

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
VOICES ORAL HISTORY ARCHIVES

AN INTERVIEW WITH ALISON MOULDING  
FOR THE  
DECADES OF CHANGE IN THE FLORIDA REEF TRACT:  
AN ORAL HISTORY PROJECT

INTERVIEW CONDUCTED  
BY ZACHARY MASON

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Zachary Mason: This is Zach Mason recording a remote interview with Alison Moulding from my home office in Baltimore, Maryland. It is August 13, 2020. This interview is part of the NOAA Heritage Program Project, combing NOAA data with oral history to demonstrate two decades of change in the Florida reef tract. Alison, could you introduce yourself really quick and let us know where you are calling in from.

Alison Moulding: This is Alison Moulding. I'm a coral biologist with NOAA Fisheries southeast regional office and I am calling in from St. Petersburg, Florida.

ZM: Excellent, thanks. I find its best to start these interviews right at the beginning. Would you mind telling me when and where were you born?

AM: Sure. I was born in 1975 in New Brunswick, New Jersey and my family moved to Florida when I was three years old. I've been in Florida for most of my life.

ZM: Oh, wow. You weren't in New Jersey very long.

AM: No, [inaudible].

ZM: Where in Florida did you move?

AM: We moved to Jacksonville, Florida. I spent my whole childhood in Jacksonville and then, went away to college in North Carolina. Then, [I] came back to Florida to Miami for a number of years. Then [I moved] to St. Petersburg.

ZM: Okay. What was growing up in Jacksonville like? Can you tell me a little bit about it?

AM: Sure. I lived just outside in Orange Park, which is kind of a suburb. I liked living in Florida. I liked Jacksonville. We weren't super close to the beach, it was about an hour away, but I used to spend a lot of time there, particularly when I got older and I was able to drive and had friends who drove. [I grew] up doing outdoor activities [like] water skiing. We lived on the water on the St. Johns River, so I spent a lot of time doing that. I really loved living there, but I was ready for something different when it was time to go off to college. As soon as I moved, I missed being by the ocean, so I moved back.

ZM: What did you study in college? Were you interested in the ocean before you went to college?

AM: Yes, I decided, I don't know, sometime in middle school that I wanted to be a marine biologist. So, when I was looking for colleges that was one of the criteria. I wanted them to have a marine biology program. I ended choosing Duke University. They didn't have a marine biology degree, but they had a marine science campus – a whole separate campus. I ended up spending a whole semester there in my junior year and a semester abroad in Australia. That's where I really got my marine science background. I always knew I wanted to be marine biology from a young age, but it wasn't until after college that I decided to focus on corals.

ZM: Do you remember when you decided to be a marine biologist? Was it one moment that you decided this is what I want to study or did it slowly work itself out that way from spending so much time near the ocean?

AM: When I first decided that I wanted to do marine biology? Well, I think [laughter]. People are going to laugh because it's kind of a stereotypical maybe way people think of a marine biology. I loved dolphins when I was young. I thought they were an amazing animal and I wanted to study dolphins. I think being near the water and the ocean definitely had an influence on that. Then, as I got older, I realized that that's probably not what I wanted to do. I took an invertebrate zoology class when I was at the Duke Marine Lab [Duke University Marine Laboratory] and that's when I kind of fell in love with invertebrates. I decided that that was a lot more interesting and probably what I'd like to focus on.

ZM: Can you tell me a little more about the program at Duke University? They had a marine science lab, but not a marine science program, is that correct?

AM: They didn't have a major. I majored in biology, but I had what they called a "concentration" in marine biology. They had a separate campus out on the coast. You could spend a semester there or a summer. They also had a graduate program out there. That's what I did and that's how I got most of my marine biology classes. Like I said, I also got some from spending a semester abroad.

ZM: Where did you go abroad?

AM: I went to James Cook University, which is in Townsville, Australia.

ZM: Oh, nice. Where you a scuba diving by this point? When did you start diving?

AM: I got certified when I was at the Duke Marine Lab. I spent some time snorkeling when I grew up, but diving was definitely new to me. Several of the students that were at the marine campus decided that we would all like to get dive certified. We had a class that was just a small group of students. I was there in the fall semester, so by the time we ended up actually getting certified it was probably around October. Diving in North Carolina in October was not the most pleasant experience. It was really, really cold and really, really bad visibility. It was completely different experience once I started diving in Florida, in South Florida in particular along the reefs. It was much more enjoyable.

