Episode 31 Mixdown PROOFED

Wed, Apr 13, 2022 12:23PM • 1:02:15

SUMMARY KEYWORDS

sting, swarm, bees, colony, hive, honey bees, nest, beekeepers, queen, wasps, venom, question, cluster, people, honey bee, work, site, bee, scouts, commercial beekeeper

SPEAKERS

Jamie, Amy, Guest, Stump The Chump

Jamie 00:05
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. In this episode of Two Bees in a Podcast, we will be joined by Dr. Juliana Rangel from Texas A&M University. She'll be with us talking about scout bees and how they begin searching for nest sites prior to the colony swarming. That will be followed by a segment in which Amy and I talk about bee stings. And of course, we'll conclude today's episode with our famous question and answer segment. So thank you for joining us, and we hope you enjoy this episode of Two Bees in a Podcast. So Amy, I'm actually kind of excited about the segment. Go ahead, ask me why.

Amy 01:22
Why are you excited about this segment?

Jamie 01:24
I'm excited about the segment because I was talking about swarm behavior, I was actually doing a Zoom lecture to a group in the UK last week. And I know our listeners are going to be weekless. But this is being recorded the week of 12 August 2020. But anyway, I was speaking to a group in the UK on Zoom last week about swarming, and I was talking about hosts how to find a new nest site and all that stuff. And a question came up: Do worker honey bees start scouting for their nest sites prior to initiating the swarm? And I gave the answer that I thought that I heard was correct. But we actually have a guest in this segment who has done the research on this topic, Amy. So we actually get the right answer, although it may be a week too late.

Amy 02:10

Okay, but I thought you're really excited for this segment because you got to roll your r's by saying her last name.

Jamie 02:17
No, there's no chance. Our listeners will understand what we're about to say, and that's because we are joined by an expert of a lot of different topics, but today, as an expert of swarming behavior, and that is Dr. Juliana Rangel who's an Associate Professor of Apiculture, Department of Entomology, Texas A&M University. Juliana, thank you so much for joining us on Two Bees in a Podcast.

Guest 02:40
Hi, Jamie and Amy, thank you for inviting me. I'm really excited about this. This is my first-ever podcast recording.

Jamie 02:47
Well, it's cool to have you, and let me tell you, just for our listeners' sake, I always try to get the guest's name completely correct before they join us. And I was asking you, Juliana, how you pronounce your name just to make sure that I got it perfect.

Amy 03:02
Rangel.

Jamie 03:02
I've always said Juliana Rangel. And you said --

Guest 03:06
Rangel.

Amy 03:07
Rangel. See, I can do it.

Jamie 03:09
I cannot roll my Rs for anything. So anyway, that's not why we have you here.

Guest 03:16
Some people say Rangel, Some people say Rongel.

Jamie 03:19
I bet Rangel was probably the --

Guest 03:22
Ran-hell, like ran from hell. I just say yeah, yeah. All of the above.

Jamie 03:27

Well, if it makes you feel any better, Juliana, my name, Jamie, is androgynous. So a lot of people who have not met me will often think I'm a lady. And it was funny because one time I was at this meeting, 500 people there, it was not a bee meeting, they were bringing me in to talk about bees.

Amy 03:45
I love this story.

Jamie 03:47
And this lady gets up, "I've not met Dr. Ellis, but I've heard she's a great speaker and I can't wait to meet her. She's going to be so good." And then she said, "Dr. Jamie Ellis!" And I stood up and there was this collective "Oh!" across the audience. I'm like, "Yep, that's a boy, Jamie. Sorry, guys, to disappoint." Anyway --

Guest 04:06
So I have one of those Hispanic last names where I have my father's surname Rangel, and then Posada is my mom's. I preferred the short version just for the Rangel. But in documents, I have both. And one time, when I was working in North Carolina State, someone called the bee lab asking for help with a swarm, and they asked for Julio Poblano. We'll never forget it. I think I know who you're looking for.

Jamie 04:50
It's good that my name is not the only one that's butchered then. So we brought you in because we're excited to talk with you specifically about swarming. As I've noted, you've done a lot of different things. We'll have to definitely have you back in the future to talk about some of your other research. But specifically, we want to talk about swarming. Probably, as you know, the seminal work on this topic was published by Dr. Tom Seeley, whose lab you spent some time in. He wrote Honey Bee Democracy so a lot of people have read that book, and it kind of outlines swarming. I know you were a large part of helping uncover some of the truths that he put on those pages. But I specifically want to talk about that one aspect of swarming, which is home seeking. So before we get there, I want to ask if you'll just tell us briefly about yourself and how you got on to the topic of swarming?

Guest 05:41
Sure. I grew up in Columbia, South America. And I moved with my family when I was 17 to California, where I went to school for my undergrad at UC San Diego. And I wanted to do some research and looked into different possibilities, and I landed two opportunities, one working in a neuroscience lab with mouse brains. I just didn't really enjoy that part of having to kill mice. The other opportunity was working with James Nieh, whom a lot of you might probably know, who worked on communication and behavior of honey bees, and at that time, with stingless bees. So I worked with both labs, and I decided that I really didn't want to do any kind of lab neuroscience work, I really enjoyed the bee work, and the rest is history. I started doing my undergraduate research there, got an opportunity to travel to Brazil with James and published and I was hooked. Originally, I wanted to continue working with stingless bees for my PhD. And so I applied to work with Tom Seeley at Cornell University to work on stingless bee behavior, in Costa Rica this time. I did a couple of years of field work, but it was going really slowly. So

Tom suggested that maybe I switched to honey bees to help them answer some of the questions about swarming behavior. And I switched to that, and I fell in love with it. And he was local, I could work longer seasons without having to travel. And since then, I've been working on questions that relate to reproduction, swarming, supersedure, queen and drone health, reproductive quality in general. So after working with Tom on the questions that you're gonna ask about, I moved on to working with David Tarpy at North Carolina State as an NSF Postdoctoral Fellow. I was there for three years, and then moved to Texas A&M as an Assistant Professor in 2013. And I've been here since.

