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SPEAKERS

Jamie, Amy, Stump The Chump, Dr. Boncristiani, Honey Bee, 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. Welcome to another great episode of Two Bees in a Podcast. In this episode, we will be interviewing Dr. Mike Simone-Finstrom, who's the Acting Research Leader at the USDA lab in Baton Rouge, Louisiana. That lab is the Honey Bee Breeding, Genetics and Physiology Research Lab. And Dr. Simone-Finstrom will be talking about all of the projects that they're doing at that lab. We will follow that with a segment where we interview Dr. Humberto Boncristiani from the UF Entomology and Nematology Department, specifically our honey bee research extension laboratory. Our lab in the past few years has been engaged in a really cool project called World Honey Bee Health. Dr. Boncristiani has been leading that for us and we'll talk all about that. Of course, we will end today's episode with a question and answer segment about honey bees and beekeeping. Hello, everyone, welcome to this segment of Two Bees in a Podcast. In this episode, we are joined by Dr. Mike Simone-Finstrom who is the Acting Research Leader for the Honey Bee Breeding, Genetics and Physiology Research Laboratory managed by the United States Department of Agriculture and it's headquartered in Baton Rouge, Louisiana. Mike, thank you so much for joining us on Two Bees in a Podcast.

Guest 02:06
Yeah, thanks for having me. It's a pleasure.

Jamie 02:08
So, Mike, I've been in the bee research world for quite a while and I've always admired the stuff done at the research lab in Baton Rouge. I really enjoyed the breeding programs and just all the work coming out. When I first started in bee research, Tom Rinderer was the research leader there. We know Bob Danka was there, he retired a little bit earlier. You're the Acting Research Leader. So we just want to have you on and talk to you about the types of projects that you guys do, the history of that lab there,

etc. But before we get there, our listeners love to know something about the people we're interviewing. So could you tell us a little bit about yourself and how you got into bee research specifically?

Guest 02:48
Yeah, so if we go back to my childhood, I grew up in Southern Maryland, and kind of on the coasts of the Chesapeake Bay. And so when I was little, in middle school, I decided I was going to be a marine biologist because I was just so infatuated with sort of the ocean and water. But really, as I kind of went through my career and education, it was really about animal behavior that really got me. As a kid, I loved to feed ant lions, ants and their little pits and sort of watch how they interacted with the ants and built their things. So that was sort of my first real love of insect behavior. And when I went to the University of Minnesota for my PhD, I took an insect behavior class. I really was like, I really should work with insects because there's so many cool behaviors. And I kind of approached Marla to see if I should switch my path and get into honey bees. I went out into a honey bee colony, and as I think most of us, that first time really seeing honey bees in action was really astounding and really awe-inspiring. And to me, the thing that really hooked me was you have 10-50,000 sort of individuals all kind of doing their own thing, but also working as this really cohesive unit. And if kind of that colony level life or organism isn't functioning well, the whole thing goes down, and that to me was just really exciting and really cool. And so after I got my PhD with Marla, I went to work with Tarpy at NC State as a postdoc, and then made my way here to Baton Rouge.

Amy 04:43
That's awesome. Part of this podcast, I think, is just to kind of share all the different research that's going on, especially at the USDA Bee Labs, just because there are a few of you all around the nation. So I know that you all have specialties and kind of just focus on what you're doing research on. I would also kind of like to touch base on some of your outreach events because I know that you all were supposed to have a virtual Baton Rouge outreach honey bee day. So, I guess, could you just tell us an overview of kind of the type of research that you all do? And maybe some of the outreach stuff that you also do?

Guest 05:17
Yeah. So the research that we do here at the Honey Bee Breeding, Genetics and Physiology Research Lab really sets the stage for honey bee breeding. And, as Jamie said in his introduction, there really has been this impressive series of work going back since the lab really started. As Jamie said, some names Tom Rinderer, Bob Danka, they really inspired me early in my career too. I remember meeting Bob Danka at a beekeeper meeting in North Carolina and just being in awe of his research and Lilia De Guzman, really, too, meeting at the scientific conferences, and just the work that they were doing, mite resistance in honey bees was really crucial and really inspiring. And, really, that's been the history of the lab, trying to find ways to work with bees so they can be healthier and more productive using their own natural traits. And so the research that we do at the lab is really highly integrative. We have to know a little bit about everything in order to really breed bees effectively. So our lab name really indicates sort of all of these things. So we have to know a lot about the honey bee physiology and how they function, we have to know a lot about the parasites and pathogens that they're constantly fighting off so that we can really breed better bees, and we also have to know, especially as the field goes into more genomic-based directions, more about honey bee genetics, and genetics that are defining some of these traits of interest. And that's really how we can also help move honey bee breeding into the

future and to align more to things like even cattle, how genetics are really informative in selection processes for cattle and other organisms and other livestock. We can do some of these things and translate them into honey bees as well, though, it's very different. But, that's sort of the goal, to use all of these techniques and all these tools to really help bees and manage bees in a way that they can be healthy and productive, sort of, by using some of these traits of interests. So like mite resistance or this social immunity, these colony level defenses, but also their own individual immunity, and different behavioral traits like grooming, all of those things can work in concert and work together and work with certain management strategies to really improve the health.

