Episode 250: Apis Mellifera Mellifera with Dr. Mark Barnett

Jamie

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In this podcast, you'll hear research updates, beekeeping management practices discussed and advice on beekeeping from our resident experts, beekeepers, scientists and other program guests. Join us for today's program. And thank you for listening to Two Bees in a Podcast.

Amy

Hello, everybody, and welcome to this segment of Two Bees in a Podcast. Today I am co-hosting with Dr. Cameron Jack. Some of you do know Cameron. Hey, Cameron.

Dr. Cameron Jack

Hey, thanks for having me back.

Amy

Yeah, always good to have you as a co-host. Jamie's gone today, so Cameron and I are going to take over this episode. Today, we are excited to be interviewing Mark Barnett who worked at the Roslin Institute at the University of Edinburgh in Scotland. He worked at the Roslin Institute for about 12 years and co-founded a company called Beebytes.

And so, we'll talk a little bit about both of those in just a second. But we've brought him on to talk about Apis mellifera mellifera, which I'm very excited about. We'll talk about the cultural importance of it in Scotland and a little bit about just the lineage of it. So, thank you so much, Mark, for joining us today.

Dr. Mark Barnett

Hi, yeah. Thank you for inviting me to speak to you.

Amy

Yeah, we're really excited to hear about you. You were kind of telling us behind the scenes a little bit about your history, but of course our listeners love to hear about the history of all of our guests, and we'd love for you to share a little bit about yourself, how you got into the beekeeping world and all that good stuff.

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Dr. Mark Barnett

OK, well I got into beekeeping. Basically, me and my partner moved out to the Scottish Borders to a rural location after previously living in Edinburgh. That was about 2009. All the stuff from colony collapse disorder had obviously been hit in the press.

So, I'd heard about all these problems with honey bees and that was the kind of impetus for me to start, you know, I thought, well, I'll start to keep some bees in the garden. So, I think the next year I signed on to a beekeeping course in Edinburgh and that was the beginning of it really.

Sometimes I've been up to about 39 hives, but I think I'm on about 28 hives at the moment. So, I've got sort of a small honey selling business. Then I was working at the Roslin Institute and, basically, there was a citizen science project which was run by Science and Advice for Scottish Agriculture, which is basically the branch of the Scottish Government that deals with honey bees and other insects, etc, and all kinds of things.

And so, I joined this as a citizen scientist beekeeper, and we were basically looking at mapping Nosema across Scotland and also deformed wing virus. And this was all this was done in the laboratory of Fiona Hyatt.

So, I think what happened was that I was basically taking holidays from Roslin to go and, you know, work in this bee lab. And then anyway, that one thing led to another and the person I was working with decided, you know, we'd start doing some work on honey bees at Roslin Institute.

So, we did, basically, sequence a bit of the UK population. We did metagenomics. So, we were looking at the bacteria in the microbiome and also detecting pests and pathogens within short read whole genome secrecy.

At that time, I also established a collaboration with Alice Pinto in Portugal and that was basically getting some samples for a low-cost genotyping platform, which basically allows you to identify, you know, how much lineage and how much C lineage you've got in your bees.

Yeah, well, with a relatively small number of snips, so we did that. We also were one of the first groups to do single cell RNA sequencing and that was done on the worker pupa at 2 stages. I think that's what most scientists mention when I speak to them.

Yeah. And then there were some plans for me at Rolin Institute to continue working on bees. And that led me to start a part-time MSC in entomology at Harper Adams University, which is in Shropshire. Things didn't quite work out, and I went to another, had to take another position and another job.

And I continued with the MSC. And I think you're supposed to do it in two to three years. But I was working for a startup company, and it was quite demanding on time and everything. And so, actually, it took me 5 years to do the MSC, but I finished it last September. Yeah.

Dr. Cameron Jack

Well, awesome, and congratulations on graduating. That's great. So, this is really interesting, Mark, and it's interesting to hear your background, how you get out into bees. Everybody kind of comes in through different ways, but there's just something about bees that just really hook us and kind of keep us there. This is a stupid question, but the only thing I know about the Roslin Institute is that's where they clone Dolly the sheep. So, I got to ask you, have you ever seen Dolly?

