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SPEAKERS

Amy, Stump The Chump, 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. Hello, everyone, and welcome to another episode of Two Bees in a Podcast. Today, we are joined by Jennie Durant who is a USDA-NIFA Postdoctoral Research Fellow at UC Davis. She'll be here talking with us about the use of honey bee pesticides during almond bloom. We will follow that with our Five Minute Management segment on reptiles and amphibians, what they do to your colonies, and how you can protect your colonies, and we'll finish today's episode with our question and answer segment.

Amy 01:51
Hi, everyone. Welcome to this segment of Two Bees in a Podcast. Today, we are joined by Dr. Jennie Durant, who is a USDA-NIFA Postdoctoral Fellow with the Department of Human Ecology with the University of California Davis, and also with the Institute of Ecology and Evolution at the University of Oregon. Today, we're going to talk about her work with pesticides and honey bee health. And I'm really excited to speak to Dr. Durant today. Welcome, Dr. Durant.

Guest 02:19
Thank you. Thanks for having me.

Amy 02:21
All right. So we normally go into every single segment with our guests just having our guests introduce themselves. So tell us a little bit about yourself, and really, how you got into your work.

Guest 02:31
So I got into studying bees as a topic when I was, interestingly, living in the Philippines. I was a Fulbright scholar, and I was studying rice in the rice terraces and how introducing new hybrid rices, hybrid rice varieties had an effect on this community, this indigenous community in the Philippines. And I wanted to take a break from my work. And I went and stayed at, kind of, a bee farm on an island called Bohol for about 10 days. And it was in 2007. And this was when Colony Collapse Disorder, which was sort of this, you know, at the time, mysterious -- was causing these mysterious bee losses. And it was in the news. And like everyone, I wanted to understand, or like many people, I wanted to understand why bees were dying and disappearing. And so I kept trying to follow and track this, kind of, as a hobby until around 2012. I should say around 2011 when I then applied for PhD, and I started my PhD at UC Berkeley. And I decided to pursue this question as a social scientist for my dissertation. So trying to understand the policies that economics and other sort of social contexts that may also be shaping honey bee health and bee declines. So one of the things I was trying to understand, I was in California, and I wanted to understand, and I also was aware that a large portion of bee colonies were coming to California each year. And so it seemed like a really important nexus to understand, perhaps, how pollinating for the almond industry might play a role in honey bee health in some way. And so I started interviewing beekeepers and almond growers and regulators and scientists, but I primarily was looking at how beekeepers changed their management practices to pollinate for the almond industry. And then, also, the sort of pesticide context for beekeepers, when they were in the almond industry as well, when they were, I should say, during almond bloom. And so that was kind of the driver that led to this research. And I'll just add that currently, I am a postdoc conducting a survey of almond growers. I conducted one from 2019 to 2020 about the barriers and challenges of implementing bee friendly practices and now conducting follow-up interviews growers who have adopted cover crops and other practices to better understand the context behind their decision-making and what's driving them to want to adopt bee friendly practices. And then in the fall, I'll be moving on to USDA to keep looking at that in that agency as well. So that's a little bit of background.

Amy 05:18
Dr. Durant, I think you're like my new hero. I'm a social scientist as well, and I love doing focus groups and interviews. And I feel like we should probably chat outside of this podcast a little bit more about some of the methods that you have.

Guest 05:31
I'd love to, and I do want to add that I, just make a pitch that I think more social science is necessary to help us understand these questions. I have so much respect and I've learned so much from all the other natural science, ecological science, biological science happening to understand bees, but I do also feel that social science has an important role to play in understanding these dynamics as well.

Jamie 05:55
I agree completely. It's a very complex issue that we have with bee losses, and I really feel the more people who are involved from diverse perspectives and diverse sciences and experiences would really

help us get a handle on this better. So during your time as a PhD student, as a postdoc, you started developing research projects related to bee-toxic pesticides and their use in almond orchards. Could you tell us a little bit about some of the research that you've done, your methods, and discuss some of your key findings?

