

[00:00:00]

Zack Mason: OK. All right. My name is Zack Mason. I work for NOAA's Coral Reef Conservation Program. Today is December 19th, 2022, and I am calling into this meeting from my home office in Baltimore, Maryland. And I'm here with Doctor Rodgers. Doctor Rodgers, can you introduce yourself, please?

[00:00:29]

Kuulei Rodgers: I'm Doctor Kuulei Rodgers. I work for the University of Hawaii at the Hawaii Institute of Marine Biology, and I'm the Principal Investigator of the Coral Reef Ecology Lab.

[00:00:39]

Zack Mason: Awesome. Thank you. And thanks for meeting with me today. I'm really excited to talk to you. And so, as I mentioned, let's just start right from the beginning, all the way back to when and where were you born?

[00:00:53]

Kuulei Rodgers: I was born here on O'ahu. And I was born in 1956, when things were very different back then.

[00:01:02]

Zack Mason: And what was it like growing up on O'hau?

[00:01:06]

Kuulei Rodgers: Like I say, it was a very different time. The population was much lower. It was more laid back. I grew up surfing. So I was in the water every day before school after school. There weren't crowds when I was surfing. I kind of gave it up when I was about 35 40 because they're just so many people now that are surfing. And it was really nice back then because you sometimes had whole sites, full waves, all to yourself. That's the part I remember the most. It was really easy to surf back then.

[00:01:48]

Zack Mason: And where on O'ahu did you grow up, and where were your favorite surfing spots?

[00:01:52]

Kuulei Rodgers: Well, I started surfing really young. So, my father would surf every day before work and after work. So, I'd go with him to Waikiki, and you'd think Waikiki is very crowded, but it's not. So, there's a spot called Canoes(ph.), and that's where I used to surf every day. In the winter, we would go down to Makaha, where the surf meets, because my father judged the meets

and all my uncles ran the meets. So we would go there. And there were spots to the side of Makaha with the smaller waves. So, as a child, myself and my cousins all surfed in that area, too. So those are my favorite spots.

[00:02:32]

Zack Mason: So you said you would surf with your cousins and your father. Sounds like you had a lot of family that were that were local.

[00:02:42]

Kuulei Rodgers: Our family actually was pretty small, but when I say cousins, we have a lot of calabash cousins. So, just people we grew up with that are very close to the family.

[00:02:53]

Zack Mason: And what did your father do for a living, if you don't mind me asking?

00:02:56

Kuulei Rodgers: He was the head of the paroles and pardon system for the state, and he had took care of the whole state. Now, there are parole officers that are on each island, but then it was much smaller, so we had to travel a lot to the other islands.

[00:03:13]

Zack Mason: And was your father born on O'ahu as well, or did he travel there for work mainly?

[00:03:20]

Kuulei Rodgers: No. He was born on The Big Island. So he was from a small plantation town called Pahala in Kolaoa on The Big Island. And he came over to go to school at Midpac when he was in intermediate school, or middle school, and he started surfing and stayed ever since.

[00:03:43]

Zack Mason: Got you. And how about your mother? What did she do? Where was she born?

[00:03:49]

Kuulei Rodgers: You know, in those days, a lot of tourists were coming, and my father used to rent out canoe rides. He had a small canoe in Waikiki, and my mother took a canoe ride. She was a tourist from Indiana. But my mother left. There were three of us, and after I was born, I'm the youngest, my mother left. So it was just my father that was there for us.

[00:04:18]

Zack Mason: Yeah, that sounds tough, but it sounds like you were close with your father. Do you think maybe that relationship... And you said you surfed together. Do you think that relationship with your father kind of pushed you into a field that revolves around the ocean, kind of?

[00:04:35]

Kuulei Rodgers: I think just being in the ocean a lot. In those days, the kid's kind of did their own thing, so they weren't hanging out with their parents. They were just with the other kids swimming, playing, fishing. Things like that.

[00:04:52]

Zack Mason: So it sounds like you have been in the water since you can remember, but do you remember the first time maybe that you saw a coral reef?

[00:05:02]

Kuulei Rodgers: You know, a lot of people ask me this. Are the reefs different than when you were young? Well, I couldn't tell you. And the reason was only a few people had masks, and these were the adults, the ones that went spearing. The rest of us didn't have masks. There was no such thing as a snorkel. I mean, there's no wet suits or leashes on surfboards. It was a different time back then. So, I never actually saw a coral reef until I was an adult and snorkeled (unintelligible).

[00:05:36]

Zack Mason: Oh, wow. So, when did you start scuba diving?

[00:05:41]

Kuulei Rodgers: I started scuba diving when I started at Sea Life. It was before that. I think I was in my mid-20s.

[00:05:53]

Zack Mason: OK. So, I guess sometime in the late 70s or early 80s?

[00:06:00]

Kuulei Rodgers: Yes. Yes. 70s, early 70s because my daughter was (unintelligible). Early 70s.

[00:06:08]

Zack Mason: Got you. And what, I guess, made you get into scuba diving? It seems like, and I could be wrong, but back in the 70s and 80s, it was kind of very rare, I guess. Right? It's just kind of making it into the mainstream, maybe.

[00:06:26]

Kuulei Rodgers: It was not as many people, but it was still very popular. I just wanted to do something new. I wanted to see new things in the ocean.

[00:06:41]

Zack Mason: And so, when did you go to college? Where did you go to college? And what did you study?

[00:06:49]

Kuulei Rodgers: I didn't go to college until a little later. I was an ocean recreation specialist for the city and county of Honolulu during the summers. And then I got a job when my was, she was about seven years old, at Sea Life Park. And it's an oceanarium. I started out as the girl paddling the canoe in the shows, but I became a marine mammal trainer, training sea lions, dolphins, other animals that we had there. And that's where I first became interested in actual research because I had to help researchers when they were working with the animals. And so, I decided to start taking a few classes while I was still working there. And there was a community college that was fairly close, at Windward Community College, and that's where I went. Picked up a few classes, and I really liked my zoology class and decided to go from there because, in my zoology class, the professor had asked us... She was working out at Hawaii Institute of Marine Biology, and she asked us if we wanted to come and volunteer. She was doing a butterfly fish project on mapping butterfly fish. And I did so I volunteered there. And then, when they had funding, they hired me on. And then, later, I went to UH Manoa after I got my associate's degree and then continued there on my master's and my Ph.D.