Dr. Mark Barnett

I'm afraid I've only seen Dolly after she was stuffed. I never saw her face to face, I'm afraid.

Dr. Cameron Jack

Oh, that's all right. Well, that's still pretty sweet and much more than me. So, we're kind of here talking about the genetic diversity of British bees, not Dolly the sheep. But it's cool to hear about your background and how you got into this. And you had mentioned this startup that you actually helped co-found, Beebytes, right? I wanted to ask you just a little bit about that. What kind of led you to want to start up this company?

Dr. Mark Barnett

Well, yeah, as I previously mentioned, this collaboration while I was at Roslin Institute with Alice Pinto, we decided, basically, that we would set up – We set up the test basically in the UK.

So, we basically thought, there's a lot of interest in keeping the native honey bee in the UK, and basically, the test separates M lineage and you know, it'll tell you how much M lineage and how much C lineage you've got.

So, you know, we thought that's the test that these guys need. So, we decided that we'd set up a company and offer that test to them. And that actually, the company was formed in December 2020. I think I actually left the Roslin in September 2021. But as I say, Beebytes has been going the last, you know, over five years now.

Amy

So, Mark, you had kind of talked about the genetics piece of it and I'm just wondering, you know, what do we know about the genetic diversity of the bees in the UK and the British bees that you were working with? Can you tell us a little bit about that? And I don't know much about

genetic diversity. So, I would love for you to kind of explain, I guess, just the history and how you go about doing this and searching for these.

Dr. Mark Barnett

OK, well, firstly I'll just say I'm not a geneticist, OK? I'm a molecular biologist. I always seem to get called a geneticist and I'm not really. I don't feel I'm a geneticist, you know, basically molecule biologist.

Anyway. So basically, there is, in the 20th century, there was a lot of importation of bees into the UK, which were basically C lineage bees.

And there was also obviously the creation of Buckfast by Brother Adam at Buckfast Abbey. So, that led to quite a lot of hybridization in the UK. So, a mixture of, I believe that the Buckfast one, was Apis mellifera mellifera times Apis mellifera ligustica.

So, it would have mixed 50% mix of M lineage and C lineage. And obviously since then, well, Brother Adam went on to breed his Buckfast over many decades. So basically, when we did the whole genome sequence and sequence in the UK bees, we didn't do that many.

It was like a pilot study. I think we only did about 19 colonies. But what we did was, I think we did 15 colonies in Scotland, and we got quite a lot of high proportion Apis mellifera mellifera, you know, like nearly 100% likelihood of Apis that they were AMM. I think we found a colony near Selkirk in the Borders and one near Perth and, obviously, the island of Colonsay, we sequenced Andrew Abraham's bees and they were obviously – they're an example of pure Apis mellifera mellifera.

But most of the samples in Scotland from a random selection, really, were, you know, seemed to be quite high proportions of Apis mellifera mellifera. And we went to get 4 good examples of AMM from England, and these were all, you know, quite heavily hybridized.

So that was my first experience of looking at the hybridization of bees in the UK and seem to think that if this was correct, and obviously it wasn't high numbers done, but it led me to think that possibly, you know, Scotland was quite a good place to keep Apis mellifera mellifera.

And that might be possibly due to the climate or possibly due to its geographical structure. Because Scotland, certainly north of the River Forth, it's, you know, it's basically Glens and valleys and, you know, quite hard for things to move around.

Dr. Cameron Jack

So, I guess I have some idea to this, but just so that we can understand a little bit further, you're saying AMM, like that's Apis mellifera mellifera. And so, what's the logic and the reasoning? Why would we want to preserve Apis mellifera mellifera populations in the UK?

Dr. Mark Barnett

Well, from a scientific viewpoint, yeah, I think it's a good idea to preserve genetic diversity, you know, especially with what's going on, you know, with the climate these days. I think we should preserve these examples of the subspecies, you know, basically, because we don't know what we're going to face in the future.

