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*Can you please tell us about your relationship with plants? How did it all start?*

Michael DeMotta

Even though I grew up in the city of Honolulu, I think I grew up pretty typical for a lot of local families in that everybody grows stuff. Where I grew up, I was third generation in that household, and fifth generation in that neighborhood. Even though we were in the middle of the city, my grandparents, my mother, had all that love for plants, and for growing plants. So I had a connection with growing stuff from when I was very young. I started assembling a collection of orchids for example when I was ten. With native plants specifically though, it didn't happen until I got into high school, when I got involved in hula. In Hawaiian poetry and ancient storytelling, there are a lot of metaphors used. And they often compare things with plants, and birds, and creatures of the forest, and the forest itself for that matter. It was very interesting to me, and I did understand a lot of it from early on. My interest was piqued in native plants because they're not easy to find. On Oahu, you got to hike way up on the Ko'olau Ridge before you start coming into some native forest, and so I always wondered why that was. That's kind of how my interest in plants generally, and in native plants in particular, got started.

*Were you attached, or had a relationship, with any particular plants while growing up, while learning about oli, chants and mythology?*

Michael DeMotta

Most of the chants tell us the stories of people, of the gods and their travels, for example, the story of Ihiaka, and how she was sent to Kaua'i. That is an epic, long story that was transcribed more than a century ago, and different parts of the story have different chants to tell of Ihiaka and her sister's adventures through the mountains. I've always found those things to be really interesting.

*Could you please tell us about the evolution of the Alaka'i.*

Michael DeMotta

I've been to all the Hawaiian Islands, and even though they all had the same volcanic origin, even though the evolution of each island is geologically similar, they turned out to be different. Kaua'i was built by one big volcano. The erosion of that volcano and the kind of lava flows that occurred over the history of the volcano made the Alaka'i Swamp. The ground underneath it is fairly impermeable, so all that rain had to sheet out, and that's how the swamp itself actually still exists today. The summit is really wet and all the creatures that made it over there, plants, birds, insects, they all found the niches that they needed. When you get into some of the really rich, diverse

mesic forests on Kaua'i, and then you get up to the summit, the habitats are so different and yet, they're all related. You find plant families in every niche, in every part of the island. And so what I really found fascinating, not just in Alaka'i but near the summit in particular, is as sopping wet as the ground is up there, the same plant families are found further down a thousand, or two thousand feet further down the slope, and they look very, very different. Unless you recognize the family, you would never know that they were closely related.

*Could you please talk about pollination ecology?*

Plants and insects arrived on the Pacific Islands over tens of millions of years. Some of our main islands today are fairly recent being only several million years old, but some of them are descendants from ancestral introductions that go back to the Northwestern Hawaiian Islands. Insects made it to these islands fairly easily because they are able to travel on the jet stream. When I try to imagine islands without birds, in my mind, I see a lot of the plants that we have today that are insect and wind pollinated. And those plants are pretty unremarkable in the sense that they kind of blend right in because they don't need to advertise that they have nectar and pollen and all these other things. When the ancestors of the forest birds finally arrived, the plants found a vector that was very useful for them. And so, as the birds began to take advantage of the plants, the plants began to evolve to cater to the birds and their feeding habits, which is why today we have such unique co-evolution examples between native forest honeycreepers and a lot of the native plants. The best example of tubular plants that honeycreepers might have adopted to pollinate, the one genus that is the most diverse is cyanea, which is in the family of lobelioids, the campanulaceae. I don't remember off the top of my head how many cyanea species were recorded on all the islands, but they are really good examples of tubular curved flowers that produce prodigious amounts of nectar and depend on honeycreepers to feed on them to be able to cross-pollinate. I've done a lot of hiking on every Hawaiian Islands, and in my time, I've seen cyanea species that were considered very common suddenly just disappear. I think it's a combination of introduced pathogens and lack of pollinators. It probably also has a lot to do with the lack of seabirds. You know, before the Hawaiians arrived here, tens of millions of seabirds were nesting at all the different zones, on all the different islands, and that nutrients cycling from the ocean to the mountain is missing today, and I really think that soil nutrients are not what they probably were even just a few thousand years ago. I think that might have something to do with the decline of the populations of plants as well.