Jamie 08:02
So Mike, I really applaud one of the statements you made there about looking at how the cattle industry and others have done it. It's always been kind of interesting to me how a lot of the other -- I'll broadly say cattle, although I know cattle is specifically speaking about cows, I guess livestock is a more appropriate word -- people have been breeding animals for quite a long time. But for some reason, in our own industry, I would argue that it's not adopted at the level or championed at the level that you see in cattle and poultry and other things. So it's really neat that you guys are looking at cattle as a model. Your lab, like you said, does have a long history of breeding bees. We've mentioned some names of individuals who've been in those, Bob Danka, Rinderer, Harbo, etc. Can you tell me some of the stocks of bees that had been produced by the Baton Rouge bee lab over the last couple of decades?

Guest 08:51
Yes. So the Russian honey bee program is probably the best example and one of these great examples of what we call technology transfer. So our mission at the USDA is not only to identify and develop solutions for the beekeeping industry, but ultimately, to transfer those solutions to the beekeeping industry because if we don't transfer this technology or these resources to the industry, then it ultimately doesn't matter. So what the Russian honey bee program did, they imported these from the Primorsky region of Russia where there was this long history of Varroa and these honey bees interacting. And so the idea is that there was some natural resistance developed there. They were imported here and quarantined on an island in the water in South Louisiana and evaluated. There were many years of research led by Tom Rinderer, and now Lilia De Guzman and Lanie Bilodeau. That research really resulted in transferring that stock, handing that stock over to the Russian Honey Bee Breeders Association. And now they, along with still help and support from us, maintain this, essentially, closed network of bee breeders where they're really continuing selection and maintenance of this Russian honey bee stock and then producing queens and nucs to sell to beekeepers. That's one stock that was produced by the lab. And they do show a level of mite resistance that is valuable to the industry. I know a lot of the beekeepers in this program are kind of smaller, or they're not these really large queen producers. So it's somewhat limited in terms of the number of people that can get Russian honey bees, they do sell out, but it is an important stock that was transferred to the community. The other major stock that's still developing and these commercial partnerships that we're working with is the VSH, which is what it was originally called. So this trait that was bred for Varroa sensitive hygiene. So these are bees that selectively pull out pupa that are infested with reproductive Varroa mites. And so it essentially can limit or completely reduce the population growth of Varroa over time. And so this is a really important trait that was first evaluated and developed by John Harbo, and then Bob Danka transitioned that VSH line into the Pol-line. So, P-O-L-line. And that was a result of outcrossing. So breeding this VSH line with commercial beekeepers to increase that honey production and to make

them more commercially viable. And in the last four or five years, there's been this partnership called the HILO bee project led by Bob Danka and the Hawaii Honey Company. And they've invested a lot of time and resources in developing these commercially viable bees that have a high expression of VSH, this Varroa resistance trait, and they've been producing thousands of queens this last couple years and selling them. So we're really excited about how that's progressed and where it's going.

Amy 12:37
That's really interesting. I was actually going to ask you how many queens they're producing. So I'm glad you had kind of a number, a thousand, with the HILO bees specifically. So Jamie and I have spoken a lot with queen breeders in the past and different associations. And I think the number one question we receive from beekeepers is where do we find these bees? And I know that you were talking about the Russian stock and how there aren't that many of them. And so, I am a hobbyist beekeeper -- if I was a hobbyist beekeeper, what would you recommend for me? Where would I go to receive this? Or what time of year are they available?

Guest 13:11
So for the Russian stock, the Russian Honey Bee Breeders Association, several of them do sell queens, some of them don't. So you'd have to look at those individual members. But they would typically sell queens late spring and even early summer. And that's when most of the queen production would be happening. For the HILO bees, the Pol-line bees, they're really ramping up that production. I think even last year, they sold 10 to 20,000 queens, so that one is going to be still on the rise in terms of their production. Beekeepers, they may or may not sell small quantities. So that's something to contact them about. They have a newly developed website, HiloBees.com and that's something to look into a bit more. But really, those are the two main ways to get these two stocks of bees.

Amy 14:06
We'll have to add that to our additional notes, definitely their websites on there. So what are some new directions that you all are working on? Where are you headed now? Where do you see kind of your breeding or just your research in general, where are you guys headed?

Guest 14:22
So we're really excited here at the Baton Rouge Lab about our future and how things are progressing. So over the last two years, we've hired three new scientists, so three new research groups that really have expanded the potential options and all of these new creative avenues of research at the lab. So Arian Avalos, Kate Ihle, and Vincent Ricigliano are all of these newer scientists that we've hired. And part of this is now looking for new traits of interest. So one thing that Kate and Vincent are looking into is, are there genetic traits that are associated with the bees' ability to sort of process nutrition? So we know that nutrition or access to proper nutrition is something that bees are faced with and have to contend with. So are there bees that are better able to deal with poor nutrition, or even adequate nutrition? Are these supplements better than others? And is that something that we can breed for? And similarly, Kate has a line of research looking at vitellogenin, which is this major storage protein. We do know that there's some genetic relationship with production of this vitellogenin, which is associated with overwintering success and likely, just general hive health. So can bees be bred for higher production of this vitellogenin, this lipid storage protein or conversion of food into that storage protein more effectively? And ultimately, then, is that good for the bees or not? We still are at the early stages of that.

