

POLLINATORS.INFO PODCAST EPISODE 6: INTERVIEW WITH DR. ROBBIN THORP

Quick Glossary of science terms that aren't explained in this podcast:

- Endemic: lives only in one area
- Forage: the act of searching for and collecting food
- APHIS: Animal and Plant Health Inspection Service
- Markers: genetic markers are like the signature of a particular organism
- Microsporidian: a unicellular, spore-forming, fungal parasite

Athena (ARA): Hi there! I'm Athena, the author of pollinators.info, and you're listening to podcast episode 6. This is an interview with Dr. Robbin Thorp, and he's going to be talking with me about his research with the critically endangered Franklin's bumble bee, also known as *Bombus franklini*.

Well, thanks so much for joining me today to talk about the Franklin's bumble bee!

Dr. Robbin Thorp (RT): Ok!

ARA: So, let's give everybody an idea about what you do- so, could you describe your job for people?

RT: My job... well, I'm retired!

ARA: Well, there you go!

RT: (Laughs) But I'm still active in research. And Franklin's bumble bee is one of the projects I got into in my retirement career. I've always been interested in bumble bees, but this is an opportunity that came along and I've really delved into it. And it's gone in a very different direction from what I had originally started.

ARA: And how's that?

RT: Well, Franklin's bumble bee has a very, very narrow distribution. It occurs only in portions of southern Oregon and northern California, in an area about 190 miles long and about 70 miles wide. And that's one of the narrowest distributions of any of the bumble bees in the world, that we're aware of.

A colleague from the [US] Forest Service posed the question to me as to whether this species should be listed [as endangered], because it's such a narrow **endemic**. And, so I set out to find out more about it. It had been put on a [list of] candidate species for

endangered species listing when the Act was first enacted, because of its narrow distribution. We just didn't have enough information on it biologically to know how its populations were doing and much about it.

I had made some excursions into the area in the late '60s to look at and look for the bee, and found it then. So, in '98 I began a monitoring program, trying to find the bee and the plan was to see what I could find about its habitat requirements; why is it so restricted? It has a very close relative, the western bumble bee, that's a very widespread thing, and overlaps with it. But here Franklin's bumble bee stays in this very, very narrow range, and yet, within that range, it lives in a variety of different elevation habitats- all the way from 500ft elevation, on up to 6700ft elevation. So, with that kind of range in elevation, why hasn't it gotten out of the area where it exists, and gone into other areas?

So, those were the questions I set out to look at. The first year, I could find them everywhere. I looked at all the historic sites, all the sites we had from museum records, where we knew that the bee occurred. And, I found them virtually everywhere I looked, and even extended the range about 10 miles North and another 10 miles or so to the Southwest, but still within the geographic range that it had previously existed in.

ARA: Right.

RT: So, it occurs in between the crest of the Sierra-Cascade Range and the Coast Ranges, and South of the Willamette Valley down into California to the Marble Mountain Wilderness, in the Trinity Alps, and then Mount Shasta. And, it seems to be affiliated with major drainages of the Umpqua, the Klamath, and the Rogue River basins. But, other than that, it's a little bit hard to figure.

Bumble bees are mostly generalists; they **forage** on a wide variety of flowers. They're not limited to a specific kind of flower that might also be endangered. So, there didn't seem to be any reason there- so I did my best to try to compile a list of the flowers that it used for pollen and nectar resources. And they were pretty much the same as those of the western bumble bee [*Bombus occidentalis*], which occurs all the way from central California to Alaska and down the Rocky mountains to New Mexico and Arizona. So, it has a huge range, [and] lots of color variation, whereas Franklin's bumble bee is a very uniform color pattern.

So, it's still an enigma. But, during this monitoring process, the first couple of years- '98 and '99- I could find the bees pretty readily every day that I went out to look for them. But, shortly after that they began to be more and more difficult to find, and as I began to

graph this stuff, it was clear that these things were really declining very rapidly. And, the same was true of the western bumble bee; so here's a very widespread thing that was also disappearing in the same area.