Amy 08:26
That's awesome. So we speak a lot about queen quality, and we have spoken about swarms in some of the other podcasts. But if you could give an elevator speech of what a swarm is, just a little bit about what they are.

Guest 08:41
Sure. So honey bee colonies, and in this case, Apis mellifera, they reproduce via swarming or colony fissioning. And so when a colony is large enough to grow and to split into two units, it will do so during the reproductive season, which is typically in the spring and early summer. And so the colony will split into what we call a swarm colony. And it has about three-quarters of the adult worker population plus the mother queen, she leaves with a swarm that clusters in a temporary place technically known as a bivouac.

Amy 09:26
Bivo what?

Guest 09:27
Bivouac. Try to spell that, Jamie.

Jamie 09:33
B-I-V-O-U-A-C. Did I get it?

Guest 09:34
Very good. Yes, you did.

Jamie 09:36
I hope I got it. You're just saying very good to make me feel better about myself.

Guest 09:41
No, it's just because most people haven't heard that word. It's kind of a technical word for clustering and social insects. Anyway, so that's the swarms that most people recognize in their properties and tree branches. And then back in the parental nest, you have the remaining adult population, about a quarter, plus all the resources that were left behind, the food, the combs, of course, the very protected and highly valuable nest cavity and the developing brood, plus the colony would have started a queen-rearing process so that at least one of the several queen developing queens that remained behind is

about to emerge, or the cell should be at least capped, well into development before the swarm leaves so that there's assurance that the parental colony is going to have a queen that can inherit the nest and then start egg laying after she mates. And so that's basically swarming and that's how the superorganism that is a honey bee colony reproduces at the colony level, it's through swarming.

Jamie 10:57
So I think one of the marvels of swarming is that, when we watch it, as beekeepers, you go up to your hives, and these bees all come flying out, they circle in the air, and they cluster together in this bivouac and then they find a new home. It seems really simple to us from the outside, like they cluster there and then just go look for a new home. But there's a lot of complex and complicated behaviors that have to occur through the swarming process. I mean, there's the preparation, right? You have to prepare to swarm, you have to start rearing queens, like what you said, somehow the workers have to know in unison to rush out of that hive and circle in the air, they have to know where to land. Once they land, they have to know how to scout nest sites, and they have to be able to fly to those nest sites in unison once they've voted on the one that they like best. So there's so many little tiny mysteries of this entire swarm process that has to be unraveled. One that you were specifically working on, Juliana, is this house hunting, right? They have to find a new cavity in which to move and make their new home. So when I was growing up, I assumed that all of that took place in the bivouac formation, that cluster, when the bees are clustered and hanging from a tree limb is when they start sending off their scouts looking for nest sites. But you've done some work to suggest that it happens even before that, correct?

Guest 12:18
That's right. So when I was working on trying to decipher the signals that initiate a swarm's departure from the parental nest, we would have to label the bees that were performing certain behaviors. We used observation colonies for this and the beards that are created outside of colonies for thermoregulation so that you can look at the bees kind of on the surface and you can manipulate them and paint, mark them. So we had an observation colony, and we had a bait hive, we were working on Appledore Island where Tom Seeley has done all of his work with house hunting, because it's an island that doesn't have any tree cavities, or any bees, for instance. So you go there to do your research, you would actually get on a boat and travel along with your assistant and your honey bee colonies that you would then open up, do your experiments with, and when you are done, you would just take them back to dry land. And you would have these nest boxes, these observation colonies that you set up and try to go and scout for. And when bees arrived at the nest box, we would label them because we assumed they were nest site scouts. So what was interesting is that we would label these bees and they would go back to the observation colony. But the longer that time went, the higher the number of bees that would visit the nest box. And then we would see some of these painted bees back at the observation colony performing the waggle dance that communicates location, in this case, of potential homes. So we knew that it was the nest site scouts that were performing the behavior, the house hunting behavior and the waggle dance behavior to communicate the location of these homes because they were paint marked and we had painted them at the nest box. That's how we figured that there was house hunting going on before the swarm even left because this happened days before the actual swarming event happened. So there was a lot of recruitment of bees to go and visit the nest boxes during this process, which was the first time that anyone had quantitatively recorded this happening.

Amy 15:00
I have so many questions, but I'm not going to ask you all them because it'll probably take all day. So you guys painted them at the nest site, then they would go and scout for a location, and then they would go back to the original observation hive to do the waggle dance for them?

Guest 15:18
That's right. So we had someone at the nest box that would wait for visitation of honey bees, again, because there were no nest cavities, natural nest cavities on the island. These boxes that we set up was very high, very attractive.

Amy 15:40
Got it, got it.

Guest 15:40
So we would sit there, wait, when a nest site scout goes in to a cavity, they take a while inside just kind of doing what's called reconnaissance.

Jamie 15:57
Gathering information. You're right.

Guest 16:00
They learn how big it is, whether it has any leaks, or if I have time to tell you later, whether it's occupied by another scout from a different colony, which we actually found out that they can, that does happen, and there's actual competition between scouts from different colonies. They kill each other at these boxes because, if they're really high quality boxes, they're going to fight to the death to claim that high quality box. So we saw an increase in visitation as the day progressed because there was recruitment to these boxes.

Amy 16:42
Got it. So I think the number one call I get is probably someone finding a swarm. I mean, most of the people that call me are people who are not beekeepers at all, and they found a swarm. And sometimes I'll let them know, wait a little bit. I mean, you might want to wait a little bit, because that may not be their final destination. So my question is, why would they not just select a new nest site before swarming? I mean, why do they have to cluster beforehand, before they go to their new home?

