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SPEAKERS

Amy, Jamie, Guest, Stump The Chump, Serra Sowers

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, everyone, and welcome to another segment of Two Bees in a Podcast. Amy and I are absolutely pleased to be joined today by Lauren Goldstein, who is a master's student at the Isaacs lab in the Department of Entomology at Michigan State University. She actually, at one time, was here at the University of Florida and helped us edit this podcast. So she's a little bit familiar with it on the editing end. But now, she's a guest. And the reason she's a guest is because she's doing some really interesting work with bees as a graduate student at Michigan State University. And Lauren is joining us specifically to talk about using infrared technology to assess hive strength. So Lauren, thank you so much for joining us on Two Bees in a Podcast.

Guest 01:25
Thank you so much, Jamie and Amy, for having me.

Jamie 01:29
I mean, this might be the first time, Amy, that we've ever had someone who edited, then come back and be a guest. Am I wrong about that?

Amy 01:37
No, you're totally right. That's right. Lauren, you're the only person who has edited our podcast, worked in our lab, and is now a guest.

Guest 01:45
Amy, I'm sure you've edited the podcast.

Amy 01:48
That's true.

Jamie 01:50
I've never edited. Lauren, you've done more on this podcast, now, than I have. So the only thing you need to do is host an episode and then you'll have me completely beat.

Guest 01:59
That'd be great. Got to have you back.

Jamie 02:02
Well, we're excited to have you on. We're going to be talking to you about some of your master's research. Amy had seen you give a presentation on this and was really impressed, and we thought that beekeepers would want to know about it. So since you're familiar with the podcast, you'll know that the very first question that I have to ask before we get into the technical aspects of your work is tell us about yourself. And please outline for us how you got interested in working with bees in the first place. Give us a little bit of background about that. And then we'll launch into specifics about your project.

Guest 02:29
Yeah, absolutely. So, I feel like everybody who works with bees says this at some point, but I've always loved animals. Ever since I was little, I've been huge animal lover. And so I thought I wanted to be a veterinarian, which I think is another common trope among people who work with bees. In high school, I worked at the vet's office and I was an animal science major when I got to the University of Florida for my undergrad. I worked as a veterinary technician for a couple of years throughout undergrad. But interestingly, at the time, while I was an animal science major, I was also a vegan. I'm not anymore, but the animal science lab was an interesting place for a vegan, having to dissect chickens that were just freshly -- you know. I won't say it. And so, yeah, that's kind of what prompted me to change paths. Working at the vet's office, it didn't spark so much joy. So I switched my major to biology, and I picked up a minor in entomology and another in agricultural communication. And during the entomology minor, in the first intro to entomology course, they have you tour the honey bee lab at UF. I watched Amy and a couple of the other extension technicians give a tour of the lab and do a hive tour, and I looked at one of the technicians and I thought like, "Dang, that is a really cool job, and I would love to do that." So that summer, it was COVID, and I think there was an ad put out to do an internship with Amy working on the podcast. I just applied for it and got it and started working on the podcast and listening to all of the interviewees every week and editing their episodes. I just really became fascinated with honey bee biology. But really, the extension piece of communicating with beekeepers is really what drew me to working with bees and and helping beekeepers. So yeah, that's the rough outline of how I got into bees.

Amy 04:53
So Lauren, I knew most of that, I think. But I didn't realize that that was kind of your exposure to honey bees, here at the lab and doing that tour. So that's pretty cool.

Guest 05:03
Yeah. It was great. You should keep doing those tours. They're awesome.

Amy 05:07
I also remember that when you were trying to finish up, you were trying to figure out what you wanted to do afterwards, and you decided that you were going to go somewhere else to do your master's, right?