Guest 06:25
Yeah, so during my dissertation, I interviewed over 45 beekeepers, who pollinate for the almond industry, most of whom are commercial beekeepers that have over 500 colonies. So they're migratory, they're moving their colonies all over the United States. But for the most part, all of them were going to the almond bloom in February through March. So just to give a little context, for anybody who isn't aware of this, each February, right around Valentine's Day, the numbers are kind of a little bit difficult to pin down, but around 80% to 88% of all colonies, commercial colonies, I should say honey producing colonies in the United States are coming to California to pollinate for the almond bloom. And so this is a massive amount of colonies. And so I interviewed these beekeepers as well as almond growers, people working in the Almond Board, EPA regulators, state regulators, agricultural commissioners. So those are the people that are in charge in each county of regulating pesticide use, as well as other bee researchers as well. And one thing that kept coming up in my interviews with beekeepers was that they were getting hit with sublethal agrichemicals during almond bloom, particularly fungicides, which would be used to control mold. This is a -- kind of February can be a very wet time of the year when there's more rain and so there's the danger of mold damage. They may also be using insect growth rate regulators, which can be used on pests at the larval stage. And some are also complaining about agrichemicals called adjuvants, which are chemicals that are used to help pesticide formulations stick to the plant instead of drifting. They have other uses as well but that's sort of their primary use. So I wanted to try and quantify these findings or these experiences that beekeepers were having and kind of triangulate what they were telling me. So that wasn't just sort of reporting on what their experiences were, but also had data to sort of better understand what they were talking about. So in other words, I wanted to understand how many of these sublethal, toxic, sublethally toxic agrichemicals were being applied. So to do this, I worked with two undergraduates to figure out which agrichemicals were commonly applied during bloom, and we assembled a list for analysis. That was Kelly and Evan, who are mentioned on the paper. I then obtained pesticide use reports from California's pesticide use report database. So California is one of the only states that requires extensive reporting of all pesticides. And we've been tracking this since '90, they've been tracking this since 1990 at the California Department of Pesticide Regulation, and this data is collected by agricultural commissioners who require that growers and pesticide applicators share all their pesticide use data. So when there's a pesticide apply that information gets sent to the ag commissioners. And so we pulled these records on pesticide use from 1990 to 2016, which was the most up to date record at the time. And my colleague, Dr. Brittney Goodrich, who is an extension specialist, and I then analyze this data. I also want to add that I coupled this with extensive policy analysis and interviews with county agricultural commissioners, which are the regulators that, as I mentioned, that growers report their pesticide use to. And then I also interviewed EPA regulators to understand how these pesticide regulations work at the state and federal level. And lastly, we conducted an extensive literature review of chemicals that beekeepers were claiming were sublethally toxic and affecting their bees. So what we found was that in general, during bloom, growers

were actually following the pesticide label. They were not applying agrichemicals, with what are called bee precautionary statements, which I say labeled bee-toxic chemicals. And then I will sometimes, just to address this now, will say unlabeled bee-toxic chemicals. And what I'm saying is they're not labeled as bee-toxic, even though they do have a pesticide label.

Amy 10:49
Yeah, so that kind of goes into my next question. As far as the unlabeled, so why -- I guess you just said this, that every pesticide has a label, but then there's that precautionary statement or that little sign that's on the pesticide, and so why are some bee-toxic chemicals unlabeled, quote unquote, while others are labeled?

Guest 11:09
So there are several reasons why some bee-toxic chemicals are unlabeled. So first, it's important to think about what kind of bee toxicity we're talking about. And one of the main reasons, and since it's kind of important back up a little bit and think about how pesticide regulation is happening, so Congress has mandated in the front of the Federal Insecticide, Fungicide, and Rodenticide Act, the levels of toxicity that EPA requires for labeling as bee-toxic and the type of tests that need to be conducted to understand this toxicity or to determine the toxicity, I should say. So up until 2016, the only toxicity tests that were required by FIFRA, and that's a little different from what EPA then requires, but the only test required by FIFRA was the, what's called the acute contact LD 50 test, which is where a chemical is applied to a honey bee's body, and then they observe for a period of 24 to 48, up to 96 hours, if there is some kind of moderate or acutely toxic effect on honey bees, and enough, that would cause 50% mortality in the study population. So that's the LD 50 test. So up until that time, it was basically, what dose kills 50% of the population with this topically applied pesticide? Then in 2016, EPA began requiring more extensive testing. So they began requiring the oral toxicity test where bees are fed a chemical to study the same sort of effects, and also a 21 day larval test. And this 21 day larval test, just to give a little bit of background there, is because honey bees have a 21 day larval cycle. So the time from when an egg is laid to when they emerge from their cell as a young bee is 21 days for female worker bees and shorter for queens and longer for male drones. So the problem with this is that it still doesn't capture -- so while these, I should say, these changes are great. But, A, this still means that we have a number of pesticides that were registered prior to 2016 where we don't have that data, and so we don't know the larval toxicity and we don't know the oral toxicity. And secondly, it doesn't capture the different types of toxicities, the more complex types of toxicities that bees are going to encounter inevitably when they're in the field, when they're out pollinating or being exposed to agrichemicals. So one example of this is tank mixing, where agrichemicals are mixed in pesticide tanks. Growers often do this to avoid having to pass multiple times through an almond orchard, to give one example, instead of having to put in one chemical, do a pass through an orchard, second chemical, pass through an orchard. They'll combine it all into one and do one pass through and it saves on labor and all kinds of costs for them. But the problem is that sometimes when these chemicals are mixed together, they go from being non-toxic separately to synergistically toxic. So basically, they're toxic or even more toxic when combined. So the testing that EPA requires doesn't track this. And second of all, we might also see issues with honey bee larval development that are also hard to track, that take time. It may not