And then on the other end of these traits that we already know about, like the Varroa sensitive hygiene, what are ways that we can increase the adoption of the trait? How can we help beekeepers do the phenotyping? Phenotyping essentially means assess whether your colony has this trait or not. Because currently, the method that we do this, it's very time intensive. You have to actually open up cells, typically under a microscope, and look at how many cells contain a mite and how many of those cells with mites have reproductive mites, so mites with offspring. So there's a big hurdle there in terms of educating and working with beekeepers that can do this phenotyping, effectively, on this large scale. So we do have a project with Christine Elsik at the University of Missouri, and Arian is on this and working in different avenues as well to really identify genetic markers that are associated with this trait that we can then eventually make a genetic marker panel, and test bees, set up this marker assisted selection program. That's really the goal for some of these traits that are harder to phenotype. Can we set up a genetic panel that then can be sent to a diagnostic lab to determine which colonies would be the best to breed from? I would say that we have sort of other areas of research, also not related or tangential to breeding in terms of management, that also help us aid in various breeding efforts. One that I believe you've talked about with Frank before, this was Frank Rinkevich's work on potential Amitraz resistance in Varroa and the importance there, and he's doing several other sort of toxicological-based research, including work on breeding, and sort of this differential susceptibility bees might have to pesticide exposure. Then on another angle, we also have a lot of research going on in terms of nutrition. So sort of these things that I mentioned before with this genetic angle, but also, can we use microalgae as a nutritional supplement? And how can that be used to also help bees fight off pathogens and parasites? And then I'm involved with a lot of work on deformed wing virus and other viral infections. One, understanding how bees are either resistant or tolerant to viral infection. Again, part of that is understanding if we can use that as a target for selection so we can breed bees that are more resistant to viruses. But a lot of that then involves just understanding how the viruses in bees interact, including how nutrition might play a role in infection as well.

Jamie 19:09
Mike, I'm glad you mentioned a lot of these other projects. Just like what you said, the Honey Bee Breeding, Genetics and Physiology, that's in the name of your laboratory and a lot of the research with which I'm familiar, there's the breeding these lines of bees that you've mentioned. I'm also, having done a lot of small hive beetle work in the past and familiar with Dr. De Guzman's research on small hive beetles, one of the things I've always appreciated about USDA Labs is they're able to respond to industry need. In many ways, they're able to do it faster than academic labs, like what I am at the University of Florida because you guys have resources, you have staff, technicians, funding, etc. to do this. So it's really cool to hear you talk about all the other things that you're doing at that lab, in addition to maintaining some of these breeding lines that have been developed. So you mentioned, specifically, some of the things that you are doing in your research program. In addition to being Acting Research Leader, you have to run a lab, and you mentioned some of this deformed wing virus stuff. What are some of the other things that you are doing that your team specifically is doing to address bee health?

Guest 20:09
So the other major project that I have going on currently is in collaboration with Marla Spivak at the University of Minnesota. And it kind of has this two pronged effect. One, overall, it's really focusing on propolis. So these bee resins that bees collect and distributed within the hive and understanding the effects of that has on bee health, which I've been working on, and Marla's been working on for the last

15 years now. It's crazy how time flies. But in reality, there's been this really solid avenue of research that propolis in the hive seems to have these benefits to honey bee health, both sort of subtly, and then directly against pathogens and even that they seem to self-medicate. So bees might bring in more propolis when they're infected with viruses or chalkbroods or fungal pathogens. But, really, what we needed to do and sort of this missing link had been demonstrating the role of propolis in beekeeping settings and, specifically, commercial beekeeping. So we've worked with partners to develop these boxes with this rough interior that stimulate propolis collection and really create what has been termed by Tom Seeley propolis envelope. So the entire nest interior is surrounded by a thin layer of propolis, and we have this really cool trial going on. We're in its second year now of about 120 of these colonies going through commercial beekeeping. So they go from here to the Midwest for honey production and California for almonds. And we're looking at several different things. But, the first year, we did see that these colonies that have this rough box or this propolis, there was this slight reduction in honey production in two of four of the apiaries. And so there could potentially be this trade-off between resin collection and honey production. But when they got to almonds in February, they had on average, one more frame of bees. So it seems like that endpoint, if you're concerned about pollination services, they're going to be stronger in there, potentially. And so we repeated that again this year and found with these same boxes, so they already had the propolis established, and this year, we found no difference in honey production and actually an increase in honey in two of the four apiaries this year. So kind of the opposite effect and sort of in line what we would expect based on some work out of Brazil. So we're really excited to see how those colonies look in February in almonds. Sort of complementing that work, so again, doing this line of how can you manage bees and help the breeding and genetics work, this other avenue of research is really looking at breeding bees for propolis production, mite resistance, hygienic behavior, and honey production sort of all in one. So this idea of trait stacking again, which is something that's done in other livestock and other industries. And so this is what I really think the goal is in the future and sort of where we need to go, not just focused sort of on one trade at a time, but how can we combine these traits all together to produce healthy bees? And that's kind of what we're already doing when we breed for gentleness and honey production and color to a degree. But, if we're focusing on sort of these traits that are related to health, I think that's really important.

Jamie 20:11
Mike, that sounds like a lot that you guys are up to. How many scientists are there at the Baton Rouge lab now?

Guest 24:02
So currently, we have seven scientists with an eighth opening, essentially. That that was Bob Danka's position. So we hope to fill that in the next year.

Amy 24:15
I thought he was about to say an eighth of a person.

Guest 24:20
There are lots of people, even in the sort of pandemic conditions or where we're teleworking a lot, we're still keeping really busy and really active and this new group of scientists that have started, it's really invigorating and exciting to see where they're going to take us as well.

Jamie 24:37
I agree, Mike, we expect big things now. Don't let us down.

Guest 24:41
We won't.

Jamie 24:43
Mike, it's been great to have you on this podcast. I look forward to having you as a future guest. We could talk more about some of the specific projects. So thank you so much for joining us.

Guest 24:52
Thank you. It's been great.

