

00:00:02 Lexie

OK, so we are now recording. Hi before we get started, I really just want to break down exactly what to expect from this interview, so there's no surprises. We're gonna want to start kind of from the beginning of your life and hear about your childhood, what it was like growing up in Hawaii, and then I would really love to touch on questions about, you know, the ocean in general coral reefs. Uh, and your experience, your expertise, and so if that all sounds good to you, we can get started.

00:00:35 Lexie

All right. And then as a reminder, my name is Lexie Sturm. So I'm the current Knauss fellow at NOAA's Coral Reef Conservation Program, and Madyson couldn't be here, but we are working with her and she's the former fellow at CRCP today is Friday, March 31st, 2023, and it's 3:00 PM Eastern Standard Time, 9:00 PM Hawaii time right 9 AM, Oh my gosh.

00:01:03 Lexie

And if you could please state to me your name, your current affiliation and title, and where you're calling from.

00:01:12 Mari

So I'm Mariko Quinn, but everyone calls me Mari. I'm currently a junior at UH Manoa and I'm also an intern at the Hawaii Institute of Marine Biology. And I'm calling from Manoa on Oahu.

00:01:26 Lexie

Very nice, thank you. So let's start from the very beginning. I read in an article that you grew up near Kaneohe Bay. Can you describe a little bit? What that area is like and what it was like to grow up there?

00:01:40 Mari

Yeah. So I grew up in Hayya, which is on the windward side of Oahu and I was really fortunate to grow up in a home that's actually right on the Bay.

00:01:50 Mari

So the water was basically like my backyard my whole life and my parents were both born and raised in Hawaii and so the ocean was really important to them and it was really important to them that they pass that on to their children.

00:02:02 Mari

And so I grew up basically like paddleboarding, snorkeling right outside my house, really for years and so, like everything that I love to do is around the water. I knew paddling, paddle

boarding, snorkeling, that kind of thing, and it was really impactful to grow up and that's definitely how I ended up in the job that I'm in today.

00:02:25 Mari

But it was also really interesting to see the changes in the Bay first hand growing up there.

00:02:32 Lexie

So would you say, like, your love for the ocean was really passed down to you from your parents, like they've always loved the ocean?

00:02:40 Lexie

Did they ever do anything in the ocean like uh or ocean related with their careers or they just, like, loved it growing up?

00:02:49 Mari

Um, yeah, so both my parents, I definitely think that my love for the ocean comes from them and they also really emphasized a very deep respect and appreciation for it.

00:02:59 Mari

My mom didn't go into an ocean related career, she's a pediatrician.

00:03:03 Mari

But my dad ended up being a boat captain for basically the entirety of his life and so he really made being on and around the ocean like his entire life, as much as he could.

00:03:14 Mari

And so that was very much what I was looking towards when I was growing up.

00:03:17 Lexie

That's super cool. What kind of boat captain was he?

00:03:20 Mari

So he has done a variety of different boat captaining. He for a while was running sailboat charters sailing between the Hawaiian Islands. But what he ended up doing was working as the boat captain running the research vessel for Hawaii Pacific University and he did that for 25 plus years and so that vessel actually operated in Kaneohe Bay and so I also grew up watching him do that.

00:03:49 Mari

Hawaii Pacific university has a program where they take their students out for boat labs on that research vessel and that was what he was in charge of.

00:03:57 Lexie

Oh my God, that's amazing. I bet he has some super cool stories.

00:04:01 Mari

He definitely does.

00:04:02 Lexie

Did you ever get to go out?

00:04:03 Mari

So when I was little on the weekends, he would take me out to where the boat was moored in the Bay for like maintenance and I would get to go with him in the mornings and like I really liked it cause it's obviously a bigger vessel than like any of the little boats that we had. And so I got to sit on like the bridge up at the top and I would like sit there in my little chairs like a four year old and watch the day from above.

00:04:30 Lexie

That's so cute. That's adorable. That's really, really cool.

00:04:34 Lexie

You touch kind of on my next question, a little bit, but you know you're still relatively young and still you seem to have noticed that there's already in your short life that like there's changes to Hawaiian reefs as you've grown up.

00:04:47 Lexie

So I'm wondering if you could talk a little bit about any like if you've observed any changes personally and if So what?

00:04:55 Mari

Yeah. So, my my dad growing up with him. He was a boat captain. He loved the ocean, but he was, he's also and still is like is very much somewhat of a nerd like he just he has a lot of knowledge and he really wants to share it. And so my mom would always say, like, you're giving the kids, like, way too in depth explanations like they are too little for that amount of detail.

00:05:18 Mari

But when I was little my mom likes to tell the story. When I was three years old, we were standing kind of like at the edge of like a pier looking at the water and looking at the coral and I

just like spontaneously told her I was like, mom, do you know what gives the coral their color? The zooxanthellae.

00:05:34 Mari

And she was, like, really shocked that I had picked up anything but I think coral for me was always a really big draw because our house was surrounded by several coral reefs and we had as a family talked about coral bleaching, a variety of different times just because we could see we had seen it in the Bay in years past, but when I was in 8th grade, which was 2015 the worldwide coral bleaching event hit Kaneohe Bay really, really hard.

00:06:05 Mari

And so the summer before 8th grade, I just remember, like you could stand in our backyard and you could visibly tell without being in the water that all of the reefs in front of our house were just white and it was really striking to see that because I had known those reefs for years and it wasn't just in front of our house, it was throughout the bay. The reefs were just entirely bleached.

00:06:31 Mari

And so that kind of led me in 8th grade to do my science fair project on coral bleaching, which kind of like, set me on this trajectory that I'm on today.

