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SPEAKERS

Jamie, Amy, Stump The Chump, Guest

Jamie 00:10
Welcome to Two Bees in a Podcast brought to you by the Honey Bee Research Extension Laboratory at the University of Florida's Institute of Food and Agricultural Sciences. It is our goal to advance the understanding of honey bees and beekeeping, grow the beekeeping community and improve the health of honey bees everywhere. In this podcast, you'll hear research updates, beekeeping management practices discussed and advice on beekeeping from our resident experts, beekeepers, scientists and other program guests. Join us for today's program. And thank you for listening to Two Bees in a Podcast. Hello, everyone, and welcome to another episode of Two Bees in a Podcast. Today, Amy and I are joined by Dr. Lewis Bartlett who is an Assistant Professor in the Center for the Ecology of Infectious Diseases in the Odum School of Ecology. He also has a co-appointment in the Department of Entomology in the College of Agriculture and Environmental Sciences at the University of Georgia. Lewis, thank you so much for joining us on this episode.

Guest 01:12
Thank you for inviting me, Jamie. It's a pleasure to be here, and Go Dawgs.

Jamie 01:18
I was going to make a statement like that, but then you beat me to it.

Amy 01:21
Of course you were.

Jamie 01:22
Well done, Lewis. I emphasized the University of Georgia. So, well done, Lewis. So Lewis, you're going to be with us talking about Darwinian beekeeping and a new perspective that you're taking on it. But before we get there, we know that you've been on our podcast before. You've told us a little bit about how you got into beekeeping, bee research, but we've always got new listeners for every new episode. So could you remind our listeners a little bit about yourself, how you got where you are? And then we'll get into what we actually brought you on to discuss.

Guest 01:52
Yes, gladly. Pleasure to reintroduce myself to longtime listeners and hopefully to your new listeners. This will be informative. So I've been beekeeping since summer 2011. So just passed my 12th year now. And that was something that I began doing as soon as I got to university as an undergraduate student, but I've always held long interest in bugs and little beasts and the outdoors. Personally, I trace a lot of that back to my father who is a big fisherman. That's his main hobby. He's an angler, and he used to take me with him on most fishing trips, and kind of just let me run wild through the countryside of Britain while he was peacefully fishing. And I think that's where young me really started digging through the mud in the grass and finding interesting things. My interest in ecology and organismal sciences and entomology, in particular, has really always just built from there. And then, I started beekeeping as part of my scientific enterprise as an undergraduate student. I initially thought that that was not for me, stepped away from it, but maintained it as a hobby because I loved the beekeeping part. The science was just quite difficult. Little did I know that all science is difficult. So I went on and tried some other types of ecological science. I worked as a zookeeper for a while, and then as a behavioral scientist on captive breeding programs, I did some work for the UN's Environment Programme on their World Conservation monitoring centers projects. I really specialized in infectious diseases following that, which is what brought me back into bees and back into beekeeping as a place where I could explore the biology of host-parasite interactions, so how diseases overcome hosts and how diseases harm hosts, but also in a system that I cared about. I knew that information wouldn't just be scientifically interesting,but it will be useful to people and practitioners and society, and be able to kind of give back to a hobby that I'd been enjoying. And as you'll know, both of you and everyone listening, there's always more to learn about bees, and there's always problems in beekeeping. So that's where I've gladly ended up specializing, in this idea of understanding the epidemiology and the spread and interaction of bees and their diseases, particularly in the US here, where I moved in 2016 full time. So I've been stateside for about seven and a half years now.

Amy 04:31
Very cool. Yeah, we always say the more you learn about honey bees, you realize the least you know. I don't even know how to say that. The more the less you know. Does that even make sense?

Jamie 04:40
It possibly does. We'll replay it slowly.

Amy 04:46
Yes, please. All right. So Lewis, I know that you and Jamie had spent some time -- we are recording this right now in mid-November -- and you both just got back from Iowa and you were both speaking there. We had you scheduled for the podcast, and Jamie had messaged me while you were in Iowa and said, "We really need to talk to Lewis about Darwinian beekeeping. He's talking about this at the conference." And I'm like, "Yeah, let's do it." So here we are. We're going to talk about Darwinian beekeeping. So you've been giving a talk on Darwinian beekeeping, and I'm just interested to know, what prompted you to begin discussing this idea? We'll kind of delve into it a little bit more as well.