appear until a couple of weeks after bees emerge, and at that point, a beekeeper might not even be in the original place where they were exposed. So in my case in almonds, they might have already left the bee on to the next thing and then start to notice some kind of developmental damage. Maybe bees are having a hard time navigating back to the colony or having other issues. And so those are two main things that can happen. And then the third is that there are some chemicals applied in agriculture that are combined with pesticides, which I mentioned earlier. And EPA doesn't require the registration of these chemicals. They're known as sort of, "other ingredients" that are not -- testing is not required on them. So one of them is Organosilicone Surfactant, which is a type of adjuvant that helps pesticides spread or stick to the target plant or pest. And because these chemicals don't make pesticidal claims, like they're not targeted to kill an insect, they're recognized as these "other ingredients" that don't require testing. But this can be problematic because this means that these chemicals are applied along other size pesticides, and we have no idea if they're toxic or not. So I just want to say it's important to remember that pesticides are really a cocktail of chemicals applied to a plant or insect. The active ingredients impact is tested during the labeling process, but these adjuvants do not have testing requirements. So there's a lot we don't know about them as a result because they're missing from the pesticide risk assessment process. And I just want to add that adjuvants are not just something bees are exposed to. We're all being exposed to them in our food. And these effects have been reported, toxic effects have been reported in humans, as well as the environment. So we know very little about these chemicals and the effects on humans and the environment.

Jamie 16:31
There's certainly a lot to unpack here. One of the things that I'd like to re-discuss, because I want to make sure that our listeners aren't confused, so all pesticides are labeled. That's a term that we all know, right? So as we talk about what you're calling unlabeled bee-toxic compounds, it's a labeled product, but up until now, we're unaware if it has an impact specifically on bees, right? So it's labeled, but not necessarily including a bee hazard statement, because we're not sure what that hazard is, if that testing was done, maybe prior to 2016. So it might be caught upon re-registration. But perhaps we don't know it at this point. So if all of that is true, then how can growers who might be very sensitive to protecting pollinators know if a particular labeled product is toxic to bees or not if it does not contain a bee hazard statement?

Guest 17:28
It's a great point and clarification. But I do want to add that even if it was labeled after 2016, we may not know because of those last three points I made, if it's bee-toxic, so we may not know if it's synergistically toxic, we may not know if it's toxic because of the adjuvants in it or we may not know if it causes developmental issues that would take longer than the acute toxicity, oral toxicity tests or 21 day larval tests. So even if it's been tested after 2016, we still may not know its full toxicity. And your question is a great one. My experience is with the almond industry so I can speak more about -- that's going to be more where I'll speak to that question. But it's a complex one that addresses all of that that's relevant to all of agriculture. Oh, so how growers can know if a product is bee-toxic on the label. Okay, so this will take some effort. There are some good websites like the UC IPM website, so that's the insect pest management website that's created by the University of California system, and that has

information on which agrichemicals are not labeled as bee-toxic, but do demonstrate some bee toxicity. We, as part of our paper, also created an almond-specific table that shows the different toxicity tiers for chemicals that are used in the almond industry. And these are also chemicals that are commonly used by other agricultural industries as well. I feel growers could also get information from extension specialists, though I'm not sure what resources are available outside of California. And another big piece is commodity groups like the Almond Board and other commodity groups can continue to work to educate growers as well. The Almond Board has done quite a bit of effort. I'm not sure how, I think they're kind of the leader in commodity groups in the United States in doing this, and that can also make a huge difference in shaping growers' pesticide practices and understanding of toxicities of different agrichemicals. And lastly, this is a complicated one, but I think that beekeepers and growers need to have conversations about pesticide practices, difficult conversations, to try and understand some of this emerging information about how agrichemicals are affecting honey bees.