ZM: I bet. You said you had experience snorkeling before you even started diving. Do you remember the first time you saw a coral reef?

AM: Yes, the first time I saw a coral reef was probably in high school. My family took a vacation to the U.S. Virgin Islands. I remember going on a guided snorkel trip in, I think it was in Buck Island, their national monument. They have a snorkel trail. I remember having to go along this trail following whoever the leader was on the boat. We'd all snorkel one behind the other in this line. I remember being very frustrated because the leader would dive down and point out things, but you really couldn't see because there were people, and you were on the surface. I have recollection that you weren't supposed to dive down but I could just be making

that up. So, it wasn't the most awe-inspiring experience. But my next experience was in Australia on the Great Barrier Reef, so that was a much more exciting and memorable time. I remember coral everywhere. I couldn't believe how much coral was there. By that time, I was dive certified so being able to get up close made a big difference in what you could see. Fish everywhere. So many fish. I'd never seen so many fish in my life. I saw this huge giant clam on my first dive. That was really amazing. That was probably my favorite part of the whole dive trip – this huge giant clam. I remember it was kind of partly open. They have photosynthetic algae in their tissues. They like the sunlight. I remember going to touch it because it just looked so soft. I put my hand gently on the tissue. It actually jumped. I think I just scared it. And it scared me because it was such a big animal to actually see. It didn't move very far, but it did jump like off the ground. [laughter] It was very surprising, but very cool.

ZM: You said sometime in college is when you decided to move away from marine mammals and toward marine invertebrates. Do you think that trip had an influence or had you already decided by that point?

AM: By that point, I had already decided. I also took a marine mammals lab at the Duke Marine Lab. I really enjoyed it, but there was something about invertebrates. I just found them so interesting in all their different forms. I just really fell in love with them. That's when I decided that invertebrates are the way to go. It wasn't until after I was graduate that I started to focus on corals.

ZM: What year did you graduate?

AM: I graduated in 1997.

ZM: What did you do after graduation?

AM: I took a year off. Because I spent my whole junior year away [in Australia], I didn't have some of the courses I needed to graduate, so my senior year was kind of difficult. I was trying to take some courses that I needed to fulfill my requirements. It was so much that I didn't have time to study and take the GREs, which I needed to do for graduate school [Editor's Note: GRE, or Graduate Record Examinations, is a standardized test that many graduate programs require.] I took a year off. I did an AmeriCorps internship in Biscayne National Park. That was a really great experience. That's where I decided I wanted to focus on coral reefs. The project I was doing was with sea turtles. I would walk on the beaches on the islands in the park and look for sea turtle nests. If we found them, we would put wire mesh screen on top because they had a lot of problems with the raccoons digging up the nests and eating the eggs. We'd find the nest, record them, [and] put the screen on. Then I think it was forty-five days later, we'd take off the smaller mesh screen so the turtles would just be able to crawl out from underneath the screen when they hatched. When I was there, my mentor was interested in corals and sponges. He started to teach me coral species. That was really cool when I could start identifying corals to the species level. That's when I decided. I like invertebrates and now I know some things about corals. I think that's what I'm going to focus on. During that internship, I started to apply to graduate schools and took the GRE. That's where it all began.

ZM: Where did you end up going to graduate school?

AM: I went to the University of Miami, which was convenient because I was already living in South Florida. Because I was a state resident, they had some scholarship opportunities which was a nice component too. They also have an advisor who was studying coral reefs. [Peter Glenn?] was my advisor. He was mostly focused on Indo-Pacific reefs in the eastern Pacific area. I was really interested in more Florida reefs, my own backyard type of thing. He agreed to take me on. That's how I got started in coral research.

ZM: Can you tell me about your graduate curriculum or what your major focus of study was there?

AM: The program I was in was called, at the time, "Marine Biology and Fisheries". We had to have a background [in] some core courses you had to take. I had to take Geological Oceanography, Chemical Oceanography, Physical Oceanography, and Biological Oceanography. Those were the core courses and then it was kind of whatever else you wanted to take that was related to what you were studying. I think I also had to take statistics. I think that was another one of the requirements too. I don't think I actually ever took a coral reef class. The person who taught it ended up leaving my first year there. I did take a tropical marine biology class that had coral as part of that. I took several courses that were related to marine biology. It was so long ago. I remember I took a mangroves class. I took two statistics classes. I took a marine disease class [and] the tropical marine biology.