Guest 05:25

Yeah. So, the front for me really leaning into an infectious disease biologist's understanding of the breeding and these Darwinian or evolutionary or survival-based breeding programs really came about from an Eastern Apicultural Society meeting, I believe, back in 2019, when it was in South Carolina, where I'd been asked to give a lecture on disease virulence -- virulence being how dangerous any given disease is. And I was listening to all the talks and noticed this theme of a lot of emphasis on all the different ways we can try and breed our bees to be resistant to diseases, in particular, Varroa. I had some really useful conversations with some of my colleagues there, Jay Evans being one of the many who I remember being one of the first people I bounced this idea off. Having worked a lot in how insects evolve resistance to things like viruses during my PhD, not necessarily just on bees, I worked on a lot of different insects, there were some ideas I had from that field of, how do insects evolved to be resistant to parasites, that probably needed to be brought into the beekeeping realm and the Varroa resistance breeding scheme much more explicitly. And so that's what we've been working on. This project really should have been finished up some years ago, but a different infectious disease intervened. The pandemic happened. That put a bit of a wrench in a lot of scientific progress. And me and my co-authors ,who I've been working on this with, are finally at a stage now where the scientific manuscript, at least, is close to being published. We've all been presenting on this for a number of years now. And we're moving forward with trying to communicate some of those ideas from the infectious disease biologist sphere to both other honey bee scientists, but also the beekeepers and the queen rearers and the people who are really driving forward the bee breeding efforts in the US. Shout out, in particular, to the efforts of Tom Seeley over the years, who I think was the one who really popularized these ideas as a cohesive kind of packaged, philosophical approach with some of his phenomenal books on the biology, such as "Following the Wild Bees" and "Honey Bee Society" and other ones like that.

Jamie 08:06
So you're right, Lewis. The first time I've ever heard of Darwinian beekeeping was when Tom Seeley was promoting it, and I even think I read an article of his about it. It's clearly prompted you to begin discussing it. But let's just, for the purposes of getting our listeners all on the same playing field, what is Darwinian beekeeping? And secondly, how is bee breeding involved?

Guest 08:25
So I think that what is Darwinian beekeeping is part of the discussion that I've been trying to have with beekeepers. I think we all agree that it is somehow inspired byDarwin's ideas that organisms need to adapt, right? They need to change with new challenges. So in our case, that's typically things like the arrival of Varroa, and we seek bees that are able to change themselves, adapt, evolve, whatever words you want to use to describe that kind of short timescale breeding, to better cope with this new threat. Now, Tom popularized an approach to this where he assesses mite loads in colonies, and as soon as that might load gets higher than he finds acceptable, I think he uses the typical three per 100, he kills that colony so that it's not contributing to his local breeding stock. And in that way, he's only allowing colonies that are capable of keeping their mite loads low themselves without treatment to contribute to future breeding. So they're the only ones able to pass on their genetics and their traits. And in doing that, you direct the evolution, you direct to the breeding of the bees towards bees that are able to control the mites themselves. And so in that way, it's somewhat explicitly linked to what we might call treatment-free beekeeping. Now, Darwinian ideas are often associated with this survival of the fittest idea, right? This concept that in nature, things adapt, because those that aren't well suited to new

challenges somehow are unable to reproduce, whether that's by death or by other means. And I think that's been interpreted by a lot of beekeepers to mean that this survivor stock approach where you just let colonies either thrive or die without intervening, which will also alter which colonies move their genetics forward and contribute to the next generation, that that is entirely the same thing as Tom Seeley's approach. But there are subtle differences in the outcomes there that beekeepers need to be informed about. And so, I'd say that survivor stock is one style of Darwinian beekeeping, but it's not the only style. Tom's method of assessing mite numbers and then actively removing colonies from your breeding stock that have too high mite levels, that's also Darwinian beekeeping, just a slightly different approach. I, personally, would also argue that efforts to breed for specific hygienic behaviors, whether that's these brood assets that Marla Spivak and Tyler Wagner and Olaf Rueppell and others have all developed all the kinds of mite fighter bees, while you're selecting for bees that aggressively chew the Varroa, those are also Darwinian beekeeping approaches. What's really at the center there is you're directing the adaptation and the evolution of the honey bee population. But those different methods of directed bee breeding of Darwinian beekeeping lead to very different outcomes, ultimately, or they can do. I think that's the perspective I brought in. Depending on how we approach this and exactly what we're measuring -- are we measuring survival? Are we measuring mites number? Or are we measuring some very specific bee behavior? It will all lead to a different type of bee emerging as the victor, so to speak. That's the point of a lot of my work on this topic, being mindful that the way we approach things directly corresponds to different outcomes available to us that are then also were important for viewing our bees, not just in isolation in our apiaries, but how our bees interact with your neighboring beekeepers, and the wild bees that also share our landscapes with us, bumble bees carpenter bees, leaf cutter bees, and the like.