Guest 05:17
Right. So I was looking all over the country for master's programs. I lived in Florida my entire life, and so I was really interested in just expanding my horizons. Dr. Rufus Isaacs at Michigan State University had just received a grant for working on the optimization of blueberry pollination by honey bees, working with stocking density of bees and how that might impact blueberry yield. And so I just thought it was a perfect opportunity to both get out of my comfort zone, go somewhere new, and also get to work with bees. His lab has a huge extension focus, which was really important to me. So, yeah, that ended up working out really well. And I've been there for a year and a half now, and hopefully graduating in May, or maybe over the summer with my master's degree.

Amy 06:15
Absolutely. It's been really fun to see you grow. You just jumped right into the honey bee research. And so I remember going to the Entomological Society of America conference in Vancouver just a couple of months ago, and you had given a talk about your graduate work, and you were talking specifically about infrared imaging to assess honey bee colony size. I thought that that was really interesting. I don't know why, but I never really thought about that before. And when you were talking about it, I was like, "Man, we should really have Lauren on the podcast to discuss this." Can you just talk a little bit about infrared imaging and how that technology works?

Guest 06:53
Yes, absolutely. Just for a little bit of background, the reason I got into this is because, on that stocking density project I told you I'm involved in, through that project, we got connected with the Bee Corp. They have this technology called Verifli, which is a service where infrared images are taken of hives, and then they can estimate colony size from those images. The way it kind of works is this handheld thermal camera is used to capture an image of a hive at night, at least three hours after sunset to make sure there's no solar heat or anything. And then that produces a heat signature. That image is sent back to the data scientists at Verifli, and they have a proprietary algorithm where they are able to use the heat signature from the image to estimate colony size. At this point, they can't really produce individual hive size estimations. They're going to produce about an average frame strength on a farm or a field. And then those results are posted to a user's online account. So a beekeeper or grower can go back and see what the average frame strength of their field is. So my interest in working with them was to see if they could accurately produce hive size estimations on an individual hive basis. And the reason for that is because we beekeepers and growers and brokers are often using the cluster count method to estimate hive strength for pollination contracts. And so being able to rapidly, and non-invasively, get hive size estimations on an individual hive basis could be useful for that, and I'm sure we'll talk about that in more detail.

Jamie 07:00
I was going to say, this is very interesting, because I'm one of those poor folks who have done the standard estimates of colony strength assessments where you go frame by frame. I know a lot of the folks who move bees to pollinate various crops, they'll pop a lid and count the rough size of the cluster

from above, maybe do the same thing from the bottom of the box. And so you were branching out looking at infrared imaging and I'm curious, why it, as a technology? What would be some benefits to it over some of the more traditional methods of doing colony strength estimates?

Guest 09:43
Yes, absolutely. So yeah, like you said, that cluster count method, or some people call it the interframe space filled with bees method. There's lots of different --

Jamie 09:55
That's quite a name.

Guest 09:59
That standard visual method, it can be somewhat invasive to the colony. You're opening the colony up and exposing it to the elements and the sunlight, and they live their lives in the dark so that can be kind of disruptive to them. And then of course, it's extremely time-consuming, especially if you were to measure the size of all colonies on a commercial crop field, which is really just not realistic. And it's physically demanding for the person conducting the estimate. So the interest in infrared imaging is that it can be done very quickly. It takes several seconds to snap an image of the hive, and it's completely non-invasive. It's done at night, so you don't even have to put on a bee suit. And yeah, it's quick, non-invasive. I mean, those are really the benefits of the technology. So yeah, that's really why people are interested in it.

Amy 11:01
So are there any other non-invasive methods to assess colony size?

Guest 11:06
Yes, absolutely. So another recommended method is called the returning forager count. Have either of you done that or heard of it?

Jamie 11:14
Yeah, I'm familiar with it.