ZM: Your advisor was more interested in Indo-Pacific reefs. Did you ever think about leaving Florida at this point or did you really know you wanted to stay local for your research?

AM: No, I had decided I wanted to study corals in Florida. He was focused on the Eastern Pacific and that's where he did all his research, but there was another student in his lab who was also looking into coral reefs, so it just worked out really well that we were able to partner and dive together. And help each other get our field work done.

ZM: What year did you finish up with graduate school?

AM: officially, I think it was 2007, but by 2005 I had my whole dissertation done and defended. It just took me a little bit of time to finish up all the revisions. It was the end of the calendar year, so it ended up going into 2007. 2007 was my official graduation day, but 2005 was really when I stopped working full time at school. I took a job in 2005.

ZM: What job was that?

AM: I was working at Nova Southeastern University as a research scientist. It was a really fortuitous opportunity. One of my advisor's former students who was there right when I started, had been working there and got another position and left. He had some projects that were looking at coral reproduction, which is part of what I studied in grad school. It was a nice fit because he was leaving, and I was available. I had some experience. It was nearby. My husband, we weren't married yet at the time, but we'd been dating for a long time, was still in

grad school at the university of Miami. It was close by. It was just in Fort Lauderdale. I took the job there as a research scientist. I was there for about six years until my husband finished up and got a job at NOAA Fisheries. So, we took off and moved to St. Pete [St. Petersburg] and that's how I ended up working for NOAA Fisheries.

ZM: Before we jump into your NOAA Fisheries work, what kind of coral reproduction work were you doing at Nova?

AM: I was looking at corals that were off of what they call is the region southeast Florida, kind of north of the Florida Keys. There hadn't been many studies in coral reproduction in that area. I was looking at one, if there were reproductive and two, their differences of fecundity between that regions and areas a little further to the south in the Florida Keys and Biscayne National Park. That was one of the projects I did. I was also involved with some coral restoration type work. [I worked on] coral surveys, looking at recovery of sites after there was injury. [I also looked at] coral recruitment. A little bit of this and little bit of that.

ZM: It's really fascinating work. I wanted to talk to you about coral recruitment. This work was done on sites that had vessel groundings, correct?

AM: Correct.

ZM: What were you studying exactly with coral recruitment?

AM: There were two related things I was looking at. One was were coral actually recruiting and returning to this site after there was damage? After a ship grounding, it levels the whole area, so you have this flat kind of barren surface. [We wondered,] are corals recruiting back to that area? And are they recruiting back to that area in a similar way that they would back to natural areas? [We were] looking at the actual reef surface. We would lay out permanent [bots?] that we would go back to over time and look. We also put out settlement plates just to see are corals recruiting. There is a difference between are they able to recruit and are they able to survive. Because they are so small when they first settle, you can't often see them. Having the plates is helpful because you can take them off and bring them back to the lab and look at them under the microscope versus just looking in situ. It's sometimes harder to tell because they are so small when they first settle.

ZM: What did you find? Were corals coming back to these disturbed areas?

AM: They were able to settle, but what we found is that they stayed really small. I think part of the problem was that they had this nice, exposed surface, but the substrate was often broken up. We had some rubbly instances which would kind of move across the reef. They were able to settle but they stayed small and didn't really grow to larger size classes. Corals grow really slowly, so it's hard to say over a longer time frame what would have happened. In the few years that we looked at them, the corals would settle and grow a little bit, but then they would just shrink or stay the same size. They didn't really grow to larger size classes.

ZM: That's really interesting. You said you were involved in some restoration activities. [There were] a few major grounding incidents in the late 90s at least. I think we are a little quieter in the Florida reef tract. If we have a major grounding event and we are just getting this small corals, what else can be done to restore these sites?

AM: I think there are so many important to corals. Having surface they can settle to is just one. Having a structure is really important, so that they have places they can hide and where they're not subjected to little [bits?] of rubble and sand. [Structure also helps so they] don't get grazed over by fish or urchins or whatever grazers are on the reef. I think restoring structure is a really important component too. That can either be achieved through putting some artificial structure down, which to me is not ideal. If you can restore larger corals, you give them a jump start by having bigger size classes that [are] probably better able to survive. And also, as they grow, [they] can provide that structure that need to settle and have protection that helps them grow and survive.

ZM: You did studies in restoration and recruitment. What else were you doing when you were at Nova?

AM: Reproduction, recruitment, and restoration.

ZM: With the reproduction, were you out in the field gathering and raising corals in nurseries back in the lab? What were you doing?