00:06:39 Mari

But I think that change was one of the most significant, and then seeing subsequently after that 2015 bleaching event, what happened to the reefs around my home has kind of always carried with me because. Even though a lot of the reefs directly in front of my house recovered after that 2015 bleaching event, a lot of them in subsequent bleaching years didn't recover, and so those reefs now are really not the reefs that I grew up with and so that's definitely been something that I carry with me.

00:07:08 Lexie

That's heartbreaking because you know, it takes literally something happening in your own literal backyard, you know, it's something that you've grown up with. And yeah, I, I would, you know, I'm a few years older than you, and I've witnessed bleaching events and loss, and it's not my backyard, but it's just, it can be really depressing.

00:07:31 Lexie

But you've noticed that there was recovery of reefs like you said, kind of near where you grew up and in certain areas where there was less reef recovery, do you have any thoughts as to why certain areas recovered better than others?

00:07:46 Mari

So in the Bay, it's the way that it's structured. There's definitely a lot of variation in how much water turnover there is, so the bay itself, I believe the residence time of the water there is about 3 days. It takes about 3 days for the water to come into the open ocean and then cycle through the full bay.

00:08:06 Mari

But for the reefs, like the ones near our house that are really close to residential areas that are really close to the coast compared to the ones that are closer to the Barrier Reef and to the edge of the bay. There's really wide ranges and the type of water that they're in specifically like the ones near our house, like we have a like it's not sewage, but it's a water outfall pipe for runoff that comes out right near our house and so the reefs that are near us are constantly exposed to that.

00:08:39 Mari

And that's the case for many of the reefs that are near the shore and the bay and so when corals are bleached, and they're already struggling, and they're already stressed when they're dealing with that run off on top of it, which is an added stressor of like they're potentially being smothered by sediments or that kind of thing that really impacts their ability to be able to recover and so in the bay, we've lost a lot of the really near shore reefs that we used to have, and so even though a lot of the corals in the bay are doing relatively pretty well, a lot of those reefs are the patch reefs that are a little bit further away from shore.

00:09:14 Lexie

Further away from shore. So what...

00:09:18 Lexie

This bleaching event you said was, kind of a change in topic, but you said it inspired your science fair project. Can you talk a little bit about that?

00:09:30 Mari

Yeah. So, 2015 this is the summer before my 8th grade year and in 8th grade in our Life sciences class. One of the big assignments was that we had to create a science fair project and we didn't necessarily need to compete in like districts or the regional fair or anything, but we just had to have signed for a project and I had done science fair like a few years prior.

00:09:51 Mari

But I had done like the really classic elementary school projects I looked at different methods of popping popcorn. Oh, different seed growth, things like that type of stuff.

00:10:02 Lexie

Did you make a volcano?

00:10:04

I did and it went great!

00:10:09 Mari

But for whatever reason, like an eighth grade, I like, I honestly don't know what it was. There was something about it, I was like I want to do something that's a little bit more relevant to my life, because that's what all the teachers say, right? Like, pick something that matters to you.

00:10:22 Mari

And so I, like this is gonna sound so cheesy, but I was at my neighbor's house one day, like looking at the coral and a lot of my neighbors were older than me and had done like various science fair projects. And so I was talking to them about, like, what I was going to do when we were tossing around a lot of different things about, like, soil and acidification and that kind of stuff. And I was looking at the corals that were very much still bleached, even though it was, this was at this point August. And I was like, I'm. I'm going to look at the coral. And I devised this project to basically track the recovery of 24 individual coral colonies in front of my house.

00:11:06 Mari

And I really like, as an eighth grader, I had no idea what I was doing but I had this idea and I really wanted to look at how well the corals around us were going to recover. Since I knew that, you know, it was possible for bleached corals to come back from that.

00:11:22 Mari

And so my eighth grade science teacher was amazing and she helped to put me in touch with a couple of researchers from Moku O Lo'e or Coconut Island, otherwise known as the Hawaii Institute of Marine Biology and they kind of helped to guide me towards some resources on how I would be doing this.

00:11:40 Mari

And so I learned about what a quadrat was and I built my own little quadrat with PVC in my garage.

00:11:49 Mari

And I reached out to the University of Queensland, who had just developed their coral health cards, which is basically like these circular cards, and they have like these different areas with like gradients of color. They're supposed to be able to be used to track like the health of the coral just visually with color and they were built for Australian reefs.

00:12:11 Mari

But we didn't have anything for Hawaiian reefs in Hawaii and so that was like the closest I could get. And so I kind of just arbitrarily picked the colors that looked closest to what I knew the healthy coral was going to look like.

00:12:23 Mari

Uhm, and I went out to these this specific reef and I selected my coral colonies. Every week for about 10 weeks and I took pictures of these 24 coral colonies and it was truly like that was actually, funnily enough, the most field based project that I've worked on and I kind of purposefully since then have stayed away from entirely field based projects because WOW, they are a lot of work.

00:12:54 Lexie

In what sense and sense of just like tiring or?

00:12:57 Mari

Tiring and time and also like the need where like even if it's like this very rainy day in November, it doesn't matter like you have to go out there and get your data. So you gotta just have to like suck it up and go get your pictures.

00:13:13 Mari

This one set of images I have from November where like you can see like the whole... They're just, like completely brown washed because the water was so gross. It had been raining so much and I just remember on that day I was like on the boat.

00:13:22 Lexie

Oh no.

00:13:25 Mari

And I was like man, I really don't want to do this anymore.

00:13:30 Lexie

So did you go out on a boat with your dad or how did you...?

00:13:34 Mari

Yeah. So my dad drove one of our little motor boats for me and we would go out on this reef and...

00:13:40 Lexie

That is so cute.

00:13:43

It definitely was. Usually he would stay in the boat and then I would go. I would swim with my quadrat that I had built and I had attached this, I had built a camera attachment to the top of the quadrat and I would swim around to my 24 coral colonies and like sometimes I would bring my brother to swim with me because I didn't, I never wanted to be in the water by myself.