Guest 11:16
Yeah, great. So in that method, you, as an observer, would stand outside the colony and watch the hive entrance, and set a timer for one minute and count the number of bees entering the hive during that one-minute period. And that actually can be used as a proxy for hive strength. It can give you an estimate of the number of foragers available for pollination services. That method is strongly correlated with the cluster count method. So again, that is non-invasive. It's not that quick, though. I mean, you do have to stand out there for a minute. And if you want to get a really accurate estimation, you should probably take a video and play it back in slow motion. And so that can be a little bit time-consuming, as well. But it's another non-invasive method. And it's really easy for naive or inexperienced observers. So if a grower wanted to do that, instead of opening up the colony, just to get an idea of how strong the colony is. Another, maybe, pitfall to that method is that bee flight is highly dependent on weather parameters. So, if it's raining, or if it's really humid, or if it's not sunny enough, or if it's not warm enough, that might skew the results of that method of estimation. But it's an option on a nice day.

Jamie 12:42
Those are all very interesting ways to do it. It can be labor intensive. And I really liked this idea of this non-invasive method. I'm excited about hearing about your project, which kind of leads me to my next series of questions. Could you share a little bit about your specific study design? How you're addressing this question, and then maybe highlight some of the results from your study?

Guest 13:02
Absolutely. So yeah, at the time of recording this, the results of this study are still unpublished, but I have completed the study. So my goal was to compare these three methods of assessing colony strength. So that's the cluster count method, the returning forager count method, and then infrared image assessments. So, again, the cluster count method is the most commonly used and so I kind of use that as the baseline for comparison against the other two methods. This study was done in an effort to validate the returning forager count method to make sure it actually can reliably be used as a proxy for hive strength, as well as do a first look at whether or not the infrared imaging technology is able to produce accurate estimates of hive strength on an individual hive basis. So the first year of the study was done on the Michigan State University campus apiary. We used a small set of about 20 hives that ranged in sizes that were commonly found during blueberry pollination. And we just did the three methods of colony strength assessment using those 20 colonies. And then we repeated that again for a second year of the study. And in the second year of the study, we increased our sample size to include 10 colonies on each of five commercial blueberry farms. And so the benefit of that was to really use it in the setting, and test these methods in the settings where they're most frequently going to be used in a commercial pollination setting. And so that was our study design. Again, we did cluster counts, returning forager counts and infrared imaging. In the first year of our study, we did find a strong positive correlation between cluster counts and returning forager counts. However, there wasn't a super strong relationship between -- or there really wasn't any relationship between the infrared image assessments and cluster counts or returning forager counts. What's interesting about the Verifli technology is that it's constantly improving. They're always working on the algorithm and with all the assessments they do, they're kind of improving their technology. Like I said, right now, they are only reporting an average frame strength to their growers and beekeepers. There actually was great success there. They were able to report the same average frame strength that we found, but on an individual colony basis, there's no correlation. So they did some R&D, and they were able to improve their algorithm. And so in year two of our study on the small-scale campus apiary, there actually was a positive relationship between the infrared image assessments and returning forager counts and cluster counts. And so that was a really cool result. But another thing we noticed is that the infrared image assessments tend to overestimate colony sizes that are manually estimated to be small, and then they underestimate colony sizes that are manually estimated to be large. So there does seem to be a sort of discrepancy there. And I think more work needs to be done to close that gap. But again, returning forager counts were consistently correlated with cluster counts. And then we saw a very similar result in our commercial scale study. So there still was kind of an overestimation by infrared imaging analysis of colonies that were manually estimated to be small, and the flip side of that with the large colonies. So those are the results of our study. But there are some important things to consider with that. So we do use the cluster count result as the baseline for comparison. However, that is not really the most accurate way that we know of to get the true adult bee population. From what I know, the most accurate way to do that is to actually dump all of the bees out of the colony and weigh them. And so of course, that's not something

that's regularly being done. I wanted to compare methods that can feasibly be used in the field. But I do think that a next step for this study would be to actually weigh all of the adult bees in the colony and compare that result to the three standard or feasible, easy to use methods that I did in my study, to see which one actually most accurately captures the true adult bee population in the hive.