AM: We had a couple components. One was seeing if they were reproductive. We would take samples and use histology to look at the tissues and see if there were eggs and sperm in the tissues to make sure they were developing. If they were, we would try to go out and collect gametes and try to do some fertilization experiments. Unfortunately, we weren't usually successful. The timing was an issue. They weren't as synchronized as I think they are in some other locations. At least for the staghorn coral, we missed it one year. We went out and collected tissue samples. Okay, good they are fecund, they are going to spawn. Then we went out I think starting they first night after the full moon. We went out for several nights and we didn't see anything. I was really surprised. We would take in the samples and they were supposed to go. I think we just missed it. I think we were a day late. I think they spawn on the night of the full moon which it happens, but it's not when they are usually supposed to go. I think one year, we were able to collect some *Montastraea cavernosa* spawn and settle them in the lab. They didn't really survive. We were trying to get a land-based nursery set up at the time. That was trial and error type time period where we got some settlement, we had them in the lab, but we didn't have conditions quite right. They didn't really live past the settlement stage. They never really got off the ground. I ended up changing jobs and leaving before we were able to get it in the shape that was really important that was able to support coral growth.

ZM: Why did you end up leaving Nova?

AM: My husband had been in graduate school. He finished up and got a job offer at NOAA Fisheries in the Sustainable Fisheries division. We moved to St. Petersburg for his job. I was fortunate enough to have the expertise and the timing. They were looking for a contract

employee to help finish up with the Acropora recovery plan. That had been sitting dormant for a couple years. They had put together a team to write the plan. They had draft. Then NOAA got a petition to list eighty-two additional coral species under the Endangered Species Act. [Editor's Note: The Endangered Species Act was passed in Congress in 1973 with the goal of protecting and recovering species or ecosystems in peril of extinction. Under this act, species can be listed as endangered (at risk of extinction) or threatened (at risk of extinction in the foreseeable future).] The one person in the office that was doing coral stuff had to switch her focus from finishing the recovery plan to dealing with this petition to list these additional species because recovery plans do not have statutory deadlines. Once we get a petition, it sets this time table that you have to do certain steps by certain times. It fell to the wayside, so they decided to bring me in to update the plan and get it finalized. I was fortunate that I had expertise and they were looking for somebody. That's how I started working for NOAA as a contract employee.

ZM: Can you talk a bit more about the recovery plan? It was published in 2015, correct?

AM: Yes. A recovery plan is a road map of how we think we should and what we need to do to recover the species. There are several components that are required. The first is a list of "Objective and Measurable Criteria". It's the conditions that we think that are needed for the species to recover. We have to have threat-based recovery that address all the threats to the species. This isn't a requirement, but we also have population-based recovery criteria, so what recovered populations would look like. In the recovery plan for Acropora, there are ten recovery criteria, three of which are population based and the other seven are threat based. The second component that is required are actions that will help achieve those recovery criteria. We have I think its twenty-four actions in the plan, but a lot of them have sub actions. It ends up being sixty or so actions that we think we need to do to achieve those recovery criteria. The other two components that are required are a timeframe for recovery and cost of recovery. Those are a little more difficult to estimate. I can't remember what the total dollar amount was, but of course it was millions and millions of dollars. I think the recovery time frame was four hundred years. [laughter] That's not a fast or easy process to recovery full species.

ZM: Four hundred years is a long time. It's quite a number of lifetimes. It seems like it's difficult to get people to commit to something that they won't be able to enjoy the benefits in their own lifetime. How do you get people to buy in to something like this especially with the big price tag?

AM: I think it is hard when you talk about four hundred years and kind of seeing that come to fruition, but I think you can see improvements along the way. Like any big problem, you break down into steps and you do what you can do. Recovery is expensive. One of the big things is climate change. It's one of the big threats to corals and people are slow to address it. Addressing it now is going to be a lot less expensive then addressing it later. It is expensive but it's only going to get worst. If you want to have corals, and they are important for many reasons, and we should have corals, you have to do what you can do in the time that you have.

ZM: You touched on a few things there. First, why are corals specifically to Florida? Why should people care?



