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SPEAKERS

Amy, Jamie, Stump The Chump, 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, everyone, and welcome to another episode of Two Bees in a Podcast. Amy, today, we have one of our very own joining us as a guest. You happen to know her, don't you?

Amy 00:59
Wahoo, I think I do know her, and she's been on our podcast, I feel like, at least two times now.

Jamie 01:04
I don't know, we'll have to ask her when we get her on, but her name is Kaylin Kleckner. She's a PhD candidate here in the Honey Bee Research and Extension Laboratory in the Entomology & Nematology Department here at the University of Florida. She is going to be talking with us about wild honey bee colonies and some specific research she is doing in South Africa. Kaylin, thank you for joining us on Two Bees in a Podcast.

Guest 01:25
Hello. I'm happy to be back. I think it's only been one time, but it's been too long.

Jamie 01:29
Well, thank you for coming back again. I think you have an interesting story to tell because when people talk about your research, they get so excited. Obviously, we're a podcast that was originally developed to heighten beekeeper awareness of management related issues, but the podcast is morphed to include bee biology and ecology and all sorts of things. And ou're a PhD student here in the laboratory, and you've got this interest in wild honey bee colonies in South Africa, which, of course, I

also have an interest in as well. And so we wanted to bring you on and let you tell your story to our global audience. So before we go there, Kaylin, I know you've been here in the past, but it's still, I think, beneficial for you to introduce yourself to our audience. So if you could tell us a little bit about yourself and how you ended up where you are.

Guest 02:10
Sure, happy to. So I initially got an interest in agricultural research through FFA, The Future Farmers of America. I was involved specifically with cattle and food science through middle school and high school, and I went into college at the University of Florida looking for some other avenue related to that agricultural research. I started at the Honey Bee Research and Extension Laboratory, actually, as a volunteer. I learned about beekeeping in one of my introductory entomology classes, and signed up to wash dishes and count mites in mitewashes at the lab. From there, I moved through a variety of roles. I worked with Dr. Cameron Jack in his toxicology research with controls for small hive beetles and Varroa. By the time I finished my bachelor's at UF, I knew I wanted to study honey bees further, but I also knew that I was looking for a change. So instead of the more applied agriculture research, I really was interested in honey bees outside of management by a beekeeper, and that's what led me to pursue a PhD with wild honey bees in South Africa.

Amy 03:22
Kaylin, so why did you choose to work with honey bees specifically in South Africa?

Guest 03:27
South Africa is an amazing place. The wildlife was amazing when I first went there about six years ago. Unrelated to my PhD research, I did fall in love with the animals, the culture, the landscape, but I really was interested with honey bees in South Africa because they are wild there. Apis mellifera, the species of honey bees that we manage here in the US that we're familiar with in our backyards, they actually aren't native to the US. So Apis mellifera, the Western honey bee, is native across parts of Europe, the Middle East and Africa. I was interested working in South Africa because it is so rugged and wild. I have the opportunity to locate and work with colonies away from populations of managed honey bees. So it's really a unique and wonderful environment to study honey bees in the wild where they belong.

Jamie 04:20
So Kaylin, obviously, I know a lot of the answers to the questions, because you and I have spent, I don't know, countless time at this point talking about your research questions, etc, but our audience doesn't necessarily know that your entire PhD is predicated on finding wild honey bee colonies in South Africa. All the research questions that you are asking and trying to answer, they're all built on the back of having a cohort of wild colonies that you can study. And if you were working with managed bees, it's pretty easy. You just got to find some beekeepers and see if they're willing to participate in the study. But you're not. You're working with wild honey bee colonies. So I guess I have a few questions here. How do you stack the deck in your favor to hopefully assure that they are wild, number one, and number two, how do you find them?