Jamie 12:31
So Lewis, help me understand this a little bit better, because what you're describing to me just sounds like bee breeding. You are selecting, by virtue. So how does Darwinian beekeeping, per se, differ from just standard breeding?

Guest 12:48
I personally wouldn't say it does. I think all the breeders have been Darwinian beekeepers, and they've just never adopted that label. And it was really Tom's effort that unified this idea of being forward-thinking in what we're aiming up bees to be. Not all bee breeders are particularly choosy about what type of bee they're aiming to get towards. They might be perfectly happy with just using the bees at hand. I think the hallmark of this Darwinian bee breeding approach is to have in your mind a bee you're trying to get towards that you don't currently have. And so you're selecting and adapting and breeding towards that goal. So I'd say it's kind of outcome-driven bee breeding.

Amy 13:35
Yeah, so you've discussed and you've said outcomes quite a couple of times. That leads me to my next question, what are the outcomes of Darwinian beekeeping?

Guest 13:43
Well, in its simplest case, any Darwinian beekeeping or any directed bee breeding is going to have an outcome of a slightly different bee population each year. And that bee population is slowly going to

move towards some goal. That might be in mite numbers, it might be very hygienic bees, what have you. The differentiation I like to highlight is the difference between Tom's approach, which is this measure mite number and remove colonies that have too many mites in, versus this hands-off survivor stock approach, because that's when we get to two very different outcomes. So under Tom's regime, you will only ever evolve or select bees that have low mite numbers because that's what you're measuring. So they will be resistant in the traditional sense that we use it in infectious disease biology. They're somehow controlling the number of Varroa and, therefore, they're resisting parasitism. They're resisting the viruses because they have fewer opportunities to acquire those viruses. We call that avoidance. It's one type of resistance. They're avoiding the viruses because they're controlling the Varroa. That's a goal that is very well-reflected in these more specific bee breeding programs that exactly maps on to things like hygienic behavior. And Tom's approach might breed for hygienic bees. It might breed for bees that have other methods besides hygienic approaches to keeping Varroa lower. That's one possibility. In survivor stock, we're not explicitly breeding for low Varroa. And when we look at examples in nature, which are probably the purest experiments, if you want to call them that, for what happens when bees are just left to survive on their own, so if you look at places like Gotland off the island of Sweden, which very early on was identified as an unmanaged wild honey bee population that was somehow surviving in the face of Varroa. It took some time, but what eventually emerged was that these bees hadn't evolved to be resistant to Varroa. There are very high mite levels. They hadn't evolved to be resistant to the viruses either. They had very high virus levels that are chock full of virus. They're heavily parasitized with Varroa, but there's somehow surviving, and that's what we call tolerance. And tolerating your pathogens or your parasites is the most common outcome in nature. In wild populations, what normally happens when an animal or an organism encounters a new disease is that it's the tolerant individuals that end up surviving, where they're simply capable of getting on with life without being too damaged by a disease. And we've seen examples of this throughout human history as well, whereby when there's new contact between otherwise separate groups of people, it's not something that happens in the modern era really anymore, novel diseases can be particularly devastating to non-tolerant populations, whereas the tolerant individuals bring those diseases with them. They carry them around, and they're infectious. And that's the part to highlight. If you are a beekeeper, or you're a wild bee, and your neighboring apiary is full of resistant bees, you're safe, because they're resisting those infections. They're not infectious, they're not a danger to you. They're not a threat. In a way, that's very similar to herd immunity, where if most of the people around you are immune to a disease, you're also protected because you can't catch it from them. But if you've got an apiary that's full of tolerant bees that are tolerant to these viruses or tolerant to Nosema or tolerant to Varroa, they are, essentially, a factor hit to produce lots of those viruses or lots of those mites. We talk a lot about things like mite bombs in beekeeping, and if you're worried about mites drifting into an apiary, a tolerant depopulation is going to be the number one cause of that. We know that these viruses and other diseases freely transmit between honey bee colonies and between honey bee apiaries. I think that's what I talked about last time I was on, actually, was how easy it is for honey bee diseases to spread. And we know that they get into wild bees as well. So if we end up with tolerant bees, yes, that specific honey bee colony might appear healthy. But it's very, very dangerous to beekeepers who don't have tolerant bees, your neighbors, or the wild bees that are also sharing those same flowers. I think, as a community, it's important that each beekeeper who might be pursuing a kind of Darwinian beekeeping philosophy has as much information as possible about what different approaches will come to different outcomes. It might be that some beekeepers want tolerant bees and that's their decision to