00:14:03 Lexie

The lab assistant.

00:14:05 Mari

My little lab assistant, my younger brother. Sometimes I would bring like our neighbors like the other kids in the neighborhood. And yeah, it was really kind of this, it was a whole... It was very much a whole family affair, everyone, was helping me with it. Like everyone in our neighborhood knew about it and it really it taught me a lot. Like I loved that project.

00:14:27 Mari

But it, it was really fascinating because it was so impressive, the recovery that we saw in those like 10 weeks because almost every single one of those 24 coral colonies recovered, with the exception of like maybe 1 or two individuals and they recovered like in full, like by the end of the project they looked as good as they had looked at the beginning of January.

00:14:49 Lexie

So how long did you say it took for recovery?

00:14:52 Mari

10 weeks, 10 weeks. I think that by the time I had started the project it was late September. So they had kind of been through the worst of the bleaching event and the temperature increase and kind of we're already on that upward swing and I just kind of like so happened to start collecting data I think at the right time.

00:15:10 Lexie

Well, I just have to say this is so impressive to hear that you did this as like what an eighth grader or something like this is like, a master's thesis, that, that you were running.

00:15:25 Mari

I look back on it now and it's very much like what was I doing?

00:15:30 Lexie

That is just so impressive to hear that A) you like had this idea, B) you reached out to get help from all these different like resources, and then C) that you had everybody in your family in your neighborhood behind you, like monitoring these corals and collecting like really important data



and that also that you could have kind of. A little bit of a happy ending to your story, too is, is good as well.

00:15:58 Lexie

So do you think like? Like you were talking about earlier about mitigating factors that it's a high flow area kind of far from nutrient sources or inlets and stuff and maybe that's why the corals recovered there?

00:16:14 Mari

So I think. That reef actually isn't. It's, it's really close to shore. It's very close to actually two different runoff sources. And I think the reason why they recovered so strong in 2015 is because that was really one of the first bleaching events that they had gone through that was so significant.

00:16:32 Mari

And actually, in subsequent years, those corals have died, almost all of them and that reef is actually very much not what it used to be.

00:16:40 Mari

There's only maybe 10 to 20 remaining coral heads on that entire reef, and so even though they recovered in 2015 or in 20, yeah, 2015, that didn't last, which is really disappointing, but I think that it's that's the product of the other stressors and also just continued repeated stress.

00:17:01 Lexie

Do you think a combination potentially of subsequent bleaching events and you know long term stressors? That's sad. Yeah, sad to hear.

00:17:10 Mari

Yeah, it is sad cause like I still like. It's funny. Like once you like...I knew exactly where each of those 24 coral colonies are because, you know, you see the same route every week, you kind of and I still now like I could go out there and point out exactly where they were.

00:17:24 Mari

And so when I'm out there, I kind of look at them and there's like one or two that are still surviving. But yeah, the rest of them in, like, years since those kind of died and been taken over by algae, but yeah.

00:17:38 Lexie

I can relate to that experience as somebody who not as a middle schooler, but in grad school did a lot of you know fate tracking of colonies and I live in Florida, and so we're dealing with the

outbreak of Stony Coral Tissue Loss Disease was something that was happening just when I was starting graduate school, really in full force and you could just watch colonies.

00:18:02 Lexie

We had one site where you couldn't mark the colonies, so again you just kind of had to swim a route and we had maps and you just kind of got to learn the different colonies and and know them and then it was just really sad to see kind of a complete wipeout pretty quickly. So yeah, no, I, I know the feeling.

00:18:24 Lexie

In kind of lighter events I saw I read online that you did a Hollings prep program and then the actual Hollings internship, yes? I would love to hear kind of about your path to both of those programs and then from one program to the other and how do you feel about them? And if you feel like they, they benefited you kind of as a student or gave you valuable experience or anything like that?

00:18:58 Mari

So my path to Hollings is, it's a little, it's a little bit long, but basically like I, after my science fair project in 8th grade at the Hawaii State science fair with that project I met some researchers from the Hawaiian Institute of Marine Biology and one of them was the director of the Education Department and he basically said we have this like after school Marine Science Club, that's for high schoolers like you should join it next year.

00:19:30 Mari

So I joined the Marine Science Club when I was a freshman and that led me to in later years join the research experiences and marine science (REMS) summer program which is a local program that's built to get local high school students interested in marine science and that really was kind of the program that kind of reignited my love for science after my 8th grade Science fair project I encountered some issues in high school where like teachers weren't quite as willing to support my interest in research.

00:20:03 Mari

And so that summer program really kind of reignited my love for science and remotivated me to get back on that track and, and then after that I ended up as an intern for the Hagedorn lab at the Hawaii Institute of Marine Biology, which is one of the labs I'm still working in today.

00:20:20 Mari

And I worked there for several years and I also worked kind of as an intern or as a researcher with the REMS program and the Education Department.

00:20:31 Mari

And then when I was a freshman in college and I had ended up staying here, my mentor, who is the director of the REMS program, Dr. Malia Rivera, she was contacted about the Hollings Prep program. And she was like, I've heard of Hollings for many, many years, but this prep program is new and you should really consider applying.

00:20:54 Mari

So I applied and I got in and I was really lucky in that the He'eia NERR, which is the National Estuarine Research Reserve, they are kind of, they're located out at HIMB, but they also partner with two nonprofits in He'eia.

00:21:11 Mari

They had an internship position available and I started working with them, which was really impactful to me because one of the nonprofits that they work with is Paepae o He'eia, which is a fish pond restoration project or a Loko i`a restoration project that is like less than a mile from my house and when I was really little, I had actually grown up like my parents would take me to work days at this fish pond and we grew up like pulling mangroves there, which are really invasive here and that kind of thing.