[00:08:29]

Zack Mason: And so you said your daughter was seven when you started. Was that difficult going back to school with a young child?

[00:08:40]

Kuulei Rodgers: The difficulty was not that she was a young child. The difficulty was that I had gone to a public school, and I had dropped out in 9th grade, so I didn't have a background. I had to start from really early math classes. And English, I had no problem. I had a grandmother that was an English teacher, so I didn't have a problem with English or writing, but with math and some of the other subjects, I just have never had them because I hadn't had a chance to go to high school. So, I had to play catch up before I was able to take classes in the 100 level. So it took a while, and I took my time, but I really enjoyed it.

[00:09:24]

Zack Mason: Yeah, you must have really enjoyed it. That's a hard thing to do. And so you mentioned you dropped out in 9th grade. What were you doing? Like instead of... A lot of surfing or? (unintelligible)

[00:09:45]

Kuulei Rodgers: I was, I don't know if I should say typical teenager, but I was getting into a lot of trouble. I was. And I had a boyfriend, and we moved out together in 9th grade. When I was in 9th grade. I was 12, and he was 16. And we got married when I was 16 when I was legally able to, but we have now been married 15 years.

[00:10:14]

Zack Mason: Well, congratulations.

[00:10:17]

Kuulei Rodgers: So it worked out.

[00:10:19]

Zack Mason: Wow, that's really interesting. And so you went back to school, I guess, made up for all that time, you know, and not only finished your associate's but then went on to your Ph.D. Were there any professors or, I guess, role models that kind helped you through that process?

[00:10:42]

Kuulei Rodgers: There were a lot of professors and role models, and especially here at the Coral Reef Ecology Lab. And that's basically why I stayed here. It was because the people were so supportive. We really became an ohana working together on finding solutions to problems with marine issues. And some of them became like my parents.

[00:11:14]

Zack Mason: And so, you mentioned the Coral Reef Ecology Lab. That's in the Hawaii Institute of Marine Biology, right? And you've been there since the early 90s, I think?

[00:11:26]

Kuulei Rodgers: 1992 is when I started. So it's been 30 years.

[00:11:30]

Zack Mason: I was going to say happy anniversary there. So I mean, you said it's kind of like a family environment. Back in 1992, was it a new institution, or has it been around a lot longer?

[00:11:49]

Kuulei Rodgers: I think it's been around since the early 60s, so it had been around. It wasn't as large an institution. And it's still doing great things.

[00:12:00]

Zack Mason: Were you aware of its existence growing up, and when you were doing your marine mammal training and things like that, did you know that this place was around?

[00:12:14]

Kuulei Rodgers: I didn't know it until I started at Sea Life Park, and then the Education Department had an excursion there. And so I went there and looked at some of the labs, and then during lunch, half of the island was private at that time. So I went to look at the private site, which there wasn't anything there at the time. And now there are some labs there.

[00:12:39]

Zack Mason: That's really interesting, and what kind of... I guess is there a main focus on this lab, or is it... What kind of research gets done there?

[00:12:51]

Kuulei Rodgers: We do all kinds of research. You know, in the mid-60s Paul Jokiel, who was the PI of the lab before he passed away in 2016 when I took over as PI in the lab. He was the first one to look at the thermal tolerances of corals, and it still holds true today. In the 60s, there was no bleaching. Nobody heard the term. The first bleaching event wasn't until 1982 in the world and 1996 here in Hawaii. So, he was well ahead of his time. There was a power plant that Hawaiian Electric had over on the West side that they were using cooling water and discharging it at a higher temperature, and they had noticed that the corals were all turning white. So he started doing experiments here at HIMB in manipulated controlled experiments to see what the thermal tolerances are. And he did this with corals throughout the Pacific and found no matter where you are in the world, it's one to two degrees C above the summer maximum temperatures. So, this lab had a very important start in looking at coral bleaching. When I came, we started looking at ocean acidification effects on corals. A lot of global things. But we also do a lot of local issues like fishing pressure, sedimentation, nutrification, things like that. So, we're looking at overall and synergistic effects of all issues that affect coral reefs. We've worked on endemic species. We've worked on introduced species and a wide variety of things within the community.

[00:14:50]

Zack Mason: Yeah. So there's a lot to dive in right there. I know you mentioned looking at all of these different factors that are impacting coral health, but one that I wanted to touch on because we've already, kind of tangentially, mentioned it is human factors. You said that the population on O'ahu was so much lower when you were growing up. And now, with such an influx of

people, I'm sure these kinds of issues have been magnified. Is it safe to say that humans are bad for the health of coral reefs? Like, what do we do that hurts corals?

[00:15:32]

Kuulei Rodgers: There are negative, and there are positive things that humans do for the coral reefs. There are a lot of negative things, and it's well established now. NOAA, through the Coral Reef Ecosystem Division (unintelligible) had established from all their sites in the Pacific that the ones with the higher populations had lower coral cover. We also did research on the (unintelligible) or the watersheds and the reefs here in Hawaii. And what we found was the better the watershed, the better the reef, and vice versa. So the human population is a major driver, and it has to do with access to reefs. It has to do with fishing pressure. It also has to do with sedimentation, runoff from all kinds of things, including coastal construction. A variety of nutrients from fertilizers and agriculture that are put into the ocean. Humans here in Hawaii, tourism is the number one main industry. Eight million tourists a year. Billions of dollars come into the state. 250 thousand jobs. A thousand ocean recreation companies are supported by this. And so you can see that the impact on the reefs can be great in terms of trampling or just overuse. We have a project looking at the carrying capacity of Hanauma Bay, which is the number one place that tourists frequent. And we have found that, yes, in the high-use areas within the bay, the corals, the fishes are very different than low use. And we had this wonderful opportunity during COVID to look at before, during, and after effects so we could see how quickly does it recover, how quickly does it go back because the visitors are here again. And it's not just... Residents are also at Hanauma Bay, but it's mainly the visitors. And we found market differences, as many researchers did during COVID throughout the state, in the water visibility, in the fish populations, in the monk seal populations. Things like that.