Jamie 18:18
Lauren, you're bringing back nightmares from my undergraduate days where that's exactly how we would do it. It's really simple, you weigh a colony full of bees, and then you weigh a colony empty of bees, and you know the total weight of bees because you could subtract that. And then you take a subsample of the bees and weigh those and count those individuals. And just with some quick math, you can estimate the number of bees in the colony and it's just labor intensive, very labor intensive. I do want to follow-up on one question. And incidentally, this here is off the air. So if I ask the question, and you don't know the answer, then we can just cut it and move on. So I'll pause for a second re-ask it. I do want to ask a question about this idea that the infrared technology slightly overestimated the size of the cluster when you guys counted and determined the cluster to be small or underestimated the size of the cluster when you guys counted and estimated the size of the cluster to be larger. I'm just wondering, so infrared technology relies on heat signature? And I wonder then if the heat signature resolution is not quite as good because once they reach a core temperature, it's that temperature, regardless of the size of the cluster. So maybe it doesn't grow as linearly as the size of the cluster does. Does that make sense? And I'm curious if that's part of what you guys were thinking about?

Guest 19:46
I definitely think that's a possibility. So I think the Verifli data science team, they have like a nuclear physicist on there and they have a honey bee biologist. Their algorithm does take into, as far as I'm aware, their algorithm does take into consideration a lot of those things. And so, yeah, I definitely think that's something they're interested in working on in the future is kind of improving their ability to estimate smaller colony sizes as well as larger ones. And I think the more average-sized colonies are really where their strong suit is. But yeah, I definitely think that's possible. And that's a great question.

Amy 20:33
I'm just thinking about the beekeepers listening to this, and they're like, "I'm going to go get an infrared camera, and we're going to assess honey bee colony size."

Jamie 20:42
Or hire a nuclear physicist.

Amy 20:45
Exactly. As beekeepers, we know that the size of hives, that's important to having nice, healthy colonies. And so can you just discuss a little bit about how colony size is relevant to growers, specifically? Because I know that you're working with blueberry pollination. Do you think there are any implications for pollination contracts?

Guest 21:07
Yes, absolutely. So hive size measurement is very relevant to growers. And in some of our other work in highbush blueberry, we are finding that a measure of frames per acre is actually a more reliable

predictor of blueberry yield than the standard measure of hives per acre. A lot of blueberry growers, and I'm sure other crop growers will stock their fields at a specified hives per acre. And that's kind of like just the standard recommendation at the moment. But frames per acre actually seems to be a better predictor of yield than that hives per acre. And so that is an argument for ensuring that all hives on your field are really strong and large in size. And there are a lot of implications for pollination contracts there. Being able to rapidly and non-invasively measure the size of all colonies on a field would allow growers to kind of get what they pay for by only bringing strong hives onto the field. As well, beekeepers can possibly argue for higher hive rental fees if they're able to prove that they're bringing consistently strong hives. And so I think this could have really great implications for pollination contracts. And I think it could definitely benefit beekeepers and growers alike.

Jamie 22:50
So Lauren, your work is very interesting. What you're doing is quite fascinating to me. I really appreciate you being able to come on and join us on Two Bees in a Podcast. We, at the University of Florida Honey Bee Research and Extension Laboratory, are proud of what you're doing, and we're looking forward to see where you're heading in the future. So thanks for joining us.

Guest 23:06
Thank you so much for having me. It was so great to be back.

Amy 23:20
Well, I was really happy to have Lauren on the podcast. She was our podcast editor for a year, a year and a half or so before she graduated. And then I was sad when she left us for Michigan State, but I'm glad to see her doing really, really great things for the honey bee world.

Jamie 23:37
You're a proud aunt or uncle or father or mother, right? Anytime you see someone go from your program on somewhere and do something successfully. And in this particular case, Lauren was actually doing something that's going to help beekeepers in the long run. So it's exciting to see the research. And of course, we're proud of her and all the folks who've left the lab to go and do some really cool things. But she also is another good example of how amazing students are these days, not only around the United States, but around the world, who are trying to address issues on behalf of beekeepers, and I think will soon radically change our industry for the better.