00:21:43 Mari

So it was really special to go back there as part of my job and kind of start doing some research in those spaces and then after the Hollings Prep program I knew that I was gonna apply to Hollings and then I, I got in last spring.

00:22:02 Mari

And so this summer, I will be doing my internship in San Diego, looking at kind of different macroalgae feeding and diet for the white abalone.

00:22:13 Lexie

Oh cool. Is that going to be...?

00:22:14 Mari

Yeah, just something a little bit different.

00:22:16 Lexie

Yeah, different. Is that going to be through a NOAA lab or?

00:22:19 Mari

Yeah, yeah, it's with the NOAA Southwest Fisheries Science Center, I believe.

00:22:25 Lexie

Very cool. That's so exciting. It's nice to hear that you had a mentor who kind of reignited, like your passion for science, and I feel like a lot of times it's just somebody taking that one chance on you that then, you know, opens the next door, which opens the next door, which opens the next. And so it's cool that it seems like you had that experience, and it seems like you're excited for your Hollings internship.

00:22:50 Mari

I know.

00:22:51 Lexie

That's really cool.

00:22:52 Lexie

I did the Hollings program too, now years ago and I got to go to Guam and so that was really, really cool.

00:22:58 Mari

Oh, that's cool.

00:23:00 Lexie

I had a really good, really good summer. I didn't know that man...so mangroves are invasive in Hawaii?

00:23:08 Mari

So in Hawaii, mangroves are really, really incredibly invasive and actually in He'eia, we, in the area where this fish pond is trying to be restored and also a little bit upland, there's another nonprofit Kāko'o 'Ōiwi that's trying to restore more of the upland habitat.

00:23:28 Mari

But basically this whole area, it's really hard to explain, like without pictures to like just see the magnitude that had grown into this mangrove forest with the mangroves that grow like 20 plus feet tall actually way more than that, probably like 100 plus feet tall, and I don't remember what species it is but I want to say it's maybe the red mangrove, but yeah, they're massively invasive.

00:23:54 Mari

Hawaii is not set up to have mangrove habitats. We're not supposed to have those but we do. And so the problem in He'eia and also in several other locations, is that it prevents the flow of the streams down the mountain and into the bay, like how they're supposed to.

00:24:13 Mari

And so that prevents these fish ponds from having the right balance of sea water and fresh water that they're supposed to and so one of the big things with restoring this fish pond was removing an incredible volume of mangroves. And they did it over the course of, I think, close to 10 years, but the area that they cleared is truly spectacular.

00:24:39 Mari

And if you have time, you should just go and like Google pictures, because it's, it's honestly shocking and I think it was...it had a really big impact on me and I think other students who grew up in this community to see like how it started, which was as this really invasive, just like massive mangrove forest that all just we kind of all just took that that was like the way it was going to be and then kind of over the course of our childhood it was removed and converted like you can see how it was supposed to look. You can see how this ecosystem looked like 100 years ago or 200 years ago. And seeing that conversion has been really impressive.

00:25:14 Lexie

Do you know how the mangroves got there in the first place like were they planted?

00:25:20 Mari

No, I actually don't. I want to say that it was brought in, I'm going to guess on some type of ship. That's usually how things get here, but, yeah.

00:25:34 Lexie

And then do you know if downstream kind of, of the bay and and the, the fish ponds, do you know if that having mangroves has any effect on the reefs?

00:25:47 Mari

Yeah, so that's been kind of one of the areas of interest that the He'eia NERR and some other people have been working on because one of the areas of concern was if you're going to remove this massive volume of mangroves, are you going to remove what is effectively a filter for large amounts of sediments in the bay?

00:26:04 Mari

Like, are you going to release a lot of sediment into the bay? And so far it looks like the answer is very much no. Like the, the mangroves are removed, but they're also being replaced by native vegetation. And so it's not really clearing the stream to just be a large outfall into the bay, it's kind of just changing how this ecosystem is supposed to look. And I'm very much not the expert on this, so don't quote me but.

00:26:31 Lexie

No, it's this is just so interesting to hear about because in Florida, we...

00:26:34 Mari

It is.

00:26:35 Lexie

have the opposite problem where...?

00:26:39 Mari

Yes, but in, that was one of the main areas, areas of concern was like, are we going to suddenly release a bunch of sediment into the bay? And we haven't seen any of that and the research that has come out has been that the corals have not been negatively impacted by the removal or anything like that, but, yeah.

00:26:57 Lexie

That is so interesting. I never knew that. So thank you for teaching me something new. So we touched a little bit on it. So you're now currently a junior. You said you're still working in the Hagedorn lab, was it? Can you tell me a little bit about your work you're doing now or some other things you might be working on or studying?

00:27:22 Mari

Yeah, so uhm, I've been working with the Hagedorn lab for about 5 years. I started with them, when I was in high school, as I was also kind of working with the REMS program. And so it was really beneficial for me to kind of have both sides like the REMS and the education program and then also the Hagedorn lab and more of this like in-depth lab experience.

00:27:46 Mari

So right now I'm working on a project to cryopreserve the symbionts from coral. So Mary Hagedorn, her whole thing in her brilliance, is cryopreservation of corals, specifically coral gametes and so the idea is that genetic diversity really needs to be preserved when we're thinking about conservation and when we talk about coral conservation and restoration, a lot of times people are talking about fragmentation, right?

00:28:15 Mari

We use smaller fragments of coral because that accelerates their growth rate and we use that as a restoration mechanism. But when we focus on fragmentation, you're not adding in genetic diversity. And so the idea is if we cryopreserve sperm, for example. Coral sperm. Then in 100 years, you know, if we're really facing a diminished population, as long as we can get corals to spawn and we have some eggs, we can reintroduce some genetic diversity and try to make sure that we keep that population as strong as possible.