The other thing is that there is a lot of interest among the beekeepers in the UK. A significant proportion of beekeepers like to keep the native honey bee or would like to keep the native honey bee. So, I think that's two reasons why we should be interested in that.

Amy

Yeah, Mark, actually, we had another episode a couple of weeks ago, which I guess probably will fall in line with the Two Bees in a Podcast timeline. But we did talk a little bit about Apis mellifera mellifera. It's such an interesting species and subspecies, and I know that it is native to the area that you're in.

And I'm wondering what the cultural importance of these bees are. You may have touched on this already, but you know, I'm interested to know the cultural importance of keeping Apis mellifera mellifera populations going.

Dr. Mark Barnett

The cultural importance. I think people like it because it is the native UK bee, and therefore, as I say, a significant proportion of beekeepers like to keep that bee or would like to keep that bee.

Dr. Cameron Jack

Is there something that you would recommend as a conservation management strategy for this bee? How would you go about preserving the Apis mellifera mellifera genetics within the UK?

Dr. Mark Barnett

Think if we look at Alain Vignal's work, he's done a lot of sequencing of drones over Europe. It seems that the best places that have been conserved are on islands. Yeah. So, like the Île d'Ouessant in France, the Isle of Colonsay in Scotland.

I should have also mentioned that Colonsay was set up as a protectorate for Apis mellifera mellifera by the Scottish Government, so you're not allowed to take any, you know, bees of other lineage on to Colonsay.

Amy

So, Mark, how can the beekeepers in your area assist with keeping Apis mellifera mellifera populations going?

Dr. Mark Barnett

Right. Well, it's quite difficult because, as you know, if I'm keeping Apis mellifera mellifera in my patch, right, which is around Kelso and the Scottish Borders, and I'm quite lucky, I don't have many beekeepers around me. But, of course, beekeeping is becoming more popular so you can easily get someone down the road, you know, who starts keeping. He gets into beekeeping and he buys his bees on the Internet and he gets Buckfast or something, then that's kind of, you know, wrecking my projects.

So, it's quite difficult really. I think it's probably going to be assisted by restriction of imports, really. That's probably where it's going. And I know this is getting support from the national associations now.

Amy

Definitely, Mark. I'm wondering, you know, what's next for you in the bee world?

Dr. Mark Barnett

What's next for me in the bee world? Most of my bee research is now exclusively through the company Beebytes, which we've spoken about, as well as doing the test, as I said, the low-cost genotyping test and the C lineage.

We've also got involved in all kinds of other projects. For example, we've done some whole genome sequencing of the bees in Newfoundland. We've been involved in a project in the Isles of Scilly where there's a number of several islands and we've been looking at, you know, sequencing the bees on there, and I've seen this as evidence of bees moving between islands.

We're aiming to look at, well, we looked at disease on the Isles of Scilly. We're aiming to look at RNA viruses. We've got some work going on with that. So that's where my research is going. It's through Beebytes, really. We've been doing metabarcoding on pollen samples.

So, we've been looking at what plants bees are bringing in in various locations. We're also looking at honey now with, you know, metabarcoding. So, that’s all developing through Beebytes. But as I say, that's not my main source of income, currently.

Amy

Yeah, that's fair. That's understandable. I think it's really cool all the work that you're doing through Beebytes. I'm interested to know who your clientele is through Beebytes. You're talking

about genome sequencing and looking at different viruses and, you know, looking at pollen samples and honey samples. And so, who do you primarily work with for this?

Dr. Mark Barnett

OK, well, this was quite interesting because when we started Beebytes, we had a lot of support from what was called Edinburgh Innovation, and we sat through meetings, you know, helping you form companies, because the universities are very keen on people forming companies and commercializing research and stuff.

And obviously, we were different because Beebytes is a community interest company, so it's not profit. So, we were quite different, but they sort of liked us because we were different. So, I've just lost the plot now. What was I going to say? All right, so the clientele. We basically did a survey when we were setting up the company, and initially, we were looking at what's the demand from the general beekeeper.