Amy 24:07
Yeah, absolutely. And I think the infrared technology is really interesting. In my days, I was a county extension agent before I came to the honey bee lab. And when I was a county agent, I used to work with different theme parks and lots of public entities who use infrared technology mostly for pests. They would walk around in the morning, look to see if there were any, I don't know, any animals, any other vermin that were like in walls or ceilings or whatever, especially in public places before guests came in. And I guess I never thought about using that for bees. So I thought that was a very creative idea. And I'm just wondering, Jamie, do you know if this is common? How fast or how soon do you think it'll be before we start adopting this practice, especially in ag settings?

Jamie 24:56

Well, it's kind of funny that you mentioned the whole theme park pest perspective because the only -- well, I won't say the only -- the most frequently I see infrared technology discussed, at least in concert with honey bees, is when honey bees are nesting in a nuisance area and when pest control operators are trying to locate where the colony is. For example, if a homeowner has bees flying into and out of a wall somewhere, and there's a cluster somewhere, and there's a colony and the homeowner wants it gone, and the pest control operator doesn't want to open any more of the wall than he or she has to, so they might use infrared technology to locate specifically where that nest is in the wall, in the chimney, wherever. And so that's most often how I hear it, kind of in that same pest context that you mentioned. I have seen a lot of talks on infrared technology, just looking at colonies, perhaps being able to estimate colony condition, right? If they were able to thermoregulate appropriately, maybe they're okay, if they're not able to thermal regulators appropriately, maybe there's a problem. And in particular context here, Lauren's specifically talking about using it, essentially, to grade colonies that are being used for pollination purposes, which is yet again, another way now that I'm seeing this technology be used in the apicultural world for the betterment, really, of all involved.

Amy 26:13
Yeah, absolutely. Also, this is probably something that many growers don't realize is a technology that they could be able to use in the future. And so I think it's really cool from the beekeepers' perspective, but also from a grower's perspective to understand how the technology is used.

Jamie 26:30
So Amy, you're spot on there. You and I, in our capacities, we're hired as honey bee, quote, experts.

Amy 26:37
Quote.

Jamie 26:38
The reason I say, quote experts, is because you're the expert. I'm just a bum here who has a podcast. But the reason I point that out is because there's the impression that we work specifically for beekeepers. Well, we actually work for honey bees. And as a result, we try to help beekeepers improve their craft and increase the sustainability of beekeeping. But also growers, we have an interest in helping growers. Growers deserve to get colonies that are appropriately sized and able to do what they need to do in order to pollinate crops. And so here's a really good technology, I think, that can be a benefit both to the beekeeper to share how his or her bees are doing or growing, etc., and also, to the grower who's an equally important part of this whole pollination equation, so that the growers are making sure that they're getting what they're paying for when they're paying for colonies to come pollinate their crops.

Amy 27:28
Yeah, absolutely. Well, I'm excited to see where this technology goes. I know that Lauren said it was just in the first year and the second year looked different. So, it seems like there still needs to be research on the accuracy of it. I guess we'll see where it goes.

Jamie 27:43

Yep. She sounded like a true scientist. We've got data, but we need more data to figure it out. And that's how we scientists always do. We get some resolution, but we always want a little bit more data. But this is definitely one of those exciting uses of infrared technology. And I think it's just the tip of the iceberg of the direction that the honey bee industry is heading.

Stump The Chump 28:05
It's everybody's favorite game show, Stump The Chump.

Amy 28:15
Welcome back to the question and answer segment. Jamie, this first question. I know we've been doing this for the past couple of weeks now but I'm going back to the American Beekeeping Federation in Jacksonville because we just received so many questions. So there's just a lot of follow-up from that meeting.