00:28:44 Mari

And so for the last few years I've been working the project working on the cryopreservation of symbionts, because if we're going to help these coral larvae grow in the future with cryopreserved sperm, they're also going to need symbionts to take up and there's no guarantee that we will have those in the right clades that the corals need to take up, and so cryopreservation of symbionts has been the thing that we've been working on for the last few years.

00:29:10 Lexie

Wow, that's really cool. I've heard about the cryopreservation of sperm, but I haven't heard about the symbionts yet.

00:29:11 Mari

It's really cool.

00:29:17 Lexie

So are you just culturing the symbionts in in essence and then cryopreserving them from there? Or how does it work?

00:29:25 Mari

So we actually extract our symbionts directly from corals. So the day of an experiment we will extract, we extract them using a waterpik actually like a dental waterpik, but basically just like a really high power, you know, stream of water that blasts off the coral tissue and also the symbionts and then through a variety of like filters and spinning down in the centrifuge, we concentrate it to just...

00:29:38 Lexie

Used those before.

00:29:50 Mari

Be the symbionts in as high of a concentration as possible and so we've used that because culturing symbionts can be particularly challenging, but in the future I think we're going to work on cryopreserving symbionts from culture.

00:30:07 Lexie

So have you had much success then? Have you tried, once you preserve them, bringing them, reviving them and bringing them back?

00:30:16 Mari

So about two years ago, we had our first success in getting the symbionts to live through being cryopreserved, which was. It just was so amazing and just a really incredible moment to be there to witness.

00:30:29 Mari

And then last summer, 2021, we had our first moment of having a coral larva that took up a previously cryopreserved symbiont, which was also really, really incredible. So we do have a methodology that works, but it's a pretty small scale one, and so what we're working on now is trying to figure out how we can scale up so that it's more applicable for conservation purposes.

00:30:56 Lexie

That is so cool. How much success have you had... have you all been trying to do eggs as well? Or is that...?

00:31:06

So eggs are really challenging because they're so fatty and so one of the things with cryopreservation is you, you do not want, you cannot have any ice crystal formation and so we put samples through a variety of different chemicals to try to reduce that ice crystal formation and get what we call vitrification, which is called like turning to glass, but basically it just means that things will freeze without ice crystals and with eggs that's really hard to do. So eggs is not something that we have been working on. There's other people in the world who are doing that, but that's not something that we work on.

00:31:41 Lexie

How do they do that with human eggs? Do you think coral eggs are fattier? I don't know.

00:31:45 Mari

I actually don't know.

00:31:47 Lexie

That's interesting. That's really, really cool. Are you focusing...? Are you just kind of collecting...? Do you all go out and collect spawn like sperm and do you...? Do you have certain targets or do you just go out and kind of randomly hope for the best?

00:32:07 Lexie

I guess my question is, how do you know what, what level of genetic diversity you're capturing versus potentially genetic clones or or coral? Twins of one another.

00:32:19 Mari

So depending on what we're trying to do, we will use different collection techniques but every summer the spawning season is always like one of our busiest. Actually this summer since I'll be at Hollings will be the first summer in about 5 years that I haven't done coral spawning, so that'll be really interesting, I might have some withdrawals, but so depending on what we're trying to do, we will either collect individual coral colonies off of a variety of patch reefs in the bay and



then we will keep them in individual tanks and we'll collect their bundles individually and that way we can control the pools of like who's getting crossed with who and that kind of thing or if we are just trying to get a bulk of whatever's out there, we will go out in kayaks and actually scoop the bundles off of the surface of the water just around Moku O Lo'e and just get as much as we can from whoever will get it, and we'll use that for like bulk cultures of what's around.

00:33:18 Mari

But in the last several years, our main species that we work with in the bays is *Montipora capitata* or rice corals it's one of the two most prevalent species, *Porites compressa* is the other one. They're our main reef builders in the bay, but in the last few years the capitata spawn that we've collected from the wild or just from the kayaks has been really poor reproductively.

00:33:41 Mari

They have yielded really, really bad larvae and that's part of this other kind of piece of research that Mary was doing when I first started working with her, which was kind of understanding that even if corals have visually recovered from a bleaching event, their gametes and their reproductive ability actually doesn't fully recover for potentially another like 3 to 4 years after that.

00:34:06 Lexie

So you think they're just stressed or they've put all of their energy into recovering from the bleaching event and have less energy to reproduce?

00:34:15 Mari

Yup, mhm.

00:34:15 Lexie

That's hard.

00:34:16 Mari

Yeah.

00:34:16 Lexie

That's crazy secondary event effects, I guess. Do you know, if anybody is looking at recruitment and if recruitment is also down?

00:34:28 Mari

I believe that people are, that's not something our lab does, but I believe there are people in the Coral Resilience Lab at HIMB that are working on that.

00:34:36 Lexie

That's really cool. So this is awesome! Sorry, I, I did coral genetic stuff for my PhD, so I love to nerd out and talk about all this stuff, but we did not get into cryopreservation or anything. It was just collect in the water and preserve it immediately. I don't want to deal with it in the lab. But that's really cool and I didn't know that you could scoop up the gametes from a kayak. I've only seen you know how we do in the Caribbean we put, you know, drape...

00:35:07 Mari

A net yeah...!

00:35:09 Lexie

And netting and collect gametes that way, but that's really cool that you could just...

00:35:13 Mari

Yeah, yeah, the really the really big spawning events in the Bay are really impressive, because around Moku O Lo'e, right? It's, it's a really small island and it's basically surrounded by coral reef and so on the really big nights, it'll, the surface of the water is just like blanketed in bundles from corals and it's it's really crazy.