Guest 05:08

Those are all great questions. It is a fun challenge. I ensure that the bees are wild by selecting specific regions to look for colonies. So we start by working in South Africa. That's a region where Apis mellifera is native. And then even zooming in further, I select field sites that do not have any managed bees nearby, so I ensure that the properties I'm working on, there's no beekeepers, no one importing other colonies that could potentially affect the genetics or the stock of the wild bees in the area. And finding them, that's a fun but hard task. I locate wild colonies using bee lining techniques. Bee lining, in its simplest definition, involves following bees from a resource back to their nest. It sounds simple, but can be difficult. In practice, I try to stack the deck in my favor by recruiting lots of bees at once to follow. So I set out stands of sugar water, including some anise essential oil as the attractant. I found that bees, the foragers, really love and come to the anise, so it's an essential ingredient. I set out these stands of sugar water to attract foragers. One by one, foragers will find the stands, begin drinking the sugar water, and then they will return to their colony and recruit their sisters, tell them about this great dish of sugar water they just found, and before long, there's really a highway of bees traveling back and forth from my stand to the colony. That bee line is what I follow on foot through various types of vegetation, grass or thicket, alongside various other animals. But I follow them on foot, slowly listening and looking carefully until I find the nest.

Amy 07:05
So, Kaylin, it's always fun to see pictures and videos of this bee lining. How did you end up using anise as the essential oil for the attractant?

Guest 07:17
That's a great question. I learned about anise through Dr. Tom Seeley's work. So he has tested a variety of essential oils as attractants to honey bees, and found that anise worked the best in his research, and I can attest that it worked very well in my field work.

Amy 07:30
Awesome. I love hearing, you know, you do updates to the lab, and for those of you who have attended our bee colleges, Kaylin has done some really great presentations that we had recorded and given to our participants, and so it was really awesome. I can listen to you talk about the wild bees in South Africa for days. Everything about it's just so awesome and looks like a lot of hard work, so kudos to you. The next thing I wanted to kind of talk about was your findings, as far as these nests that you are finding. So can you describe some of the wild honey bee nests? And were there any interesting discoveries that you've made? Were there things that you didn't really expect after bee lining? What have you found?

Guest 08:12
I find colonies nesting in all sorts of places. The majority of the nests I've located are actually in the ground. And this was quite surprising to me. Often, Apis mellifera, the Western honey bee, is described as a forest-dwelling insect and, often, their colonies are in trees. And while I found some nesting in trees, majority of the nests were actually in the ground, in abandoned animal burrows. So in South Africa, there are variety of small mammals that dig burrows underground, but aardvarks in particular are known as ecosystem engineers. Their burrows are utilized by a plethora of other animals, including snakes, other small mammals like mongooses and, in fact, honey bees, quite often too. So I was

definitely surprised by the sheer number of colonies relying on burrows dug by other animals. Honey bees also tended to nest near or inside termite mounds. And in South Africa, these termite mounds are quite large, sometimes three, four feet high above the ground. And so they often were affiliated with those termite mounds. Outside of the ground and these termite mounds, colonies were in trees, they were in manmade structures, so the sides of walls or roofs. They really are opportunistic and were looking anywhere to nest, even if it was a stack of abandoned tires.

Jamie 09:39
So Kaylin, I do have a scripted question that I have to ask you, but I'll ask you that in a second. I do want to kind of circle back to this term that you keep using because I feel like it's so important to our global audience to kind of have some clarity on this. You keep using this term, right? Wild honey bees. Wild honey bees. I hear a lot of folks here in the US, for example, call honey bees that aren't nesting in a managed box wild honey bees. And could you elaborate a little bit more on essentially, why South Africa? What is a wild honey bee, and how does that differ from some of the ways that we might think about it, here and elsewhere, for that matter, around the world?

Guest 10:12
Thanks. I think that's a great point to clarify. Wild refers to simply within the native distribution of a species. So Apis mellifera, this Western honey bee, is native across parts of Europe, the Middle East, and Africa. So colonies within that region that were not imported to that region are considered wild within that distribution. They still can be managed or unmanaged. So a beekeeper managing colonies that were caught from the local area in South Africa are managing wild colonies. Feral colonies are often described as colonies without the management of a beekeeper, but outside of the species native range. So here in Florida, we manage colonies, and they are not within their native distribution, so they are not wild. If one of our colony swarms, and that swarm establishes itself in a tree outside of our apiary, that's considered a feral colony.