Amy 19:50
So you kind of touched on the next question that I was going to ask you about how growers and beekeepers can work together. During your research and during your discussion with all of the stakeholders, what were they doing so far? I know you've already said the California Almond Board has been part of this process. But what else have growers and beekeepers done so far to work together?

Guest 20:13
So one of the findings that I also wanted to add that will feed into this was that while growers were following the label, which is the title of our paper, they also were applying these unlabeled as bee-toxic agrichemicals. And so that awareness was really coming about in 2014 here in California in the almond industry, and I think provides a helpful model. I think their response can help provide helpful model for other industries. Also, California has one of the most strict pesticide regulation contexts. And so there are a few other things that we're doing here that I think can also provide a helpful model. But even within that there are some gaps in how we need to address this. So one example is that in California, we have what's called a Notice of Intent system. And so this is where beekeepers are supposed to register the locations of their colonies to the county agricultural commissioners, and then growers report any labeled bee-toxic chemical use to the ag commissioners, and then the ag commissioners or the growers then contact beekeepers that are within a one-mile radius of this pesticide application. And so what can happen there is if the beekeepers register, which doesn't always happen, then the beekeeper can then communicate directly with the grower to perhaps make a pitch for applying at a certain time of day. Ideally, bee growers would be applying pesticides in the evening when beekeepers are not present. Or, and not just pesticides, fungicides, insect growth regulators and these other potentially problematic agrichemicals. So one of them is to just set up systems where beekeepers and growers can communicate like this Notification of Intent system. And this is especially -- this can still be challenging, because beekeepers can feel uncomfortable asking growers to alter their pesticide practices. They're really grateful to have a contract or to have a honey bee, or sorry, a bee forage location site. And so overcoming this challenge of beekeepers feeling uncomfortable asking to negotiate pesticide use is one that's going to require some creative thinking, and I'm still trying to wrap my head around it. But I think having commodity boards like the Almond Board, like other commodity

boards, also conducting strong pushes to educate their growers about the potential toxicities of these agrichemicals that are not labeled as bee-toxic is really important. In my interviews with growers, they've definitely learned a lot from the messaging that the Almond Board has done. So that's another key piece there. Then it's also a challenge, I think this is a greater challenge in some ways and situations where beekeepers are not pollinating a crop because a grower there is not so, say, invested in protecting the colony that they've hired to come and pollinate their orchard. So, like, when beekeepers are out making honey in the Midwest, for example, they're not being exposed to agrichemicals in the same way because they're not pollinating a crop, which may be hit with pesticides. But on the other hand, they have no real control of how the landowner or manager manages their land, I would say less control, anyway. And so this fear from beekeepers about complaining is a very real one, that again, I think more work needs to be done here to really try and help beekeepers feel more safe about communicating directly to landowners, land managers or growers about pesticide practices, so that they can work directly and collaboratively with them to manage and apply pesticides in ways that are healthy for bees.

Jamie 24:09
So in your article, you talk about the need to shift labeling requirements. So how would that shift appear? What does that actually look like at the end of the day?

Guest 24:17
So I'm not a policy maker, so it's not my place to prescribe policy changes, but I do think as scientists, we can give some insight about changes that might be meaningful, and also just, in speaking to your audience, we are all citizens, voters, we have a role in helping shape these policies as well. So one of my thoughts is that if we want to understand the full toxicity of the chemicals that bees are exposed to you in order to better protect honey bee health, then I think that we'll need to intest the entire pesticide formulation for labeling requirements to measure the combined effects of the active ingredient and the inactive ingredients, which are these adjuvants, often these adjuvants in formulations. I think it's really important for us to think about the regulation of adjuvants. Again, I'm not wanting to say whether we should regulate them or not. But I do think at least understanding their toxicity is going to play a major role in helping us understand bee health. I also think information about synergistic toxicities, I think that we could find out what types of chemicals are commonly mixed during almond bloom or when, during and sort of before and shortly after almond bloom to get a better sense of what these combinations are that could be tested prior to regulation, or, excuse me, prior to labeling, or when the EPA revisits the label every 15 years. And so that information could also help with this revised labeling process that happens for them as well. I also think what would really help us understand which pesticides are bee-toxic is if county agricultural commissioners could collect emergent data on chemicals that are causing bee damage. So, currently, the agricultural commissioners' or ag commissioners' purpose is to help mitigate label violations and to penalize label violations. And if there is no label that says this is bee-toxic, then they really aren't in a position to often even conduct an investigation about whether or not, or to conduct an in-depth investigation about what happened, what might have killed beekeepers' bees. So this, to me, is a bit problematic, because then we're not collecting emergent data about which agrichemicals are bee-toxic. So what happens then, is that if a beekeeper suffers from colony damage