So, about 2003 or so I contacted a colleague up at Humboldt State [and] he was noticing that it went missing too. [We] put together a letter and submitted it to the Bumble Bee List, and asked if anybody else had noticed this decline, particularly of the western bumble bee. And, it looked like, from the responses we got, that it had pretty well disappeared from central California to southern British Columbia. In other parts of its range, the western bumble bee still seemed to persist. It wasn't clear whether it was declining or not, but at least it was persisting in those areas during that time.

ARA: Right.

RT: So, here we had these two very closely related species disappearing, and yet other bumble bees were doing just fine in these same areas. So, that really put another puzzle into the equation, and wondering why just these two bumble bees should be declining; one [with] a very narrow range and one [with] a very broad range.

So, it didn't look like the standard kinds of things that are responsible for bumble bee declines in most areas; things like habitat conversion, pesticides, or a variety of other habitat changes, particularly habitat degradation. Because the habitats themselves, where Franklin's bumble bee in particular occurred, were not changing that drastically during that period, at least as far as I could perceive.

ARA: Yeah. Weird.

RT: Yeah! So, I did a little bit of investigating, and it turns out that, you know, this looks very much like a disease, or something quite specific to this particular group of bumble bees from this one little branch of the family tree. And, it turns out that, in the early '90s, there was a three-year window in which companies that were trying to commercialize bumble bees for greenhouse pollination wanted to bring in the European bumble bee, *Bombus terrestris*, which was being cultivated at that time. Well, **APHIS**, the branch of the USDA that controls introductions and things, said no, very wisely so. [And] several of us had recommended that, you know, we have plenty of local species, and those could be reared and used for commercial pollination.

Well, that got started- in the East they started rearing with *Bombus impatiens*, the eastern bumble bee. And, we needed something in the West, because the eastern bumble bee is not native out here either. So, I had suggested the western bumble bee

to some colleagues here, so they brought the technology in from the European bumble bee rearers and applied it to the western bumble bee and, sure enough, they were able to produce colonies. And, for several years, the western bumble bee was used in greenhouses in the West, and *Bombus impatiens* in greenhouses in the East.

But there was one company that didn't have local facilities for rearing, so the idea that they wanted to do was to collect queens from here, ship them to Europe, to be reared in facilities there, and then the colonies shipped back here for use in greenhouses and so on. So, that was allowed for a period of 3 years. Several of us had objected to it, and written some letters to APHIS, and we had quite a long discussion with them during that period, and finally it was stopped in '94. But there was a 3-year window in which our bumble bee queens were shipped to Europe, reared into colonies, and then shipped back here.

Well, they were being reared in facilities where the European bumble bee had been reared, and my hypothesis is that they picked up internal diseases, pathogens, from these rearing facilities, and those were brought back here. And, some of our bumble bees were particularly susceptible to that pathogen or pathogens that were accidentally introduced in this process. So, that's kind of the working hypothesis now, and [we're] trying to find ways to test this to see if, indeed, that is the cause.

ARA: Wow, that's interesting. So, do you do a survey for it every year?

RT: Oh yeah. I go up anywhere from 3-5 times a year, and spend several days in the area, searching for these bumble bees. It's a lot of field work, but it takes me to some pretty nice venues, like Mount Ashland, and Mount Shasta, and from my site on Mount Ashland, I get a gorgeous view of Mount Shasta on a clear day, so yeah, it's rough work, but somebody's got to do it.

ARA: (Laughs) So, is that what you like most about the work, is being outside and the views?

RT: Oh yeah. My son joined me one time up on Mount Ashland to help me by taking some photographs of things, and he looked around and he says, "Boy, this is a great outdoor office!" (Laughs) That's the way I tend to refer to it now myself. A bad day in the field is better than a good day in the office anytime!

ARA: (Laughs) Yeah, so that leads me to the next question- what are some particular challenges involved with this work?

RT: Well, you know, just the time and travel to get to the field sites, the constant searching, the fact that there are a lot of other bumble bees out there that look very similar, so you've got to look closely at these things. What I do is kind of wander through flower patches and look and count the bumble bees that are visiting these different kinds of flowers, and try to sort out and keep in mind the search image for Franklin's, in contrast to the much more common bumble bees that we have in the area. Because they do superficially look like it, you've got to look pretty closely at these things.