And when we started in that first, you know, the first sort of April-May, I thought I was going to be absolutely swamped, you know, with samples. But it didn't happen. Yeah. We just got a trickle of people testing that's built up really slowly, actually, over the years.

And so, the number of, you know, the general beekeepers testing their bees. And what happened was, I mean, I'm not sure the company would have been viable, actually, just on that. But what happened was we started to work with beekeeping groups and academics as well.

So, a lot of our work has come from that. So, there's a group in Cornwall called the B4 project. We've done a lot of work with them. Their aim is to, you know, conserve Apis mellifera mellifera in the Southwest, you know, and we found some reasonable examples of colonies usually on, I think Cornwall's got some usually on sort of big estates, reasonable places to conserve AMM.

And also, Cornwall's got these like big headlands out into the sea, you know, so you've got sea on sort of three sides. And yes, that's reasonable as well. So, it came from there. We've worked with them.

Well, the guy in Newfoundland was a bee farmer. He wanted to know, he was interested in the survivability of his bees and what their genetic makeup was. So yeah, we've kind of worked with beekeeping groups, really, academics, tested a lot of bees in Ireland, you know, working with an academic at Galway University called Grace McCormack.

Amy

Grace is actually who we interviewed about Apis mellifera mellifera couple of weeks ago, so that was the other episode that I was referring to.

Dr. Mark Barnett

Right. Brilliant. Yeah, yeah. No, no, Grace is great. Yeah.

Amy

All right. Mark, is there anything else that you wanted to share with our listeners?

Dr. Mark Barnett

Can I tell you a little about some more MSC?

Dr. Cameron Jack

Yes, please do.

Dr. Mark Barnett

Because that obviously started with an interest in honey bees, and obviously there were a lot of them, you know, after colony collapse disorder and all the neonicotinoids thing, I think there was a lot of research money that went into honey bees, didn't it? I think a lot of other ecologists and stuff quite rightly thought, you know, well, it's not just honey bees here.

We've got massive insect decline, you know, mainly in the Western world, actually. So, getting into doing the MSC, I got a real sort of, you know, more of an insight into this. I didn't know more than half of the eukaryotic species on the planet are actually insects, which, that kind of astounded me that there's that many, you know, it's like the planet of the insects.

Dr. Cameron Jack

It absolutely is.

Dr. Mark Barnett

And also, that we don't know how many insect species there are on the planet. So, like there could be the most conservative estimates say that there's about 6 million. The more weighed ones are about up to, you know, high 20s in the millions.

But I think most entomologists, at the moment, favor that there's about 10 million. And we've actually only described one million species of insects. Only 10% have actually been identified and recorded.

And obviously most of life is around the equator in the tropics. So that's where a lot of these, you know, species are.

Dr. Cameron Jack

Yeah, there's a lot of work to be done here, it seems.

Dr. Mark Barnett

There's a lot.

Dr. Cameron Jack

Yeah.

Amy

All right. Well, I'm excited to see where everything goes forward with you and Beebytes, and we look forward to seeing you, hopefully, at different conferences in the future with the honey bees. But we're really happy that you were able to join us today.

Dr. Cameron Jack

It was super nice to meet you, Mark. I was going to say, you know, I don't do a lot of research related to honey bee genetics or anything. So, this is all really interesting to me and I'm just taking notes over here and being fascinated by it, and I just got to tell you, I mean, you sure sound like a geneticist to me, Mark. I don't know.

Dr. Mark Barnett

It's just not my background. I did biochem. I did a degree in biochemistry. I did a PhD in developmental biology. And then I've worked in neuroscience. I did some neuroscience then, basically, before getting into the bees.

Dr. Cameron Jack

The geneticist is as the geneticist does. So, it sure seems like you're doing a lot of genetics. I'm going to tell the people that I think. Oh yeah, I know Mark Barnett, the geneticist. But OK, I won't say that.

Amy

Mark, if it makes you feel any better, we call Cameron our toxicologist.

Dr. Cameron Jack

Yeah, that's true. And I know zippy zap about toxicology.