[00:18:21]

Zack Mason: Yeah, and so, it sounds a lot like tourists, they come in and support the local economies. They probably contribute to a lot of efforts to help corals monetarily, but then they're also the problem, right? A little bit. How do you balance all that?

[00:18:43]

Kuulei Rodgers: Well, this is for the government to balance, and I don't think they're doing the best possible job of this. In places like Australia, a lot of the fees are put back into the environment in helping research and helping restoration efforts, and this isn't the case so much in Hawaii.

[00:19:09]

Zack Mason: Got you. And is that, I guess, a local state government issue, or is it more of a federal government issue, you think?

[00:19:18]

Kuulei Rodgers: It's a local-state government issue.

[00:19:21]

Zack Mason: Got you. And so I want to... I hope I'm not jumping around too much, but I'm really interested in when you're talking about coral bleaching and that that didn't really happen in the 60s and 70s. I think you mentioned the first bleaching event was maybe in the 80s or 90s? Or 96, right? I think you said.

[00:19:45]

Kuulei Rodgers: 96 in Hawaii, 82 in the world. So we didn't get... We're in this sweet spot in the Northern Pacific where our waters stay cool enough and move enough with the currents that we didn't get our first bleaching event till 96, but in 96, the corals recovered right away; we did not have high mortality. This happened... The time we had the high mortality was only the 2015 and 16 back-to-back bleaching events. And 35 percent of its corals actually died. Then 2019 is when we had another bleaching event, but it was mild, and corals recovered. So really we've had one really large bleaching.

[00:20:38]

Zack Mason: And So what makes those bleaching events different? How do you go from most corals recovering to 35 percent dead? What happened there?

[00:20:49]

Kuulei Rodgers: Well, it's not just the degree heating (unintelligible) or how long the corals are exposed. It's a lot of other things. How much irradiance? How much cloud cover there is? How much wind and currents there are? How much local issues there are. Like, if we have a very low level of sedimentation, it can actually help ameliorate bleaching because the radiance. The sunlight is not as strong on the corals. But if you have too much, it can actually be detrimental to corals. And this is what we're finding for nutrients as well. At a very low level, it's actually helping ameliorate bleaching, but at a higher level than, it's detrimental to corals.

[00:21:43]

Zack Mason: Got you. And you mentioned a temperature range at which corals bleach. Can you talk about that a little bit? Why are corals so sensitive, and what's the threshold that they can survive at?

[00:22:02]

Kuulei Rodgers: Yeah. So, like I mentioned, it's like one to two degrees centigrade above the summer maximum temperatures. So, in Hawaii, this would be 29 30 degrees. They might start to bleach if it's over long period. In some place like (unintelligible) it can be 31, 32, or above. So, it just depends what the corals have adapted to in that area. But all of them only have that small range, and outside of that can be very harmful for corals.

[00:22:40]

Zack Mason: And what was it like? I think you said the 2019 bleaching event that where 35 percent of corals died off after that? Yeah. What was that like seeing something like that?

[00:22:50]

Kuulei Rodgers: That was 2015, 16. The 2019 was very light, but that one was very detrimental. In 2015, it came down from the north, so the islands of Kauai or Ni'hau were affected and Maui most heavily. But in 2016, it came up from the South. So The Big Island was affected more, and that's where on the West side of The Big Island is where most of the coral mortality occurred. But it also depends on how many of us are out there in the field looking. So, at places that are very difficult to access, we don't have people looking there. So we have a lot of tools now that we can use to go out into larger areas and be able to assess the entire state. But, some areas, like the island of Molokai, did not have high mortality. So we're starting to look at these. And NOAA included, is starting to look at these factors to see what are the things that are helping corals in certain areas while harming them in others. And one good example is during the 2019 bleaching, we have a coral color card we designed for the public, and we used this to see the level of bleaching and the health of corals. So we were there training some marine option program students at Richardson's on The Big Island. And everywhere else in the state we had gone was bleaching, but not Richardson's. So I swam around looking, you know what this is, and I noticed very cold waters, very cloudy waters. There was a lot of freshwater seeps coming up. Then when I looked to see because fresh water is also not good for corals in large amounts. We have had a lot of freshwater floods that have wiped out some reefs. But this water was moving very quickly down the coastline. So it really depends on local situations. If there are other local issues, like sediment and nutrients, and if there are things like freshwater seeps, currents that are taking these warm waters offshore, things like that.

[00:25:34]

Zack Mason: Got you. That color wheel was really interesting. I think that's a neat tool. And it got me thinking, are there any local volunteer monitoring efforts that kind of help out and kind of alert you to maybe bleaching sites or disease sites or things like that?

[00:25:57]

Kuulei Rodgers: Yeah. Well, the coral color chart is posted on the NOAA (unintelligible) site. And people can look at the area corals in their area and put the data into this site. And it's a GIS-based format that NOAA helped develop. And people, school groups, managers can look at what everybody is seeing, which areas are bleaching more than others.

[00:26:33]

Zack Mason: That's really interesting. And is there, I guess, a lot of local buy-in with that? Do you think there are a lot of people going out and providing information?

[00:26:40]

Kuulei Rodgers: There has been. This is not just pretty colors. There were over 10,000 colors that we chose from, and each of the 10,000 were linked with experiments that we did. We had 600 corals representing 17 different species, and we bleached them by increasing the heat. And as they bleached, we took fluorescent readings. We looked at electron transport. We looked at from the tissue samples what the chlorophyll levels were. We looked at how many zooxanthellates(ph.) or symbiotics are in the corals as they're bleaching. And that is what was changing these colors. So, these colors are all quantified.

[00:27:42]

Zack Mason: So a lot of science has gone into those colors.

[00:27:45]

Kuulei Rodgers: Three years.