make. It might be that really what we want are resistant bees so that we're not worried about spillover of diseases from our bees into your neighboring beekeeper's bees or a vulnerable population or a bee that still helps agriculture like, say, the native blueberry bees that we have down here. Our blueberry growers and our beekeepers don't always agree on everything, and you can imagine a scenario where if you're putting tolerant bees in blueberries and it kills off all the other bees that also contribute to that fruit set, that that's not going to be a great outcome for that agricultural system. So from my perspective, it's really about understanding how these different approaches, hands-off survivor versus actually measuring mite stock, lead to bees that sit in a very different final outcome that drastically changes how dangerous they are to other bees, both honey bees and wild.

Jamie 19:39
So, Lewis, there's a lot that you shared there that we can unpack, but one of the things that constantly comes up to the top of my mind when I think about selecting bees, really either way, the survivor way, but let's just pick the Darwinian beekeeping way and Tom Seeley's case where he's selecting for colonies with low mites. Low mites is good. We want low mites, we want no mites, we want bees that survive. But commercial beekeepers need bees that thrive. So, in my mind, it's conceivably possible to select for bees that have low mites numbers, but that don't do anything or that still have small colonies or aren't productive, so to speak. Sometimes, I feel like the focus is so on hygienic behavior. On hygienic behavior, you're selecting for bees that abort half their brood. Well, that's tomorrow's bees. And so, how, in these scenarios, do you ensure that the bees aren't just surviving, that they're actually thriving, that they're productive in a way that, for example, commercial operations could benefit?

Guest 20:44
Yeah, I completely agree. I think focusing on one thing like hygienic behavior often leads to bees that don't do a lot of the other things we want bees to do. They're great at controlling mites and they're really not good at anything else. I think Tom's approach inherently balances that in some ways, because you're likely to end up with bees that do a little bit of everything. They collect a little bit more propolis, they're a little bit hygienic, they maybe have slightly higher immune systems. But I think what's really the hallmark of Tom's approach is that you're measuring things about your colonies. In his case, he really only highlights the mite numbers, probably, mostly because those books are for the hobbyist beekeepers, typically. I think for the commercial beekeepers, it's not just measuring low mite numbers, it's also measuring what else they want to get out of those bees, whether that's honey production, or whether it's colony size going into almonds, or whether it's how many nucs or packages they can get out of them in March, if you're in South Georgia, for instance. I think that's really the lesson to be learned there is you need to measure the things that you want out of your bees and make sure that those then are the ones you're allowing to contribute to the next generation of genetics. The meeting we were at just over the weekend, myself and Jamie, the Iowa Honey Producers Association, Marla Spivak gave a phenomenal talk on that, in my opinion, about a commercial operation that was choosing their best colonies each year to go to their breeding yard. And then once those colonies were there, they measured mite numbers amongst those very, very good colonies and took the colonies that had only little mite numbers, and that's how they did their selection. So they did this two part of, what really good colonies do we have? And then from that pool, how many of those have little mite numbers? And those are the ones that we're going to allow to generate all queens for the next year. That way, you're able to tier, essentially, your priorities, where maybe the first thing you're measuring is honey

production, and then after that is low mite number, and so then you're only allowing breeding from high honey, low mite bees. And I think that's really the lesson that Tom has taught us all quite intentionally in his discussion about this. You have to measure the things you want about your bees. And that sometimes sounds a bit obvious to other scientists, but I know that I forget to measure things all the time when I'm out in the field. Then, I look back at that experiment and I say, well, I wish I'd have known what was going on with what pollen they were bringing in, for instance. And so think coming up with your priority list and then making sure you're just keeping track of all of those is really the hallmark of best practice Darwinian beekeeping.