*What are the major threats to endemic plants species?*

Michael DeMotta

It's really easy to list them all and you can start with some of the smallest ones, like the pathogens. Our islands are super isolated, so plant diseases that will take out native plants today were probably non-existent not even too long ago. The plants are just not well adapted to resisting to these diseases. And then there are a lot of insects. I'd like to talk about spider mites for a minute. There are different species of spider mites, and they travel on the wind. When it gets hot and dry

in the summer, spider mites begin to spread themselves out, and they can become so abundant, on a plant for example in our garden collections, that if you don't pay attention, and you don't notice that there are mites, you go up at the end of the day, on a Friday, and you can come back on Monday and find the plant completely defoliated. That's how fast they reproduce and that's how devastating they are. So one thing about plants becoming rare or extinct in their habitat, in the wild, is insects, like spider mites. And then of course you have larger creatures like slugs and snails. I've seen slugs and snails, non-native ones pretty much everywhere I've ever hiked. I always find snail shells, non-native ones. And then you have rats, mice and pigs. There is always a challenge to regeneration of native plants in the field.

Another thing to consider is how the habitat is changing. We all know and talk about climate change, and how things are warming up. They can probably model it at this point with computers, but we're not really sure how plants are going to react to that. I really think that the islands have been through different cycles over time, and some of our plant families have been here long enough, so I'd like to be an optimist in this, and I really hope that there is resilience. I think we should continue to focus on preserving ecosystems and let the species cope with it on their own. I mean what are we going to do, right? We're not going to change the climate overnight. We need to work together so we can slow it down as much as possible, but in the meantime, we have to hope that there is resilience in the species. Having grown a lot of native plants, and a lot of rare ones, if you get a big pile of seeds, certain seedlings and young plants will be more adapted and able to handle warm weather better than others. So over time, I think creating large collections of ex-situ collections of plants, you know, within gardens or even in restoration sites, by planting large numbers, maybe we'll find individuals that are resilient and can withstand warmer temperatures to carry their species into the future.

### *Why it is important to preserve plants?*

From a native perspective, if we start losing more and more plants, then our connection to the past will also be lost. People will chant a chant and say names of things that they won't know what that is. Is it a bird, an insect, or is it a plant? If these things go extinct, the connection with the past will go. It's the same as if the language itself completely disappears; connection with Hawaiians today, with their ancestors, will also disappear and it'll be a really tragic loss because people identify with their ancestors through the language and through the traditional stories that were handed down. You have to give the native Hawaiians credit. Over one hundred years ago, the Hawaiian written language was created because they knew how important it was after almost 2,000 years of oral tradition, to get it all documented, because they understood at the time, with the coming of the West, how much longer was their culture going to be able to survive. There's over a million pages of published newspaper print in the Hawaiian language, written by Hawaiians, with a Hawaiian mentality. Being able to preserve, maintain and restore what's native is really important for that cultural heritage and connection.

Another important thing to consider is this. Take the 'ohi'a tree for example. It's the dominant tree in most of the Hawaiian ecosystems, particularly the high wet ecosystems, and this is the

reason why we have water on this island. The 'ohi'a forest is the watershed, it preserves the moisture. Even when it's not raining, as clouds pass over, all that moisture is condensing in the 'ohi'a trees, and on the lichens and mosses that are up there and percolating down into the soil. If we lose all of our forests, we won't be able to live on this island 50 years, 100 years from now because the watershed will shut down. Every time we will get a big rain, it will just run off the surface. If you ever hike through a big area where you've got nothing but eucalyptus, and it's dumping rain, it all just runs down the surface as little rivers. If you do the same thing in a pretty intact 'ohi'a forest, you don't see any surface runoff; it just percolates through the mosses and the roots of the trees and all. So yes, our ability to live in these islands is contingent upon the preservation of our watershed and the native forest that sits on it.