AM: Florida is really dependent on their natural resources because a lot of our income comes from tourism. People like to see pretty corals with fish. People like to fish. There is a huge recreational fishery component. We have a lot of people who come to Florida specifically to fish. They support fisheries. They support tourism. They provide coastline protections. Hurricanes are a big issue in Florida. The coral reefs if they are big enough, tall enough, [and] lush enough, they can break up the waves before they come to shore. So, it can help with things like coastal flooding. They provide a natural barrier. Beyond importance to people. They are important to coral reef ecosystems in general. They builder of coral reefs. There is an estimate of quarter of the world's marine species are dependent on coral reefs at some point of their lives. [Editor's Note: This figure is correct. It is estimated that twenty-five percent of all marine life is dependent on coral reefs at some point in their life. Source: EPA] It's a big component. I hope that figure right. They are important to marine life in general by providing habitat, shelter, and food for a lot of species. Many reasons to protect coral reefs.

ZM: There is an argument that I've heard against coral restoration. It goes something like, "Scientists should not be wasting their time on restoring corals that are just going to die again and we should all be focusing our attention on fixing climate change first." What do you think about that?

AM: That argument drives me crazy. It's true that climate change is one of the biggest threats to corals, probably the biggest threat to coral recovery. It is very important to address climate change, but you can't put all your eggs in one basket and just focus on one thing. Climate change is not the only threat to corals. If we fixed climate change magically tomorrow, I'm not confident that corals would be able to recover on their own. There's too many other threats, there's too many other issues. Just focusing on one thing I think is kind of a narrow vision. There's multiple paths we have to take for a big problem. For me, coral restoration provides a way to preserve what we have. If we were to not do any coral restoration and only focus on climate change reduction, by the time we fixed it, there may not be any coral left that are able to recover. You have to take this approach where you just try to do different things and multiple things. You don't put all your eggs in one basket and say this is the one and only solution. You kind of scatter. You try to address as much as you can and hope that it's enough.

ZM: You're working at NOAA now. Just to clarify, is the first position you accepted with NOAA? Is that still your current position or has that changed?

AM: I started as a contract employee working on the recovery plan. Once the recovery plan was finished, I told them I would like to stay on and continue to work if they were okay with that. And they said, "Yeah, that sounds good to us." And then they actually changed me over to a grant funded position, so I was no longer a contract employee but still not a federal employee. My employer was actually Nova Southeastern University again, so I was employed as a research scientist, but I was based in St. Petersburg NOAA Southwest Fisheries office doing work related to coral restoration recovery efforts. It changed because I retired from the recovery plan, but I was still working on recovery efforts. It was pretty much different jobs but still doing kind of the same thing. And then, I did that for about six additional years and I'm happy to say that finally in February, I got hired as a federal employee. I'm pretty excited about that. I'm still working on coral recovery, coral restoration coordination, and just doing some science support for

management decisions. Yes, it's kind of evolved, but it's pretty much doing what I've been doing all along.

ZM: Congratulations first of all.

AM: Thank you.

ZM: That's great. You brought up something that I meant to ask you that I almost forgot to ask. The endangered species list, you said when you first started working on the Acropora recovery plan because someone else had gotten pulled away to work on adding eighty-two species of coral to this list. What is the benefit of adding corals to this list and is there any criteria that needs to be met? Can you explain the process a little bit?

AM: Sure. Usually what happens [is] we get petitions. Anyone can submit a petition. Usually it's from conservation organizations. They submit a petition that gives us information about the status of the species and the threats and why they think the species should be listed. We evaluate that petition, and we determine if there is enough information in the petition to determine if a listing might be warranted. We have ninety days to do that. It's a very short turn around to do that. "Yes, there's enough information", we will go through our whole process or "No, you didn't submit enough information" and then we no longer consider it. Once we say "Yes, there is enough information", we develop a status review of the species. That can either be done internally or externally – we contract it out – or set up a team to do that. For Acropora, we set up a team to do a status review. Once the status review is done, we then make a determination of whether or not we think this species could be threatened or endangered. Then we write a proposed rule that we send out for public comment. The public has an opportunity to read the proposed rule and send us any additional information that we may have missed or not considered. We get a lot of opinions about what people think, whether we made the right decision or not, [and] how it's going to affect them. But really, what we are looking for is any information that we may have missed. Then we look at all the public comments, go back over all the information, and end up writing a final rule that considers all the public comments. So, we have to respond to all the public comments and list all the reasons why this species should be listed as threatened or endangered. That's kind of the process we got through and there are different timelines required for those. I mentioned the ninety-day timeline for the petition, then I think we have to do a proposed rule within in one year – I don't remember if it's the petition or one year since the ninety-day finding. But then, we have an additional year until we can develop the final rule. Those are all statutory deadlines which is why the coral person in the office was pulled away because it's quite a lot of work in a pretty short time period. That's the process and then I think your other question was: "what is the advantage of listing a coral or any species?" For corals in particular, there are a lot of rules and regulations protect corals. For instance in Florida, the Virgin Islands, and Puerto Rico, which are the US jurisdictions in the Caribbean that have coral, all of them already had laws that protected them from being collected and sold, used in trade. That's one of the advantages of listing them under the Endangered Species Act. Corals already were protected by other laws. Really the big thing for corals listing them under the Endangered Species Act is the advantages that any projects that the federal government funds or carries out for permits that may affect any listed coral species, they have to come and consult with NOAA Fisheries to make sure their project is done in a manner that will not jeopardize the