Amy

All right. Well, thank you again so much for joining us today. We look forward to hearing from you in the future.

Stump the Chump

It’s everybody’s favorite game show, Stump the Chump.

Amy

All right, welcome back to the question-and-answer segment. Jamie, the first question that we have today is there is a new beekeeper, this is the first time ever owning a beehive and they found out the hard way that wax moths were taking over and so they've put the boxes in their freezer. Just wondering, is there any way to prevent wax moths from coming in and taking over your colony?

Jamie

Yeah, I get this question so much. And Amy, you made the point that they're a new beekeeper. And I was going to say I get this question so much, especially from new beekeepers. So wax moths, like the name implies, are moths who utilize the wax in honey bee colonies. Very specifically, they lay eggs in the nest.

They're larvae, which we call moth larvae caterpillars. Caterpillars go through and eat the wax and the debris associated with it, creating this webbing that can decimate the combs and and and and and. Now, if you've been in beekeeping any length of time, you'll know that bee folks, you know, especially commercial beekeepers, bee scientists, etc., say that wax moths are not primary predators of the honey bee nest.

They are rarely the thing that's causing the problem. Now, to the new beekeeper, especially, when you go into your colony or into your hive, in the colony, and it's very dwindled and you see wax moth webbing everywhere, it is very intuitive to say wax moths did this thing.

They're the reason my bees are suffering. But, in reality, wax moths are a secondary pest, something else made your colony weak to make it susceptible to wax moths. My guess is that every colony in the United States has wax moths already in it, and, for the most part, the bees are doing a fantastic job at keeping their populations very low.

So, when you see this manifestation of webbing and caterpillars and cocoons and moths etc., it's not really the moths that created that initial issue. It was something else, queenlessness, Varroa. Something weakened your colony that calls the wax moths to take over.

And so, the question is, what can I do to control wax moths? I've done all of these things to control wax moths. What can I do? And I hate the answer that I have to give, but it truly is the correct answer, which is you've got to manage all those other things that should have been managed in the first place, and then wax moths would not have been able to get a foothold in that colony.

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Usually, by the time you're seeing significant webbing and things like that, you're not really capable of managing the wax moth. The colony might be on its way out. So, what I would do in that particular case, if there are any combs that are still good and there's a critical mass of bees, I would remove all the combs that have been infested that aren't good.

I would freeze those. And the ones that have a critical mass of bees that can protect the combs, I might make those into a nuc until the colony recovers and can guard more space. Essentially, when you have enough bees in the hive to guard the space that's in the hive, you won't have wax moths as a problem.

So, that was probably the actual issue that happened. And I know maybe you wanted to know, well, can I put this treatment in the hive? There aren't really things available in that context. Now, there is a product that's based on Bacillus thuringiensis, BT, that you can spray on combs, but even that works better in the stored combs situation and not really in the hive situation.

So, really, the best defense against wax moths is controlling all those other problems that bees get and keeping your colony strong and healthy. Now, if we're talking about moths in stored equipment, then I have, you know, different recommendations and a different response. But this question sounds like it was more directed at an active infestation in a hive, in which case there's little you can do except condense the colony to the point that they can take care of the space they have, and then freeze the affected combs if they're not too far gone.

Amy

Yeah, definitely. You know, something that I always get asked is how long do you put stuff in the freezer?

Jamie

Yeah. I mean, I've not seen really great data on this. So, I always like to freeze things a week or longer. And if I do it over a week, I feel very comfortable that I've controlled the problem. If you put it in for 24 hours, it is very reasonable to expect the moths might reanimate or might not have been frozen sufficiently.

So, I like to do things a week, and that will usually kill all the pests that would otherwise be in the combs.

Amy

Yeah, definitely. So, while we're on the topic of wax moths, I actually just thought of a question from an e-mail that I received just recently. And the individual was essentially trying to put swarm traps out in their yard. So, what they did was they used old comb to put in the trap to try to get the bees to come.