Amy 23:38
Yeah, we're excited to bring both Tom Seeley and Marla Spivak back on for 2024. So, I'm excited to potentially have them as speakers this year. The last question I have, Lewis, for you, again, we've mentioned a couple times that you and Jamie were in Iowa, and I'm just interested to know, how has your research and how has the talk on Darwinian beekeeping been perceived by beekeepers?

Guest 24:01
So far, for me, it's been very well-received. It's always a somewhat tense discussion to talk about the impacts of beekeeping on wild bees, given that there are factions, I think, of scientists who are quite dismissive of beekeepers' concerns, and that's certainly not the approach I want to take. From my experience, beekeepers always appreciate having as much information as possible for them to make their own decision, and that's really the mission of this talk. If beekeepers ask me my opinion, I will give it. But that's usually during the question and answer session. I don't have much interest in kind of evangelizing during these talks. So, broadly, I think discussions have been very respectful and different beekeepers have different approaches to what they want out of their bees as well. You ask 100 beekeepers a question of what they want to do with their beekeeping, you're gonna get 120 different answers. So I think we're very used to those differing priorities. And really, everyone understands the need for as much information as possible when they're making these big decisions. So far, it's been perfectly well-received, I think. Every now and then, some beekeepers don't like the idea of going in and killing specific colonies. That seems a little harsh from that perspective. But that's about the only squeamishness that I've ever encountered. And there are other ways to remove a colony from a breeding population than just simply getting rid of it, as Tom instructs in his book. So mostly, it's been extremely well-received, which is why I'm happy to keep giving it.

Jamie 25:42
Lewis, that was really, really good. I can already see now getting a lot of questions and comments about your ideas on this thing. You'd mentioned that you're working on a manuscript. Hopefully, that'll be published in the near future, we can make sure beekeepers, ultimately will be able to find a link to that someday. If it's well after this episode is published, maybe they can search for it. But I'm sure you're going to keep staying on the speaking circuit talking this up. So I really want to thank you so much for joining us on Two Bees in a Podcast and sharing with us your views on Darwinian beekeeping.

Guest 26:13
Thank you for the invite. It's always a pleasure to talk to both of you and your listeners at large.

Amy 26:23
So, Jamie, I think I liked the idea about the Darwinian beekeeping specifically because he did focus so much on outcomes. It is breeding bees, but with an outcome in mind, knowing what you're looking at, and recording what's kind of going on. What are your thoughts on everything?

Jamie 26:39
I did really enjoy Lewis's take on this whole idea, because I'll be honest, on the outside, I'd been a little skeptical of the Darwinian strategy. I likened it very closely to survivor stock. Again, I know that just speaking about this can open a can of worms. But what you said in your intro to this is its outcome-driven. Notice the example he kept using with Tom Seeley over and over and over. Well, Tom was selecting for colonies that had lower mites, and then he mentioned this commercial operation that first chose their most productive colonies, took them to a single apiary, then selected for the ones that had the fewest mites. And so what you have is you're still keeping in mind production, and you're still keeping in mind mite loads, and it's outcome-driven. Few mites, lots of honey, few mites, lots of honey. Whereas survivor stock, and again, I know I can really get into trouble talking about this, it's a bit directionless. What bees survive every year is different depending on what the stress is. So, for example, this year, it could be a drought, so the colonies that survive are the ones that stored more honey last year. Next year, the high pressure can be Varroa, so the colonies that survive are the ones that are resistant to Varroa. The next year, it could be some swarmed more than others. It was a great swarm season, so some overswarmed. So every year with these different stressors and every 10 years when we get these major introductions of new stressors, small hive beetle, Nosema cerana, now it's yellow-legged hornet, what are they surviving? It changes every year and so it's a little directionless. On the other hand, like Lewis emphasized, if you do Darwinian -- I'll call it breeding or selection -- it's not directionless. Like you said, Amy, it's output-driven, and you're trying to get your bees in a direction to things that matter to you. And I think that that's a far more reasonable approach, maybe, than some of the survivor strategies that I've been hearing.