Jamie 28:32
Yeah, happy that folks really were engaged with us on that on that live Q&A series we did there. So it's nice to be able to follow-up on some questions we were unable to answer.

Amy 28:41
Yeah. One of the individuals at that conference actually asked us about queens. From what I remember, he had asked and he had kind of prefaced it by saying he had just paid four cents for a queen. And of course, this was at the beginning of January. And so I think he was wondering, is it okay to introduce a queen? And so he kind of went into that. After the talk, someone came up to me and said, "I think he was really talking and asking about queen cells." And we had kind of answered it based on the assumption that he was talking about mated queens. Well, first of all, he said it was four cents a queen, I didn't realize. Is it four cents a queen for queen cells?

Jamie 29:23
That seems kind of low. I won't say ridiculously low. The way that I usually tell folks about this is mated queens might be $20 to $40. Queen cells might be $5 to $15. And so usually, people are paying a few dollars for queen cells, but it's definitely never something that low, so maybe they just got a deal, because I hate to speculate, but maybe they just got a deal.

Amy 29:45
Yeah, so when I heard the four cents, I think I just automatically assumed it was 40. And of course, I had stage fright and I was just like fumbling over my words anyway. So can we talk about receiving queen cells maybe during the offseason? When I say offseason, it's during the winter time. It's not really a time where you typically would introduce queens or have splits or anything like that, unless you're in Florida, of course. But let's talk about putting a queen cell into a colony during the time of year that you typically would not do that. Is that okay to do or what are your thoughts?

Jamie 30:21
I'm going to answer that question kind of under the premise that we're in North America, and the vast majority of places in North America, you could not put a queen cell into a colony, a queenless colony in January and expect a positive result. And that's because it's just simply not mating season. There are

hardly ever drones available in most of the cooler climates during the month of January. There are also cold snaps, depending on where you are, up in the northern hemisphere. And I would say this is true across anywhere in the temperate Northern hemisphere. So, maybe that's why the queen cells were such a deal, because there's not much you can do with them at that time of year. But it all boils down to this, let's say that you put that cell into that queenless colony, it's January, it's cold. And let's just say she emerges, right? That's great, that's fine. But there have to be drones available for this queen to be able to mate with. Otherwise, you're not going to be getting a fertile queen at the end of the day. And the likelihood of that happening at sufficient numbers is really low. It's not impossible, right? We live in Florida, which is a warm state and maybe in southern Florida and southern parts of the US or tropical islands around the world, January is not that big of a deal. But in most of the temperate northern hemisphere, January is essentially a time of year when it's nearly impossible to mate queens. So I don't think it's advantageous or even recommended to be doing that this time of year, even with a mated queen, even if you could find mated queens to purchase in January. Even that's a little tricky. But going back to the queen cell, even if you had drones, you can't predict when you're going to get cold, wind, rain freezing temperatures, it's just really hard and not a really advisable time of year to do that.

Amy 31:58
Well, as far as the queen cells go, obviously, the beekeeper's wanting the queen to emerge from that cell. Has there been any research on moving queen cells, and whether it takes longer for them to emerge? Or, is there a certain temperature that the workers need to keep for that queen to kind of stay content in that cell before she emerges?

Jamie 32:20
I mean, she needs to be treated like all the rest of the brood, which usually develops around 94 and a half-ish Fahrenheit, which is around 34 and a half-ish Celsius. And you're just not going to necessarily get those temperatures in colonies unless they already have brood present in the nest, a little bit of brood because when bees don't have brood, they don't maintain the nest at that temperature, they let it go significantly cooler. And if there's no brood, but one queen cell, the likelihood of them taking care of that cell at a temperature that needs to be is pretty slim, too. So it's just not an advisable thing to do this time of year.

Amy 32:53
Alright, I think that's fair. So if you're the beekeeper out there that got a four cent queen cell, let us know where you got that queen. I'd be interested to get some for our lab. All right, Jamie. So the second question that we have, so this question actually came from me because I thought that it would be really fun to talk about this.