from an agricultural application, it would be helpful if an ag commissioner had a greater mandate to test those bees, I should say, the inspectors with an ag commissioner, to test those bees and discover what chemicals may have been applied. If they had a greater ability to send them out to a lab to see which chemicals were applied to the bees that may have caused this damage, then that information could be tracked at the county level, which would then be sent to the California Department of Regulation, and then be sent to EPA, which plays a role, which is helpful information for their labeling review. So I think strengthening that sort of emergent data, and I think that the almond industry is a great place to do it. They've shown a really high interest in protecting bee health. It's where the greatest number of bees are collected. So it's kind of a great, sort of, lab, so to speak, where we can have an understanding of other toxicities, and then it's also the beginning of the year for many beekeepers. So what happens in almonds really affects their their colonies for the rest of the year. So if we could be gathering this data, even just at the almond industry level, I really think that would give us a lot of information that could help us protect bees the rest of the year. And then lastly, it might make sense to include more tests for chronic toxicity, synergistic toxicity, as I mentioned, as well. So longer term testing to understand some of these agrichemicals, how they're affecting bees developmentally and over longer periods of time, I think will also help our understanding of what chemicals are bee-toxic. Well, it seems like there's a lot to be done. And I also feel like communication and collaboration is really key, right? I mean, just having everyone working together to figure out how to move forward. And so thank you so much, Dr. Durant, for all the information that you've just provided to us. Is there anything else that you'd like to add, any final words of wisdom? Yes, I want to also empower our listeners to remember that they can play an important role in this process. Any changes, any big changes that would need to happen in FIFRA, if this is regulated by Congress, so we have the ability to write to our Congress person and Congress people and requests for changes and things like adjuvant regulation, for example. And in addition, industries pay attention to the demands of their customers, and I'm really seeing this a lot in the almond industry, how they're responding to demands for bee friendly almonds in companies like Kellogg's and General Mills are giving incentives for bee friendly almonds as well. And this is affecting production all the way down. So consumer pressure can help shift the tide in how growers are raising their crops. And a lot of growers that I interviewed would love to be more bee friendly but need some help with the cost of adopting these additional practices. So if consumers are willing to pay for bee friendly foods or applying pressure to companies that are buying almonds or honey or things like that, these demands can translate into price incentives for growers that then mean that we can have more bee friendly crops. So I just want to also encourage us to play a role in helping protect bees in this way as well.

Amy 30:17
Great. Thank you so much for being on our show today.

Guest 30:20
My pleasure. Thanks so much for having me.

Amy 30:22
All right, everyone. That was Dr. Jennie Durant, the USDA NIFA Postdoctoral Fellow with the Department of Human Ecology at the University of California Davis, and also with the Institute of

Ecology and Evolution at the University of Oregon. Thank you for joining us today on Two Bees in a Podcast. You're listening to Two Bees in a Pod, brought to you by the University of Florida's Institute of Food and Agricultural Sciences Honey Bee Research and Extension Laboratory. Welcome to our Five Minute Management. Jamie, when I was getting the timer ready, I just pulled my calculator up on my phone. So that's where I am right now.

Jamie 31:18
You can time me with that.

Amy 31:20
Okay, yeah, that's what I'll do. Okay, so today for our Five Minute Management, we are looking, we're continuing the honey bee pest. And today, we're going to be talking about reptiles and amphibians. So can you go ahead, Jamie, to give us five minutes of what kind of reptiles and amphibians we have in our apiary?

Jamie 31:40
Yeah, I'm going to have the reverse problem with this particular Five Minute Management that's having enough to talk about very well, because I think that I'll make it. So let me just say, broadly speaking, the only reptile I've ever seen be of any reasonable problem for bees would be lizards. Occasionally, they'll show up on hives and eat the bees. I don't actually see that commonly, but I know it happens. And then from the amphibian perspective, the biggest threat would be toads. And I'll talk about these kind of separately. Before I do though, I will say that there is one reptile that a lot of beekeepers mention in their apiaries. But it does not pose a threat to bees, it's more of a threat to people. Almost every beekeeper who has kept bees for any length of time has found a snake under their colony or something like that. And I was gonna say almost every beekeeper, because I hear a lot of beekeepers talk about snakes, but I have personally never found one under a hive. So I'm happy that that's the case. I'm just going to remind all beekeepers in this Five Minute Management, be careful where you put your fingers underneath the hive or when you put your feet underneath hives from a snake perspective. Alright, so back to what can be a problem for bees. So there are a few lizard species, at least where I live, and I'm sure all around the world this is true, that just eat insects. That's just what they do. And so honey bee colonies provide a nearly endless source of insects for them. I have seen some lizards on my own colonies eating bees, but I just don't think it's a major threat. It's not something worth controlling, not something worth worrying about. Just be aware that they may be there. And if you really think it's a problem, you can always pick up the lizard and take it somewhere else. Basically, removal is how you're going to have to deal with that particular threat. Now, toads can be a much bigger problem. I've been to Australia a couple of times now, and I very specifically remember a beekeeper taking me to his apiary and telling me that cane toads are a really big problem for his bees. And so, cane toads are an invasive species in Australia that come up to colonies at nighttime, and they just sit there and eat bee after bee after bee after bee from the hive entrance. So in this case, like with lizards, the only real hope that you have is removal of the toad. You have to catch them in action, and you have to remove them. This particular beekeeper, I'll tell you what he did. He put a piece of plywood down in the

