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SPEAKERS

Stump The Chump, Amy, Jamie, 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.

Amy 00:43
Hello everybody, and welcome to this segment of Two Bees in a Podcast. Today, I am joined by Dr. Huw Evans, who is a lead innovation for BeeHero X, and he is calling us from Italy. We've invited him on today to talk about a publication that came out. The project is called "Hive orientation and colony strength affect honey bee colony activity during almond pollination." And so I'm really excited to talk to Dr. Evans today. Thank you, Dr. Evans, for joining us.

Guest 01:17
Well, thank you very much for inviting me to be part of this.

Amy 01:20
We always with our listeners introduce our guests. If you could tell us just a little bit about yourself, how you got into honey bee research, and then we'll delve a little bit more into the research project.

Guest 01:32
Well, for me, I've been a beekeeper for over 20 years now, predominately as a hobby in the early years, and about 15 years ago, I was examining a hive. I was doing what they call swarm inspections. That's how they teach you in the UK as a beekeeper in the spring, you look for queen cells. So it means removing every frame from the hive, shaking the bees off, looking for them making queen cells. And the

bees didn't really want to be disturbed. I didn't really want to disturb them. I was kind of getting stung from a suit, and I came back and I thought to myself, I didn't really enjoy that. I mean, I love beekeeping. It's the perfect mix between the science and the craft. For me, I like the smells, I like the honey, but I also like having to think about what to do next. But what I'd done just didn't feel right, that every seven days you have to look for these queen cells. And I thought, in this day and age, if a surgeon in a hospital can replace a valve in your heart via a vein in your leg, there must be some way of finding out what's going on inside a beehive without completely taking it to bits. So I have a first class degree in electronic engineering. Sandra, my partner in crime, has a first class degree in biology, and so we started researching into what noises bees make, what changes in temperatures bees make when changes are happening within the hive. That's what started our interest in using electronics to try and predict what your bees are going to do without having to open them up and disturb them.

Jamie 03:01
I tell you what, Huw, that's definitely a topic that we could talk about for a long time, because I've got a lot of questions about that. Maybe it'll come out during the podcast. But the specific research project we were reading, and it came to mind, was the one that you and your colleagues examined hive entrance orientation, hive strength, and looked at how that influenced pollination activity of honey bees and almonds. And I tell you, I was looking at the paper, the design is elegant and straightforward. The results are elegant and straightforward. So it answers some age old questions for me as well. So before we spill the beans on all of that, maybe I'll just simply start from the top and ask, what's the background of the project? How did you and your colleagues end up studying hive orientation and how colony strength and hive orientation impact, essentially, flight activity?

Guest 03:47
As Amy's already mentioned, I mean, if you fast forward to today, I lead innovation at BeeHero, I believe at the largest pollination service supplier in the world these days. As part of the innovation arm, I do the kind of wacky stuff. I'm potentially to BeeHero what Q is to James Bond, you know, I do the stuff that's slightly off pieced. So we do all sorts of things, like monitoring bees in the field itself, not around the hive, but how many bees are in different parts of the field. We look at both the density, we can also look at the diversity, both in space and time during pollination seasons. We look for Asian Hornets. We have acoustic signatures for Asian Hornets. If we spot an Asian Hornet, we can raise an alarm. I recently was chasing wild pollinators around the Peruvian rainforest, but our main focus is optimizing how bees pollinate crops, and particularly in the almond industry, the almond orchards of Central Valley California. There's a few ways that we look into improving so, you know, how do you maximize the amount of pollination trips from a bee hive? And one thing to look at is the condition of the hive, and primarily its strength. Strong hives tend to pollinate better than weaker hives. Also, the resource within the hive. There's also things to do with hive condition that can affect how much flying they do. Alternative forage is another interesting thing to look into. Often, nature will provide alternative forage, but places like the Central Valley of California, it's a very much a monoculture environment, so you can actually manage alternative forage. I think last year, in last year's almonds, we did see a drop in bee activity inside the orchard, and we identified, I feel the plums were stealing the bees at some point in that pollination. We also think about where you place the hives. I think most people would like to see the hives placed uniformly throughout the orchard, but that's just not practical. I mean, even the

grower who wants to drive a spray truck around doesn't want to be tripping over hives all the time. Beekeepers would just prefer to drop them off all in one place, turn up with a truck, drop them off all in one place. It tends to be a compromise, where they drop down the roads that surround the orchard. This tends to work quite well. And finally, so if you decide where to put the hives, what we studied here was specifically the orientation of the hives, which way the hives were pointing. Do they point the sun rising in the morning or east or west? I mean, we focused on the difference in performance from hives facing east to hives facing west.