[community?] resistance of this species. We look at almost all the coastal development projects that would affect corals and look at the way they're going to do their project, where they're going to do their project and see if there's any way that we can make modifications so that it minimizes the effect on corals. The other advantage, kind of to back track, when we list corals species or any species under the Endangered Species Act, we also often times designate critical habitat. For coral, we have critical habitat that identifies the conditions that they would need in their habitat that is important for recovery. We designate an area and designate the features of that habitat that are important for recovery. When a federal agency comes in to consult, they also have to look at the effects to coral critical habitat. That's kind of the big thing because coastal development can have a major impact on corals. To me, that's the biggest advantages and what they were missing in other federal regulations that just looked at collection and trade.

ZM: I didn't know that anyone can submit a proposal. The commenting is interesting to me too. Do you get a lot of public comment during that phase?

AM: Yes, we do. A lot of them are not as useful. You sometimes get conservation organizations that will encourage their membership to send us a letter and they usually have a form letter, saying "We support listing this coral species as threatened under the Endangered Species Act". "Okay", we get 3,000 letters saying the same thing and it's an opinion that is not particularly helpful. What is helpful is when people have information that we haven't considered. Sometimes you'll get scientists that will submit unpublished data or grey literature that we didn't see or surveys that can show us that can show us trends of species population. [Editor's Note: Grey literature are research, data, or materials collected or produced by organizations outside of typical academic publishing] Those things are very helpful. We do end up getting a lot of public comments, but the actual useful public comments are often not as great as the total number that we get.

ZM: Can you describe a little bit about the point in the process that you evaluate whether or not there is enough evidence to list a species as endangered? What evidence specifically are you looking at? What datasets do you look at? Do you go out and do field work?

AM: No, it's usually published literature or any kind of grey literature that we can find. There's five factors for listing in – I'm going to admit that I don't know them all off hand, but we look at those five factors and then we look at if the species would meet the definition of "threatened" or "endangered". Endangered species are at risk of extinction and threatened [species] are at risk of extinction in the foreseeable future. So, there's just kind of a time difference. Endangered is really endangered right now of going extinct versus threatened which could be, yes they're at risk of going extinct but maybe a little bit farther off. They have, I think there's twenty have corals listed under the Endangered Species Act. Seven of those are in the Caribbean, fifteen are in the Indo-Pacific, and three are international so they don't occur in US waters. All of them are threatened, except the three that are in international waters. We believe that they are all at risk of extinction in the foreseeable future.

ZM: That's scary. In what you're doing currently, you see a lot of those risks. What is threatening corals? What are the things happening to them that are making at-risk of going extinct in the foreseeable future?

AM: The biggest threat right now is climate change. I don't think that's the original reason, at least for the Acropora, when they started to decline, but that's definitely the biggest threat to their recovery and persistence right now. We have climate change [and] there is risk of land-based sources of pollution [like] nutrients, sediments, contaminants. There's a risk from coral disease, that's a big one. At least for the Acropora, that's why they were thought to decline in the first place. Coral disease came in [and] really wiped out the population down to like 97% of what it was in the 1960s I think. We have predation is [also] a threat. I think those are the major ones. There are minor threats from physical damage from storms and ship groundings. I think the major ones that we listed were climate change, disease, predation, and land-based sources of pollution. Lots of threats.

ZM: There's a lot going on. You said you're involved a lot in restoration efforts decision making for managers. Which one of these threats do you see evidence of on a daily basis most?

AM: To me, the biggest threat that I think that we can have a real impact and really control [on] is land-based sources of pollution, especially coastal construction projects [because they] usually increase sedimentation and turbidity. We have increase run-off from coastal development projects and that affects nutrients and contaminants. I know that climate change is the biggest threat, but I feel like the one where I try to focus [and] see what we can do really is for those land-based sources of pollution. That's a little bit more tractable. It's something that we can have a direct influence over. Particularly, on that project level basis if you can change their construction methods so that it reduces those impacts. That's really where I think we can have the most bang for your buck, I guess.