And instead, you know, a bunch of wax moths came. Now you've already mentioned that wax moth is typically a secondary pest issue, right? And so, I guess we could assume that, yes, wax moths would go into that because it's old comb and there are no bees on it. But what else could this person do, I guess, at that point? Like, would you recommend taking the old comb out? What do you recommend as far as continuing to keep that swarm trap there, etc.?

Jamie

Perfect question. This is a great conundrum. Essentially, the questioner is doing what they're supposed to do to attract bees to swarm, trap nest. One of the things that Tom Seeley and his researcher colleagues have shown is that bees, when looking for a new nest, so swarms are looking for a new nest, prefer cavities that were once inhabited by honey bee colonies.

In other words, that have old combs or the smell of bees that makes that cavity more attractive to successive swarms. And so based on that, when you put up these swarm boxes or swarm traps, if you hang a couple of old combs in that swarm box, it does make it more attractive to swarms.

The downside is exactly what the questioner said. The downside is that wax moths love, you know, these black combs. And to make matters worse, in a swarm trap, they're completely unprotected. There are no bees in there to keep the moths away.

So, what should they do? Well, I can tell you every time you put these black combs into a swarm trap, the moths are going to eat them. So, you've got a couple of options. Option number one, don't use black combs. Well, of course, that's going to make that cavity less attractive to the bees.

I'm going to circle back to this in a moment. Option number two is that BT treatment that I mentioned earlier, the one that's based on Bacillus thuringiensis. This is a perfect scenario for it. You can follow the label and spray it on these dark combs and then you can use these combs in swarm traps.

And presumably because you've sprayed that BT formulation on it, the wax moths will die while they eat the comb. So, I think that'll extend the life of the comb that you put in the swarm trap. So, you might give that a try. Make sure you follow the label recommendations. But I want to circle back to one option that I said if you remove the combs all together.

A few years ago, I heard someone say, and I can't remember who it was and I wish I could because I'd like to give them credit. But a few years ago, or maybe last year, I can't remember, Amy, but we had a question about, or I think maybe when I was answering for the American Bee Journal, I had a question about slum gum.

And slum gum is kind of a slang term for that stuff that's left over after you melt beeswax. So, imagine that you have a lot of combs that are old and you want to melt them and filter them and use the beeswax in another setting.

All that stuff that settles out of it, that dark nasty black stuff that you cut away from the beeswax or you know, that old nasty comb that you balled up. Is there a use for it? And someone said, I actually take a fistful of that stuff and put it in the bottom of my swarm traps.

That then provides that attractive smell in lieu of combs. So, you're not having to hang dark combs up in it that the wax moths are going to eat, but you still get the scent provided by that massive slum gum that you're putting in the bottom of the hive. I've never tried this.

I can't verify that it works, but it was a neat thing, and it makes a lot of sense in my head. So, either you can not use combs at all, or you can use combs and spray them with this BT formulation. Or you can not use the combs but you can put something else like slum gum in there.

Of course there is another option. They do have these swarm baits. These swarm lures, I think, is what the formal term is that you can purchase from beekeeping equipment supply catalogs and put into these cavities to make them more attractive to swarms. But those are some options that you have on the table to avoid wax moths just destroying the combs that you put in there.

Amy

Well, yeah, that's crazy. I wonder, you know, even with the slum gum at the bottom, that's hard to say. You say that five times in a row. Slum gum, slum gum, slum gum.

Jamie

That was three.

Amy

Slum gum. Slum gum. I wonder if putting that at the bottom, if that brings in wax moths as well.

Jamie

Yeah, I thought about the same thing. But even if it does, hopefully they're just limiting their damage to that pile of slum gum at the bottom and not touching, say, any of the frames of foundation that you hung in the upper part of the box. It's worth studying. That would be a neat resource. See, Amy, another chance for you to do a PhD.

Amy

I have all the questions for all the PhD projects. All right. So, I guess this is a little bit longer of a Q&A, but that's OK. The second question that we have is, and you know what's funny about this is I think we've answered this a couple of times before, Jamie, but it's always asked in a different way, which is what I kind of like about it.