Jamie 24:53
Everyone, that was Dr. Mike Simone-Finstrom, the Acting Research Leader at the Honey Bee Breeding, Genetics and Physiology Research Laboratory for the United States Department of Agriculture based in Baton Rouge, Louisiana. Thank you for listening to this segment of Two Bees in a Podcast.

Honey Bee 25:15
Have questions or comments? Don't forget to like and follow us on Facebook, Instagram, and Twitter @ UF Honey Bee Lab.

Amy 25:29
Welcome to this segment of Two Bees in a Podcast. We have a very special guest today. It's actually Dr. Humberto Bonchristiani, who is our research scientist here at the University of Florida Honey Bee Research and Extension Laboratory. And I know that him and Jamie have been working on a really cool project, and it is called WorldHoneyBeeHealth.com. So we kind of wanted to talk about this resource and talk a little bit about how it will benefit all of you listeners. And of course, because it's virtual, you will all have access to this awesome website. So I guess we'll start with Jamie. Can you tell me a little bit about the history of where WorldHoneyBeeHealth.com started, and it's really difficult to say that so if you could say that five times in a row, that would be great.

Jamie 26:15
That five times in a row, that would be great. I did it. Alright. So Amy, really this is like a momentous moment because this is the first time in a segment that I will be an interviewee and an interviewer. You just asked me a question. Yeah, this is the only question I'm going to answer as if I'm an interviewee. But then I'm going to join you as we question Umberto further about this. What do you think about that, Amy?

Amy 26:40
Now everyone's just gonna be confused.

Jamie 26:42
Yeah. Well, we'll try to keep it straight.

Amy 26:46
So tell me about the history.

Jamie 26:48
Yeah, I can give you a little bit of the history of this. So I did a postdoc at the University of Georgia. And while I was there in the lab of Keith Delaplane, at the University of Georgia, and our listeners will know that we interviewed Keith Delaplane a few episodes ago, he had told me at the time about a series of publications that occurred in Bee World. Bee World is, of course, the more popularized beekeeping journal that's published by the International Bee Research Association. We had someone from IBRA on one of our earlier podcasts, and also had Robert Brodschneider, the editor of Bee World on one of our previous podcasts. Bee World is really a journal in which science is translated for the beekeeper. It's really international in scope. And since the mid-1990s, if I'm not mistaken, or the early 1990s, there was a series of authors who published a few articles on the global distribution of the known honey bee pests and pathogens. So Andrew Matheson did the first few, and he focused mainly on the honey bee pests and pathogens that were not viruses. And then Brenda Ball and colleagues looked specifically at the global distribution of honey bee viruses. So there are three or four publications on these topics. And what they would do is they would print in these articles what the major pests and pathogens are, as well as maps showing where these things occur. And one of the cool things, too, is that they had this really large table and all of these documents. So you could look in these tables by country, for example, United States of America, and you could see all the honey bee diseases and pests, or pests and pathogens that had been found in the United States at that time. And then correspondingly, you could go to that particular disease or pest's map to see its global distribution. So you could search it by country and see everything a country has, or you can go by pest or disease and see where they occur. And so, Keith Delaplane, when I was a postdoc at Georgia suggested to me that, "Jamie, it had been about 10 years since the most recent one was published, why don't you consider updating and rolling all of these pests, pathogens, including the viruses, into one manuscript?" The editor of Bee World at the time was Pamela Munn. So she and I worked on doing just that. I scoured the literature since the publication of the Matheson and the Ball manuscripts to see what new pathogens had occurred where. I painstakingly, for every country in the world, at the time, I colored them present or absent for each of the pests or pathogens, made these really large tables, and then I basically published a manuscript on the global distribution of the known honey bee pests and pathogens, and that was published in Bee World in 2005. And the cool thing about that is that was immediately before colony collapse disorder and all the issues that were discussed with that. The reason that's important is because when quote CCD was first talked about, there was a massive explosion, post-CCD. So starting in late 2006, there was a massive explosion all around the world in honey bee disease and pest research. So my publication came out in 2005. It said, here's the things that we know to be major issues for honey bees, here's where they occur around the world. The year after it was published, everybody started looking for new pests, new pathogens, expanded ranges of existing ones. So since 2005, there's such essentially been a large gap in understanding the global distribution of these new and emerging and even the existing pests and pathogens. And the funny thing about it is that particular paper I published in 2005 remains one of my most cited papers. Scientists from around the world, they'll start off their manuscripts, "We are studying Varroa. Varroa has a global distribution, see Ellis and Munn 2005." And in a lot of the meetings I go to around the world, people had Photoshopped or copied the maps from my manuscript and include it in their presentation. So when they talk about a disease or pest, they'll show

the global distribution. So all of that background is kind of the history of this series of papers, which I was happy to be a part. And when I came to Florida, it's 2006, and then some years thereafter, I started getting an itch and saying, this needs to be updated because of this explosion of research. And then of course, Dr. Umberto Bonchristiani joins our lab a couple of years ago. And up until that point, some previous students and postdocs of mine and I had been working on an update, I think, embarrassingly since 2014. And when Umberto came, I said, "Hey, Umberto, what do you think about taking this on and seeing if we can't get this thing updated in its entirety and published?" Umberto, to use the old saying, he grabbed the bull by the horns and just ran with it from there. So yeah, that's the history. And now it's even better. So I'll let you kind of take it from here, Amy, as well.

Amy 26:51
So, I have two questions for you. The first one is when you went through every country and had to basically say, "Yes, this pest is present in this location," were you just finding that through the different manuscripts, like through the literature review? How did you do that?