ZM: Can you describe how you're dealing with that and what methods or strategies to tackle that problem?

AM: One of the big types of projects that affect corals in terms of sedimentation is dredging channels, where they will pick up sediment at the channel entrance or inside ports or wherever its [shoaled?] up and make it shallower so ships that need to get in the ports and channels [can get in]. They'll periodically go in and dig out all the sediment and then dump it offshore usually. Some of the things that we look at is, can they use different equipment? They pick up the sediment and usually put it into a barge and then transports it offshore. Of course when you pick up the sediment, you can allow water in with the sediment. They try to decant that off so that they can add more sediment, but when you do that, you're releasing all these fine sediments into the environment which can travel very far and be a real problem for corals. Just things like that. [We also look at] how they're doing their construction, when they are doing it, [and] can we get them to do it [during] a less sensitive time. Particularly for dredging, they like to do that in the summer because it's calm weather and can work longer hours and get more done in a faster timeframe, so it saves them money. [But] that's also the time that it's the most stressful for corals because it's hot and they spawn during the summer. [We look at:] can we influence projects to encourage them to do it during a time that's not as impactful to corals, trying to avoid those hottest months of coral spawning seasons? Things like that.

ZM: If I understand correctly, you're the person that has to persuade people to change their project, right?

AM: I don't actually do the consultations. I just provide the scientific support for the people that are actually writing the consultations, but that is a big part of what the division that I work in. [My division] does consultations looking at the effects to species. I'll help by going through the literature, looking at when the coral spawning windows are, making recommendations on monitoring, looking at effects of the project on the species...things like that.

ZM: It's tough to persuade people especially when there are so many real consequences and sometimes the health of coral reefs may not seem as real to them as pushing back this dredging project and losing money. Are people generally responsive to these kinds of requests?

AM: It usually comes down to money. How much extra money is it going to cost them? We get more pushback from some people than others. Some people are like, "Yes, let's do conservation. I'm all for that. Let's change our project in a way that's going to be beneficial." That's pretty rare usually. Usually, we get a lot of pushback. Because coral species are listed under the Endangered Species Act, we do have some capability to dictate the way they do things. We can write terms and conditions in their consultation that say you have to do these things to minimize your effects to the corals. That's one of the advantages of having this species on the list. It can't change the project so much that it's not what they came in to consult on, but through these different ways of doing things, it may not cost them extra money or at least not too much extra money, we can definitely require them to do those things.

ZM: When you talk about dredging, I immediately think of Miami and the port there. Is there evidence that that's having an effect on coral reefs around Miami or Southeastern Florida area, north of the Keys?

AM: That was kind of a huge fiasco, one which we were trying really hard not to repeat. [dogs barking] There was evidence that that project caused quite extensive coral damage and at the same time that that project happened, we had this outbreak of coral disease that has been going on for I don't know like six or seven years now. [Editor's Note: This coral disease is called Stony coral Tissue Loss Disease which effects over twenty species of hard corals in the Caribbean. First discovered in 2014 off the Florida coast, it has spread all across the Caribbean. This disease is thought to be caused by a bacteria and can wipe out coral colonies within weeks or months.] That's also starting to spread to other parts of the Caribbean. I don't know if there is a direct correlation, but the two kind of happened at the same time. It had some major impacts. Not just Florida, but [it's] starting to impact other areas of the Caribbean. I don't know we can say for sure that that project was the cause, but it definitely didn't help. It put the corals under more stress and possibly making them more susceptible to disease. That project was just a really bad example of what you should not do. We are trying not to repeat that same mistake with projects going forward.

ZM: Can you elaborate a bit more on what made that project such a fiasco?

AM: I believe it was the way they transported the sediment offshore. There's something called the "green valve" [used] when they transport, which I think that means to let water off to decant it from their load. You're trying to get more sediment and less water, so you just let the water out. They all have to do that, decanting that water off. But with Miami, I think that they were doing it as they were moving it. They just spread sediment as they moved along. Instead of keeping it in one area, it got dispersed all over the place. That was a really bad idea. That's something that we are focusing on for other projects. It's kind of hard. I'm trained as a coral ecologist. I don't know much about construction in general, so sometimes it's not asking them the right questions or not understanding the way they're going to do things or not having enough information. [It's difficult] having to try to figure out what you think the impacts are going to be based on the information you have. [I] try to make decisions based on very little information. It's very challenging and I do get frustrated sometimes because I feel like I don't know enough to make good decisions. Or at least, I'm not the one that should be making the decision. But at least advising on how to make good decisions. It is interesting. [laughter] [It's] an interesting thing that I never thought I would be doing when I got trained as a coral ecologist is having to make recommendations based on things that I really don't know a whole lot about.