Amy 06:11
I'd love to hear about your methodology. As you're telling me everything you were looking at, I'm like, what did they find? What did they find? But before we get to the findings, let's talk about the methodology. So what did you all do for your project?

Guest 06:23
We ran the project in collaboration with the USDA, the Baton Rouge genetics team, Liz Walsh, Frank Rinkevich, maybe, and Kate E. Ihle. I can't really pronounce their names. That's right. That's right. Thank you very much for that. And they're quite a team. They were actually looking at the difference between bee genetics. So they have their Pol-line bee, which has been selectively bred for pollination, and they wanted to see how it performed with respect to the Russian bees. When I say the Russian bees, I think it was 1993 when the USDA started bringing a lot of Russian bees into the US for pollination services. There was a bit of selective breeding that went on. Nowadays, they have the Pol-line range, and we also compared them with what you might call Italian mutts, your general stock bees brought to almonds in the US. So we ended up with 24 pallets, two with Pol-line bees, two pallets of Pol-line bees, that's eight hives of Pol-line bees, eight hives/two pallets of the Russians, and two pallets/ eight hives of the stock bees, and they were a great team. I mean, they spent most of their time assessing the hives with the Liebenfield method. So that's not just a quick, sort of dirty grading. Often, as is normally done in the almonds, they actually go through each frame. If you think about that, that's 24 hives, and they go through every one of the 20 frames in each of those hives. So they're looking at almost 500 frames. And they grade them all by precisely how many bees are on that frame, how much brood is on that frame, how much stores are on that frame, pollen? And they went through and did it all. They caught returning bees, weighed how much nectar they collected, they looked at the sugar level of this nectar, they weighed the pollen that came back. They were a great squad. I mean, they just went through those 25 colonies to grade them all, just in one go. It was hot, and they just did it. They're quite a talented bunch. Our role in that was more from a technology perspective. We reached for the technology. We put bee counters on the entrance of each of the hive that allowed us to get a very accurate count of how many bees leave the hive and how many bees return to the hive. The counter has two light beams, and as the bee breaks the beams, the order in which the beams are broken, you can tell whether the bee is leaving the hive or returning to the hive. It's quite a sophisticated bee counter, in which it just looks at the attenuation of the light beams. You can almost see the profile of the bee going through it, which makes it more accurate than a normal light beam counter. We also weigh the hives. We have the hives on hive scales. You can actually see the foraging force leave the hive by a dip in the weight. And then you can see it get more as they come back with the nectar, as they collect the nectar. And we also have a little electronic gizmo. This is the main core of BeeHero technology that

lives inside the hive. And this not only tells us a lot about the fitness of the colony, the colony health, which we could go into, but also it does act as what you might call an E-scale. We can tell to a certain degree, how the colony is changing in weight by the changes inside the hive in noise temperatures. I mean, the bees tend to process the nectar once they collect it. So you get a feel for changes in weight. And also, we can see the bee activity using this little electronic gizmo. The electronic gizmo gives us an idea of these things, but if we actually use the scales and counters for the scientific experiments, it gives us a far more accurate result. So we measured all these parameters. We had these six pallets, and half of the hives were facing east and half of the hives were facing west. So it was two of each of the three strains of bee. So yes, indeed, half the hives -- the road the pallets were placed on was actually running east to west. So, exactly half of the hives were pointing due east and the other half the hives were pointing due west so we could monitor the precise activity from each of these hives.

Jamie 06:34
Yeah. Kate E. Ihle So, it's funny, because it's a simple research question: Which direction matters most, right? If you point them east versus pointing them west, does it matter with hive activity, pollination activity, etc? Amy, you already alluded to the fact that you can't wait to hear the answer. I'm sure our listeners cannot wait to hear the answers. Huw, what is the answer? What did you find?

Amy 10:28
What is the answer?