apiary because toads like to hide under stuff during the daytime. And every time he would go to the apiary he'd flip up that plywood, see the toads, and I will say he disposed of them. Let's say it that way.

Amy 34:32
Ok. I thought you were going to say what he did.

Jamie 34:35
I was very carefully just going to say, "disposed of them," but in this case removal is what is the big deal. I've lived in quite a few places in my lifetime. I've never really seen toads be a significant problem for my colonies. But if they are a problem for yours, you need to just simply remove them. And if they're an invasive species, eradicating them is a guilt-free option for you as well. How's that?

Amy 35:04
Yeah, that was great. You actually have a minute and a half left. So I guess the one question I do have, since we have a minute and a half and can talk about this, do these reptiles and amphibians, do they normally eat live honey bees, or do they normally go after dead honey bees?

Jamie 35:22
Good question, Amy. They actually eat live honey bees. I see them capturing live honey bees, especially, like, cane toads, which then begs the question, you know if you were to pick up a honey bee and grasp it with your hand, right, it's going to sting you. And I think they've dissected cane toads that would have dozens or more stings in their digestive tract, like on the way down the bee is stinging, in their gut they're stinging, but for some reason, it just doesn't seem to bother the toads, and they'll just keep eating bees. Toads will often defecate, they're often larger piles of poo than you would expect. And so you can see these piles around colonies, and people often think that they come from mammals, and they're not really mammals. And then you can see bee exoskeletons.

Amy 36:07
What, really?

Jamie 36:08
That's right, you can see bee exoskeletons, it's pretty big. It's kind of impressive. But you can see bee exoskeletons in these piles of feces. We have a toad that lives outside of our garage, and at nighttime, it comes out and eats insects that go on to the white door of our garage, and it's got big old piles of feces. So you can see similar things around honey bee colonies with honey bee exoskeletons in them, and you know you've got some critter coming up at nighttime eating bees.

Amy 36:33
Awesome. Well, there was your Five Minute Management. And I'm sure you just learned way more about reptile feces than you ever wanted to know. Thank you for listening to our Five Minute Management.

Stump The Chump 36:52
It's everybody's favorite game show, Stump The Chump.

Amy 37:09
Alright, it is the question and answer time. So, Jamie, the first question we have is, what is the deal with the one inch holes drilled into brood or honey supers? I guess the hole is usually in the center of the box, and it's used as a secondary entrance. I don't know. Is there a benefit? Or why do beekeepers even do that?

Jamie 37:28
Yeah, Amy. So one of the things that you'll see in beekeeping is that there's just tons of modifications and then proclamations about what this modification does or doesn't do. And before you know it, a lot of beekeepers are doing it. And then you're having to wonder if it's beneficial. So this hole that you described is one of those things. Almost everybody that I see who does it will call it upward ventilation, or a secondary entrance, but they oftentimes say we're trying to ventilate our hive. And so a lot of folks do it for a few different reasons. It depends on which beekeeper you ask. Some say it's increased ventilation. Some say that it just gives them a secondary entrance so bees don't have to run all the way down to the bottom. If you look at a wild colony, there may often be, in a hive that they're living in, multiple entrances. So they're just trying to duplicate that. Some folks claim that it helps with honey production, some folks claim all kinds of things. I have never seen any research projects on these holes being drilled into boxes, but in the very least, it doesn't seem to hurt colonies. So I don't usually discourage it when people are talking to me about it. I usually go, so why do you use it? Oh, we think it does this, this and this. And I'm usually just kind of nodding my head in agreement, just because it's a learning opportunity for me. It's just one of those things a lot of folks do that I think the action of doing it has preceded the science of supporting its use. So that's usually the way that I describe upward ventilation. If you think about it, Amy, we've had a couple of podcast guests recently who've argued you can over ventilate colonies. So it's just one of those things a lot of beekeepers do, and almost all of them have their own unique reason for doing it.