Jamie 11:15
Yeah, I think that's key because wild colonies really have no history of domestication, whereas feral colonies do, right? So when you want to understand wild honey bees, you've got to go where they're from. And I think that's really cool. So you've gone out, you do all of these feeding stations, you bee line to these feeding stations. You've already talked a little bit about the discoveries that you've made, but essentially, what do you do after locating a nest? I mean, how do you catalog? What do you catalog? What are things that you're doing once you find these nests?

Guest 11:44
The first step is usually a happy dance, because it's quite a challenge to find the nest themselves. But we record a variety of data once we locate a nest. The first is the coordinates, so we, using a app on a mobile device, will tag the coordinates of where that nest is located so we can come back to it in the future. We also collect natural history data. So what type of cavity is the colony in? What is the height of the cavity? How many entrances are there? What orientation/direction are those entrances facing? Things like that that describe the natural history of the nest itself. I also took samples of bees themselves, so I use a net at the nest entrance to collect about two to 300 bees per colony that I later transported back to the US that will be used in a really cool molecular project that I'm super excited

about. We can, essentially, in the lab, break up tissues of the bee and extract their genomic DNA or their genomic material, and later calculate relatedness and investigate a whole piles worth of questions with the samples of bees.

Amy 13:04
Kaylin, I'm going to go a different direction now, and I do want to ask what some of the unique challenges are to conducting field work in South Africa.

Guest 13:11
It's amazing. I really love it, but it definitely comes with its own suite of challenges. Some of the challenges I didn't expect, but definitely proved to be persistent were the baboons. So there are a lot of really cool animals that we get to see and interact with doing fieldwork, but some are more interested in us, in our work, than others. So baboons in the area were particularly interested in my stands of sugar water, and so some of them would knock them over or just simply tilt back the stand to drink the sugar water straight from the dish. So there are definitely some interesting wildlife challenges of ensuring that we were safe and able to work efficiently and also not interfere with any of the wildlife. I also had quite a run in with some road conditions and driving. So I was in some remote areas with some rough roads, and it did occur that we popped a tire or two, sometimes two in one go. So with any type of field work, we gained a multitude of fun stories. And in South Africa, some of the rugged conditions in wildlife can pose additional challenges.

Amy 14:23
So kind of just looping back, can you talk about the distances that you would be traveling to find some of these nests?

Guest 14:29
Yeah, that's a great question. So I was based in Makhanda, South Africa, in the Eastern Cape. So this is in the southeast region of the country. All of my field sites were about an hour to an hour and a half from my home base. Within a field site, I surveyed one square kilometer at a time, so I had a grid or a boundary that I would essentially stop bee lining at, or stop looking for a colony. Bees can forage very, very far -- upwards of over five kilometers in some cases. So instead of trekking through the bush -- the bush is what they call a lot of the vegetation there -- instead of trekking through the bush for hours on end in search of a single colony, we chose to work inside of a given land area, that one by one kilometer grid. So often we would only travel the distance of that grid before moving on to another line and searching for another colony.

Jamie 15:26
So Kaylin, this is all very interesting. I'm just going to ask you the very generic question, what's next? What do you have in your immediate future, maybe long term future, with working with wild honey bees in South Africa?

Guest 15:37
Right now, I am back in the United States, processing samples and analyzing the data I collected from my previous field season and time spent locating colonies and collecting samples. For the remainder of