When you are combining a strong colony with a laying worker situation, what happens with the laying workers? We've got the question of what do you do when you have laying workers? And then we always kind of recommend, well, you could try to put a stronger colony and merge them together, but then what happens to the laying workers? Do they stop producing? Do they stop laying eggs? How long does this take? I'll let you go from there.

Jamie

All right, here we go. We routinely mention I give a whole presentation on this about utilizing nucs in beekeeping operations. I like to have nucs on hand to help solve, among other things, queen problems. And one of the queen problems that you can encounter is laying workers.

So, imagine you've got this, kind of in contrast to the question, a strong colony that went queenless and it's got laying workers. I would like to use a queenright nuc to requeen that colony. So, whether it's a strong colony that you're requeening with laying workers or a strong colony that you're just moving a laying worker colony into so that you don't lose the bees, what happens to the laying workers? So, Amy, drumroll. There you go.

Amy

That's my drum.

Jamie

We don't know. I know that it solves the problem, but I don't know how it solves the problem. My guess is that when you merge two colonies and there's enough chaos in the merged colonies that the laying workers just quit laying because there's a queen present.

But it's also possible that the bees from the queenright colony are seeking out and killing the laying workers. This is one of those scenarios that we don't know how it works, we just know that it works. So, what do you think about that Chump stump, Amy, another great PhD project for you?

Amy

I was just about to say, I think, yeah, not for me, but what I was going to say was I think we should have a segment called, “Just Another PhD Project.” You can come up with so many questions and so many ideas and there's just so much to know.

Jamie

Amy, I also do the Q&A for the American Bee Journal here in the US, and a couple years ago, so I'm famous for answering questions in the American Bee Journal of like, well, I could get you to

this part of the answer, but for the rest of it, we just don't know yet. And someone emailed me, a question, like Jamie, and we published this in ABJ.

It was essentially like, Jamie, do you keep a list of all these projects that you say we don't know the answer to this yet for our PhD projects. I was like, actually, I do, the ones that are easy enough for us to tackle, I keep a running list on my desk. I write it on a sheet of paper.

And this laying worker question is one that every time it comes up, I'm like, man, I got to add that to my list. But it would require, essentially, us creating a laying worker colony and then doing this in an observation hive. You know, creating a laying worker observation hive, identifying and painting the laying worker so that we know who they are, and then combining that with a queenright observation hive and watching what the two hives do.

And you know, this is some work, but I'm now intrigued to the point that I've got to see it happen. I need to know. So, the answer to the question is I do keep that running list of projects that come up just like this.

Amy

That's hilarious. Yeah. Oh, my gosh, There's so much to know. I know. And that's the thing, that gives us more content to talk about, I think in the future, you know, like not just PhD projects or research questions that need to still be asked, but just like the methodology of everything, right?

Like you just said, it's not as easy as just looking at it, but you've got to mark them. You have to know – there's probably hours and hours and hours of video recording so that you can go through and, you know, look at the behavior. Anyhoo.

Jamie

I'll tell you, people who aren't familiar with bees or academics, when I tell them I study honey bees are like, really, there's enough to study? What do you study? I always make the point, and I this is a Jamie-ism, I will never live long enough to study all the things that I want to study with bees. I am going to retire with way more bee questions than I ever answered. So, it's just one of those things. They're a never ending source of fascination.

Amy

Just one of those things. All right, the last question that we have, I like this question. Do bees collect aphid dew like ants do?

Jamie

Yes.

Amy

Aphid dew, like Mountain Dew.

Jamie

Answer is yes. Next question. So, let me elaborate. Aphids are little soft bodied annoying insects, little, tiny fellows that have piercing sucking mouth parts almost needle-like so they can poke it into a plant and suck out the juices that circulate through the plant.

Now, as you can imagine, the nutrient load in the plant liquids is not that great. So, aphids have to have a high throughput of this liquid to take out the nutrients that they need.

So, basically, they have to pass a lot of that liquid through the system just to get the nutrients that they need to survive. And so, as a result, as quickly as they're drinking in this stuff, they're excreting out of their anus, they're excreting this liquid.