Jamie 32:07
Yeah, it's crazy that you asked those questions because that's the real work, Amy, is trying to figure out where these things are. The other thing that we haven't even discussed, I will answer your question, I promise, but the other thing that's an underlying issue here is just because someone says something is somewhere, doesn't make it there. So for example, I could say small hive beetles are in Mozambique, but that doesn't mean they are. They have to be identified according to standard identification management practices. So I would scour the literature, the refereed literature, and look for authoritative reports where a formal identification of a disease or pest had been undertaken by a reputable laboratory. So for example, it just had been published in a local bee journal, "Hey, we think we saw some small hive beetles in our apiary five years ago." That's not enough for a positive hit for that country. I had to see there was a scientist or a beekeeper who collected it, they sent samples off to a noted diagnostic lab, they conducted a taxonomic analysis or a molecular analysis, or whatever standard identification method, ensure it came back positive, and that positive was reported in a refereed journal, which means other scientists have vetted the authenticity and the quality of the work. And so you ask about sources. That's the real work is you can't just get a paper that says, "Small hive beetles first reported year, you have to read that paper, judge for yourself if it was reputable and done appropriately, and then you have to know that paper exists. So how do you find it in the first place? This was right on the early cusp of the internet being particularly useful. And so at the time, the International Bee Research Association published a series of books every year called Apicultural Abstracts where their scientist would look across all the big literature that had been published that year, write abstracts for all of those papers, and publish it in a yearly memoir, as it was, saying, here's all the stuff that came out last year about honey bees. And I combed through every entry of Apicultural Abstracts that had occurred since the last publication of the World Bee Health, so that I could update from the previous scientist comments, and it was an incredibly painstaking process. So I had fun. And I will tell you, the coolest thing about it is I learned world geography in a way I never knew. I mean, at the time, I knew every country that existed and where it was because I had to color them based on their disease or pest presence, but that's the background.

Amy 34:50

Okay. Well, so then my second question for you, do you feel like 2005 is when you peaked in your career?

Jamie 34:56
No, absolutely not. I'm like a whiskey. I just get better with age. Everybody says wine, but wine doesn't get better with age, right? It's put into a bottle.

Amy 35:05
Sure it does.

Jamie 35:05
I'm like a whiskey in that barrel. The longer you leave it in there, the better it is. And so I'm sharper and better than ever, Amy.

Amy 35:14
That's fair. All right.

Jamie 35:15
Moving on.

Amy 35:16
Okay. So Dr. Umberto, you took over this responsibility and you took over the World Honey Bee Health when you started in your position here. Can you give us a little bit of background of your experience and kind of where it was when you had kind of taken it over?

Dr. Boncristiani 35:31
That was, I have to say one of the biggest challenges I think I overlooked this project. And I was very, very excited when Jamie proposed that I could take the lead on this project because I know how big of a deal that paper was in the past, his original paper was in the past. I was all in, oh, I want to do it. I want to do it. However, I was very excited but I didn't think straight at the moment. Just like Jamie said, that was before CCD and all the bee buzz. So since that last publication by Jamie, until today, that was where the explosion of honey bee pests and pathogen research happen. So there are thousands and thousands of new research to look at and to read all of them and find out if they are they have done things properly and if we can exclude these or not. So there is a humungous amount of work that we had to get done. So we have a very good thing and I want to first of all, before we move forward, I want to credit all the team members just before I forget that because it's the team members, not just me. We have Dr. Cameron Jack here, our apicultural lecture. We have Jason Rohan, we have Ashley Mortensen, we have Chase Kimmel. We have Daniel --

Jamie 36:57
It's okay. It's Schnell. Dan Schnell. He's a postdoc here. Dan, if you're listening buddy --

Dr. Boncristiani 37:02
And Tomas Bustamante. So these incredible people get together and we split in the pest and pathogen and we start to look in the internet for everywhere in the world to identify which country has what. So it

was very challenging. But one thing I can say, Jamie, I need to thank you for the opportunity because I learned a lot.

Jamie 37:24
Yeah, it was pretty cool, Umberto, you're right. So, Amy, Umberto is just like spot on. He, Tomas, Jason, Cameron, Chase, Ashley, Dan, basically, they divided and conquered. They put out all the diseases and pests that we knew of that we wanted to look up. Each individual then would search the literature since the last report. They fed all of that to Umberto and he had to take it from there. Chase Kimmel was a specialist with GIS, so he did a lot of the mapping work for us, and Umberto really carried over the finish line. Because until that point, all of these former lab members and I, we've been working, but it was easy to kind of get distracted with the things that we were doing. So when Umberto got on board, he really ensured that we finally got this thing published and improved it. So Umberto, that's kind of what I want to discuss with you. I mean, those improvements. So obviously, there's a paper that's already been published online if you go to the Bee World website, the pre-publication is online. It will be probably published on the first issue of 2021. We'll make sure and link the article online so people can go look at it. But you've done some updates, Amy, I know you're going to ask him specifically about one update but Umberto, the format's a little different. Right? We don't bury tables and maps physically in the paper this time. We've just got text in the manuscript. Could you tell us a little bit about the format of the document now?

Dr. Boncristiani 38:47
Yeah, we had to change the format because the amount of information was gigantic. And that's where I came up with the idea of, well, I cannot put everything in one single paper. There is no way to, otherwise, it's going to be a book. So what we decided to do is to build a website. So now we have this paper itself, which is going to be published on Bee World. And we have this companion website where all the maps and all the tables are going to be in that specific area. So everybody can go there, everybody can have access, can download the maps, can download the tables, and more importantly, they can also help us to improve this work. So we don't need to be continuously doing the same thing over and over. So everybody in the world today can come to us, "Look, we have new information that you might you guys might have missed. So I give you the information." And if it passes our criteria here, we can immediately update the website and people know where those diseases and pests are in the world today. So that, I think, was very exciting.