Amy 28:30
Yeah, definitely. I'm excited to hear what our listeners also think. If you have comments or questions about it, feel free to send us an email or a message on social media. We'd love to hear your thoughts on Darwinian beekeeping.

Stump The Chump 28:49
It's everybody's favorite game show, Stump the Chump.

Amy 29:00
Welcome back to the question and answer segment. Jamie, I think in a past episode, I said that we'd been doing this for three years or something. Now, I think we're in our fifth year. Time flies very quickly. I didn't realize that we've been doing this podcast for five years now. It's kind of crazy to think about. Anyway, thank you to our listeners for always supporting us and sending us questions. We've got this ongoing list of questions. You all know that if you have any questions to feel free to send us an email or send us a question on social media. To get us started, the first question, Jamie, so this person, fortunately, has never experienced European foulbrood, but they're just wanting to know if or when they

get it, what do they need to do? Is there anything that you can do as a beekeeper to prevent getting European foulbrood or if you identify it, what are you really looking for? What's next?

Jamie 29:50
Actually, I think, Amy, this is a very important and timely question, and I'll tell you why I believe that's the case. I think European foulbrood is making a resurgence in beekeeping operations. Maybe it's not resurging as a disease. In other words, there's more of it. I just think beekeepers forgot how to recognize it, and are just now re-recognizing. Let me give you a quick example before I answer this individual's great question. So years ago, we had beekeepers complaining about something that was being called the crud. Crud, this disease in the brood seems to melt the brood, they look discolored, and twisted and brown, and I would hear these descriptions and I'd be baffled with the beekeepers and we weren't sure. And we sent off samples, and it wasn't overly conclusive, but one of the things that they always had in common is they always had European foulbrood. And then I had a colleague in Canada who shared the same thing and a colleague in Michigan who shared the same thing. And before long, I started going, "Gosh, this is crazy. What we're seeing is probably just European foulbrood. We've convinced ourselves to look for Varroa, we've convinced ourselves to look for all these other diseases, Nosema, deformed wing virus, and we've forgotten how impactful and important European foulbrood is." And so, colleagues of ours, Meghan Milbrath and others around the US, and for that matter, around the world, are beginning to study this in big fashion again, largely because we're noticing it again. We've forgotten to look for it. And when we see it, we think it's not European foulbrood. We give it a mystery name. So I would argue that it's making a resurgence, and we really need to be able to recognize it. So then how do we recognize it? Well, it's got brood in its name, European foulbrood. So it certainly affects the brood stage in the honey bee colony, specifically where you are most likely to notice it would be the larval stage. When the larvae consumed food that has a bacterium that causes European foulbrood in it, a larvae will die and in the dying process, they might become discolored, yellow, orange, light brown. They twist in their cells, they no longer lie in the back of their cell in the shape of the letter C, which is what you see with healthy larvae. Instead, they start getting discolored and twist in their cells. There are lots of really good images of European foulbrood-infected larvae on the internet. If you just Google it and look for Google Images, you'll see lots of images. Furthermore, you can go to the BMD, and we even have a University of Florida EDIS document on European foulbrood. We can link both of those in our notes. So when you have it, what do you do? Well, there's a couple of things that you can do. Number one, in the US, you can treat with antibiotics to control it. You have to have a prescription or a VFD from your veterinarian, so you're going to have to work with your veterinarian to get a hold of antibiotics. When you treat with antibiotics, that usually clears up the infection so your bees will get healthy. I know a lot of beekeepers in other countries around the world don't have access to antibiotics, and if you don't have access to antibiotics or elect not to use them, if you're here in the US, you can also requeen your colonies with a hygienic stock of queen because, generally speaking, hygienic bees are pretty good at keeping this disease out of the nest. If individuals die from it, the bees will remove it. Historically, beekeepers have found, as well, when you feed colonies that have this disease, it can pull them out of the disease. They can outpace the disease and get away from it. And I know a lot of beekeepers are familiar with the shook swarm method where you will have a new hive and new frames of foundation into which you shake just the adult bees from the infected nest. So you're removing all the combs, all the old nest, all the brood from the infected colony and you're only moving the adult bees over to that new clean nest. But what I