00:35:37 Lexie

That's so cool! I just, oh, wow, that's really impressive!

00:35:42 Lexie

So are you planning to continue working in this lab?

00:35:49 Mari

Yeah so I am planning to continue with them at least for the next probably at least until I graduate I will be working with them. Kind of what I'm doing after graduation, is kind of up in the air. But yeah.

00:36:06 Lexie

That was going to be my next question, you don't have to, you know, have a specific plan or anything, but in your dreams where would you see kind of the next, the next steps in your career path going?

00:36:19 Mari

Yeah, so for years, my very, very immediate answer to that was I was going to go directly into a PhD in marine science, and that is still mostly I think what I want to do, I think I will be taking a gap year but going into PhD is still my plan.

00:36:37 Mari

I think what I've been considering more recently is that I would really like to do work that kind of includes a little bit of policy and community based research initiatives a little bit more.

00:36:53 Mari

Which is something that I kind of would like to reflect in my graduate work, but kind of figuring out how to make that happen is a little bit of a challenge since that's not the most common thing to do, but definitely graduate school, I think, is on the horizon.

00:37:05 Lexie

Do you think you would want to continue working with coral reefs?

00:37:08 Mari

I do, I think corals have kind of always been my one true love. In the last few years I've also been working on urchin reproduction. So I never thought like when I started this, but like invert reproduction was gonna be my thing but it's kind shaken out that way, I started working with urchins when I was in the Hollings prep program as a NERR intern.

00:37:34 Mari

And then that's kind of become the basis of my undergraduate thesis and some of the other research that I'm doing now and so that's also been really interesting. I think in general of genetic impacts on invert reproduction just across the board is really interesting. But corals are very much what make me the most happy, so I would like to continue doing that.

00:37:56 Lexie

And do you, do you have any ideas of how you would incorporate more of like community engagement or, or things like that that you talked about being interested in?

00:38:08 Mari

So I think it's really it's easy for me to imagine those connections and possibilities here, just because I've grown up here and like I can see how I could get involved with the community and work with people who are from here and working here but I think since likely I will go away for grad school it's a little bit harder for me to think about how I'm going to engage with the community that I'm not from.

00:38:37 Lexie

Absolutely, and you kind of touched sort of on my next question, which is, you know now being young living in Hawaii, working on coral reef issues like what is that like? Do you feel like people maybe outside of your, of your college program are still really engaged in issues that are happening, you know, either on Hawaii's coral reefs or or environmentally in general?

00:39:05 Mari

Yeah, so I think depending on...I think it depends. I think overall the people in Hawaii are very passionate about their natural environment. I think growing up here, we're we're all kind of raised with a sense of responsibility for our natural resources and so I do think that people are very conscious of the issues that are happening, a lot of people who have grown up here, they're well aware of what's happening and you know the risks that we're facing, the threats that we're facing in terms of our reefs and also like our upland environments because people have seen the changes just like I have, they've seen what can happen to their backyard.

00:39:47 Mari

And so I think in that sense, people are very much aware and they want to do something, but I think where we lack awareness is with all of the research that's happening in relation to it. I think that there is kind of a lack of scientific communication and engagement with the community in terms of understanding, you know what we're trying to do, but also the community trying to express what they would like to see. So there's kind of a disconnect there, but I think in general people are very aware of what is happening.

00:40:18 Lexie

Do you think that's maybe also like you said, kind of a lack of scientific communication, like maybe from the scientists standpoint too that they could do a better job maybe at communicating their work?

00:40:31 Mari

Definitely, I think that. You know, most researchers whether they mean to or not. Academia kind of breeds, you know, a very specific type of communication, and it's not necessarily the type of communication that is most accessible to the general public and community.

00:40:53 Mari

And I think that things at the Hawaii Institute of Marine Biology are improving. There's a lot of great programs that are focused on community outreach and a lot of specific labs. They're working hard to try to translate their research to the public and get it out there. But that's very much kind of something that I think has recently started to become a priority and it very much should be.

00:41:17 Mari

But you know, like I grew up probably like 5 minutes away from the pier to Moku O Lo'e like we're we're very close to that research facility and a lot of people in my neighborhood still today they have no idea the research that's happening out there. So I think that that kind of thing is how the scientific communication starts lacking and that's why people kind of don't really know what's going on or what's being done.

00:41:42 Lexie

Yeah I'm surprised you wouldn't do like a field trip or something there I don't know. So I know you said there's kind of, you know, varying levels in engagement, but I'm interested sort of what would you say some of the biggest environmental concerns that young people, locals in Hawaii have?

00:42:06 Mari

I think, I mean, right now I think the biggest one environmental not related to the ocean, it's Red Hill. I think that that's been on the forefront of a lot of people's minds because that's what's been in the news and it's very much, I think the most immediate threat for us. The Red Hill...

00:42:28 Lexie

Yeah, just describe what what's happening?

00:42:31 Mari

Yeah. So the Red Hill bulk storage facility is run and owned by the US Navy and it sits directly over the Southern basal aquifer, which is a single source aquifer that basically provides the water for upwards of 70% of Oahu's population. So that is our fresh water source. That's it.

00:42:51 Mari

And this fuel storage facility it has the capacity to hold, I think 140 million gallons of oil. It's the volume is massive, there's 20 tanks. Each of them are bigger than Aloha Tower and it has been there for decades and decades and decades since about World War 2. 1941 is when construction was built, was started, and since then it has actually leaked over 75 times. Most people don't know that, but it's been leaking, it's leaked for for quite some time.

00:43:26 Mari

But in November 2021, there was a really big fuel spill. In which the water actually or the oil, the fuel actually contaminated drinking water, we've recently found out that it's not just fuel that contaminated drinking water it's also antifreeze and that poison.