Guest 17:15
I've had that question asked several times. In short, we don't really know the answer. But we suspect that they cluster because of several reasons, one being that they may not have found all the possible cavities that are available while they're preparing to swarm. And so clustering allows them a little bit more time to potentially find a couple more spots. And also, from what I just said, because there's competition at these high-quality boxes, they need to cluster in order to find out whether they were the ones that their swarm was able to claim that box before moving to it because several colonies in the

same environment are sensing the same environmental cues. They will swarm typically at around the same time. So it's not unusual that on a given day, with the prime swarming conditions, you will see a few swarms swarming at the same time. If that happens, then they're going to be looking for homes at the same time. This competition can happen.

Amy 18:26
Yeah. Now, just thinking about honey bees, how they communicate like, "Nope, that's not a good spot. Don't try that one again."

Guest 18:33
Yeah. Another question that we don't really know the answer to, one day, maybe I'll try to get at that, is why do swarms take different amounts of time in the cluster? So you as you said, it's typically a temporary site, Apis mellifera is a cavity nester, not an open nester. If they stay outside without it being a cavity, it's very likely that they're not going to survive the winter, at least in temperate regions. But we do know that they can take anywhere from a few hours in the cluster to a few days. And so I wonder if that has to do with whether they did a lot of their homework prior to swarming, or if they did most of the work at the cluster site, or if they have to compete for several sites with other swarms and they lost, so they have to look for other potential alternatives. I mean, plus the weather, of course, like if you have storms going through, they can't really do this house hunting process, and it gets interrupted sometimes for a few days before the weather clears. So there's so many unanswered questions when it comes to house hunting.

Jamie 19:50
So, Juliana, I was actually asked that same question when I was giving that swarm talk last week. I essentially made the comment that, "Yeah, I've heard or I've read, I can't remember, that the bees, in fact, do start scouting potential nest sites while they're in their colony." And one of the questions that came back again, like what Amy just asked you, was then, "Why form a cluster at all?" Which is an interesting question. But then they asked, "Well, if they are, in fact, scouting while in the hive, how do the other worker bees recognize a scout dance compared to a foraging dance?" If you're in that hive, and the bees are dancing for a potential nest site --

Amy 20:31
What are they dancing for?

Jamie 20:32
Dancing for potential resources, how can the scouts differentiate between the two of those dances since there seems to be legitimate recruitment happening at those dances?

Guest 20:43
That's an excellent question. So I can think of two things that are going on. One is that when a food forger is performing the waggle dance for recruitment, there is a very strong olfactory component to the dance. And that has been studied by several people. The bee has the smell of the flower that they're visiting, basically, communicating to the followers what specific species of plant that nectar and pollen

is coming from. They also, if they're nectar foragers, they give a little taste of what they brought back when they're unloading the nectar. So house hunters, the site scouts are dancing, they're not providing any reward to the dancers. Potentially, they are smelling off the potential home site, whatever residence or particular smell that that home has, will smell completely different to a flower that food foragers are going for. Also, there is evidence that there are certain genetic lines or certain genotypes that are more prone to being nest scouts than food scouts in colonies. So the followers of nest scouts are probably those that are also genetically inclined to looking for homes, instead of food. So I think those two things combined are making the followers know that what they're following is for a home site and not a food site.

Jamie 22:41
Well, it's funny, because as I shared a little earlier, I've never really gave a lot of thought to swarming. And then when I read Honey Bee Democracy some years ago, it just was fascinating to me. As a honey bee biologist myself, it's amazing to me the number of complex behaviors that honey bees have. I mean, we're just talking about swarming. They also collect food, they also maintain a nest temperature, they also can forage over great distances, they can also defend a nest, they can also collect and use propolis. And we can go on and on and on about the complex behaviors they have. One of the interesting things that I had thought about is why cluster at all? And this is a question that you had mentioned as possibly one that's been unanswered, but one of the hypotheses that I'd put forward is when bees are preparing to swarm, there's a lot of preparation that takes place. It's not just nest site hunting, it's also getting the queen down to her flying weight, it's also the production of queen cells. And one of the running hypotheses that I'd had, well, maybe the bivouac is necessary, because there is some overlap between the trigger for searching for new nest sites and the trigger for producing new queens. If they had to hang around in a hive until they found that new nest site, there could be a great risk to new queens emerging when the old queen is still present prior to the swarm. So maybe the bivouac is necessary just because they can't complete the task. They can start it but not complete it, given that queens are also being produced during the same trigger, as a result of the same triggers. I don't know.

Guest 24:16
Yeah. That makes a lot of sense. And in fact, we discovered that the signals that the bees are using to initiate a swarm's departure from the nest are exactly the same as the signals that are used by the same bees on the bivouac to move to the cluster and move to the new home. So you're right, they're using the same signals in two slightly different contexts. The first, leaving the colony to cluster, and then leaving the cluster to the new home and so there needs to be some partition between the two processes so that they can actually be completed.

Jamie 25:02
Yeah, I wonder if there's any occurrence that people have been able to document of a colony essentially going straight to the new nest site? I mean, I'm not aware of it. But it certainly seems maybe possible.

Guest 25:15

Exactly. I've been asked that question, I don't really know. When we did our experiments, all the colonies that we used attempted to cluster. But interestingly, also, they all performed scanning behavior when they were still in the colony. So there could potentially be colonies that go straight from the parental colony to the new home, but I have never seen it, and I never heard of it. I have seen the failed attempt to swarm. And I think some beekeepers have seen it too. When you know that the queen is really not involved at all, in this swarming process, she's kind of forced out of the colony, she has no control over it. This is the workers who basically tell her, "Let's go." Of course, they will have exercised her so that she loses weight the weeks prior to swarming. But sometimes, she doesn't lose enough weight, and she drops to the ground when this swarm is happening. She can't really fly and they fail to swarm.

Amy 26:34
So they won't just like cluster on the ground or like pick her up and carry her to their site.

Guest 26:37
They can't pick her up. No. She's basically there until I think she probably perishes. But they don't really go back to their colony, they don't lift her up and take her somewhere.