Guest 10:29
We noticed that hives facing east tended to start flying, on average, 45 minutes sooner than hives facing west. And this is intuitive to most people, because the sun comes up from the east and shines on the front the hive, starts warming the hive up. That light pours through the entrance of the hive, and it gets the bees going. They both get warmer. They both know it's morning and time to start work, where it takes longer for the sun to come round and start doing the same thing to the west facing hives. Of course, on bad weather days, you did not see the same advantage because the sun was not shining on the front of the east facing hives. So on a cloudy day, both hives facing east and west, regardless of strength, started flying at approximately the same time. Now, the reason it's better to face east, and the reason you get more pollination trips from hives facing east, is that at the end of the day, even though the sun leaves the east facing hives sooner than it leaves the west facing hives, of course, by that time, all the bees are warmed up and flying, they don't really rely on the sun to get them going. So while the bees facing east start flying, on average, 44 minutes sooner, at the end of the day, there's only four minutes difference between the hives facing east and the hives facing west when it comes to when they stop flying.

Jamie 11:45
It's funny you say that, because one of the things that I was thinking when I was reading this was like, I wonder if it matters at the end of the day. I also wonder, Huw, if I could get my employees to work harder if I orient the building a different way.

Amy 11:58

Hahaha.

Jamie 11:59
Think I can get them here 45 minutes earlier?

12:01
Well, we're warm blooded. So we kind of generate our own heat so we don't rely on the sun to get us going in the morning as insects do.

Amy 12:09
When Jamie says his employees, he means me.

Jamie 12:12
No, no. Anyway, it was very interesting that you found that, because I've educated folks about beekeepers, it's embarrassing to say now, three decades, I guess. And people always ask me, does it matter? And I'm like, well, if you read the books, it usually says something like, face them east or face them south, but I've never really seen any research on it. I mean, it's intuitive, but I've never seen research. Well, here you guys are. You did the research. You answered the question.

Guest 12:36
We were surprised. There was a study before ours done by William Merkel, he works for the USDA in the Tucson Research Unit, and he published a paper on hives facing north, south, east, west. East and west have the biggest contrast, I feel like. We focused, we preferred a bigger one on east and west than spreading them pointing in all directions. But we were surprised how little work had been done on it. It's a fact that is intuitive to most beekeepers, and most beekeepers know about but it was never really shown before. I think the interesting part of the experiment came later. So we got to the point where we'd concluded that, on average, bees facing east started flying much sooner than bees facing west. But then we went on to split into two groups of strong bees and weak bees, and then reanalyze the data from that perspective. And this is where things did get interesting, because what we found out was that the strong hives didn't really mind which way they pointed. It was the weak hives that were very, very sensitive to their orientation. So weak hives facing east didn't start that much later, but the weak hives facing west, where they really had to take much longer to warm up, they really suffered. So we found out that strong hives don't mind as much where they face. The weak hives care a lot more. So some of the west facing weak hives took up to two hours to get going in the morning. And this is what drives the average down between the east and west facing hives. The strong hives, on the other hand, didn't mind as much.

Amy 14:09
So could we say, basically, that if you have a weaker hive, it would be more ideal to face them east for pollination services?

Guest 14:16

Well, very much. So, I mean, if you think about this as -- okay, from a pollination service perspective, from a commercial beekeeper, even as a commercial beekeeper, it's better if your bees start flying earlier in the morning, even if you're not being paid for a pollination service. But if we do think, how can we take this research and apply it to beekeeping husbandry in general, both from a commercial and from a hobby beekeeper perspective. It is quite interesting because obviously the rule of thumb for an amateur beekeeper is that you should really face your hives southeast. That is the optimal direction. And if your beehives aren't on pallets, it's quite easy to do that. Wherever you are, you can twist the hive to point wherever you'd like it to. The problem comes in commercial beekeeping because on a commercial beekeeping pallet, there's four hives, two hives face one way, the other two hives face in the opposite direction. So if you're going to point two hives east where you want them, inherently two hives are going to be facing west. And you can think, okay, well, I'll face two of them south, but then two are facing north, which isn't good either. So you can't really control the orientation. I mean, how would you, even if you didn't have this problem, which is inherent in a pallet of bees, imagine, as a beekeeper, trying to say, okay, well, what I'll do is I'll put all my weak hives on one side of the palette and the strong houses on the other side of the palate. I'll then have to indicate to the dude that picks up the bees and takes them which way I'd like the pallet to point, and then as he puts them down, he'll have to spin around the pallet to make sure -- it's just not practical. It's not practical for the beekeeper to balance his colonies in that way, and it's not practical for the person delivering the bees, positioning the drops for them to consider the orientation in this way. The roads might not even be going in the right directions. Our second finding about the strength does apply and can help commercial beekeepers. It generally means that strong hives are better than weak hives because they don't really mind which way they point. We found, in general, we call this the non-linearity rule. It's not straightforward at all, but we find that strong hives do better pollination than weak hives. Now, you could say, well, of course, there's more bees within a strong hive. That is not what I mean. What I mean is the environment of a strong hive is more productive than the environment of a weak hive, and it could, I mean this orientation is one reason for that, because weaker colonies, smaller colonies, are colder and they rely more on ambient heat. The non-linearity rule is that a frame of bees in a weak hive, if you move that frame of bees into a strong hive, that same frame of bees will do more flying in a strong hive than a weak hive. So what I'm saying is a 12 frame strong colony will do more flying than the combined flight of two six frame colonies.