Jamie 39:54
So, Amy, he's telling you something that's really important. I know you're about to ask him about this but one of the things that's incredibly crucial about this is when Umberto and our colleagues and I put on a sheet of paper that a pest is in a country based on some manuscript that we found. A lot of governments might take action on that pest. And so I remember when I published the article in 2005, there were some errors, not necessarily on my part, it's just that I used manuscripts, that even though we vetted appropriately as we could, may have had a false positive or things like that. And so I remember, at the time, a few countries represented are coming to me say, Jamie, you had this present in this country or not present in this country, when in reality, it's the other way around. Here's proof that we could show you. So there really wasn't an easy way, in the old manuscript, the manuscript I published with Pamela Munn in 2005, for it to be updated. And I think that's some of the motivation behind what Umberto did. Rather than bury the tables and maps in the manuscript, which as a refereed

manuscript, gets published once and that's it, it's changeable. He elected to put this on the internet where things can be updated. And so I think that's crucial improvement over the way we've done it before. So I'll let you kind of ask Umberto specifically about that, because I think that's really where some of some of the most important contribution and changes here.

Amy 41:23
It just reminds me of like the person who had to move all the information from an encyclopedia to the internet, right? It's like that transition. So I feel like we're kind of in that transition with the World Honey Bee Health. And so what you're saying is that there can be updates, and this is a really good opportunity for us to keep it up to date, which is, I personally think, and I think you all will probably agree, is super important to have out there. Because we don't want outdated materials. So Umberto, how can the website be updated?

Dr. Boncristiani 41:52
So the website is divided, and we have the maps there. If you go to WorldHoneyBeeHealth.com, you have all the information you need to navigate the website. And inside the website, you have the maps, you have the tables, and if you are somewhere in the world and you disagree with us, and you have more updated information that you think is relevant, and you need to update that in your country of origin, you just send this paper. You need to send us a paper following the criteria that we use in the manuscript, and also, you can find the manuscript in the website. But basically, we have a criteria that we divide into four, five groups. Number one is, when a pathogen or past is present, we call it confirmed present, the country of color is going to be red and the symbol used in the table is going to be a plus symbol. And this only happens when you have a reported present in a peer-reviewed article or in some kind of alternative review or investigation, some kind of report. You need to have documentation showing that the pest was found following scientific laboratory techniques, standard laboratory techniques. The other criteria, we suspect present, so that's going to become the color yellow. And the symbol used in the table is going to be plus, together with the question mark. And this is when you have an anecdotal or hearsay report, few diagnostic of condition with or without signs of infestation and infection in the field. Presence not confirmed using standard laboratory techniques. So we might have somebody saying something, but it's not completely confirmed. So we put this in a category called suspected present. So if you go to the website, you can see much more details about the those criterias and how we categorize things. And using those criterias, send the information you have to us, and we're going to analyze that. And if it passes our filter, we're going to be very happy to update immediately on the website and the table. So we're going to be up to date and conforming with the situation in your country.

Jamie 44:22
I think it's so important to emphasize that, Umberto, if we've made mistakes, and there's no doubt some errors, either from the sources that we've had, or just by virtue of us having to do so much work, if, for example, we said it's present in a country when it's not there or absent in a country when it is there, we give a strategy on the website where people can report to us these errors and have them changed. And I think that that's incredibly important because it makes us a very dynamic site. In the absence of being contacted by people who are using the site, we plan to update it at the beginning of every year. Umberto and our coauthors and I have discussed about how every year, say, January and February, we'll bring on some students here at the University of Florida who will look at the previous years

publications to update the map through the previous year. So I'll give you an example. For the listeners who are hearing this now, we're recording this early November 2020. So in January of 2021, we'll bring on some students to the lab who will come the 2020 literature, and we will update the maps and the tables on the website through 2020. And we won't do 2021 until 2022, and so forth. But if we are contacted behind the scenes using the strategy outlined on the website, we can update errors in real time as people make us aware. And the second thing I'll say is that there are so many more pests and pathogens that we've included this time around that have ever been included in our previous reports. If you just look at the viruses I probably included, I don't know, just guessing here, seven to 10 viruses in my manuscript originally in 2005, Umberto, you think what? You have 30 here? Yeah, and we can continue to add as new viruses or new pests or new pathogens are failed. For example, the Asian Hornet is a buzzword these days, and we are working on developing maps and tables to correlate with that. Umbero, obviously I'm involved in this project and could talk forever about it. But one of the things I'd like to ask you is how do you see this being used? Why is this of value to beekeepers and bee scientists and regulatory authorities around the world? What do you see people doing with this website and this manuscript?

Dr. Boncristiani 46:49
Well, one of the things that I like to emphasize to everybody that asks that question to me is in today's world with internet and everything, we have a huge amount of information being thrown everywhere. But I would say few are verified. And I think this, with the effort that we did here is to collect all the information that is good information and put it in one place so everybody can go to that place and get verified, confirmed, reliable information about honey bee health, honey bee pests, and pathogens. And I think this is very important in a world that we can find all kinds of information today, especially in beekeeping. All kinds of information out there, and few of them are verified scientifically. So I think this is the great value of this work, the effort to collect all this information and put it in one single place. Another thing is, when I say for government agencies and regulatory people, sometimes they don't have the resources in their own country to do things. And with that, we already did a very deep part of the work for them, if they want to use the information for policies in their own places. I think that's a huge value for many different countries out there.