Amy 39:17
Yeah, that's so funny. You ask like 10 beekeepers a question and you get 15 answers. Is that what they say? I don't know. I've heard that. But --

Jamie 39:25
Yeah, that's one of those things that a lot of folks say for sure.

Amy 39:31
Okay, so for the second question, and I feel like I could totally relate to this because this happened to me, I feel like, when I had bees in Orlando. So this person has a colony, and it's grown to a full double deep with two supers. The bees have always been pretty chill. They've always been really easy to work, but the bigger they get, the hotter they get. So this person opened them up the other day, and they literally covered this person's veil. It happened immediately when they took the screen inner cover

off. So, is this, I mean, I guess the question is, as colonies start to grow, does that have to do with whether they're chill or whether they're more defensive? Or, is it just because they have more bees? Or, what's your take on this?

Jamie 40:15
Yeah, so here's the deal, Amy. I've kept bees for a long time, myself. And I know that through working with bees, I will often make these observations that just kind of stick in my mind, and I will uniformly apply that belief to all of my colonies. So I have heard before that colonies might get more defensive the larger they get, but I suspect it has less to do with how predisposed they were to defensive behavior in the first place and more just an artifact of size, right? If you're working a small colony, that is, quote, hot, right, one that might want to attack you more often than others would, you still may only get two or three bees coming after you because it's a small colony. So as it grows, there's just simply more bees available to come after you. So I would argue that there's a genetic basis, right, for this defensive behavior. And it's probably uniformly spread over the life of that colony, and they just, quote, get hotter, because they're bigger, and there are more bees to respond. That is my general comment. Now, you could argue too, though, that they become more defensive because they have more to defend. We use that word defensive, and not aggressive, aggressive implies that they come out to get you on purpose, defensive means they're just defending their nest. That's why swarms are quite docile, they have nothing to defend, whereas established colonies can be defensive, because they have something to defend. So maybe they just have more to defend. Also, if you think about it, to me, colonies tend to be largest in the middle of the season, right? They're coming off of their honey flow in June. They're the strongest that they're going to be. Now, there's no nectar flow available for them, and we're in July, August, September, the colonies are still very large, but there's nothing for those old forager bees to do. So they tend to be around the colonies or hives when we visit. So they're the ones who would most likely be defensive anyway. So we're just exposed to more bees that are otherwise predisposed to be defensive. So it didn't have anything to do with whether or not that colony was calm at one point, but now it's defensive. It's now just those bees who are the defensive ones are around the nest when we work the hive. Does that make sense? That makes sense to me. I hope it makes sense to our listeners. And if not, I'm sure this person will email us again to follow up. But you hear that same thing, though, with shade. Bees in sun tend to be less defensive, bees in shade tend to be more defensive. And I wonder how much of that's real versus, just, we hold on to these anecdotes. And because we've seen it once or twice ourselves, we've kind of uniformly apply it across all the colonies we work. I just, I think in the case of a strong colony, like I said, they tend to be strong at times of the year, when the bees are otherwise back in the hive, they tend to have more to protect, there tend to be more of them to encounter. And I think all of those have more to do with you experiencing what you believe to be heightened defensiveness than them actually just getting grumpier.

Amy 43:15
Yeah, I mean, I would add to that to say that the time of day and the time of year, and there are just so many factors that go into that, I think. Alright, so for the third question, this person, this is kind of a fun question, I'm excited to ask this one to you. We hear that as we use the same cell foundation that bees get smaller, they start getting smaller year after year, right, or generation after generation. So this

person was asking, if you take a honey super out, and let's say that the cells are pulled out just a little bit deeper, do the bees get longer? Do we get longer bees?