Amy 16:57
That was the next question I had for you, actually. How is a weak hive defined? And how is a strong hive defined?

Guest 17:03
Well, it's a bit of a sliding scale. There's no sort of threshold for that. It's quite difficult for almonds. It's already enough to say to a commercial beekeeper, okay, make strong colonies. I think all beekeepers would like to make strong colonies. The problem being, almonds is in mid-February. I mean, that's still winter to a lot of people to raise a strong colony. I mean, the BeeHero bees, we have these gizmos inside the hive. We can modify how they're managed. We can monitor them throughout the winter, and it does make it a lot easier to to raise strong colonies. There's also a lot of beekeepers who can raise strong colonies without such electronic assistance, but not many. So, if you can raise strong colonies, that would help, but it's a very difficult thing to do in time for almond pollination.

Jamie 17:49
So, Huw, all this is very interesting. I really enjoyed our discussion with you. What's some follow-up that you guys are going to do with this? Anything planned?

Guest 17:57
Yes. I mean, we repeated the experiment again. This experiment was performed in 2023. We repeated it again in 2024. We got similar results with respect to orientation as we expected. I mean, the results the first time around were statistically significant, so it's no surprise that they reproduced. What we did find interesting was that in 2023, once almond pollination had finished, there's sometimes a bit of a problem in the almond groves, where, if it rains, they get very, very muddy, and the big bee trucks that come to collect the bees, they're delayed in collecting the bees. But we kept monitoring them anyway. We sort of kept the camera rolling, so to speak. And we noticed that once bloom had finished and there was nothing to eat, they went through a short period of not having anything to eat or being able to find anything. We could watch the weights go down, and then the weights started to climb slightly. And we could see by the trip time of the bees that they were going elsewhere for their forage. So when they were actually foraging in the almonds themselves, there was quite a short trip time. They'd go collect something and come back quite quickly. But we could tell that they were actually traveling more than a mile for this alternative forage that they found post almond bloom, and we drove off, and we found that. There was some mustard and things growing, and that's what they were going off to find. It was really interesting to see the change in trip time. But what was fascinating this year is Blue Diamond was running an incentive for cover crops, and there's a certain incentive to grow cover crops between the rows of almonds or in neighboring fields. And we noticed that our bees, following the almond pollination, once the bloom had finished, these cover crops started sort of flowering. We did notice so much shorter trip time when the bees went for their alternative forage. And this was a direct result of these local cover crops being grown by the almond growers, which is quite important, because bees don't have to suffer in almonds. Bees do very well in almonds. They usually come out pretty strong. But if you do have this dearth of food for a week or two after the bloom's finished, these cover crops actually bring quite a good advantage. So we're going to start looking into that next. That's quite an exciting area.

Amy 19:55
Yeah, I was about to ask, so what other projects are you wanting to look at? What's next?