this year, I'll be continuing to analyze data. I will be investigating what environmental factors are influencing the nesting of wild honey bees in South Africa. So using that locality data I collected, I'll incorporate some geographic and landscape data available online, and hopefully, point to some specific environmental factors, such as the slope of the land or the type of vegetation, some of those factors that are influencing honey bee nesting. I also, very excitedly, have additional trips to South Africa planned. So I, in addition to my spatial projects and my molecular projects, am interested in some behavioral work with wild honey bees in South Africa. This coming year, I am planning to study drift. We know, as beekeepers, of drift in our apiaries as the phenomenon of workers moving from one colony to another. A lot of the research on drift attributes this phenomenon to our management. We pack colonies tightly in an apiary, and often that's the explanation for why bees are moving from one box to another. But I think it's interesting to pose this question in the context of wild colonies, where they are choosing where to nest and the density that they are nesting in. So we are looking to investigate drift, or this movement of workers between colonies, by painting bees and watching and observing where they go in the landscape. And you might be wondering, how are you going to look for painted bees in these colonies, in the ground or in the trees? And the answer is, we're going to set up catch boxes as almost a sort of catch and release mechanism, like in many other ecology studies, with other types of animals. So we're going to set out catch boxes, allow wild colonies to inhabit those boxes, a typical box that has frames that can be removed so later we can make observations to look at their behavior.

Amy 17:57
So Kaylin, I did want to ask you another question about the time that you spent and what that actually looks like. How much time did you spend in South Africa bee lining, looking for wild colonies and what did your typical day look like?

Guest 18:11
In the last year, I spent six months in South Africa. In total, I spent four and a half of those months doing initial surveys looking for nests, and then I spent that last month and a half revisiting all of my nest sites to see who was still there, who lasted and persisted throughout the summer season. A typical day often started pretty early. The weather was one of the trickiest parts of bee lining, and so we often would go out early in the day to beat chances of rain and wind. I would often get to the lab around 6:30 or 7am and load our bakkie, which is the local word they use in South Africa for a truck. So we would load our field truck with all of our supplies, like our sugar water and our stands, and, of course, some good snacks to power us through the day. We would drive to a field site, and often, by 8am we were out in the bush bee lining. So we would fill our stands in the morning and spend anywhere from four to six to eight hours bee lining, really, depending on what the weather conditions allowed. We would then drive back to the lab, and the work wasn't quite over. We had to process all of the samples we collected, so we would individually count the bees, give them a unique label per colony so we can keep track of who's who in the transportation process, and then, of course, reset for the day. We often had to sanitize stations to ensure we were not spreading any pests or disease of honey bees or otherwise, and we also had to make lots and lots of sugar water just by dissolving sugar and hot water with a tea kettle. So overall, there were long days dictated by the weather, but they were my favorite of all my work in my PhD so far.

Jamie 19:59

So Kaylin, I kind of have to end with this. Why do this work at all? Why study wild honey bees?

Guest 20:05
That's a great question. I think often wild honey bees are overlooked. We study, globally, so much about managed honey bees because they are important for pollination and agriculture, no doubt. But wild honey bees are likely very important pollinators in their respective ecosystems, and many parts of their distribution are really understudied. In South Africa, for example, there are currently no pollinator conservation initiatives. There are few pollinator researchers, but very few in comparison to the number of researchers studying managed honey bees. And so this is an important natural resource for the persistence and success of these local ecosystems. And I think that other than how interesting they are, even for the sake of preserving landscapes and ecosystems and all the ways that honey bees contribute, it's essential that we find out what they're doing, how they're nesting there, and how humans are potentially impacting their populations.

Jamie 21:10
Kaylin, I really appreciate you joining us to talk to our audience about all these really neat things that you're doing in South Africa. And of course, I've got a vested interest in your success as well as the success of your projects. But I'll just say, good luck with your work, and when you're done, we'll have you back on to see everything that you found.

Guest 21:25
Thank you. I look forward to being back again.

Amy 21:39
So Jamie, you were in South Africa with Kaylin doing a lot of the pilot work. And I'm just interested in knowing what you were doing when you were there, and what you had decided together, as far as research methods and all that good stuff goes.