Jamie 26:51
Juliana, it's interesting because I clip my queens wings. So if I ever, for some reason, fail in the swarm control process, and my colony still put out a swarm, this always happens to me. And a lot of the times the queens will go but the whole mass will just crawl back up into the hive. And then there's this kind of disparity at this point. A good chunk of the time, she'll crawl under the nest and cluster there, and that's where they will remain. There's been plenty of times in my beekeeping years that I've suspected a colony tried to swarm but knew that my queen was clipped so they couldn't. So once I got down to the brood box, I would just rock it up and find them hanging down under there. If, on the other hand, they have made it back into the hives multiple times, my old queen has always disappeared, and they've always swarmed with the first virgin queen that's emerged. So there are these kind of interesting behaviors that I've seen, just by virtue of essentially causing that same phenomenon that you said is natural. If the queens are too heavy, they can't fly. Well, I cause them to not be able to fly for other reasons. But I still feel like I see regularly, repeatedly, these kinds of two sets of behaviors, either they're clustering under the hive and won't go back in or if they try to go back in over multiple times, the queen will just be lost, and they'll swarm with the virgin.

Guest 28:13
Isn't that curious that they've managed to make it back to the box? But they don't really go in?

Jamie 28:20
Yep, you're right.

Guest 28:21
And if they do, they potentially get killed. I don't know what happens. But if they've already made it to the box, which is the most, probably, perilous movement, why don't they just make it all the way in?

Jamie 28:36
I can't figure it out either. Like half the time, they'll stay in that swarm cluster. And the other half of time, they'll go back in. But like I said, the bees themselves aren't usually lost. It's usually just the queen. It's almost like, and I hate to give anecdotes because we're always, as scientists, fighting anecdotes. But, anecdotally, I've always just thought, well, bees are able to detect if they're queen is simply unable to swarm after they've tried a few times with her. And if they can't do it, she just doesn't. She disappears. Let's put it that way.

Stump The Chump 29:06
Let's just say, yeah.

Amy 29:08
Let's just say.

Jamie 29:10
One of the encouraging things about talking with you, Juliana, is that nothing in science is fully known, and I know that that statement is self-defeating, I suppose. But the point that I'm trying to make here is that even with something that you and your colleagues with Tom Seeley and others have spent so much time trying to understand swarm behavior, there are still mysteries. Why cluster at all? Why do swarms take different amounts of time to cluster? How do they differentiate between the different types of dances? So it's fascinating to me that there's still work to be done. And that's exciting to me as a biologist. I know it is to you as well. So I really appreciate you for joining us today and just kind of shedding some light on these very complex and fascinating behaviors bees do.

Guest 29:53
Oh, yeah, no problem. I really love the topic. As you said, there's so many unanswered questions still. The benefit of doing the work that we did with Tom on Appledore Island is that you can control a lot of the cues that bees are receiving from the environment in terms of swarming because there are no natural tree cavities and no bees. So you know that all the bees that you see around are coming from your own colonies. So it would be more difficult to do those precise experiments in areas where there are a lot of feral colonies and managed operations nearby, because as I said, all the bees around are doing the same similar behaviors in the same environmental conditions. So it would be trickier to control for who's who, but there's definitely a lot of opportunity to learn more about what's going on in colonies that are swarming. One thing, if we still don't know a lot about swarming, we don't know almost anything about after swarm.

Jamie 31:04
Absolutely.

Guest 31:05
That's another thing that we should really --

Jamie 31:07
We talked about that with our guest from the UK a few weeks ago on our podcast, the one who had been working on that queen tooting and piping and the communication for after swarm. So it's fascinating. And one of the things that's so encouraging to me is, if you're out there listening to us and you're a prospective masters or PhD student, there's lots of things left for you to unravel and uncover. So, Juliana, thank you so much for joining us on Two Bees in a Podcast. It's been great to have you today.

Guest 31:32
Thank you very much for the invitation. I look forward to coming back sometime in the future.

Jamie 31:38
All right, everybody. That was Dr. Juliana Rangel, the Associate Professor of Apiculture in the Department of Entomology at Texas A&M University.

Stump The Chump 31:51
For additional resources, visit the podcast page on our website UFhoneybee.com.

Amy 32:06
Jamie, how many times have you been stung in your lifetime?

Jamie 32:09
Tens of thousands. Probably as many times as I've been asked that question.

Amy 32:14
That's so funny. I feel like I've only been stung, maybe, 20 times.

Jamie 32:19
Are you serious? Don't you have bees?

Amy 32:20
Yeah, but one time, listen to this, one time, one of the bees stung me in the face. And then she crawled around and she started burrowing into my ear. Brandi Stanford who is our apiary inspector, the chief woman of the FDACS apiary department, she had to actually pull a bee out of my ear and it was so disgusting. And it was a great time, and we bonded over that. Yeah.

Jamie 32:42
So, BFFs right?

Amy 32:49
Yeah, exactly.

Jamie 32:50

I tell people I've been stung, like literally everywhere except on my eyeball. And it's funny because --

Amy 32:57
That's good.

Jamie 32:57
I don't want that to happen. I've asked an expert once before, what happens if you get stung on the eye? And he told me that if you don't get it addressed quickly, the venom can cause blindness, like very quickly. So it's something that I wear a veil to try to protect against, but I've been stung everywhere else. My whole body, tens of thousands of times at this point in my life.

Amy 33:22
No, thank you. Well, it's actually not that bad. But that's what our segment is going to be about. Today, we're going to talk about managing stings.

Jamie 33:29
Maybe I'm not the one to ask, given my history with stings.

Amy 33:34
Well, every time you're out working bees, you just wear a veil. Don't you --

Jamie 33:38
That's correct.

Amy 33:39
-- on your arms, you're not like fully suited up. Whereas, I know a lot of beekeepers, and usually, I do too, I will fully suit up because I don't like getting stung. I mean, they've stung me through the suit. But I take more precaution, I think, than a lot of other people. And I know some of my fellow beekeepers out there, especially some of the commercial guys that I work with, they've got like duct tape, they work with wasps, too. So anyway, let's start from the beginning. Can you tell me about stings and some of the biology behind stings?