Guest 20:00
Well, we're also tackling the Asian Hornet, and it's recent incursion into the US. We focus on the infield a lot. We predominantly used to monitor beehives, what goes on inside a beehive. But because we've got these small, relatively cheap sensors, this actually allows us to spread them throughout entire fields and monitor the activity of the pollinators. This is quite fascinating. Some crops, we're talking about positioning of beehives, some crops, it doesn't really matter where you put them, the bees find their way throughout the crop. Other crops are a lot more sensitive to how local, how much you have to spread the beehives. So we've been looking at where the bees go from a spatial perspective and what time they get going. I assume they finish in the day, and things like that. So it's both spatial and

temporal. More recently, we've been looking at biodiversity. So we used to focus on looking for honey bees and Asian Hornets, and now we've extended that library of insects that we can recognize. So now, we can actually look at the biodiversity within a crop, not only the honey bees, but how many wild pollinators come and actually scale out to biodiversity in general, even places people that would bring honey bees, we can put our little sensors and get a feel for both the density, as in how much, but also how many, but also the diversity. How many different species come to any crop and pollinate it.

Amy 21:20
Well, I'm excited to see what you find in the future.

Guest 21:22
Well, yes. I mean, that's quite interesting for the cover crops, because not only do we monitor the almond orchard itself, we monitor the bees coming and going from the hives, we're monitoring the almond orchard, and we can also monitor the cover crops. So we get a good feel for precisely how many bees are leaving the hive and where they're actually going at any point in time, which is quite exciting.

Amy 21:40
Very cool. Well, as we end your episode today, was there anything else that you wanted to share with our listeners?

Guest 21:46
It might be a generalistic thing, and it might not edit here best, but when we put our small amount of electronics inside the beehive, and you kind of wonder, so what does this tell you about the beehive? I mean, this is the core BeeHero technology, and I find it quite interesting. So the first thing we look at is temperature, and there's a lot you can tell by the temperature fluctuations in a bee hive. Bees tend to thermoregulate the brood, and it's pretty easy to interpret changes in temperature with changes in health. And I find this interesting, because now, just to human beings, if you have a child and you're interested if their health is good, you can reach for thermometer, and you can take their temperature, and you can read what that temperature is, and you can interpret from that temperature reading whether your child has a fever or not. It's very similar in a beehive. Interpreting temperature inside the brood area of a beehive intuitively tells you quite a lot. When we listen to the sounds, that's a little bit different. If you think about, I mean, the bees don't sort of intentionally make sounds. Basically, you've got a throb of like 20 or 30,000 bees throbbing in the brood area of a colony. So what we sort of do is listen to that throb and how that throb changes depending on the state of development, depending on their health, depending on all sorts of things, it affects the general throb of the bees. I think this throb is analogous to the heartbeat of a human. A heartbeat is an incidental noise we make. We don't make it on purpose, but listening to it, you can tell a lot about human health. But it is less intuitive and much more difficult to interpret. And in the same way, you could listen to your child's heartbeat, but you probably wouldn't tell a lot about the health from it. But if you go to a heart doctor, he can listen to your heartbeat and tell you quite a lot about your health, because the difference is quite subtle, and it's the same with the throb of the colony. And for decades, people have looked at this, and it's never really produced a huge amount. But I think in this day and age of artificial intelligence and machine learning,

with a data set the size of BeeHero's, we've got tens of thousands and possibly hundreds of thousands of data sets from different hives and different states of development, and using this huge data set and modern analytical tools, we can interpret that heartbeat rather well. So yeah, I think that's quite interesting, because it's analogous to human being health.

Amy 23:59
All right, Huw, thank you so much, again, for sharing the results and sharing your methodology of the hive orientation and colony strength that affects honey bee colonies during almond pollination. Jamie and I, we read the title, and we were like, huh, this is probably what we assumed, right? And so we're happy that you were able to share your methodology, share your findings and work with beekeepers in California for almonds. So thanks for joining us today.

Guest 24:21
Thank you very much for having me, and it was nice to meet you guys.

Amy 24:34
So Jamie, before you went into this episode, were you thinking that direction was going to make a difference, and what direction were you thinking?

Jamie 24:42
Well, okay, so I'm gonna answer those in reverse order. I've always heard, even as a kid, when my mentor was training me, that you need to face your colonies either east, because the sun will wake them up in the morning, or south, because when you live in the northern hemisphere, the sun does go -- actually, the Earth turns, it's not the sun going, but it gives the appearance that the sun is moving from east to west, but it moves kind of along that kind of southern orbit. So yes, it goes from east to west, but there is a southern slant to it. So if you point a colony south, they get maximum exposure to sunshine throughout the day. The only catch with that is the answer to your first question, which is, yeah, that's true. I've heard that it makes sense, but the scientist in me has been very skeptical if there's any data. I always wondered if it's one of those things we just do because we think it makes sense, or is there actually meaningful data? This is the first attempt that I'm aware of to address that meaningful data part where, no, seriously, if you point your colonies east, you get about a 45 minute head start than if you point them west.