Jamie 43:54
Okay, so this is an interesting question. I actually had to look up some potential articles on this. And you might not be surprised that I found none at all. So I'm just going to kind of give you my perspective on it. So let's start from the top, small cell. What does that mean? So when I first got hired at the University of Florida around 2006, there was this huge explosion of interest in small cell keeping of bees. And what it means is you can buy sheets of foundation that have smaller cell sizes than the traditional sizes of cells on the foundation that we ordinarily use. So there is this huge explosion in folks using small cell foundation, which produce, on which bees built smaller cells because there were all of these purported benefits. Varroa control, this control, that control, this thing, that thing, bees on small cells do this and not that. We actually did a research project, one of the first research projects that I did here at UF, and showed that small cell foundation didn't influence Varroa populations in hives at all. And since then, two or three or four other labs have shown exactly the same thing. So there doesn't seem to be a Varroa benefit related to small cell. We might get some emails and comments on social media about that. But nevertheless, some of the purported reasons for its believed efficacy at the time is that bees that are developing in small cells themselves are slightly smaller, but also develop faster, and if they develop slightly faster, there's slightly less time for Varroa to mature in cells, so you get a reduced Varroa reproduction rate, again, none of which has been substantiated over the long-term in multiple studies. However, bees developing in smaller diameter cells do tend to be slightly smaller. It is likely something that you would be unable to see with the naked eye. I found a couple of research projects where they were measuring the size of bees being produced in small cell foundation relative to standard cell foundation, and they did find that the head width was smaller, that the thoracic diameter was smaller. But I have yet to find a paper where they measured the overall length of the honey bee. So this questioner is basically saying, we used small cell in honey supers, but we use nine frames in a 10 frame super, so they pulled the comb out wider than they ordinarily would. So you still got smaller diameter cells, but longer cells. So they're essentially asking, would I get smaller-sized bees that are still longer than ordinary in these small cells? And I've just not found any papers where they measured the length of bees developing in shallow cells or deep cells, or even for that matter, small cell versus big cell. Almost everything is head capsule width, thoracic width, things that would match the diameter cell rather than the depth of the cell. So now we're left for my grand speculation here at the end. You might or might not get longer bees in shallower or deeper cells. I think the jury's still out. My gut tells me if there even is an impact on length, and I suspect there's not much of one, but even if there is, number one, it wouldn't be noticeable with the naked eye, you'd have to detect it in measurements, and number two, I'm not sure what benefit that would give to our bees. I will say when I did my PhD in South Africa, when I moved there and started working with those bees, they sounded like flies flying around, and my eyes noticeably could pick out that the cells are smaller and the bees are smaller. And when I came back to the states, the bees sounded deeper, they were bigger, they flew slower and all of these things. So a lot of stuff very quickly popped out to me. You can notice some, but I don't think you can notice that easily just by using small cell or regular foundation here in the States. I think the sizes are awfully close.

Amy 48:07
Yeah. And I think I had asked this, I had asked this question to you last week. And I think you had mentioned something about whether a queen would even lay an egg in that cell. I mean, is there --

Jamie 48:17
Yeah.

Amy 48:17
What are your thoughts on that?

Jamie 48:18
So that's a good point. Yeah, if cells are extraordinarily long, a 1ueen is almost certainly not going to go in there and lay it. I mean, when you use nine frames in a 10 frame super, you can get cells that are probably too long for the queens to use for laying eggs in the first place. I mean, that's a really good point. And just for the benefit of the listener, why would you want to use nine frames in a 10 frame super anyway? Well, in a honey super, so this is basically another question. This is a bonus question, you guys, this is the fourth question. The reason folks would do this is because when you use 10 frames in a 10 frame box, the surface of the cell capping is usually right at the edge of the frame, making it a little difficult to uncap the cells cleanly prior to extracting. When you use nine frames in a 10 frame box and you space them out evenly, they'll make the comb wider, and it will be much easier to uncap both in automatic uncappers as well as the hot knives that you can use or anything like that. So a lot of folks will use nine frames in a 10 frame box just because it's easier to get to the honey. So then the questioner then is saying, well, if you use these deep combs as a brood box, will a queen lay in them and then produce longer bees? And so that's why we went through all of that rhetoric and hopefully came to some semblance of an answer, I hope.

Amy 49:45
Yeah, that's actually a good point. I never even thought about having nine frames in a 10 frame box to make it easier for uncapping. So that's kind of cool. All right, so those are our question and answers. So keep the questions coming. Jamie, we're kind of at the point right now where people are listening to our podcast while they're in their apiary, and we'll be talking about something in our Q&A, and they'll be doing that exact thing while they're keeping bees. So I think that's pretty cool. I'm hoping that we're helpful and that the podcast is providing good information, and we'd honestly love to hear your thoughts on how our podcast, how the Q&A sessions and some of the programs, how this is affecting your beekeeping management. So let us know by contacting us on social media or by email. Hi, everyone, thanks for listening today. We'd like to give an extra special thank you to our podcast coordinator, Chelsea Baca, and to our audio engineer James Weaver. Without their hard work, Two Bees in a Podcast would not be possible.