Amy 48:10
And I think it's also just fun to know what's going on outside of where we are in the world, that there's just so much out there.

Jamie 48:20
Amy, I'll add that the other value, just like what you said there, another value is it was fun for us to put together. And it really taught us a lot about the diseases and pests of honey bees and the distribution. But one thing that's unique about this one that's different from all the others is in the previous manuscripts, people were literally using the little edit tool from PDF to take images of the maps and tables to put into their presentations. Again, I saw this plenty of times. But now, the purpose of putting the maps on the website, among other things, is to make them downloadable. Anyone out there giving a presentation in which you need to show the distribution of any of the diseases or pests or include tables of any of the diseases or pests, these things are freely downloadable and usable to you. We only ask that you cite them in your presentations or in your manuscripts. So another beauty of doing it in the hybrid way where we have a website as well as a manuscript is the website provides them the

opportunity to physically access and use the information that we posted online. And I think, Umberto, my name is on the paper but I really want to give credit to Umberto and the other coauthors because they did a lot of work to make this resource so useful to beekeepers and bee scientists around the world.

Amy 49:39
Well, thank you so much Dr. Umberto Boncristiani. Again, everyone, that was Dr. Umberto, a research scientist with us at the University of Florida Honey Bee Research and Extension Laboratory. He was talking about the World Honey Bee Health. They were talking about the manuscript, the history, and if you want to visit the website, we'll definitely add it to our additional resources. And the website is WorldHoneyBeeHealth.com Thanks again, Umberto.

Dr. Boncristiani 50:05
Thank you, everybody.

Stump The Chump 50:09
It's everybody's favorite game show stop, Stump The Chump.

Amy 50:22
Okay, it is that question and answer time. We have had a lot of questions from our listeners, which I'm really excited about. A lot of them are a little bit longer. So I'll try to do my best to summarize what these people have been emailing to us. But the first question I have for you, Jamie, is that this beekeeper is a new beekeeper, and their hives have swarmed a couple of times. So during their inspection, they had capped queen cells and then they basically just kept catching swarms. Their question is will an unmated queen leave with the swarm?

Jamie 50:55
Easiest question I've ever been asked. The answer is yes. Next question.

Amy 50:58
That was the hardest question I had to summarize.

Jamie 51:01
I know they want a little bit more information than that. So let me just explain. In a typical colony that is very strong, and they're doing their reproductive swarm, it is the old queen who will leave with those 30 to 70% of the bees, that first swarm. We call that a primary swarm. There are instances where after that primary swarm leaves, that the colony is still strong, or where multiple queens emerge at the same time. For any number of reasons, a virgin queen may leave with the second swarm, and those, you might guess, are called secondary swarms. It's even common for the colony still to be strong enough or because multiple queens emerged for whatever reason, a third queen leaves. So this would be the second virgin but the third total queen. That would be a tertiary swarm. So colonies, these are overgeneralizations -- again, this is biology. Biology is messy. But generally speaking, the primary swarm is headed by the main mated mother queen from that colony and you can get secondary and tertiary and so forth swarms headed by virgin queens. These are all relatively common phenomena. I don't have, before me, statistics related to how many colonies only issue one swarm versus how many

issue two or three or multiple. But when they issue multiple swarms, they're usually swarming with virgins.

Amy 52:32
You're right, that was an easy one.

Jamie 52:34
Yep. And when they get to their new nest site, they'll go out and mate and that's that.

Amy 52:38
Okay, so the second question we have is wondering, is it safe to use bamboo to make equipment for honey bees?

Jamie 52:46
I love these questions. Because so far, they're just short one-word answers. So yeah, it's safe. Really, the important thing about a hive, it needs to be weather tight. Rain doesn't need to be able to get in. Sunshine doesn't need to be able to get in. If you live in a colder climate, cold doesn't need to be able to get in. I have traveled all around the world and have seen beehives made out of all kinds of things, all types of wood, plastic, Styrofoam, I've seen people cut 60-gallon drums in half and make top bar hives out of the halves of the drums. So in that case, they're metal hives. I just seen it all. So bamboo is just one more thing out of which you can make a hive. Now, I'm assuming, based on the question, that you're talking physically about the rounded baboon. Baboon, haha. Don't make your hives out of baboons. That would not be good. I will tell you, I lived in South Africa, so baboons, I saw them everywhere. You don't want to, no. All right. So I'm assuming when you ask about bamboo, I'm going to have to watch myself now because I'm going to Freudian slip all over this, but if you make a hive out of bamboo, I'm assuming you're talking about the physical rounded stalks. In which case, if you're putting a bunch of them together, there might be natural gaps between them. I'm from the south. When I think bamboo, I think, fishing.

Amy 54:12
Of a panda?

Jamie 54:13
No, I think about cane poles that we all use to go fishing. I imagine trying to make a mat out of those and then being the sidewall of the hive, you'd have these cracks and crevices throughout. In many places around the world, people would do that, and the bees would just fill those cracks and crevices with propolis. So I think as long as your hive is weather-tight, it's not a problem. And I believe, Amy, if I'm not mistaken, when we talked about this question before we actually went on air to record my answer, they even asked about cypress as a potential option.

Amy 54:41
Yeah, is cypress a better choice?