Jamie 34:06
Yeah. I think starting from the beginning is a good place to start. So a sting is basically a honey bee's defense. So I need to give you a little bit of biology of insects in order to appreciate what I mean here in the next few minutes. But honey bees, wasps, ants, and something called a sawfly, which is not a fly at all, but something called one, those four critters, bees, wasps, ants, and sawflies are all related. They're in this group called Hymenoptera, which is Greek for -- hymen means membrane, optera means wings, so membranous wings. Alright, so all these four groups of critters are related. Now, in a lot of Hymenoptera, at least, the sting is actually what we call an ovipositor. Ovi, like egg, positor, to deposit. So a sting, in many wasps, as an example, is used to lay eggs. They'll actually sting their prey, lay an egg through that sting, the sting is not being used to deliver venom, in this case. They'll lay an egg through that sting, and deposit that egg inside of their prey. And believe it or not, most wasps are

parasitic wasps that do this. That's how they use their stings. Their stings are ovipositors. So they're used to lay eggs. And there's some wasps that have incredibly long ovipositors, multiple inches. And that's because, as an example, they might parasitize beetle larvae that live inside of trees, tree trunks. So they'll take that long ovipositor and weave it down these tunnels until they find their prey and sting and lay an egg. So that's what they were, quote, designed to be used for. Now, in the more derived Hymenoptera, some other wasps, bees and ants as examples, the stings quit being used for oviposition purposes, and then they became a defensive organ. So a lot of wasps, the hornets, yellow jackets and things a lot of people know, all the bees and the ants, they use their stings as defense. Now, in an ant's case, they will use the sting for more than defense. They'll actually sting their prey and maybe immobilize it and take it back and feed it to their young. A lot of wasps do that same thing as well. They'll use their stinger, not to lay an egg but to immobilize their prey. All the paper wasps do this, hornets, yellowjackets, they'll go and hunt caterpillars, sting the caterpillar, immobilize it, they'll chew it up and take it back to the nest.

Amy 36:49
Wait, hold on. Are there insects that can use that as an ovipositor and lay an egg and/or decide to shoot out venom?

Jamie 36:58
So let me tell you, Amy.

Amy 36:59
Is that a dumb question?

Jamie 37:01
In the biology world, anything's possible. I'm not aware of any, but my guess is it's possible. I do know that, obviously, a lot of parasitic wasps use them exclusively for egg-laying purposes, and then the rest of the wasps, the ones that aren't parasitoids, are more predators like the paper wasps, they use it to immobilize their prey, not for the purpose of laying eggs. Ants, again, if you think about ants and wasps together, they're sting is partly for defense and partly for prey immobilization. Bees, on the other hand, don't eat meat. They're not hunting things. They eat plant-derived products, nectar, pollen, things like that. So their stings are exclusively used for defense. So obviously, they're made to hurt. Even wasps are made to hurt. They use it for defense and to hunt. So they're made to stop their prey or to hurt things. So by the time you get to bees, they're made exclusively for the purpose of hurting you, deterring them. If you think about it, it makes sense. Bees, especially social bees, like bumble bees and honey bees, have these nests that are absolutely full of food for lots of different critters. Bears might want to eat the brood or the pollen or the honey, whatever. And so bees, especially honey bees, bumble bees, the social bees, they use their stings to defend their nest to ward off these things that might want to come in and eat the stuff that they're trying to protect.

Amy 38:29

I feel like I have so many questions, but we'll move on. Next question. Okay, so how else are honey bee stings different from wasps as far as the venom goes? A lot of people ask me, "Is a wasp's venom worse for you or stronger than honey bees'?"

Jamie 38:48
So that's a good question. So all the insects that produce venom for the purposes of pain, or some sort of reaction, the venom is different by the species. There are subtle differences and that's why you can get stung by a fire ant, as an example, and go, "Yeah, that's not so bad." Or stung by a honey bee and go, "Yeah, that's worse," or stung by paper wasp and go, "Holy Moly, that really hurts." So there's actually a scientist, Justin Schmidt, Dr. Justin Schmidt, I forget where he is but he's somewhere in the southwestern US. He actually tries to get stung by all of the stinging insects. And he has a rating or ranking called the Schmidt sting scale or pain scale. We need to get this guy on our podcast because he'll talk about the relative pain related to each sting. And believe it or not, honey bees are relatively average or mild compared to a lot of the other stinging insects' stings. But when it comes to bees, what we're working with specifically, honey bees, their purpose is to keep you away from their nest. That's why they sting. Of course, as beekeepers, that's why we respond by wearing, those of us who wear suits, gloves, veils, etc. I always wear a veil. You mentioned that earlier. I always wear a veil. I don't like to be stung in the face. But really I wear a veil to lower lower the risk of getting stung in the eye. Otherwise, I don't mind stings as much on my legs or my torso, etc. But one of the things that is incredibly important for our listeners to hear is the beekeeping world, you have nothing to prove. You don't have to be macho. It is absolutely okay if you want to wear a full bee suit and you want to wear gloves. It is absolutely okay, there's no need to try to strut your stuff around. The idea is that I always tell people, "You need to wear as much personal protective equipment, PPE, that you're comfortable wearing." And my only recommendation with that regard is that you should wear a veil all the time. The rest of the stuff, it's really up to you. If you want to work without gloves or with gloves, I don't care. If you want to work with a suit or without a suit, I don't care. But I do recommend that you wear a veil to keep those stings out of your face. If you think about it in that regard, stings to the eyes aren't just the bad area to be stung. If you're stung around the nose, around the throat area, just a few stings can cause those airways to close. And so while you might take a lot of stings on your legs, you take comparatively fewer around those sensitive areas. And so that's just why I want to keep these away from my head and neck area.