[00:27:47]

Zack Mason: And are you still doing the those bleaching experiments to see? Or, I guess, why are you still doing them? Right? You mentioned Doctor Jokiel was doing them for a while, right? Are they still going on? And what are you hoping to learn?

[00:28:07]

Kuulei Rodgers: Well, with when ocean acidification or the changing in ocean chemistry started when I first came, we started doing synergistic effects. We looked at bleaching and ocean acidification. We looked to see if they were additive or negative. We added light in different areas to see what that would be, to simulate depth. A variety of other things. Adding sediment, adding nutrients, trying to see what it would look like for areas throughout the state. Right now, we are looking at coral metabolism model and a proton flux model, which will help us to understand the basic metabolism of corals. But we also do things in the field, of course. We do a lot of fieldwork. We also work with committees. We worked with the first CBSFA Community-Based Subsistence Fishing Area on Haena in Hawaii and we looked at what the efficacy of their

management was, and we found that it worked very well to have the community be the ones to manage themselves.

[00:29:30]

Zack Mason: That's really interesting. Are there any kind of plans to implement that on a wider scale? Is this just like a one-off test in that area or?

[00:29:40]

Kuulei Rodgers: It took them 15 years to get that designation, and in the meantime, other communities were also trying to get this CBSFA status. And (unintelligible) on The Big Island has just received that status. And there are 13 other areas throughout the state. Few are on O'hau. There are a couple, but the thing is, if you don't have a resident Native population that understands the dynamics that are happening on the reefs there, it's difficult to manage it.

[00:30:18]

Zack Mason: Yeah. Is this only happening in Hawaii that you know of, or maybe in other locations around? I mean, I guess I would think Florida, maybe, but is this something especially unique to Hawaii?

[00:30:34]

Kuulei Rodgers: It's not unique to Hawaii. So, other places in the Pacific have similar things, and it's not unique to Hawaii or the Pacific in that the communities managed themselves throughout history. So there's thousands of years where they did manage their own communities.

[00:30:57]

Zack Mason: Yeah, that's really interesting. And so, how did that get started? Who started it? Was it the community themselves that said, hey, we can manage this on our own, or?

[00:31:11]

Kuulei Rodgers: The community and the Division of Aquatic Resources work together to do this, and then the university, which was our part of it, came in just to do the science part.

[00:31:23]

Zack Mason: Got you. OK, wow. And I guess, do you think that people living in Hawaii might be more aware of what's going on with the reef than maybe elsewhere? I guess that's a tough question, but maybe I'm not phrasing it correctly. But I guess how aware... Maybe that's better. How aware are the people of Hawaii of what's going on with like reef health and how things are doing?

[00:32:03]

Kuulei Rodgers: There is traditional knowledge that goes back generations, and many of the local people have this. They've been in the water since day one when they were born, and they can see small changes, little nuances in the reef, in the fish. They know the moon phases and when certain fish will spawn, and all of these things that scientists have tried to do through experimentation, but that native traditional knowledge has been using all of this time. So now research is trying to incorporate, especially here at Hawaii Institute of Marine Biology. We're trying to incorporate community input. Not to see if it's working because we know it's working, but to help to guide us with our research.

[00:33:00]

Zack Mason: Yeah. And so, what's the relationship like between local communities and Hawaii Institute of Marine Biology? Have you guys been working together for a while? Is this a new effort? How do local people think of your organization?

[00:33:21]

Kuulei Rodgers: You know, it really depends. So, we have been working with communities for a long time. Many of the times, they asked us to come in and help them with their work. So, a lot of the local people do support research. However, many of the fishers feel that science... That management is using science to shut off closeout areas, have more marine protected areas that they can't fish in, and so some of them do not look kindly on it. But overall, I think the majority of the community supports the research that we do. And not only here at HIMB, we do research, I'm a full researcher, but we have education labs we have community outreach programs. So there's a lot of things here that benefit the local community.

[00:34:28]

Zack Mason: And can you tell me about some of your community outreach programs? I know there's one specifically that you participated in, the Hawaiian Culture-Based Science Readers, but is there... And I do want to talk about that, but is there anything specific that HIMB does?

[00:34:47]

Kuulei Rodgers: HIMB goes out to all the communities throughout the state. They also have programs during the summer that bring high school students in, and we have had them continue on as graduate students because local and Hawaiian students are underrepresented in science. This is why when I started, there were few women, and there were few local people involved in science. And that has changed over the years, and part of it is because we are trying to bring them in at an early stage.

[00:35:33]

Zack Mason: And so I guess again, I feel like I'm jumping around a lot, but there's so many interesting things that I want to ask you about before I forget. You mentioned there weren't a lot of women in science when you started. I imagined it was the same, if not worse, in scuba diving in general and even surfing. And so, was it like being a woman in all these male-dominated fields? Did you ever face any discrimination? Sexism? Double standards?

[00:36:06]

Kuulei Rodgers: I really didn't. I have to say everyone was really supportive of me and of other women in the field. Our lab, when I first started, was male-dominated. In fact, I think all of the principal investigators and labs on the field in here were headed... It was all white-dominated. Way back when I first grew up, as a child, we didn't look at color. We didn't look whether you were white or brown or Hawaiian or Japanese, whatever. We all just pretty much got along because there were so many of all of them. And I'm mixed race, and most people now are mixed race. There are more mixed-race marriages in Hawaii than there are same-nationality marriages now, so it's not an unusual thing. And I feel some people just have the spirit of aloha, and we always have supported each other. And I never felt this type of discrimination that I hear about in other places.

[00:37:22]

Zack Mason: That's nice to hear. And so it sounds like there are maybe programs in place to continue incorporating that spirit of inclusivity. (unintelligible)

[00:37:37]

Kuulei Rodgers: There are quite a few at UH that are looking to make sure that everything is diverse.

[00:37:37]

Zack Mason: And you mentioned the high school program where you bring in some high school students, and some of them have stayed on to be graduate students. Is there a big demand for that? Like is that a popular program for you guys?