Jamie 21:52
Yeah, so you and I have the benefit of knowing what's happening in real time. For our listeners out there, we are recording this in July 2024, so if you're listening, that just kind of gives you a point of reference. So, Amy, you're right, Kaylin and I, and of course, I took my family with me, were there for two months in early 2023 where the two of us were piloting some of the research methods that she was going to end up using. So for example, we were trying to figure out what components we would need to be able to build these feeding stands. We were working with trying to figure out ways to get them attracted to different baits and all of that stuff. Kaylin didn't mention it, but we opted to use sugar water for a very obvious reason. While they were attracted to honey, we didn't want to use honey because of potential spread of disease, right? So sugar water, and then when you've got scentless sugar water, you've got to get bees there, which, then came the anise, but a lot of that stuff she worked out after she went back a second time. So really the reason I went there for two months with Kaylin was to get her settled, us figure out what's possible in the region, find potential locations, make some contacts, all of that stuff, so that when she went back a few months later to start hunting for wild honey bee colonies, she was ready to go, and she had the techniques worked out. What she did, and obviously it's difficult work, it's hot, you're in the bush, you're working with wild honey bee colonies, you're at the mercy of

what the honey bees do. And sometimes the densities were high, in these square kilometer grids she was in, sometimes it was low, but persistent work, and she found a lot of colonies, and I think ended up having over 130 wild colonies for her research purpose. She didn't find all those by bee lining. Some of them, maybe, were word of mouth, but the vast majority of them were through bee lining, and she's starting to reap the benefit now, because she's got all these good data coming in.

Amy 23:38
Yeah, absolutely. When I had asked her about what her day to day looked like, my biggest point was that that's a lot of hard work. I mean, it is just a lot of work, and it's not for the faint of heart.

Jamie 23:48
Yeah. Graduate students are special people anyway, but it takes a special person to be able to do field work a long way away from home under the conditions that she was doing it in. And South Africa is so beautiful. Our colleagues at Rhodes University, actually, where I did my PhD, so collaborative and helpful. The property owner's so great, but it's still work, right? And it was so hot and she'd have to get up early in the morning and be out there before just setting things up to be ready. She told you, Amy, how many people's research projects are threatened because of baboons, right? I mean, it's just little things like that that you kind of have to work through. But man, it just all fell into place. She's got some future trips there, planned. We're eternally grateful to our colleagues, collaborators, the beekeepers, the homeowners, landowners, and really all the above. It's great work. And of course, a lot of kudos to Kaylin, because she's cream of the crop, right? A stellar individual, stellar grad student who's got a bright future and is doing really cool work.

Amy 24:43
Definitely. I'm excited to see what publications come out of this, and we can interview her again when that time comes.

Stump The Chump 24:57
it's everybody's favorite game show, Stump the Chump.

Amy 25:07
All right. Welcome back to the question and answer segment. Jamie, the first question that we have today is related to liquids used with fume boards. And so this person is wondering, basically, they've got a couple of different liquids that they've used. One of them, they said, they're not really excited about. Another one smells really bad. Do you have recommendations on specific liquids used with fume boards?

Jamie 25:30
Great questions, Amy. I'm not aware of any research project that have compared the commercially available liquids that will run bees out of supers. So I'm just going to broaden my answer and give some thoughts kind of throughout that answer. Essentially, the question is what liquid should I use to get bees out of my supers? What works best? So there are really multiple ways to get bees out of supers. The most manual way involves frame by frame, removing a frame, shaking the bees off of that frame, brushing the remaining bees off of that frame, moving that frame into an empty super that you've got a