Amy 41:27
Yeah, and I mean, people react differently to venom. And maybe one person who gets stung by one honey bee could go into anaphylactic shock. They could potentially die from that. So I guess the other thing, too, I remember learning this, but I don't remember the exact numbers, what's the actual percentage of people who are allergic to bees?

Jamie 41:47
That's a good question. I've actually looked this up multiple times because I get that question a lot. And there's no consensus in the medical community. I've seen numbers as high as 3 or 4%, and I've seen numbers as low as 1%, or lower. So usually, when I answer that question, I say, relatively comfortably, it's lower than 3 to 4% of the population, and more like, lower than 1% of the population. That means

less than 3 to 4% of the population is truly allergic. I think that's important to know because a lot of people will say, "I had to get out of bees because I'm allergic to bees." And I'll say, "Well, tell me about that allergic response." "Well, I got stung on my hand, and my whole arm was swollen by the morning."

Amy 42:27
And that's normal, right?

Jamie 42:28
That's within the realm of normal. An allergic reaction means that you're having a significant reaction away from the sting site. So you get stung on your hand and your throat closes, you get stung on your torso, and you're having difficulty breathing. Those are true allergies. And maybe we could have another episode later about the levels of response to stings, Amy, I actually ought to make a note of that because I think it'd be important to cover. But at the end of the day, the average person is not allergic to bees. And if that's the case, the stat that I've seen is that the average human can take five to 10 stings per pound of body weight before you die of just toxicity, because venom is a toxin. So you can only take so much of it, even if you're not allergic. So the average, say, 100-pound individual can take 500 to 1000 stings before they just die of venom toxicity, they've just got too much venom in them, which is why those of us who are not allergic will not ever have that risk because usually we get away from the nest when we're in a couple of the dozens stings. We don't sit around to get that 500 to 1000 or more. But it does illustrate the point that if you're getting a lot of stings, that you need to get away from the nest. Of course, Amy, that's a sliding scale. Five to 10 stings, again, around my legs are no big deal, but five to 10 stings, if I accidentally inhale bees, five to 10 stings in the throat could really be a problem. So it's all a little relative.

Amy 44:00
So there was another thing that I heard about bee stings as far as when you get stung and how to remove the stinger. I mean, some people will say, take a credit card and swipe it versus pinching it and pulling it out. Is there a method that you recommend? I mean, has there been science that has shown that there has been the same amount of venom that gets distributed or not?

Jamie 44:22
Yes, yes, yes. And yes. All right.

Amy 44:24
I have so many questions.

Jamie 44:25
When I was trained to keep bees, I was told what everybody was told and what all the old books say. When a bee stings you, she leaves behind the whole sting mechanism, which is the shaft, that's the pointy end that's in your body, incidentally, you don't even feel that going in. It's not the shaft that you feel, it's the venom going through it that you feel. So the shaft is in your body, and on top of that will be this muscular bulb that looks a lot like a heart. If you look closely, it's beating, pumping venom into your body. So the premise was if you grab it and squeeze it to remove it, that you're squeezing the venom

through that shaft into you. You're doing that bulb's work for it. So instead of doing that, you should scrape it out. But there was actually a research project in the last 10 or 15 years where they looked at scraping versus squeezing and removing, and they found that there was no difference. The only key to minimizing the impact of a sting once you've been stung is the length of time it stays in you. In other words, you need to get it out as quickly as possible. And that's the key to minimizing the impact of that sting.

Amy 45:36
Got it. Got it. Got it. So I know we always tell people that honey bees, they normally sting once. Are there instances where honey bees can sting multiple times?

Jamie 45:45
There are. I'll say on the onset that worker honey bees have sting shafts that are barbed. If you look at the tip of a fishhook, you'll see that little barb. That's designed to keep the hook in the fish's mouth, not to pull out backwards. Well, worker bee stings have the same thing. They have barbs on either side of that shaft. They're designed not to be pulled out. The idea is that this is going to rip out of the bee's body and the bee's going to die. She wants to leave that sting in your body as long as possible to get the maximum impact possible. So as a result, worker bees usually can only sting once because after she's implanted that thing into your tough skin, she's not going to be able to remove it and use it again. With that background, though, there are times where I've had worker bees sting me and fail to get it appropriately in me. Maybe they've only scraped me or only gotten it in so far, and then they can withdraw it and move on and sting me in another spot. But that is the exception rather than the rule. Normally, when she plants that baby really well, it's stuck and she's going to rip it out of her body. Now, that's the worker. Queens, on the other hand, have smoother barbers -- barbers, haha. Yeah, they got much better barbers, they keep their hair taken care of. They have much smaller barbs on their sting shaft so they don't get stuck in your skin. So they're a lot more like yellowjackets and hornets, they can sting you and sting you and sting you and sting you. And incidentally, all of this biology that I just shared with you is why when I get asked about stings, "I had something sting me, your honey bees are doing a problem." The first thing I ask is, "Well, was there a sting left in you after this?" "No, it wasn't. She flew away with her sting." Well, then it likely wasn't a honey bee unless they got stung by a queen, which is even less likely unless they were physically working the hive and picking up the queen. And in that case, they would have known it was the queen stinging them. So the vast majority of stinging events that are attributed to the honey bees are actually not honey bees. It's wasps etc, who don't have barbs on their sting, and as a result, can sting you multiple times.

Amy 47:51
In what instance would a queen need to really sting? Have you ever been stung by a queen?

Jamie 47:55
I have been stung by a queen, and that's because I've picked up hundreds, maybe thousands of queens at this point in my life. And the reason that queens are capable of stinging is they fight one another when a new queen is born. Or she'll go and sting her competition. So, incidentally, that could be one of the reasons their stings aren't barbed. It, obviously, would be terrible if a queen loses her

sting upon stinging something else. So as a result, they have smooth stings, and they're used for that purpose. And incidentally, I have picked up way more queens than I have been stung by queens. So it's still not common to be stung by a queen when you do handle queens. So yeah, they're pretty interesting to pick up. But, as a result, I've just been stung a few dozen times by queens when I picked up hundreds or maybe thousands of queens.

