be beneficial for your beekeeping operations.

Stump The Chump 38:13
It's everybody's favorite game: Show the Chump.

Amy 38:34

Question & Answer time. We have questions about queen management and bird feeders and brood capping. I'm pretty excited for these questions, Jamie.

Jamie 38:46
What do they have in common? They're all being addressed on this podcast. Because otherwise, nothing else.

Amy 38:52
Exactly. Nothing else! Okay, so the first question we have is regarding queen management. In order to maintain gentle behavior, is it necessary to bring in new genetics every couple of seasons or can I leave my genetics be?

Jamie 39:08
Interesting question. So, in order to maintain gentle behavior, you would just requeen anytime you have a mean colony. So, I think the broader question behind that is, if I've purchased stock that's known to be gentle and I moved them into my apiary, do I need to requeen all those colonies every year with the same stock in order to maintain that gentle behavior? What I would submit to you is that defensiveness is variable enough that even if you buy 100 queens from a producer of known gentle stock, you still might get 2 to 10 whose offspring are defensive. So you really wouldn't look at it from a perspective of, I need to requeen every year to maintain gentleness, you'd look at it more from the perspective, I need to requeen colonies that are too defensive. Kind of on a case-by-case basis. There are some general rules of thumb, right? In general, working with certain stocks like Italian bees might be better because they're less defensive. So, in general, if you routinely requeen once a year, then you might tilt the scales in your favor, but I prefer the standpoint of controlling it as it pops up in the operation by requeening those colonies that just turned out to be hot in the first place.

Amy 40:20
Sure. And I always think it's kind of funny too, because when bees are hot, you know, people will requeen and then they'll think suddenly that it's, it should be like an immediate change. Right? And that's not how that works, so --

Jamie 40:30
If you think about it, Amy, that's a perfect comment. Right? So you got a situation, you requeen your colony where her offspring, the former queen's offspring are still in there, you know, from the worker perspective --

Amy 40:40
They're still defending.

Jamie 40:41
Exactly. And to make it worse, if you think about it, the former queens drones are in there for another three to four, or maybe up to six weeks, which means if you allow colonies in your apiary to requeen

themselves during that period, there's a probability that they could mate with the drones from that defensive nest. So requeening the colony only solves the problem from the colony's perspective in about six weeks, but there still could be some residual genetic holdover, based on the former queens genes being pumped out through drones into virgin queens, or formerly virgin queens, in your apiary.

Amy 41:17
Okay, so for the second question we have, have you heard of honey bees eating food from bird feeders? And I will say, when I first read this question, I was thinking like, you know, when you put different bird seeds into a bird feeder, but also, I guess, I have seen honey bees eating from a hummingbird feeder, right? And so, let's talk about both.

Jamie 41:39
Yeah, so in the case of regular bird feeders, I have absolutely seen it and heard of it. So my explanation for it is that honeybees are really good at collecting powders of nearly any type, especially powders that are proteinaceous, that have proteins or some sort of vitamins or minerals in it. So what I think that they're doing in the case of these bird feeders is they're going and collecting the dust that's associated with the seeds, because there's some, maybe small ,but nevertheless, some nutritional benefit to them. It suggests to me, if they're visiting bird feeders, and I'm wondering, I'm looking at the greater question here, they mentioned it was fall, exactly what I was going to say, I tend to see this happen more during times of the year there's less quality pollen available in the environment. So, that oftentimes pushes them to suboptimal, quote, "pollen" sources when it's not really pollen at all, things like bird feeders. I've seen, I've heard stories of them going to folks' cattle and horse feed troughs, probably under the same premise. They're collecting dusts, or something that they think is of nutritional value from that. But I will submit to you if you're seeing it, it suggests that there's low or no quality resources available in the environment, at least from the pollen perspective. So I think that they do it when pollen, high quality pollen is not available.

Amy 43:04
Sure. Now, what about humming bird feeders? I mean, that's just sugar water.

Jamie 43:09
Yeah, they're absolutely going to hummingbird feeders for the purpose of sugar water. I will tell you, in many cases with hummingbird feeders, the access to the sugar water is too deep in that fake flower for the honeybees to reach it. So oftentimes, so if you think about a hummingbird's beak, right, it's very long. And that's one of the ways the manufacturer tries to keep away critters that aren't hummingbirds. But there are cases when you're, you know, putting the feeder together or filling it with sugar water, that there can be some residual sugar water sprinkled on the outside of the container that can attract honey bees. And there's some hummingbird feeder types that are just shallow enough that the honeybee's tongues can reach the sugar source.

Amy 43:46
Alright. So, our last question, how long does brood capping take?

Jamie 43:51
Alright, good question. How long does it take bees to cap a sale of brood? And it takes anywhere between 20 minutes up to six hours. I read this years and years and years ago when I wrote a column for the American Bee Journal, and I had to deal specifically with the bees that engage in this behavior. And I looked it up in some honey bee biology reference material, and they said it takes from 20 minutes to six hours. That's quite a range. All right, that's a 30 fold increase in time, right, to go from 20 minutes to 6 hours. But my guess is it all has to do if there's a lot of bees working on it, or if there's, or if there's just one bee chugging along to try to get that --

Amy 44:31
That poor bee. Is there like an average of how many bees work on a capping?

Jamie 44:36
Probably, but I've not seen it before.

Amy 44:38
That's fair. That's fine. Alright, so those are some great questions. Don't forget to ask your questions to us on email or on social media or however best works for you. Give me a call, leave me a voicemail, and we'll be sure to add it to our question and answer segments. Hi, everyone. Thanks for listening today. We'd like to give an extra special thank you to our podcast coordinator, Megan Winfrey and to our audio engineer James Weaver. Without their hard work, Two Bees in a Podcast would not be possible.

Jamie 45:23
For more information and additional resources for today's episode, don't forget to visit the UF/IFAS Honey Bee Research Extension Laboratory's website ufhoneybee.com Do you have questions you want answered on air? If so, email them to honeybee@ifas.ufl.edu or message us on Twitter, Instagram or Facebook @UFhoneybeelab. While there, don't forget to follow us. Thank you for listening to Two Bees in a Podcast.