There is one project that's going on, a USDA-sponsored project, of which I'm a collaborator, with Sydney Cameron at the University of Illinois, and Jeff Lozier, who is now on the faculty at the University of Alabama. And, Sydney and Jeff are looking at the genetics of bumble bees; they've found some **markers** that will allow them to detect the primary pathogen that we think may be involved with this, and that's an organism that's called a **microsporidian**. It's genus *Nosema*, and *Nosema bombi* is known from bumble bees around the world. It probably has more than one strain, may actually be more than one species, but it's been worked on a lot.

We know there's some variation as far as bumble bee responses to it, and its responses to different bumble bees as hosts. But, anyway, the signatures can be detected in museum specimens, so we're now gathering together specimens from as far back as 1985, and looking for *Nosema* that may have been here prior to 1992 and then also looking at specimens since '92, to see whether there are different *Nosema* patterns or not. And that would be a pretty good test of this hypothesis. We just don't know enough about our native bumble bee diseases, but this is one genetic approach that should give us a handle on this kind of thing.

ARA: Is *Nosema* native to North America?

RT: Well, that's the question! There may be a native *Nosema* here. It is present- we are finding it in other bumble bees now, in recent surveys. But, we don't know enough about the historic occurrence of it, nor do we know enough about the genetic patterns as to whether what we're seeing today is the result of introductions from this commercial trafficking in bumble bees, or whether the *Nosema* was here prior to that and whether it was a different *Nosema* strain or not. So, those are the kinds of things we're trying to look at.

ARA: Right. Let's give people a take-home message here. Someone who lives in Florida might be wondering, "Why should I care about a bumble bee in California?" So, what would you tell someone who asks you that? What are the broader impacts of this research, and the fact that this bumble bee might be going extinct?

RT: Well, bumble bees are part of the larger ecosystem. They certainly contribute to pollination of native plants, and in keeping native ecosystems together. And, although it may not directly impact somebody in Florida, whether it goes missing or not, but the causes of this are things that will alert us to strategies of, "How do we prevent this kind of thing in the future?"

ARA: Right, and if people like tomatoes, the kind that are grown in a greenhouse, it'd be harder to get a hold of them without the bumble bees. So, what would you recommend for someone who tells you that they want to help conserve bumble bees and other pollinators?

RT: Well, there are a number of things. Bumble bees need food, so gardeners are a great resource for plantings. Bumble bees do occur in urban areas, because there are a wide variety of flowers that gardeners plant that still do have resources in them. A lot of horticultural varieties aren't much use to bees because the reproductive parts are not there. So, pollen and nectar are not necessarily available in, let's say roses, where you've got all those compound petals. Those petals are produced at the expense of anthers that produce pollen. So, if you've got a very showy, multi-petaled rose, bees are going to ignore that flower because it has no resources for them. But, if you plant some heirloom roses, that are much simpler and have anthers, those will produce pollen for bees.

The other thing bees need is nest sites. Bumble bees tend to nest mostly underground, in cavities that are formed by burrowing rodents, like pocket gophers. Artificial boxes can [also] be set out. Usually they like an underground entrance, [and] they need some kind of nesting material in the box. Things like upholsterers cotton [not polyester] is probably the best. Not medicinal cotton because it's too fibrous and the bumble bees kind of get hung up in that.

ARA: Mmm-hmm. Do you have any final thoughts you'd like to add about anything?

RT: Bumble bees are beautiful! (Laughs)

ARA: (Laughs) Well, Dr. Thorp, thank you so much for your time today!

RT: Well, I enjoyed talking with you.

ARA: Thanks again for listening. This has been pollinators.info podcast episode 6. I'm Athena, the author of pollinators.info, and I was talking with Dr. Robbin Thorp about his

research on the critically endangered Franklin's bumble bee. Learn more about bumble bees, other native bees, and all kinds of pollinators all over the world by visiting www.pollinators.info. You can also get all kinds of fun free stuff and discounts on product releases when you sign up for the free weekly email newsletter. So, stop by [pollinators.info](http://www.pollinators.info) for all your pollination needs, and let me know if there's anything you don't see on the site that you'd like me to feature in the future. Thanks again for listening, stay tuned for next month's podcast, and take care!