Amy 25:47
What about the colony strength question? In the publication, the project looked at both direction and strength.

Jamie 25:54
Yeah, that part was interesting too, because at the end of the day, Huw basically said that there's this kind of interaction between the two. East and west matters, but it only matters if the colonies are weak. If the colonies are strong, it doesn't matter at all. And I guess that's also intuitive. So it still seems like the best practice that would result from this would be face colonies east. Because why take a chance if your colony is weak or strong? Right? You would just do it anyway. And he also mentioned a couple

times that idea, well, east or southeast or south, and I think all those are still probably the best practices. Somewhere between the east and south facing entrance is good, and I was totally going to ask him that question, except he voluntarily answered it before I got to it, which is, did it matter what direction it was facing for the length of time they'll forage into the day? And he said, no. But I do want to circle back to a point that he was kind of dancing around. He kept making this point that it's not just true that strong colonies forage longer and forage better than weaker ones because they're strong. He made the point, I don't know if you caught it, Amy, he said, a colony with 12 frames of bees is going to be more productive than two colonies both with six frames of bees. Well, two colonies with six and six equals 12. Why are two colonies with 12 frames not better than one colony with 12 frames? He was dancing around the issue, and he was making the point that bees in strong colonies seem to be more efficient and harder workers than bees in weak colonies. You're not just adding two weak colonies together to get the activity of a strong colony. You actually have amplified effort in a strong colony. And what's interesting to me, he was dancing around this issue that's been known in the bee research for decades. Farrar or Farrar, depending on how you pronounce the gentleman's last name, F-A-R-R-A-R, Ferrar had a principle. We call it Farrar's principle. And the idea is that bees are more efficient in strong colonies than they are in weak colonies. Huw illustrated that point exactly. Two colonies of six frames doesn't equal one colony of 12 frames, and that's because the bees in one colony of 12 frames, while still just 12 frames of bees, are more efficient and harder workers than two colonies with six frames a piece that also equals 12 frames. And so Farrar's principle just simply says, keep your colonies as strong as possible because the bees will be more efficient workers as a result.

Amy 28:30
That's pretty cool. Yeah, I'm excited to see how they continue their research. It seems very practical. So I'm excited to see what else comes out of it in the future.

Stump The Chump 28:46
It's everybody's favorite game show, Stump the Chump.

Amy 28:55
All right, welcome back to the question and answer segment. Jamie, in episode 171, I think that was the one about honey bee stings and what to do. And the listener said the episode was great, except there was one glaring omission, that we didn't fully address how to treat a bee sting and whether or not to remove the stinger. So, the understanding from this individual is that the first thing that you need to do is scrape the venom sac off the stinger. Let's just start from there. What is the most important thing? I think I remember, in that episode, I think you had mentioned that it was the timing, right? It was like the amount of time.

Jamie 29:32
Yeah, I did mention it. And so maybe I wasn't clear enough. So I appreciate the question from our listener. So the shortest possible answer is the only thing that matters is getting the stinger out as quickly as possible. So forever, even me included, forever, we were told that when we are stung, it's best to scrape it out with a knife or a fingernail or a credit card or something like that because when you are stung, the shaft of the stinger is in you, and at the top of that is this muscular bulb that's beating like

a heart that's pumping venom from the venom sac into your body. So the idea is, if you grab it, you pinch it and remove it, when you pinch it, you are squeezing the venom into your body, and you're doing the bulbs work for it. So forever, the recommendation was, scrape it out, scrape it out. Never pinch it out, because if you do, you'll squeeze the venom into your arm. Well, there was actually a research project where someone looked at that and they found it did not matter if you scraped it or pinched it out, it only mattered that you got it out as quickly as possible. So if you get stung, get the stinger out as quickly as possible. The longer it's in you, the more venom will be delivered to you. The more venom delivered to you, the greater the impact of the sting. So the answer, get it out as quickly as you can. I usually just scrape mine out with my fingernail and move on.

Amy 30:59
And you're talking about the stinger and the venom sac, both together.

Jamie 31:02
The whole shebang. Usually, when you scrape one out, the other comes. I mean, there are times where you scrape that muscular bulb and the venom sac might pop off and the shaft will still be in you. But I also will remove that sting shaft.