Amy 48:45
Yeah. For my last question for you, so we talked about workers and them singing and queens stinging, drones don't sting.

Jamie 48:54
There's a very good reason for this. If you remember back to what I was sharing early on, within Hymenoptera, the sting has a lot of different functions: laying eggs or immobilizing prey or for defense. Well, for those insects that use it for immobilizing prey or for defense, it's still a modification of what used to be, at one point in the history of these organisms, egg-laying device. So as a result, males don't have them. Male bees, wasps, and ants never had in their ancestral history an ovipositor because they never laid eggs. They were males. So as a result, male bees, wasps, and ants cannot sting. They don't have these modified ovipositors, which is why you can pick up drone honey bees or drone carpenter bees or male ants or whatever, and not have any risk of being stung. They're just not capable because they don't have that ovipositor or that modified ovipositor.

Amy 49:52
Okay, and I said that was my last question, but it's not my last question. So what do we do after we get stung?

Jamie 49:57
I think the key is, Amy, to get it out as quickly as possible. If, after you've been stung, you're still worried about it, well, I need to stop here for a second and put in a public disclaimer. I am not a medical doctor. So if you're really worried, you need to consult medical doctor related information. But there is some advice about getting the sting out as quickly as possible. There's been some advice about maybe cold compressions, there are sting-aids that you can buy. A lot of the beekeeping equipment supply companies will have these little things that you can spread on the sting that will make your hand feel better. There are recommendations about some medications, anti-inflammatory medications that you can take to reduce the swelling and things like that. And so what I would do is I would refer people who are worried about a response that they're having to contact their allergist or their doctor immediately. Most of us just kind of suck it up and let it go. Obviously, if you're having an anaphylactic shock, you need medical attention immediately. I tell you, Amy, this sting discussion is great. It definitely makes me feel like we need to have kind of another segment here in the near future talking about what are the reactions that humans can have to stings? And what are appropriate responses for each of those reactions? So listeners, what I will tell you is our commitment to you is we'll make sure and cover this here in the next couple of weeks. So maybe once you're hearing this, maybe look out a couple of weeks after that for another episode that we'll release on what is the appropriate beekeeper response to a sting or sting event?

Amy 51:24
Sure. Awesome. Well, thank you so much. Now we all know about stings.

Jamie 51:28
Everybody's going to want to run out and get stung now.

Stump The Chump 51:39
It's everybody's favorite game show, Stump The Chump.

Amy 51:51
Okay, it's that question and answer time. It's kind of nice, Jamie, we're starting to get some of the same questions. And every time we get a same question, I get to go back to one of the podcasts that we've had, and I get to link that so that I can force people to listen to our podcast, and I don't tell them where it is in this segment. So they have to listen to the whole thing to hear the answer.

Jamie 52:08
Well, the thing I feel bad about, though, is if people are giving us the same questions, maybe I'm not doing a good job answering the question clearly.

Amy 52:16
Well, I think --

Jamie 52:16
It's another way to look at it, right?

Amy 52:18
That's true, I didn't think about it that way. Yeah, maybe it's just because you're a horrible person, and you're just not very good at answering questions.

Jamie 52:25
I'm sure.

Amy 52:26
I'm just kidding. Okay, so the three questions that we have, can sugar water go bad? The first question.

Jamie 52:31
Sugar water can absolutely go bad. I mean, if you think about it, it's water with sugar in it, and it's just a great resource of energy for microbes. So it can ferment, a lot of beekeepers will see this kind of scuzzy black stuff on the inside walls of their jars. So the best thing about sugar water is make it when you plan to use it. And I would use it within a couple of weeks of making it. And obviously, the storage for that sugar water is going to dictate how well it survives. Obviously, if you're putting it in a warm climate or a

warm, dark climate, it might just thrive. So the key to sugar water, again, is use it when you make it and don't make it until you plan to use it.

Amy 53:15
So when you're using it, how often do you should you change it out, switch it out?

Jamie 53:21
I only put as much on a colony as the colony can take. So if I'm using, for example, a half-gallon jar, which is very popular in the beekeeping industry, I would put it on a colony that should be able to empty that in three to four days. If I'm going back and it's a week or two later and it's not being emptied, there's either a nectar flow that's happening, so they're ignoring it, or the colony is not able to take it fast enough, in which case, the next time I provide them sugar water, I'd give them half a jar or half a feeder, because I don't want to give them more than they're able to take because I want them to take it before it goes bad.

Amy 53:57
Got it, got it. Makes sense. Okay, so the next question we have is removing supers. So this person is wondering, do we remove supers to keep safe from any possible amitraz contamination?

Jamie 54:10
I don't, personally, like to leave supers on colonies that are being treated if I intend to use those supers for honey production later. It's tricky because you can't. If you read the label, the key here is, as we said in that segment some weeks ago, the label is the law. Most products used against Varroa prohibit you from having supers on those colonies while the bees are being treated if you plan to make marketable honey at that time the strips are in the hive. It's a little bit ambiguous with regard to supers that are just on hives outside of honey production season. But my stance is that anything you ever plan to use for the purposes of honey production need to be off of that hive when you are using any sort of treatment. And I will tell you, the label always takes precedent over what I say. So the label is the law. So I like to have my, what I call marketable supers, where the supers themselves aren't being sold but they're being used to make marketable honey, I like to have those things off even in the offseason if I'm treating those colonies. So, I take those supers off. It's not worth the risk. Like I said, if you're making marketable honey, then you certainly can't treat because most labels will tell you that. So follow the label.

Amy 55:36
I feel like we need to make a song. Follow the label, the label is the law.

Jamie 55:39
Alright, you write the lyrics and you sing it, and I'll endorse it.

Amy 55:42
Okay.