00:43:44 Mari

Yeah, a lot of people actually living on base in the Pearl Harbor or Pu'uloa area. But those tanks have still the Navy has failed to really take accountability. They've said that they will remove the fuel from those tanks, but they have yet to do so, and so the threat is very much still present and since November 2021 there have been a couple of smaller leaks and most recently in November of 2022, I want to say there was a leak of firefighting suppressant which has PFAs or forever chemicals onto the soil of Pu'uloa, so that could also contaminate our drinking water.

00:44:23 Lexie

Why is all that stuff in those fuel tanks like how is all of that leaking in too?

00:44:29 Mari

Yeah, yeah so the fire suppressant was supposedly, uh, you know, like, if you're going to store fuel, you have to have a fire suppressant and, and then they leak both.

00:44:39 Mari

It's honestly it is, It is ridiculous the lack of responsibility and just like it's insane to think about how irresponsible and the lack of consideration and the lack of care and it's, yeah.

00:44:53 Lexie

What is the military's excuse for not having drained them yet?

00:44:59 Mari

So their excuse for not having drained them, they wanted to, they love to say national security. They love to say that we need to have the fuel somewhere, yeah.

00:45:06 Lexie

You can't ask questions.

00:45:09 Mari

Exactly and that's kind of been a blockade that they put up for a long time, but now in spring of 2022, they finally said that they would agree to defuel, but they said that they would agree to defuel on an extended timeline. So they're targeting 2024, summer of 2024, for a full defueling which everyone here is saying that's way too long we like...

00:45:31 Mari

No one knows how much chemicals or fuel or whatever else you could put into the environment or our drinking water before then and so they claim that they need to work on repairs of the tanks before they defuel the tanks in order to do so safely, which in and of itself is really alarming and does not exactly express trust or reliability in terms of the fuel storage facility, but they claim that they are currently working towards defueling.

00:46:00 Lexie

So what are you doing in the... what are you and others doing...? Do you drink the water or?

00:46:05 Mari

Yeah. So there's one area in Pu'uloa that still do not have clean drinking water. It's primarily people who live on base. So there's actually several active duty military who just filed their first lawsuit against the Navy for their contamination of drinking water for the rest of us, like, as far as we know our water is clean.

00:46:27 Mari

This is of course, with the exception of certain areas. It just came out last week that Kunia, which is a community kind of near Pu'uloa. Their drinking well, is contaminated with forever chemicals or PFAs. And so they just had to put out a bottled water advisory and they can't drink their water. But for now, the rest of us still can and are, but yeah.

00:46:54 Lexie

Oh my God that is crazy.

00:46:58 Mari

It is crazy and it's also like the aquifer, the concern, especially with the PFAs, the PFA spill in 2022, was on the soil right? But with the way that our aquifer works, that will eventually seep into our aquifer and so, like, who knows that in 20-25 years like the next generation, they could be drinking water that's contaminated with PFAs that spilled in 2022.

00:47:24 Lexie

It might be this long term issue that we don't even know the effects of until down the line.

00:47:28 Mari

Very much so, yeah.

00:47:30 Lexie

So how?

00:47:30 Mari

Yeah, and that art has been...

00:47:32 Lexie

Sorry, go ahead.

00:47:34 Mari

Sorry, no, I was just going to say that's been part of the issue with which is like the lack of transparency like we really, we don't know what's in the water. Because we've... people have tried the Sierra Club. The more water supply has really been fighting for independent testing and finally has gotten some of that.

00:47:50 Mari

But for a long time, we had to rely on the US Navy and what they were claiming was OK, which is really sketchy it's not something that we believe in and it's not something that we trust.

00:48:02 Lexie

So how, how are most people I guess responding, responding or engaging with this issue?

00:48:14 Mari

Yeah, so I think you know, a lot of the community is angry about this, but I think also a lot of the community kind of doesn't know what to do with that anger. The most recent push has been the Environmental Protection Agency proposed a 2023 consent order. So in 2015, there was a bigger, there was a big fuel spill. Not as big as 21, 2021 fuel spill, but a smaller one in 2015 and following that the EPA and the state of Hawaii and the US Navy came together, and they created a consent order, which basically stated that the US Navy would either defuel or repair by a certain timeline and then a couple of years later the US Navy was like, actually, we decided we can't meet that timeline. Just kidding, we won't be able to do that.

00:49:13 Mari

And then in 2021 they had a massive spill as well, but anyway, the EPA came out with a consent order in late 2022 and they did not include the Department of Health, the State of Hawaii Department of Health nor did they include the board of water supply. They only entered into it between the Environmental Protection Agency and the US Navy. They did not include any state entities.

00:49:29 Mari

And so there was a period available for public comment up until about mid February and there were, I think, upwards of 2000 people who submitted public comment, largely because of the efforts done by the Oahu water protectors, which are an amazing activist group that are working really hard to address the issue, and also the Sierra Club who really are working really hard to motivate people and kind of get people engaged and kind of showing people how to engage through these more formal avenues.

00:50:00 Mari

And so I think submitting that public comment before the EPA creates their final consent order was really important. We're still waiting to see the final consent order and if they took into account any of those public comments, but I think seeing how many people engaged in that and also just seeing how many people attended, like the hearings that the EPA held was really incredible.

00:50:23 Lexie

Do you think that this is, for lack of a better word, fueling distrust between like between you know, people and the federal government, between state agencies and federal agencies?

00:50:42 Mari



Yeah, very much so I think that this instance with Red Hill really just clearly emphasizes and articulates how little the US Navy and other military entities care about these locations that they inhabit. The facility has been leaking for years. This obviously is not the first time it's leaked 75 times since it was created and even in the face of people experiencing symptoms of jet fuel consumption, symptoms of fuel exposure in late November 2021, they for days and weeks they were saying that the water was safe to drink.