[00:38:04]

Kuulei Rodgers: It's a popular program, but our education department can only handle a certain number of students, so we have to hand-pick them among the public high schools here because there are a lot of private high schools that the more privileged children go to and we want to make sure we're getting people from all walks of life.

[00:38:31]

Zack Mason: And that leads me to I mentioned the Hawaiian Culture-Based Science Readers, that's grades kindergarten through third grade, I think. And I don't want to butcher the title here and embarrass myself too much. But can you tell me a little bit about it and elaborate on that project?

[00:38:54]

Kuulei Rodgers: Sure. The (unintelligible) are Hawaiian immersion schools. They speak only Hawaiian. And there are quite a few now of these Hawaiian language schools. When we grew up, there were none. And Hawaiian, prior to my age group, was discouraged. So Hawaiian wasn't spoken, but now it has made a resurgence since the late 90s, and so there are a lot. There are many of these Hawaiian immersion schools. And this book is looking at 6th through 12th graders that speak only Hawaiian. So, it was developed in Hawaiian. They did make a translation into English later on. And this was a friend of mine, (unintelligible) Irwin, who is a professor at (unintelligible), part of the University of Hawaii. And what he wanted to do was make sure the community could do something about climate change and that they understood it. So, he wanted to give hope to these Hawaiian students. Especially in a time where there's a lot of bad news coming up. The book is divided into three different sections. Money, heavens or sky, kala or honua, the Earth, and kai, which is the sea. So that's the section where I come in. And he wanted to make sure that he addresses different researchers, or mentors, and different cultural practitioners and what they're doing to make a difference in the field. So that's basically what it's about. I answered all my questions in English. Although I took Hawaiian, I am not completely fluent in Hawaiian. I took three years, but I'm not fluent. And so, I actually answered my questions in English, and they had to be translated into Hawaiian. But, many of the other practitioners did use Hawaiian.

[00:41:12]

Zack Mason: And so, can you explain what was your motivation in participating in this project? What did you want to get out of it? Or what were your hopes for?

[00:41:27]

Kuulei Rodgers: Well, you know, I have a daughter. She has two children, although they're grown. I've always talked in the schools given lectures in their classes and other classes. I feel it's extremely important to reach them at this lower level. Our two grandchildren went to (unintelligible), which is a private school, but it's a Hawaiian-based school. They learn Hawaiian language, but it is not an immersion school, so they're not speaking Hawaiian language there, but it's a very good academic school. And I also made a similar book, or not made the book. I contributed to a book Kamehameha(ph.) school did for their curriculum on coral bleaching and on coral reefs. So many places are developing curriculum to be able to understand these new changes that are happening in our environment. And so it isn't just these few places that we've

helped. We continue throughout the years to support the younger students, and oftentimes, they want to come and talk to us or they have questions. And so we're basically available for them because they are our future.

[00:42:53]

Zack Mason: Yeah, and so you mentioned that climate change and the effects are... So you mentioned that these books want to help the children kind of deal with the realities of climate change. Or can you see the effects of climate change in Hawaii now? What are the biggest obvious signs?

[00:43:21]

Kuulei Rodgers: Hawaii, being an island nation, is one of those places you can see even more rapidly the changes that are occurring than in the continental United States or other places. The state of Hawaii has coastlines around each of the islands. And, of course, sea level rise is an issue that is occurring. Larger storms are occurring and more frequently and more intense. Then this is causing problems with additional freshwater runoff. It's causing issues with large waves and more erosion, more sedimentation. Many of our roads, especially here on O'ahu, run right next to the ocean and during high-level sea level-wise periods and during the king tides, and if there are storms, those roads are impossible. And the waves are actually breaking over them. But for many years, places like Mapunapuna near the airport have had problems with fresh water. Sorry, salt water coming through the pipes and flooding the streets and cars, going through this. And this is salt water. They've even seen hammerhead sharks in the streets, which is four or five miles from the ocean, coming in through that because of the storm surge. We are having a lot of issues from climate change, including bleaching in the ocean. Changes in a variety of issues.

[00:45:18]

Zack Mason: And so it sounds like some of these issues are very serious. And so, with all these climate change caused problems, why should people, especially in Hawaii, care about coral reefs. Don't they have bigger things to worry about? What do corals do for people?

[00:45:38]

Kuulei Rodgers: They will have bigger things to worry about, but right now, coral reefs are the canary in the coal mine. If they don't pay attention now to what's happening to the coral reefs, there's going to be real issues down the line. We're at a crossroads right now where what we do today is going to determine our future. And if we don't act quickly and we don't make the changes we need to, it's going to be devastating for not only the ocean but also for what's happening on land. But the ocean is extremely important. Culturally, it's important because we use that for subsistence fishing, for gathering of seaweeds and urchins, and other things that we actually use to sustain our families. It also is important to surf breaks. It's important to tourism.

95 percent of our tourists go in the water at some point here, so a lot of these coastal erosion and coastal protection of the reefs, USGS, look at what the evaluation of coastal protection were from coral reefs. And it was billions and billions of dollars because of shoreline protection. Coral reefs are important, just in an aesthetic way, where just the value of being there. And people realize that. In states that are landlocked, that aren't even near the oceans, they're supporting the ocean, too. If we don't have the diversity, both on land and in the sea, we lose a lot of the medicines and other things that we rely on and new things that we can use to better humankind as well.

[00:47:48]

Zack Mason: Yeah. So, can you tell me a little bit about the Coral Reef Assessment And Monitoring Program? Right. Corals do all these great things, so we should study them, right? So, what was the goal of the Coral Reef Assessment Monitoring Program? And when did you work with them?