Jamie 55:43
Malcolm Sanford has done that before. We had a segment some episodes ago where Malcolm led us out singing. So it's possible. You can.

Amy 55:53
I'll have to call him, he'll help me with the lyrics. The label is the law.

Jamie 55:58
They kind of write themselves, don't they, Amy?

Amy 56:00
They do. Yes. Okay, so the last question that we have. Someone is asking, it's kind of a funny question, which I don't think the person was thinking it was gonna be funny, but for some reason, I think it's really funny. When a commercial beekeeper is loading a pallet of hives onto a flatbed trailer, what are the bees doing during that time?

Jamie 56:16
Stinging the commercial beekeeper.

Amy 56:18
I thought you were gonna come up with a different answer.

Jamie 56:20
No, no. So what's happening is that, this is again, I'm speaking in generalities here, that's hard for me to say. I was gonna say generationalities, I was going to put generation and generality together. So I'm speaking in general terms here. That's the safest way to say it. In general, commercial beekeepers move bees at nighttime. So as a result, most of the bees are in the hive. Now, they do move them during the warm season, sometimes, because they have to go from crop to crop for pollination purposes or honey production purposes. So there may be some bees clustered outside the hive. The commercial beekeepers or whoever's doing the work for them, usually is fully suited, and they're using forklifts to pick up pallets, and there's fairly minimal response from the bees. Now, if a commercial beekeeper were on hearing me say that, they'd say, "No, there's a significant response," but what I would argue is it's minimal compared to what the general public would expect. You would almost expect every bee of the hive to be out attacking the forklift. And that's not the case. Usually, when there's these disturbances to their hives at nighttime, the bees just kind of hunker down and stay in place. And what they'll do is the beekeeper will forklift all of these pallets up onto the back of his or her truck, and then they'll cover all the pallets at one time with a net, which will limit the ability to fly. Now, the catch is, it's at nighttime, so the beekeeper can't see what he or she is doing unless they turn on the lights. And that's really the biggest liability to moving bees at nighttime because once you turn the lights on at nighttime, bees that are being disturbed will fly to those lights, which, incidentally is why a lot of beekeepers who do this at nighttime outfit their forklifts with red lights instead of the standard white lights, again, because bees can't see red. So it's a way to minimize their response. Now, red lights that we can purchase aren't perfect red lights. So bees can see it a little bit and they will respond a little bit

to it. On the other hand, it certainly minimizes the response compared to what they would get if they were using regular white lights or yellow lights or their flashlights or on the front of their trucks or on the front or forklifts. So that's the way that they try to minimize bee response. They also smoke heavily. They are smoking the bees heavily. They usually have a smoking crew going around smoking the pallets, and they're using red lights on their forklift, they're moving them at nighttime, and all of these things, for the most part, will keep the vast majority of the bees in the hive. With that said, there will be some bees that come out. And in fact, usually, commercial beekeepers will leave a pallet or a colony or two behind to catch those bees that left the hive at nighttime and never made it back. They basically are catching the drifters, essentially, the next day.

Amy 59:10
Do they reduce the entrances of each colony or each hive?

Jamie 59:14
They don't. Commercial beekeepers don't have time to do that. They just forklift these colonies. Usually, a pallet will have four colonies or six colonies on it. They'll forklift that pallet up, all the entrances are open so the bees are capable of flying if they want to, they stack them on the back of the truck, bees are capable of flying if they want to at that time, and then they put a net over the whole shebang. And so in theory, bees between colonies, while they're in transit, can go into one another's colony. Sometimes, the entrances are facing one another. So yeah, all of that can happen on the back of a truck. But yeah, that's just how they do it. It's the tried and true way. If you ever want to experience it, I'm sure there's more than one commercial beekeeper who would love to have some extra help when he or she's loading colonies on to take them somewhere else.

Amy 59:58
Yeah, I love watching. They have little competitions here in Florida where they will do the forklift competitions. Have you seen that, Jamie? They're pretty awesome.

Jamie 1:00:08
Yeah, the forklift stacking competitions?

Amy 1:00:10
Yeah. They're a lot of fun. I love them.

Jamie 1:00:12
The funny thing about it is beekeepers, and I'm one, so I can say this, beekeepers find interesting ways to entertain themselves. Oftentimes, when I go to bee meetings, they'll have a smoker lighting contest. I happen to feel that I'm the best smoker lighter on the planet.

Amy 1:00:26
Oh my goodness.

Jamie 1:00:27

So I feel like I would win that competition, hands down, every time. But they have forklift rodeos, as you've mentioned.

Amy 1:00:32
Forklift rodeos! That's what they're called.

Jamie 1:00:36
"Stack 8 pallets of bee colonies." Or they'll have hive tool throwing contests where you'll try to stick your hive tool.

Amy 1:00:42
What?

Jamie 1:00:42
I know, it's crazy.

Amy 1:00:43
No, they won't. Really?

Jamie 1:00:44
Yeah, they will. They will. And I'm pretty good at that, although, I wouldn't say I'm the best in the world, unlike the smoker lighting contest.

Amy 1:00:51
Oh, my goodness. All right, well, hopefully, we'll get a video of you doing all those things some times to show everybody.

Jamie 1:00:55
Maybe some day, Amy, maybe.

Amy 1:00:58
Alright, thanks. Keep all the questions coming. If you ask me a question and I send you a podcast episode, it's probably because we've answered it at one point or another, which is great. I think that's a good thing. So keep the questions coming. We'll continue to record podcasts as your questions come in. Thanks.

Jamie 1:01:15
Thanks, everyone. Keep those questions coming.

Amy 1:01:17
Hi, everyone. Thank you so much for listening to this week's episode of Two Bees in a Podcast. We would like to give an extra special thank you to our audio engineer James Weaver, and to our podcast coordinator Jacqueline Aenlle. Without their hard work, Two Bees in a Podcast would not be possible.

Jamie 1:01:38
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!