So, it's going in quickly and coming out quickly. And what comes out of their rear end is a sweet liquid called honeydew. Honeydew. It's all one word, honeydew.

And ants will farm aphids. Some species of ants will actually farm aphids. They'll have the aphids on plants. They'll circle them and protect them so that the aphids can get the food that they want and the ants can collect the honeydew.

And it's amazing. If a critter walks up to these aphids, the ants will attack it to keep it away. They're protecting their sheep, so to speak. And when an area is exhausted, they'll actually herd the aphids to another spot. So, it's crazy stuff. They truly are farming these aphids.

Now, there are some plants and even trees, like oak trees, that can get thousands of aphids on them that are producing so much honeydew that it's raining out of the trees. Bees do collect honeydew.

Honey bees collect honeydew, and what you'll see is in some areas of the world that tout forest honey or tree honey, a lot of times this forest honey, this tree honey, is actually honey that honey bees produce from the honeydew.

They collect not from the nectar of flowers, but actually from the secretions from the aphid's anus. I don't think anus is a better term than butt. So, you basically get butt honey. Essentially. Anus doesn't just roll off the tongue either.

So, I tried to use the scientific term to not sound so crazy, but it is also not a pleasant-sounding term. But essentially, honeydew honey is the honey that bees make from the secretion of an aphid's rear hand that you often see in what people call tree honey or forest honey. So, there you have it. Bees do collect honeydew from aphids.

Amy

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Well, so what's crazy about this – there's so much here.

Jamie

There's a lot crazy about this. I'm curious to hear what you're going to say is crazy about this.

Amy

This, no, let me see. I lost my train of thought. What I was going to say is that the definition of honey, typically, is that it is something that comes from a floral source, right? Or not floral? Is it from a floral source or a plant source?

Jamie

Well, it's interesting you asked that because the definition of honey varies based on municipality or country. So, for example, in Florida where you live and work and where I used to live and work, there is a formal definition of honey. It's called the honey standard. And I cannot remember it off the top of my head, but some places will mine down to, hey, it's a product produced from the nectar collected from nectar plants.

Now, that could include nectaries from flowers, but also extrafloral nectaries. And like the name implies, extra, out of, floral, out of the flower, nectaries. So, some plants have nectaries away from flowers. So, the question then I think you're getting at is would honeydew honey then qualify as honey?

So, a lot of people recognize it as honey because it is still, I mean, technically it's a plant product, right? It's just passing through an aphid to make that happen. But what's interesting is it's not necessarily associated with a flower.

Some species of aphids do collect these liquids around flower buds, but some of them just collect them randomly on the stems or the leaves or other parts of the flower. And so in in those cases, it's not coming from a flower, but it's still coming from a plant.

So, it all depends on whatever the legal definition for honey is in your area. But it's broadly sold as honey. Like I said, some people will say it's honeydew honey on the label, but it's often marketed as forest honey. That doesn't mean that all forest honey comes from aphids, it's just that a lot of it does.

And generally speaking, honeydew honey is very dark and very strong. But that's an overgeneralization. It's not always the case, but that's often what you see.

Amy

Right. We're so weird. Human beings are so strange. Like, how many animals does it need to go through? How many insects does it need to go through? And we'll still eat it.

Jamie

I know, I know. Especially since it's coming out of the rear end of one, sucked up by another –

Amy

Oh, my God.

Jamie

And spits it back up.

Amy

When you explain it that way, it's not very appetitizing.

Jamie

Eat it up, Eat it up.

Amy

That's hilarious. All right, everyone, I think we've had a little too much fun on this episode, on this section. So, keep your questions coming. We'll answer them as best as we can. But we love answering all the questions that you all sent to us.

Hey everyone, thanks for listening today. We would like to give an extra special thank you to our podcast coordinator, Jeffrey Carmichael. Without his hard work, Two Bees in a Podcast would not be possible.

Jamie

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 An Equal Opportunity Institution. answered on air to honey bee@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.