[00:48:08]

Kuulei Rodgers: So in 1998, I was still a graduate student, and Paul Jokiel said we need to have well managers in the state, The Division Of Aquatic Resources. They said we need to have an integrated program. Right now, monitoring is done piecemeal. Different researchers doing different organisms in different places using different methodologies, and we don't have one consistent, integrated program throughout the state where we can get baselines as to what is actually happening in the ocean. And is it changing because we know it's been changing, but we don't have anything to quantify that. So Paul Jokiel said, OK, let's make something. And so we, the four of us, developed the Coral Reef Assessment and Monitoring Program. We set up sites throughout the state. We started with 60 sites and at two depths, three meters and 10 meters at each of these sites. So, 120 different stations throughout the state. And we have permanent monitoring pins there. So we can go back whenever we need to. At first, we did this annually. It took us one year ago to actually figure out what methodology would be best to encompass all the heterogeneity in the state. We wanted to make sure that we had the statistical power that was going to be able to detect change, so we wanted to see which ones we would measure, how we were going to do that. So it took a whole year. Then, going out in the field and trying different things, different transect lanes, different number of points. All kinds of things. And we came up with our program and instituted it in 1999. So what we had there was a program that we went out annually. And then, we analyzed it and gave the data to the Division of Aquatic Resources in the state. But Paul said, you know, we're not going to be around here forever. We need to give this over to the state for them to do the monitoring. Then, it will continue in perpetuity. And he was right. So we have over the years. Maui was the first early on in the 90s to take on their sights. And then the other islands followed suit, and now we have all except O'hau on board, but that is changing now. So we've had training, and now they are actually doing this themselves. So, they

have an integrated monitoring program. In some ways, that has helped them. At Kahekili, there's a herbivore fisheries management area where you can catch any fish except herbivores because the seaweeds. (unintelligible) showed that the seaweeds were overgrowing the corals, and after five years, they found this has been very effective. So we can look at different sites and look at the trends and patterns and say, hey, what can we do to find a solution here. We've also had some very interesting uses, unexpected uses. There was an archaeologist on Kauai on the Na Pali Coast, and he had dug mittens where he had different fish bones that he found from ancient Hawaiians. And he wanted to know what's the fish population like now so I can compare them to what the fish population was like hundreds of years ago. So it has a lot of uses. It's used for Highmark(ph.). This is the collaborative where seven major monitoring programs, including NOAA and Crown, all get together give their data to have over a hundred thousand different transits over the years. And this is being used by management to be able to guide their management decisions. It's used by the bleaching coalition to be able to see what areas are in need of going out and finding some solutions there. It has widespread uses that we have been using for this. And this was developed by Doctor Alan Friedlander's Fisheries Lab, but would not only have fish, but it also has coral and other organisms, invertebrates and other organisms, as well as habitat types.

[00:53:25]

Zack Mason: So I guess a couple of questions. To me, 1999 doesn't sound like it was too long ago, but it's 23 years. To some people, that's a long time. Some people, it's not. But what strikes me is that seems relatively modern to put a program like this into place. Right? If we have known about coral reefs for hundreds of years, why did it take us this long to kind of get a baseline so that we could study them? Why was it in the late 90s and not earlier?

[00:54:06]

Kuulei Rodgers: That's a good observation, and part of the reason is that people had their own way of doing things. NOAA had their own way. Division of Aquatic Resources had their own methods. And since they had been doing them for so many decades, they didn't want to change midstream, and now things did not compare with each other. So, one of the things we took into consideration when we started these sites which we also had marine managers helping us to decide which sites were best. One of the things was, does it have a long-term record that has comparable methods that we can use? So, some of our sites like Kahe go back 50 years. Many of our sites on Maui go back an additional 20 years from 1998. So, we now do have a longer baseline at some places, but this is why it was important to establish that baseline right away.

[00:55:20]

Zack Mason: Another thing that you mentioned was that there was a local site where you could catch any fish except for herbivores because they would eat things that are overgrowing the

corals. And that seemed like a very fine granularity for decision-making. Right? Do you find that these data are being used more at that small local level for decisions? Or do you think...

[00:55:55]

Kuulei Rodgers: The state of Hawaii uses these for local management. Then you have NOAA, who has a baseline back about the same time when Rusty Brainard started the Coral Reef Ecosystem Division, and this was throughout the Pacific. So there's a baseline there as well that is continuing. And those are being used at a more global scale.

[00:56:23]

Zack Mason: And you mentioned High Mark as well. So, I guess that's a conglomerate of different organizations. All kind of cooperating for a singular purpose. And you don't often hear about all of those bureaucracies working together super well. How did the local and state agencies interact with the federal agencies? And does HIMB have a good relationship with NOAA? Do they work together often? How'd that work?

[00:56:57]

Kuulei Rodgers: You know, it's so nice living in Hawaii because we all know each other. So all of the marine people know each other. Many of our students went to NOAA, went to the Division of Aquatic Resources, went into academia, went into The Nature Conservancy. So we pretty much know all of the players, and we always work together, which has been really nice. NOAA has funded some of our programs, some of the states. We work with all of the different agencies. We work with all of the non-governmental agencies. We have people at HIMB that are in just about every agency that's in the state. And so we're not only friends, but we know what is going on in these different agencies. So I think it's a unique situation, and I feel that the management agencies all get along fairly well.

[00:58:05]

Zack Mason: That's always good to hear. Let's see. Another thing I meant to ask earlier, what's the importance of setting a baseline? You mentioned you need a baseline to compare, but what's the significance of doing that? And what is the phenomenon of shifting baselines if you could explain that a little bit?

[00:58:32]

Kuulei Rodgers: OK, so baselines are used to evaluate change. These would inform management decisions and strategies, restoration goals, and a variety of things that benefit coral reefs. Since coral reefs are changing so rapidly now, there's a loss of information from the historical baselines. Like I mentioned, some of the baselines do not go back very far. And since the methodology was different and not comparable. But where do you draw the line temporally

as to where that baseline should be or is? And this is what can be problematic because we're accepting lower and lower baselines as baselines start to shift. What we're looking at today, we can't really compare to pristine conditions. There's no way we're going to get back to pristine conditions. So where are we going to try to get back to 10 years ago, 20 years ago, five years ago? And is that going to change in the future? So these shifting baselines are very problematic to researchers, and there's no real standard as to where you should draw that line.

[01:00:06]

Zack Mason: Yeah, and so I guess now's a good time as I need to ask you. I know you mentioned growing up, you didn't have a mask, so you couldn't see the reef. But once you started diving in the 70s and the 80s, how have reefs changed since then in your experience?