usually do when we see it here in our University of Florida apiary is I will treat with an antibiotic after we get a vet prescription or a VFD or we'll requeen and make sure that we don't have European foulbrood susceptible stock. Again, we've got a lot of recommendations on our UF EDIS document that we'll link in the show notes. So something else I wanted to mention, Jamie, real quickly, was that sometimes, I think people get European and American foulbrood confused with one another just because they both have foulbrood in the name. I did want to clarify the American foulbrood is not the same as European foulbrood. With that, again, we have the EDIS document that we'll link onto our show notes, which is on our main website UFhoneybee.com I think that's a very important distinction that you made, Amy, because European foulbrood, the way that I often describe it, it's somewhat fixable. If you don't treat at all and it's a mild case of European foulbrood, a good honey flow often pulls the bees out of it. You often see European foulbrood pop up in times of stress, which is why we recommend requeening or feeding colonies to try to pull them out of this. But that's not what you would do if you believe you have American foulbrood. I know here, in Florida, as an example, the recommendation is to burn the colony, bees, equipment, and all because the bacterium that causes American foulbrood forms spores and will persist in the equipment, even long after you treat with antibiotics. So it's not really a curable disease like European foulbrood is.

Amy 35:28
Alright, so we're gonna go on to our second question. When people send us questions, they've got to give us the background of what's going on. And I'm reading this question and I feel like this is a struggle that a lot of beekeepers go through, but this person has two hives in their backyard, and during the summer, they struggled with small hive beetle in the larva. I guess, out of the two hives, they're not really strong, but they do plan on trying to feed them trying to make them stronger, and they want to continue throughout the winter. While checking the hives, they found that one of the hives had remnants of wax moths. They took the frames out, replace them with new frames, but now they're trying to figure out what should they do with the hives to prevent wax moths from, I guess, continuing coming in? And then, how do they get through the wintertime? That does matter as far as the questions go, but let's kind of keep it generic and go with what do you do when you're dealing with hive beetles, their larva, and then after that, wax moths are coming in, what should a beekeeper do?

Jamie 36:27
Yeah, so there's a lot to unpack here. Back with the small hive beetle component of it, we use traps, there's a lot of traps available in the equipment catalogs that you can find. We also try to keep our colonies strong and healthy because the best defense against small hive beetle are healthy colonies. Of course, I've seen, with my own eyes, beetles take over healthy colonies. But generally speaking, the stronger and healthier the colony, the more the bees are able to patrol all the combs, the better they are keeping the small hive beetles at bay. So strong, healthy colonies control the diseases and pests that you can't control. And consider trapping small hive beetle simultaneously. And all of these go to great lengths to keep the bee colony strong and healthy. But assuming your colony has weakened due to small hive beetles, which it seems to be in this case, the core group of bees is no longer large enough in the nest to patrol and take care of all of the combs in the nest. So this beekeeper is seeing, essentially, that effect, as that cluster of bees retreats from some combs because they're small and can't occupy all the combs, wax moths move into those combs, even though there's an active living colony in the nest. And so obviously, the first line of defense against wax moths is making sure that