Amy 31:13
Okay, I think the other question that our listeners are going to have for you now is whether you say pinch or pinch.

Jamie 31:18
Okay, so I definitely say pinch. But I tried very hard to get it right.

Amy 31:27
I think we heard that.

Jamie 31:28
Yeah, I've been made fun of multiple times in the past. Listen, the truth is, I'm from a very rural area in Georgia, and I definitely speak with a very southern dialect. I try to clean it up a little bit when I'm on the podcast or I'm speaking to people, and a lot of people will be like, "No, you still sound very southern." No, I don't sound very southern compared to how I used to sound, or how I sound when I go home. But "pinch" is one of those things that I totally sound old school south.

Amy 31:55
I know people are going to respond to this one and they're just going to crack up about it.

Jamie 31:58
Can't wait.

Amy 32:00

The second question that I have. So this Q&A, we're going to do four questions, not just three. But the second question I have, we had an episode where someone had asked about slum gum and what to do with it, and we received so much feedback from our listeners about what they do with their dead bees. So did you want to acknowledge that question real quick? That was a fun one. I didn't expect to receive that much feedback.

Jamie 32:22
Yeah, someone was asking what to do from alcohol wash, as an example. When you do an alcohol wash, you got all these dead bees in ethanol. What should you do with them? And I was like, well, there's nothing you could do with them. Just pour them out. And they're like, well, also, what about these other byproducts, like slum gum, which is basically the, for lack of a better term, the goop left over from rendering wax and the debris associated with wax or extracting honey, just this kind of slimy, messy stuff that you wouldn't know a use for. And of course, I said, well, just throw it away. There's nothing you can do. Gratefully, and thankfully, we have listeners out there who go, no, no, no, no, no, I've got great ideas. So I've heard two very reasonable things for slum gum. One of those is that it's really good compost. So just mind you, I've never done either of these myself, so I can't verify it, but it makes a lot of sense. I've heard that one listener said it's very good compost. It's mixed in with compost and at a certain ratio, and then put out for garden beds and things like that. So I think that's very reasonable. There's a lot of organic material in slum gum, right, dead bee bodies and other stuff. So it is potentially a very good compost. The other thing that someone else, multiple people, actually, wrote about, is that slum gum is really good fire starter, right? It can be mixed with slightly less flammable stuff and used to light fires. In fact, that some of the people who emailed me about that said it's better than any of the fire starters that you can purchase. So maybe you can heat it and allow it to melt on or around some material that you want to ignite. I've never tried it, but possibly. One of our listeners, on top of that, mentioned that she had heard, and I want to get this exactly right, her daughter was doing a Peace Corps in Cameroon, Africa. And when she visited her daughter in Cameroon, went to work with and visit some local beekeepers, and they saved their dead bees, put them into alcohol, not as a Varroa wash, but actually to make a salve for bald heads.

Amy 34:29
There you go.

Jamie 34:29
So the idea is that bees in ethanol could, or at least the ethanol could be rubbed on your head and make your hair grow. And so this listener and I were kind of having a chuckle back and forth. I'm a scientist, so by default, that makes me skeptical, but maybe it works. But for sure, slum gum, I like the idea of a fire starter, just be careful. I also like the idea of it being used as a compost. I don't know about the pickled bees as a hair tonic, but who knows.

Amy 34:58
That's so funny. Okay, so the next question that we have during the inspection in their hives, they found a supersedure cell on the frame of drone comb. It was uncapped and there was a larva inside. The questioner is asking, how is this biologically possible? They thought that supersedure cells were built

around eggs or young larva after the worker bees determined, basically, that the queen needs to be replaced. So in what world would a supersedure cell be built on drone comb?