[01:00:26]

Kuulei Rodgers: Reefs have changed quite a bit. We are seeing with the ocean temperatures that there are specific species that can tolerate temperatures better than other species. And we're seeing already more of those species and less of the less tolerant species to temperature. You know, there's a lot of impact, like I say, that impact coral reefs, but temperature is the main driver of bleaching. Ocean acidification adds to it, but that on its own is not what we're seeing is destroying the coral reefs. It's the temperature increase. And so there are a lot of things that are happening. Exciting things, new technology, novel, unique things that are actually coming on board. People working in restoration, people looking at the genetics of corals. And this exciting. There is hope. Even though it is a critical time right now, we have the opportunity to actually do something. We have the chance to say to our grandchildren and great-grandchildren, no, we actually did something to save the coral reefs. We didn't just sit around. And I think that is really important and sets a real level of what others can do. Things are happening really quickly. When Paul and I, first 30 years ago, found out about climate change and what was going to happen. People didn't believe it. Most people were deniers. A lot of the agencies, including the federal agencies, were not allowed to say global warming for many years, but as an academic, we could speak out. We could say anything that we wanted to say. It didn't have to represent the UH, but we were able to say it. And so we did. We went out, and we talked to group after group after group. And it wasn't from our, of course, going out there, but from all of the people who went out there and brought this forward, the people throughout the world, and now things have changed. It's basically accepted. And not only that. People are making changes. And this has only happened in the last 15, 10 years or so. It's not... It hasn't been that recent. And so I'm hopeful that once people are aware of what is happening, they will make that change. And the younger generation, they're so tech savvy. I mean, I have the ones in my lab helping me with all my technological things, and they can come up with really good novel ideas and pick up from where we started.

[01:03:43]

Zack Mason: And so... I mean, I've been hearing a lot of... Reading things from different mainstream media sources now, it's very gloom and doom about corals. Corals will all be gone in 50 years, is some of the big headlines I've been seeing. Do you think that's true? You think they'll still be around? And what's our best shot at keeping them here?

[01:04:09]

Kuulei Rodgers: I'm glad you asked that because we all have to do our part. I do believe it's happening very rapidly, and if all carbon emissions were to end today, there still would be that amount of carbon in the atmosphere. But what we need to do is keep it at that under 2 degrees Celsius. And if you're not able to do that, the reefs will disappear within 50 years. Maybe even sooner. It's happening very rapidly. But like I say, things are changing. There is a happy note to this. And, of course, people know I need to reduce, reuse, recycle. I need to turn off the lights. But some of the things they may not realize are looking at every purchase you make, especially here in Hawaii. Transport costs. 90 percent of our goods are brought in overseas or from the mainland. And we need to buy locally, eat local foods, and look at what am I going to do with what I'm buying today. How long am I going to keep it? How is it going to be recycled? What is going to happen to it? These are things we have to ask before we buy any product. We also need to consider what we eat. I am not advocating for people to become complete vegetarians, although I am, but it makes a huge difference to the global carbon emissions. On the food chain level, every time you go up a level, that's 10 times more energy you need. So, it takes 10 times more soybeans or corn to get to the next level. So if you start a meat... So if you have beef or chicken or fish, they're all at a basic level, which comes from the plant-based diets. And that is what we need to strive for. Eating more of actual fruits and vegetables. And it's healthier for you. It's healthier for our earth and eating locally from those types of foods. And then embracing. If you can afford it, electric cars, solar panels, whatever is coming out. If you can't afford it, there's a lot of things that you can do in terms of purchasing that will give you a voice to say, I'm not going to support that type of energy.

[01:07:11]

Zack Mason: Voting with your checkbook. And so can I ask you a little bit about you said you're a vegetarian. Can you describe your reasons behind that? Is it mostly for carbon footprint? Or...

[01:07:28]

Kuulei Rodgers: I was a vegetarian before I understood about the carbon emissions. It was for health reasons at first. But I continued on because of those reasons. And I drive an electric car. So I wasn't able to for many years because I couldn't afford it. But when I could afford it, then I did buy an electric car and solar panels.

[01:07:58]

Zack Mason: OK, let's see. So I have a few notes here on questions that I missed asking earlier, so I'm gonna ask a couple that seem like I'm jumping around again. Sorry. And then I have a few to kind of wrap us up if you still have some time. So, can you describe the process for mapping a coral reef? How would you map a coral reef? And then, has that process changed over the years?

[01:08:30]

Kuulei Rodgers: Yes, the process has changed. Researchers use a wide variety of different things in mapping coral reefs. For us, we use observations. We have also done ground truthing for other types of methodologies. And ground truthing is when you go in, and you see if that is what the satellite images or the aerial images are actually saying it is. So, spot checking. We've done a lot of that for NOAA over the years as well. And we do a lot of in-water things. We do a lot of underwater towing of digital photos and video mapping systems and swath acoustic seabed mapping systems. Others use higher-tech things, which have evolved over the years. And these include LiDAR. That's light detecting and ranging capabilities, airborne and space-based multispectral remote underwater types of things. So they can actually see through. They can get the bathymetry. They can get overall structure and morphology. They can tell what the coral cover is like and the distribution of coral cover. And you can tell how much sediment there is, what kind of benthic types. Is it changing over time? So these are really important things that researchers use to manage the oceans.

01:10:11 Zack Mason: Yeah, it sounds like there's a lot of fascinating technical tools that are being developed. Between these tools so, you don't have to check everything, right? You said spot-checking. Is there going to be a place for future coral reef scientists between declining corals and all of these new technologies?

01:10:31 Kuulei Rodgers: I'm hoping that there is. I'm hoping that we can have reefs to actually work on. I am not one of those all doom and gloom researchers, but I am a realist. And I do understand that this is a very critical stage that we're at right now. So I don't know what the future of the reefs are, which means I don't know what the future of the coral researchers are either.

[01:11:07]

Zack Mason: So, what was the most difficult part of your career?