Jamie 33:13
Oh, good. Well, I won't make fun of the questioner.

Amy 33:15
Thank you. Thank you. You already do but that's okay. Okay, so you and Dr. Camera Jack went to Thailand last year, and you did a study abroad there. And I am super excited because I want to go there next year in 2024 with some beekeepers. But I know that a lot of what the students thought was really interesting was just the different nesting habits of honey bees. That comes with a different

species of honey bees out there. So can you describe some of the nesting habits of honey bees? I mean, we're used to having our bees in the Langstroth boxes or top bar hives or other methods. And so, can you just kind of go through the nesting habits?

Jamie 33:55
Well, I'll tell you, Amy, honey bees are amazing. And you mentioned the whole species thing, it does vary by species. I'm just enamored with honey bee life history. This is the kind of stuff I really, really, really like to study. It just excites me. So let's think about it from this perspective. There's kind of three broad branches in the Apis world. So Apis is the genus for honey bee, so all honey bees that we're talking about, at least for purposes of this podcast, belong to the genus Apis. Depending on who you ask, there's multiple species, but in our lab, we recognize 10 at the moment until taxonomists tell us otherwise. So three of those are giant honey bees. That's Apis dorsata, Apis laboriosa, and Apis brevigulia. Two of those are dwarf honey bees. That's Apis florea and Apis andreniformis, and five of those are cavity-nesting honey bees, and that's koschevnikovi, nuluensis, mellifera, cerana and nigrocincta. And the reason I say that is because the three giant honey bees and the two small or dwarf honey bees nest on single combs that hang, in the case of the dwarf honey bees, usually from twigs or small limbs of a tree. But in the case of the giant honey bees, either big limbs of the tree, sometimes cliffs, etc. And so these bees nest out in the open, their combs are exposed. I think that's an important thing to think about when you think about honey bees in general. Honey bees do not build structures around their comb. When you look in cartoons and how the media popularizes honey bee colonies, it's almost all always this round structure hanging from a tree limb and bees are flying in and out of a hole into this round structure. Well, those bees are basically flying in and out of the hole of a hornet's nest. Bees don't make structures around their combs. So the bees that nest on tree limbs, florea, andreniformis, dorsata, brevigulia, and laboriosa, these bees, you can see the bees. You can see their comb hanging down from the structures and these combs are covered in layers of bees. Apis laboriosa, one of the three giant honey bees, is a particular interest because it seems to prefer cliffs. This is the bee that nests in the Himalayas. So you'll see it often on the rocky cliffs on the side of these mountains that make up the Himalayan mountain chain. These bees will nest in a lot of ranges and different things. You see big limbs, small limbs, bigger twigs, small twigs, high on the tree, low on the tree, etc. But because these bees nests in the open, they're obviously susceptible to things like rain, right? But these bees often are in tropical areas or almost exclusively in tropical areas, for the most part, at least. So they don't have to deal with cold and thermoregulation. Now, Amy, the five cavity-nesters, they do what their name implies. They nest inside of cavities. And of course, we keep one of those five cavity-nesters, that's Apis mellifera. And we seem to know a lot. Scientists know a lot about what they tend to prefer as a nest site. They prefer for those cavities to be about 40 liters in volume, that's around 10 gallons. They prefer entrances that are around 19 centimeters square. That's about three square inches. They like the entrances of those cavities to be towards the bottom of the cavity and facing south. Those cavities, the bees prefer them if they're about 15 feet, or four and a half meters from the ground. And they like them even better if they've got comb from previous colonies that occupied the cavity. Now, that's what mellifera prefers. Some of these other ones will take much smaller cavities because these other species of cavity-nesting honey bees tend to be smaller colonies. So I'll kind of conclude with this statement with cavity nesters, and of course, our experience specifically with mellifera. You can see them finding these cavities in all kinds of places. Traditionally, in tree trunks, but also on the walls of people's houses. My grandparents had bees nest in one of their chimneys. For years and years and years, I won't say that they were probably just swarms from my colonies, but they