Jamie 35:25
Yeah, so there's two ways that this could happen. Number one, it could be built around a female offspring amongst drone brood. So it would give you the impression that it's drone brood, but in reality, it's a female offspring, and the bees just kind of know that. So they're building a supersedure cell around it. Now, I'm going to expand on this second part because the questioner is kind of implying that maybe there's only drone brood left. I, too, have seen situations in hives where there was simply no female offspring being produced. Either it was laying workers or a queen that has clearly demonstrated herself to me to be a drone layer, and so as a result, there's nothing but drone brood available in the nest. I have seen worker bees myself try to take those offspring, those presumably male offspring, and make a supersedure cell in a queen. Obviously, that's going to fail. The workers just would have made a mistake. It was a last ditch attempt. I mean, it's conceivably possible that it is, in fact, a female offspring, that somewhere amongst this drone laying queen 99.999999% of the eggs that she laid were drones, and we assume that it's a drone, but she squeezed one female egg out that was fertilized. Who knows? So it's conceivably a female offspring, but I would say, more often than not, it's just the last ditch mistake attempt by the workers to solve the problem that's essentially doomed. If there are no females in there, it doesn't matter how many supersedure cells they make around drones, they're going to fail. Now, I will throw in one last caveat that's unlikely, but certainly possible. People have probably heard, through this podcast, me talk about Apis mellifera capensis, which is the Cape honey bee, whose workers can also become laying workers. But unlike most of the time where our workers who lay drone eggs, unfertilized eggs that produce male offspring, Cape workers are capable of laying unfertilized eggs that result in female offspring. The production of an adult from an unfertilized egg is called parthenogenesis, or the production of a living individual from an unfertilized egg is called parthenogenesis. The process of that egg resulting in a male is called arrhenotoky. The process of that egg resulting in a female is called thelytoky. So Cape bees, through thelytokous parthenogenesis, can produce female offspring from their unfertilized eggs. Even though our workers can't mate, and therefore will produce unfertilized eggs that result in males, in other words, arrhenotokous parthenogenesis, even though that's what happens most of the time, our workers are technically capable, just like Cape bee workers of, through thelytokous parthenogenesis, accidentally and occasionally laying an egg that will be produced in a female. So in the case of a laying worker colony, it is conceivably possible that one of them, through thylatoki, accidentally squeezed out an egg destined to be a female. So in that case, you could get a supersedure cell. But I think more often than not, it's just a mistake. The worker bees, just on their way out, were trying to grab whatever they could and ended up building a supersedure cell out of a drone that's ultimately doomed.

Amy 38:42
Gosh, bees. They just do the craziest things.

Jamie 38:44
Am I right?

Amy 38:46
Exactly, exactly. All right, that's pretty cool. We have a couple of past episodes, I think, on Apis mellifera capensis, but we'll have to revisit that one in an upcoming episode, I think. Okay, so this question was actually from me, and the reason is because I was working with a commercial beekeeper, and they were going out to pollinate cotton and I was thinking about that. I was like, I've not even heard of cotton honey before. So, Jamie, do bees produce cotton honey? And have you tried it? And if so, is it good?

Jamie 39:18
So they can. No. It's subjective. So I'm from Georgia, right? Georgia is known for producing cotton, even though it's not the cotton king anymore that it was. It's known for producing cotton. I have known beekeepers who have moved bees to cotton and produced honey and claimed that it was cotton honey. So cotton does produce nectar. It also has extrafloral nectaries. That means nectaries that occur outside of flowers, extrafloral nectaries. And bees can collect nectar from the extra floral nectaries of cotton, and you can get essentially cotton honey. So it is possible. Cotton is a heavily industrialized crop. There's lots of different strains growing under lots of different scenarios. And I would argue, probably, that not all strains produce the same amount of nectar, all of that stuff. So depending on where it's grown, what strains are growing, you might get more or less nectar. For example, I know when I was at the University of Georgia, we had kept bees close to cotton one time because cotton was grown on a research farm. We didn't get anything. But beekeepers in central Georgia and south Georgia, where more cotton is grown, feel like they were getting cotton honey. So it is possible to get enough nectar for honey production from cotton. I've never tasted it myself. I'd love to taste what is believed to be cotton honey, but I hear it's palatable. My guess is it's very subjective, right? Like most tastes. So some people would like it, some people wouldn't. But if you're listening out there and you produce cotton honey, let us know. We'd love to get a jar and try it ourselves.

Amy 40:46
Yeah. That's what I was just gonna say. That's gonna be homework for our listeners. So if you have cotton honey, send it our way. We are here to try it and we'll answer it on air. Okay, so thank you so much, again, for all of your questions. Don't forget to send us more questions by emailing us or sending us a question on our social media page. Thanks for listening to today's episode. This episode was edited and produced by our podcast coordinator, Mitra Hamzavi. Thanks, Mitra.

Jamie 41:23
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.