lid on the bottom and a lid on top. So you open up the lid, you throw that de-bee'd frame in there, you put the lid back down, and then you move to the second frame, move it over, third frame. So that's very manual. Another way to do it is through the use of these, I don't know a better term, these kind of noxious liquids, things that bees don't like. And the idea here is that you can purchase a fume board, which is usually a wooden frame. It's almost like a hive lid. It's kind of got this wooden frame. And then the frame has a top. The top is made of metal, usually, and underneath that metal, which would be on the inside of the fume board, is a piece of cloth. So you spray one of these liquids per the label directions on this piece of cloth on the fume board. Then you take the lid off of the hive and expose the uppermost frames in the super you want to remove. You turn that fume board on top of that uppermost super with the cloth facing towards the frames. And as the sun heats up the metal on the fume board, the metal heats up that cloth that's got this noxious liquid. And the bees don't like the smell of that liquid, so they run away from it. So it will de-bee the uppermost super. Usually, these liquids and fume boards work best on bright, sunny days when that sun's heating up that lid, which is, in turn, cranking out that fume, which is, in turn, pushing the bees away. Now, I've never really done comparison studies over product A versus product B versus product C. There is one that smells very tolerable, there is one that smells quite bad, even to us. Honestly, the beekeeper's just going to have to play around with it and see which one works best for them. Historically, I've used fume boards, and I grew up using the one that's got the stronger of the two smells, that liquid, and it's worked fine for me. And if you use them according to label, it's really no threat to the taste or the smell of the honey. It does de-bee the hive. But increasingly, I've appreciated that next way that people get bees out of supers, which is more of a mechanized way, which is where you take the super, stand it up on its end, and use a leaf blower to blow the bees out. And that doesn't harm the bees. They'll blow the bees out from one side. They'll blow the bees out from another side. Commercial beekeepers in an apiary of 30 to 50 colonies might have five to 10 fume boards working simultaneously, so you've got one fume board working to push bees out of a super while you're taking off another hive super that's been de-bee'd, and you've got this cycle. A lot of commercial beekeepers will have multiple leaf blowers working simultaneously. So really, you're just gonna have to play around with these methods and figure out which one works best for you. Since I've never seen a direct study comparing the efficacy of the liquids, it's really you deciding which liquid works best under your circumstances, making sure you're following the label, or trying one of these other methods, which is debeeing manually with a brush or debeeing with something like a leaf blower.

Amy 26:52
Yeah, definitely. Enter comment about smells and bees not liking it and making bees run away, versus people running away from the smell as well. I feel like that's what the person was saying, that it just smells horrible, smells like vomit, and they're just not sure what to do.

Jamie 29:07
So it does. But, it also works to me. Every time I smell the smell of whichever liquid that you use to put on fume boards, it just kind of smells like money, right? Because you're in honey harvest season. Again, if you follow the label, it doesn't end up in the honey. And so it's just one of those things that we do in the bee world, right?

Amy 29:26

That's fair. So for the second question that we have, this person was wondering, how do drones know where to find a DCA, a drone congregation area, since they don't have scouts? So do they have scouts? How does this work? How do they communicate to each other to know where DCAs are? And the person also adds the same question for virgin queens. So how do virgin queens know where to go? Who communicates with them? Do we even know the answer to this?

Jamie 29:54
Yeah, so your last question is the answer. We don't know the answer to this question. So I'm going to elaborate, because I don't want that to be just the end all and us move to the next question, but this is a very important series of questions. A DCA is a drone congregation area. And all of you guys out there listening to us, beekeepers, bee scientists, you know that drones that are sexually mature leave the hive every day to go to drone congregation areas where they hope a virgin queen will pass through so that they can chase her, catch her, mate with her, and then, I guess, die. But most drones never do that. Most drones will go to DCA, return to the hive, refuel, go to a DCA, return to the hive, and refuel. And they'll do this for days and days and days until they're dead. So most drones never end up mating with a queen, yet they still go religiously, as it were, every day, to these DCAs. And we also know that when virgin queens are ready to mate, when they're a week to two weeks old, they go and fly to these DCAs. The questioner is asking very pertinent questions. How do drones know where to go? How do virgin queens know where to go? Well, no one has really investigated this thoroughly and answered those questions, I would say, conclusively. And so I was fortunate to work with Nico and Gudrun Koeniger and Larry Connor to co-author a book Mating Biology of the Western Honey Bee, the bees that we use. I've been giving lots of talks on this topic over the years, since we co-authored that book, and the Koenigers talked a bit about it in their first draft of the book, so I was able to learn quite a bit. And they originally had hypothesized that drone congregation areas will form what they would call depletions in the horizon. And the way that I talk about this is imagine standing in a valley where you've got a row of mountains on your right and a row of mountains on your left, and they're going off into the distance, and they're converging in the distance, kind of in the shape of the letter V. And so the horizon in the distance is converging in the shape of this letter V, and they would say drones will fly that direction and form their DCA. The only problem with that, which is a good hypothesis, the only problem with that is, in Florida, we don't have any mountains, and so how do queens and drones find DCAs in Florida? I did have a master's student, Ashley Mortensen, who worked on this as a master student. She was also my PhD student. She's now moved on to do research in New Zealand, but she did work with DCAs, and she was looking for DCAs here in Florida. And one of the things that she noticed is that drones will often fly, they'll leave the hive and fly in whatever direction they choose, until they reach some sort of, I call it a topographical change, like a hill or the edge of a field, where there's now trees, and the drones kind of turn up from there. And day after day after day, they'll go to the same spot. Somehow, when the virgin queens come out of their hives, having never flown, necessarily, to these places before, they go to the same spot. There are no scouts for virgin queens. As far as we know, there are no scouts for drones as far as we know. They just seem to go to the right place. And I've even read before that drones use the same areas and virgin queens use the same areas from year to year to year. So whatever DCAs are around your colonies this year will be the same places that next year's drones and next year's virgin queens go and so forth, even in the absence of colonies for five years. If you move new colonies to that area, and assuming no environmental changes, DCAs will form at the same spots again. So this is an open area of research. It is absolutely one of those things that still