00:51:21 Mari

People were putting out videos of them literally lighting their water on fire because of how much fuel was in there, and they were saying it's fine. There's nothing in there. And I think that just that blatant lying, is impossible to get over like we the people of Hawaii will never trust the US Navy again. We can't.

00:51:43 Mari

And it's they're also, they're doing the same thing on other islands a couple months ago on Haleakala there was a spill that was associated with the space force of fuel on the top of Haleakala, which is one of our most sacred mountains and it's the same kind of concept that they just don't care and they aren't paying attention and they don't have the consideration and respect that you need to operate in this area because you have to be, you have to have care, you have to have consideration, you have to have respect it's basic principles of responsibility. They just don't have.

00:52:16 Lexie

Do you think this might be affecting how the public may feel or or kind of see distrust between the public and other federal agencies like NOAA?

00:52:27 Mari

Very much so. I think that it's all intertwined and it's really hard to kind of separate that out for people and to kind of try to disseminate where the lines are of, like trust, because there's a long history of distrust between the military but there's also a real long history of distrust with the State and that as you've mentioned, though, it trickles down to a lot of state entities and federal entities.

00:52:51 Mari

And that, you know, comes back around and impacts the research, people a lot of times don't trust or aren't willing to trust restoration strategies because they're coming from these entities that they have historical mistrust with and that kind of thing and so it very much all trickles down into any type of branch, I think.

00:53:15 Lexie

Well, thank you so much for sharing on you know that aspect you, you've taught me a lot about it. I mean, I've just done preliminary research, but to hear your perspective is really, really interesting. So thank you for sharing.

00:53:30 Lexie

I guess kind of on a, on a different note you know, you feel very passionately. This is your home, you know, Hawaiian reefs, you've literally grown up with them. What would you say sets them apart from other reefs throughout the world?

00:53:50 Mari

Good question. Let me think about that first.

00:53:52 Lexie

No, I know it's kind of an arm wavy question, but I guess what makes them special to you? Is, is sort of maybe a better way to ask that question.

00:54:03 Mari

Yeah, coral reefs in Hawaii. I mean, they are depending on where you are I think they, they can, they come in so many different forms. So Kaneohe Bay is that's where I grew up and that's where I have the most experience. It's such a unique environment, even within the Hawaiian Islands, there really isn't another place like it where we live.

00:54:33 Mari

There are really only two dominant species of coral that I mentioned, and those two species of coral kind of create this entire network of thriving reefs and the diversity I think in how many different types of ecosystems you can find is what really makes it unique.

00:54:51 Mari

Kaneohe Bay is so different from reefs let's say, like on the West side, and why not, and that's different from reefs that you can find out in Kona on Hawaii Island. And those are very much so different than reefs you can find out in the Northwestern Hawaiian islands. And I think that type of those differences and just really the uniqueness and how those different environments form is what really sets them apart.

00:55:14 Lexie

That's really cool. Have you, have you gotten to travel to the Northwest Hawaiian Islands at all?

00:55:18 Mari

I haven't. That's one of my #1 life dreams is to be able to go out there. Yeah, I mean, you know, it basically has to be on a research cruise, but that's one of my biggest dreams is to go out there.

00:55:33 Lexie

Has the, the vessel that your dad was running, did it ever go out to any of the northwest..?

00:55:37 Mari

No, they, they stay around Oahu because you need like a very, very big one. Well yes, but also like you need special permission since the Papahānaumokuākea was established and that's a marine reserve and so you need permission to go there.

00:55:56 Lexie

Wow, it looks beautiful, but yeah...

00:55:58 Mari

It does.

00:56:00 Lexie

I'm glad that it's it's well protected and that you need special permissions.

00:56:06 Lexie

So all in would you say that you feel hopeful for the future of coral reefs?

00:56:15 Mari

I think so. I think that really if I've learned anything in the last five years it's that things are more resilient than you expect them to be, and you know, even if things keep going wherever they're going in in 30 or 40 or 50 years like we end up losing like potentially certain species of coral we might lose certain diversities.

00:56:39 Mari

I think that coral reefs are still going to be here because I think that they're a lot more resilient than we think they are people often and refer to Kaneohe Bay as the ocean of the future because it has a really long history of pollution and other factors and also just the way that it's formed kind of changes the dynamics of how it works and the corals there are doing quite well, like they're basically thriving.

00:57:07 Mari

And so I think that even though it's really easy for things to look really grim in the face of these larger bleaching events and all of the other million stressors that they face, they're more resilient than we think they are.

00:57:22 Lexie

Well, I think what you know, your research with the cryopreservation and stuff is is very is a hopeful thing to do and is really, really impressive and you know you're, you're safeguarding potentially the, the next generation of corals. Hopefully not, but it makes me feel more at peace that we have this gene bank and we have this potential to help, help coral reefs naturally recover and help restore them or help them themselves.

00:57:52 Lexie

Well, I'm at the end of my questions and I do want to be mindful of your time, but is there anything else that, that you would love people to take away from this interview or anything else you would like to share?

00:58:07 Mari

Nope, I think that's about it.

00:58:10 Lexie

Well, thank you so much. I feel like I could talk to you all day and nerd out on corals with you and learn about Hawaii because it is... I've never been and it is just really different from my kind of background, which is mainly in Florida and the Caribbean and so it's really cool to learn from you and I want to thank you so much for your time and, and for talking with me.

00:58:37 Mari

Yeah. Thank you. It was really nice to talk with you.

00:58:40 Lexie

And I, I think once we have the recording you know gone through, uh, I think we send it to you and just make sure you know you can listen to it and that you're OK with it before you know we, we publish any materials or anything out of it so just to let you know, that's gonna happen. And yeah, thank you so much for your time.

00:59:03 Mari

Thank you.