were probably just swarms from my colonies. I've seen them, when I lived in Africa, nesting in old furniture left outside and holes in the ground. And in South Florida, where African honey bees are common, you can see honey bees nesting in water meter boxes, which are cavities in the ground. So they will nest in a wide range of cavities, depending on the sub-species or species of cavity-nester we're talking about. So it's really amazing. The natural history of honey bees is amazing, and where they choose to nest is equally amazing to me.

Amy 38:32
Yeah, I just think that's so cool. All right. So for the last question that we have for this segment, I saw this question, actually, quite a bit on Facebook. And this had happened specifically after a freeze that we had locally, which, yes, it does freeze sometimes in Florida. But people were asking. There were questions from the general public who were not beekeepers. So there were non-beekeepers on beekeeping Facebook groups, basically saying, "I found honey bees, and I had decided to feed them and they seemed really hungry. So I placed sugar water out for these bees." The question is, after bad weather, if there's no forage for honey bees, should people be placing sugar water out for bees? Because there was a lot of conversation on beekeepers responding to that, saying, "No, don't do that. We really don't want our bees to start robbing or learn that behavior," etc, etc. So what are your thoughts on that?

Jamie 39:33
Yeah, so my thoughts are no, no, no, no, no. So I will say, I totally, totally, totally appreciate the general public wanting to do something to help the bees. It just warms my heart to know that people care about beekeepers and honey bees, and that they would be willing to do that. I mean, you see people do this all the time with hummingbirds, right? Hummingbird feeders, if they put sugar water in to feed the hummingbirds. So often, it's folks that kind of continue along that line of thought, "Well, if the bees are suffering, maybe I can provide something for them." But just like the beekeepers who were answering those social media posts were saying, you don't want to start robbing. And it's funny. I like what you said early in your introduction to this question. It's like, well, we put sugar water out there, and the bees really seem to like it, and they kept coming. Well, that's what they're going to do. If you give them sugar water, they're going to like it. If it's off of a major nectar flow, you'll have 10 bees today, 100 bees tomorrow, and 1000 bees the next day. And so you can have lots of problems if you're attracting that volume of bees to sugar water feeders in your backyard. Beekeepers, also, from their end, can have it in sight. Robbing, if bees are going and stealing resources or gathering resources from something that's not a flower, or from feeders that beekeepers directly give them, it can incite robbing. It's also a way for different disease and pest spread. You're not just attracting honey bees, you're attracting anything that likes sugar water, and so you might be supporting some pest species, etc. So, there are these and other reasons I could come up with not to do it again. I appreciate, so much, the general public caring enough to even want to do it. But what I would argue, Amy, is that there are probably better ways that they can help bees than doing that.

Amy 39:42
Sounds good. All right. Well, thank you so much for sending these questions in. Jamie, we've got a huge list of questions. And I'm just really excited that our listeners are involved, and it's a way that we can communicate with them because one beekeeper probably has a question -- if one beekeeper has a question, I'm sure many others have the same question. So we appreciate your questions. Feel free to

send them to us on our email, honeybee@ifas.ufl.edu or on our social media pages, Facebook, Instagram, or Twitter @UFhoneybee.

Serra Sowers 41:49
Thank you for listening to Two Bees in a Podcast. For more information and resources on today's episode, check out the Honey Bee Research Lab website at UFhoneybee.com. If you have questions you want answered on air, email them to us at honeybee@ifas.ufl.edu or message us on social media at UF honey bee lab on Instagram, Facebook and Twitter. This episode was hosted by Jamie Ellis and Amy Vu. This podcast is produced and edited by Amy Vu and Serra Sowers. Thanks for listening and see you next week.