needs to be studied further. There are great questions. We do not know for sure. We've got some super rudimentary ideas, topographical changes as an example. But honestly, we don't even know for sure those are right. Ashley had gotten pretty good at looking at Google Maps and predicting areas that she might find DCAs, but they were often the edges of fields near wherever the managed colonies were. So a lot more needs to be done on this. It's really one of many, but still one of the many great mysteries remaining in the honey bee world.

Amy 33:56
Yeah, definitely. Is Ashley still working with drones and DCAs currently? Do you know?

Jamie 34:01
I'm not sure that she continues to do that work in New Zealand, but it's certainly possible. I haven't asked her about her research, actually, recently, so I feel bad about confessing that online. But I know she's done some pollination of local crops and other things where she's studying in New Zealand. I'm not sure if she's continued to do work with DCAs.

Amy 34:17
So for our listeners out there, you may or may not have remembered this. We did have Ashley on as a guest speaker at one point. Jamie, that was the story that you were telling us that I'll never forget about you and the dead raccoon.

Jamie 34:29
True story. It actually happened.

Amy 34:31
You want to retell that story real quick and summarize it very quickly?

Jamie 34:34
Well, I can, but as a professor, I don't get to get out in the field too much. It takes a lot to just make labs go forward. But one day, I told Ashley, when she was a master's student, "Hey, Ashley, could you take me out in the field? I'd be happy to help." Well, she's like, well, gosh, we can do double the amount of work. So Jamie, I'll set you up with one of the ways that you attract, that you discover DCAs is using weather balloons that you put high in the air with little pieces of cotton filters that you paint black and that you put queen pheromone on. So you raise them in the air, you walk around, and when drones start chasing these filters that smell like queens, you know you're close to a DCA. Well, one day, Ashley put me out at one site to see if I could trap drones at a DCA, and then she took the truck to another site at the same area where she could go find DCAs. And lo and behold, a storm rolls in. And Florida is very famous for huge thunderstorms, electrical storms. It was going berserk. Goes out there, I'm in the middle of the field with a weather balloon.I mean, I don't know what to do. I don't know if I'm supposed to stay in the middle of the field or go to the only tree in the area. So I'm like, well, I guess I'll go to the only tree in the area, which may or may not have been the right decision. But anyway, I go to the only tree in the area to try to stay little bit away from it, in case it gets struck. And there was a cooler that we had taken out and put under the tree. So I sit on the cooler, and I'm watching this thunderstorm coming in, waiting for Ashley to come rescue me, and all of a sudden, I start smelling something, and I

look over and there's this fried raccoon with this grimace on its face. It looked like it was the last thing that waited under this tree when a thunderstorm came in. And it is dead, deader than a door nail, absolutely looked like it been zapped. And I'm thinking, crud, this is my future. When Ashley finally gets here, I'm gonna be that fried thing with this grimace having been struck and fried in real time by a lightning bolt. Didn't happen. I did survive.

Amy 36:23
Well good.

Jamie 36:24
It's definitely one of those terrifying things. That's what I get for trying to help a student.