Jamie 54:43

Yeah. So the deal is the reason -- so, for the rest of the world, we've got listeners from all around the world, for the rest of the world, cypress is a particular type of tree that we have here in the southeastern United States that grows in swamps. Cypress is documented to be rot resistant. It's also good against a lot of different wood pests and microorganisms. What I was told by people who really know what they're talking about, so I can only assume that they are true, that those statements are true about old growth cypress and a lot of what's being cut and sold in beekeeping equipment is kind of the newer growth stuff. So maybe there hasn't been a lot of time for it to develop its disease and pest and rot resistance, etc. So what I always tell people, more important than the wood is how you assemble and care for the hive. For example, well, I would glue my joints, I then caulk my joints, I put my hives together with screws, I keep them painted on the outside, all of those things are things that weatherproof. So, you can use cypress or bamboo or pine or poplar, whatever you have accessible to you, wherever you are listening to me. As long as you do your part to weatherproof those on the outside, the bees don't really care. I mean, I've seen honey bees nesting in grills before. So they just are looking for a cavity that they deem to be the right size. So, as beekeepers, we can do our part to make sure those cavities are weather tight.

Amy 56:17
Yeah, I think, in my time working with plants, I think a lot of people were worried about treated lumber. And so that has also been a question that I've received quite a bit is just wondering if treated lumber has an effect on honey bees?

Jamie 56:32
That's a really sticky situation. So I'm gonna walk --

Amy 56:36
Is it honey, or....?

Jamie 56:37
Well, yeah. So what I will tell you, Amy, is that you should never construct a hive out of wood that has been pre-treated by someone else. And what I mean by that is if you go to a lumberyard and buy treated wood, like what you would use on your deck, your porch or your support poles, etc, that kind of stuff should not be used to make beehives in the US. A lot of beekeepers, commercial beekeepers especially, will treat their wooden ware, their untreated wooden ware, they'll buy untreated wooden ware and treat it with an active ingredient that goes by a lot of different commercial trade names. But the active ingredient is copper naphthenate. Again, there are a lot of brand names for this, copper this, copper that. This has been a common practice, especially commercial beekeepers in the southeastern US, where it's so warm and humid for so much of the year that wood rots so easily here. And they'll use copper naphthenate to treat their boxes. We did one very limited study on copper naphthenate, it was a wood treatment and we saw some mortality with bees. These were highly controlled studies in cages in the lab. So I'm not going to run out there and tell you not to use copper naphthenate. But I will tell you that more important than treating the wood is protecting its joints and keeping it painted. And those things we know are not harmful to bees.

Amy 58:03

Okay, cool. All right. So the third question is from someone named Tony, and he listened to the stinger episode about four times is what he said. That's probably why our numbers are so high.

Jamie 58:14
That is awesome-sauce. Four times. It must have been the best episode ever. I need to go back and listen to it to see what he's talking about.

Amy 58:20
It must have been or he didn't get his question answered, which is why we're asking his question.

Jamie 58:24
Maybe I just did a terrible job. That's also possible.

Amy 58:26
So he was talking about, I guess what we were talking about, female workers, and then when they start to become layers. So he's wondering if a stinger is both an ovipositor and a stinger? Or does something change during that process?

Jamie 58:44
I can totally get why he's asking that question because as we talked at the time, I'd made the point multiple times that stingers are modified ovipositors.

Amy 58:54
Okay, so they do change?

Jamie 58:55
Originally, the ovipositor that is stinger-shaped, it's the stinger, they would lay eggs through it. It didn't exist to deliver venom. They laid eggs through it. But when the stinger came into existence as we know it, i.e., as the stinger where it delivers venom, it ceased to be the egg-laying chamber. So queen honey bees do not lay eggs through their stinger. They have an egg canal that is separate from their stinger. Eons ago, when the stinger was once an ovipositor and it became a stinger, the bees developed another chute to pass the eggs through. So queen bees have a stinger that delivers venom, that in its earliest ancestors would have laid eggs but no longer does, and they also have a vaginal duct that they lay their eggs through. Those are separate structures. So correspondingly, worker bees are the same. When worker bees become laying workers, they can continue to sting through their stinger, and they will lay eggs through their vaginal duct or their median duct.

Amy 59:41
Hmm. Interesting.

Jamie 1:00:09
Yep. And I understand that question. That's interesting that he picked up on that, and that's why he had to listen to it four times because I didn't explain that well.

Amy 1:00:16

I was about to say, hopefully, he doesn't have to listen to it anymore and he can just listen to this another ten times.

Jamie 1:00:21
But they're separate organs now. Back in the day, again, they were used -- I say back in the day -- in most other insects, the stinger is that duct through which the egg travels. But that's not the case in honey bees anymore. When the thing became a stinger, a defensive organ that delivers venom, it ceased laying eggs. Great question.

Amy 1:00:42
Yeah, that's a really great question. Well, those are all the questions that we have for this segment, but bring it on. Keep asking questions. We really enjoy it. Hey, everyone, thanks for listening. Today, we'd like to give an extra special thank you to our podcast coordinator Lauren Goldstein and to our audio engineer James Weaver. Without their hard work, Two Bees in a Podcast would not be possible.

Jamie 1:01:13
For more information and additional resources for today's episode, don't forget to visit the UF/IFAS Honey Bee Research Extension Laboratory's website ufhoneybee.com Do you have questions you want answered on air? If so, email them to honeybee@ifas.ufl.edu or message us on Twitter, Instagram or Facebook @UFhoneybeelab. While there don't forget to follow us. Thank you for listening to Two Bees in a Podcast!