[01:11:14]

Kuulei Rodgers: I have to say I've had it really easy in what I do and in the lab that I've been in. But learning to write scientifically is not an easy thing. It's one of the things most of our students

have difficulty with. It's different from other types of writing, other literary writing. And another thing is writing proposals. The administrative work. The fiscal and personnel kind of work. Things that I was not trained in that I had to pick up on the job. And sometimes having to deal with difficult people. It's not often that I have to. Everybody here is really wonderful, but it happens from time to time. Being able to navigate that.

[01:12:08]

Zack Mason: Yeah. And being a coral reef scientist, I know you said you had it easy, but I guess that's relative, though. It's not an easy job. At least it doesn't seem like that to me. I feel like there's a lot of gear that you're lugging around. There's a ton of administrative work that you have to do in addition to all the fieldwork. If you could go back and do it all again, would you make the same decision to get into this field?

[01:12:38]

Kuulei Rodgers: OK, that is a good question because it's been easy for me because I utilize other people. We all work together to make something happen. I realized over the years I certainly don't have all the skills that I need to do these projects. Some others are better at statistics, some others are better at writing, some others are better at the different things. Organizing, all of that. So, by utilizing everybody, we all move forward together. And this is more of a Hawaiian or Polynesian type of mindset. Everybody works together. Cooperative, not competition. It's cooperating together, so we all move forward together. So, the lab moves forward together. So we're able to develop things that we will never be able to develop on our own. And I think that's one of the things I would go back and say to myself. Just be good. Be kind. Spend the time with each of these students because some need more help than others. But you're investing in the future of our coral reefs because they are the ones that are going to move this forward.

[01:14:03]

Zack Mason: And so what advice would you give those students? Someone who's interested in kind of following in your footsteps. What would you tell them if you could only tell them one thing to help them out?

[01:14:15]

Kuulei Rodgers: I think I'd say don't sweat the small stuff. I think it took me a long time to learn that things change all the time. When you're in the field, there's even a class that I help teach called Field Problems in Marine Biology. There are issues that are going to come up. Things change. Weather, everything else. The dynamics. And you have to be able to move with that change. You have to also have a plan B and a plan C so that when things change, you can adapt really quickly and move on with your day.

[01:14:53]

Zack Mason: And what's... I asked what the most difficult part of your career was, but what's your favorite part of your job?

[01:15:05]

Kuulei Rodgers: I think working together. Like I say, just being a part of the whole system and not just our lab but collaborating with other labs so that HIMB as a whole, and the Marine Science community as a whole, can move forward with all of our minds working together.

[01:15:27]

Zack Mason: And then what makes Hawaii special? What makes Hawaii's reefs special? People when they think coral reef, at least where I'm from, people think Hawaii. Why do you think that is?

[01:15:46]

Kuulei Rodgers: Well, I'll tell you why they think Hawaii. Because 85 percent of the reefs in the United States are in Hawaii. Because we have the northwestern Hawaiian Islands that stretch 1500 miles to the northwest, called Papahānaumokuākea, and we have numerous reefs there, too. We have some deeper reefs as well. So, most of the reefs in the US are in Hawaii, and they are unique. Hawaii has a lot of endemic species. So endemic species are those that are found in one place and nowhere else in the world. Then there are indigenous species which are found there, but also some other places. And then there are introduced species which are either intentionally or unintentionally brought in that were not originally in that system. We have a fourth of our marine life that is endemic, found here in Hawaii and nowhere else in the world. And it's something like 80, 90 percent of the plants were endemic at one time in Hawaii. But in the ocean, this endemism is really important to speciation, and this way, we had because of our isolation. We're so far from any landmass that we were able to radiate out to new species that are only found here. I think that's what's most important about the uniqueness of Hawaii reefs. But the uniqueness of Hawaii, I could go on and on.

[01:17:30]

Zack Mason: That sounds good. Well, I think that was actually pretty much it for me. Is there anything...

[01:17:36]

Kuulei Rodgers: Yeah, I'd like to say one other thing.

[01:17:40]

Zack Mason: Yeah, yeah, yeah.

[01:17:41]

Kuulei Rodgers: And that is the ancient Hawaiians have... It's called Kumulipo, a Hawaiian creation chant, and it was passed down throughout the lineage. It tells how organisms and people first came. It starts with Kumulipo and Po'ele, the two humans. From there, the first thing that was brought forth was the coral polyp. Not something on land. It was the coral polyp. And from there, the coral colony. The reason this occurred is they realized how important the coral was to the base of the whole ocean and the land because the fish use it for shelter. Invertebrates use it. They use it for food. I mean, it's just so important and integral in the Hawaiian culture that that was the first key organism that was produced. And so I think we have to, here in Hawaii, understand that today as well that this is not something we can do without. And we need to make the changes to make sure it stays.

[01:19:02]

Zack Mason: Yeah. Well, thank you for that. I was just about to ask if you had anything to add, so that's perfect. And yeah, I can definitely... I think we're going to use that clip in the end product for sure. Yeah, that's super interesting, and I think that theme of togetherness really applies to coral reef conservation as a whole, too. I think if we could take that and apply it to everyone working on this, we'd have a much easier time, I bet. But yeah, thank you so much for your time. I really enjoyed speaking with you. And yeah, I will send you the audio of this uncut, and you can listen back to it if there are any parts that you'd like to edit out or anything, you just let me know, and I'll clip it out and then send you the revised version. Thank you.

[01:20:09]

Kuulei Rodgers: And thank you. Thank you for doing this. It has a very important historical baseline.

[01:20:17]

Zack Mason: Thank you. I appreciate it. And yeah, again, I just can't thank you enough for taking the time to meet with me. I know you're incredibly busy and out there doing the good work and fighting the good fight. So I appreciate it.

[01:20:34]

Kuulei Rodgers: Thank you, Zack.

[01:20:35]

Zack Mason: All right. Well, have a great day. I'll talk to you soon.

[01:20:37]

Kuulei Rodgers: Aloha.

[01:20:37]

Zack Mason: Bye.

[END OF FILE]