Amy 36:29
That's right. I don't know -- I mean, I do know why, but every time I think about DCAs, I always think of that story.

Jamie 36:35
A DCA almost cost me my life.

Amy 36:39
It did cost a raccoon its life, so rest in peace.

Jamie 36:41
It did, possibly. RIP, raccoon, RIP

Amy 36:46
Okay. So for the third question that we have for today, the questioner is wondering, if certain bees fight hornets, and if certain bees can fight hornets, what bees are these and can this be taught? Can this behavior be taught? What is going on here?

Jamie 37:01
So I'm going to broaden this to say that all members of the species Apis, so the honey bees, the true honey bees, there's probably 10 or so species, all of them have mechanisms to fight arthropod invaders. So an arthropod, in this case, would be exoskeleton, jointed legs, multiple body regions, so forth. All right, so Apis mellifera, the bee we keep, can fight arthropods. It has natural hornet pests where it's native. The other species of Apis, cerana, florea, andreniformis, etc, they also have hornet predators where they are native in Asia. So honey bees, across the species, have varying levels of defensive behaviors that they use against invading hornets. So I'm guessing the questioner is maybe a specifically asking about Apis mellifera in this context. So Apis mellifera can get attacked by various species of hornets. And normally, when a hornet lands on the nest entrance, the bees may try to ball it, which is, gather around it, sting it, bite it, all of these kinds of things. We know that some species of Apis, for example, Apis cerana, are regularly attacked by hornets, so they have heightened hornet defenses. As an example, they can gather around, they can ball their hornet attackers and raise the temperature in that little ball of bees, that cluster of bees, to a temperature that kills the hornet, but not

the bee. This is one of those famous news stories from years ago that the honey bees can raise the cluster temperature to kill the hornet when they're balling this hornet. So there are varying levels of defensiveness that the different species use against hornets. Now, with mellifera, specifically, they have some rudimentary behaviors against hornets, you know, balling them at the nest entrance, biting them, but they can easily be overrun if too many hornets attack them. So we've got Vespa mandarinia, Vespa velutina, a lot of these other hornet species that can attack Apis mellifera, since these are new threats to them. So the velutina and mandarinia are species that are native to Asia, whereas mellifera is native to Europe, the Middle East and Africa. Apis mellifera is not great at combating these hornets. They do have some defenses, but they're not necessarily, quote, natural defenses, that they can employ with great success. A lot of the traits that honey bees display against these hornets, just attacking at the nest entrance, etc, that's about the limit. They're not as good at thwarting Vespa mandarinia and Vespa velutina as, say, Apis cerana is. These aren't necessarily learned behaviors. These are behaviors that are probably or can be selected. My guess is, for example, if you have 30 colonies in an apiary, and hornets have an equal pressure against all 30, there will be some colonies that are better at thwarting the hornet advances than will other colonies. And that's probably a selectable response, but I will say, generally speaking, the mellifera is not so great at combating the Asian species of hornets that it now encounters in much of the introduced world.

Amy 39:53
Alright. Thank you so much. I feel like, Jamie, we've had Dr. Guntima from Thailand talk to us about different honey bee species. I would love to do another segment on the different species and some of the characteristics, some of their biology, just highlighting each species. I think it'd be really fun to do that at some point in the future with our episodes.

Jamie 40:05
It would absolutely be a great topic, Amy. I agree.

Amy 40:15
Alright, everybody you know what to do. If you have questions for us, feel free to send it to us on our email or one of our social media pages. Thanks for listening to today's episode. This episode was edited and produced by our podcast coordinator, Mitra Hamzavi. Thanks, Mitra.

Jamie 40:41
Visit the UF/IFAS Honey Bee Research and Extension Laboratory's website, UFhoneybee.com, for additional information and resources for today's episode. Email any questions that you want answered on air to honeybee@ifas.ufl.edu. You can also submit questions to us on X, Instagram, or Facebook @UFhoneybeelab. Don't forget to follow us while you're visiting our social media sites. Thank you for listening to Two Bees in a Podcast.