you've got enough bees to occupy all of the combs available in the nest. So I don't know the particular hive configuration in this specific question from our listener but what I would do is try to condense the bees to a nest they fully occupy. So let me give a couple of hypotheticals in this situation. Maybe this beekeeper has a standard hive configuration of double deeps. There are two deep brood boxes, but the bees are only occupying five frames to the right side of both boxes. So five frames to the left side of both boxes are unoccupied. So in this case, you've got 10 frames the bees distributed over 20 frames of combs. Well, I would condense all of those bees into one box so that they fully occupy all of the combs, right? That's easy to do in this two-box scenario. But what if it's a one-box scenario, and bees only occupy five of the frames? Well, you can't condense them, they're already only in one box. Instead, you might consider moving them into a new box where they only have five combs, and they can fully protect all of those combs. So in both of these scenarios, I'm condensing the bees and giving them only the number of combs that they can patrol. If you do that, they will take care of the wax moths themselves, but there's probably a different strategy I would use in this particular beekeeper's case. They mentioned that they have a couple of hives that got weak and that at least one of them has some damage from wax moths. Probably, what I would do in my attempt to save both the bees and the combs, is I would dequeen one of these two colonies and combine the two colonies into one hive. So we're saving all the bees, we're saving all the brood, but we're making one colony rather than two. And that second colony is now condensed into the first one, which leaves me a whole hive, frames and all, that I would protect through winter. So I would remove the combs from that now-empty hive, put those in the freezer, and then I would store the equipment in a shed and everybody wins in this scenario. You're making sure the bees survive winter, you're making sure the combs survive winter, and you're increasing the chances that a stronger colony will survive winter, than two colonies that you're having to nurse through winter. Definitely. I always tell beekeepers, your colonies are always going to grow, and then they're going to weaken. You're always kind of like adding boxes, or taking space away, adding space, taking space away. And it's just like this constant knowing when you need to do that by just looking at the strength of your colony. For sure, Amy. A lot of commercial beekeepers, in their falls, combining colonies, yes, they could work really hard and nurse a lot of weak or so-so colonies through the winter. But the question is, is it really worth it? Combining colonies, you're still saving the bees and the brood and you're ensuring that your equipment doesn't get damaged in the event that those weak colonies die and then leave those combs fully exposed to small hive beetles or wax moths. So combining colonies can be a really good way to ensure that everybody wins. The bees win, the combs win, the boxes win, everybody wins.

Amy 41:05
Definitely. So the last question that we have. I'm pretty active on social media, I say, as far as just doom scrolling most of my life away, but there's a video on Instagram, and someone had sent this over to our feed, and basically said the video is of bees flying and the lights are turned on, and all of a sudden the lights get turned off and the bees just drop to the ground. The question, Jamie, is can bees not fly in the dark? Or what is going on? And what would prohibit them from flying in the dark?

Jamie 41:34
I've never been asked this question before. So this is 100% speculation on my part. But let me just say this statement and then given an example. Bees need feedback from their eyes, their antennae and even their hairs on their body. They need the input from those things to make slight decisions. When

they're flying, they're seeing where they're going with their eyes, they're sensing other things about their flight with their antenna, and maybe even picking up information about flight speed with their antenna and the hairs on their body. They need all of this sensory information to move forward safely. And when they lose that information, especially the sight information, they no longer have the information that they need to navigate safely. So, an example might be, I work long hours, and sometimes I get up in the morning before my wife and my kids get up, and I need to move through a dark house to get onto my computer and answer emails or do whatever I need to do. I can't turn on lights, I don't want to wake up my kids and my wife. So I'll leave the lights off. Well, I've lived in my house for 17 years. I know where my furniture is, I can navigate around it in complete darkness. But when I go to a hotel room and I need to move around in complete darkness at nighttime, I stumble over the bed, I hit the desk, whatever. I don't have the information. Well, bees are moving in spaces that they can't know things about when the lights are turned off. Whereas, my defense mechanism in a hotel room might be to move incredibly slowly, putting my hands out, feeling all around making sure I don't hit things, bees don't have that capability. So when they lose that sense of sight, they seem to be safer falling to the ground than continuing to fly forward in the absence of that very important information. I think that's why they fall in that video. When they lose sight, they lose most of the sensory information that they need to make flight decisions and find it safer to drop to the ground than to move forward. And I would say bees, it's not maybe a truism that they can't fly at night. They can fly at night because, in theory, the moon and the stars, there's enough light for them to see where they're going. They just can't fly in the dark. So in the complete darkness, they've lost that important sensory information that allows them to go forward, and they find it safer to just fall than to continue moving forward.

Amy 44:01
That's really funny. All right. Well, thanks for that. Thank you for our listener for sending us that video and asking about this really fun behavior. But anyway, if our listeners have other questions, again, don't forget to send us an email or send us a message on one of our social media pages. Thanks for listening to today's episode. This episode was edited and produced by our podcast coordinator Mitra Hamzavi. Thanks, Mitra.

Jamie 44:36
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.