ZM: You mentioned a really long-term disease outbreak. A couple questions about that. That's not normal for disease outbreaks to last that long?

AM: No, it's not uncommon to get disease outbreaks several flare ups in the summer and might last until the water cools down, it might even last until the next summer, but usually they flare up and then they go away. This [coral?] disease event has been unprecedented in the amount of time that it's come around, the number of species that it effects [which is] more than any other coral disease that we've seen to date, the [rapidity?] of the mortality moves through very quickly and kill the corals very fast, and the spread of it. It started off the Miami area. [Then] it moved north first then moved south and now it's impacting other areas of the Caribbean. Just really all the possible worst effects a disease can have seem to be all embodied in this one disease outbreak.

ZM: This is Stony Coral Tissue Loss Disease?

AM: Yes, Stony Coral Tissue Loss Disease.

ZM: Are you involved personally in any disease monitoring responses?

AM: No, there are teams that are set up to try to address the disease and respond to it. The other colleague in the office who also has coral expertise has been the one who's been participating in those types of coordination efforts pretty heavily. I haven't been directly involved.

ZM: I imagine it's tough to miss though. If you're out diving, you see a lot of it.

AM: I don't personally dive that much anymore. St. Petersburg is on the west coast of Florida, corals are on the east coast of Florida. I really haven't been diving since moving to St. Petersburg. From what I hear, it's just heartbreaking. [It's] devastating the disease that really ripped through a lot of the reefs and just caused mass destruction [and] devastation.

ZM: That would be a terrible note to end on for our session today. [Laughter]

AM: [Laughter]

ZM: I'm watching the clock. Maybe we can push toward something a little happier. I heard that in spite of this disease outbreak, dredging, and land-based sources of pollution, there are actually some patch reefs and some secluded places in Florida that are doing quite well. In your experience, is that true?

AM: Yeah, like I said, I haven't been diving in a number of years and definitely not since the disease outbreak. I think that there are areas that are okay and that somehow weren't as affected by coral disease. It's definitely widespread, but it's not every single reef from what I understand. There are still some areas where they are in good shape. And there's a lot of positive response and efforts that have been going on. They are looking at different ways to treat the disease. There are so many people involved and so many organizations. It's been a really great collaborative effort to get all the people together and working together. I think that's one of the positives. Even though this disease is horrible and causing a lot of destruction, we do have a lot of people working on it, doing restoration to try to improve the condition, looking at treatment of disease, [and] rescuing corals out front of disease so that we have something to work with and they aren't all lost. There are a lot of positive things coming out of it. I definitely think that there are areas that are still in decent shape even with all the destruction going on.

ZM: That's good. Do you think maybe that, even though there are a lot of terrible things happening to corals right now, at least the awareness that corals are in trouble and we need to change what we've been doing has picked up in Florida over the past few years?

AM: I hope so. At least in South Florida, where the people live around corals, I think that there is more awareness. I don't think that's true in all areas of the state. I think particularly with the younger generation, I'm always surprised how well informed they are. I do have hope. I do think there is a lot that we can do, and I think people are concerned. I have hope.

ZM: Excellent. That's a much better place to hit pause for today than the previous. I don't want to keep you too much after time especially since it's already the end of the day. Alison, thank you so much for sitting down with me. I think our second part of the interview is scheduled for tomorrow. Is it tomorrow?

AM: It's tomorrow. I don't remember what time, but it's definitely tomorrow.

ZM: Excellent. If you have any questions after that or if you think that I missed any important parts when I went chronologically through your career, definitely feel free to let me know. We can always backtrack and talk about it a little bit tomorrow. I definitely want to talk about what you're currently doing and what projects you're working on and then, we'll try to get a little retrospective. Especially since you grew up in Florida, I think that's a great perspective for this project. A lot of the people I've been interviewing, I don't know if this is surprising or not, grew up in landlocked areas and then moved to Florida. I think I expected the exact opposite.

[laughter] This is great. I think talking about the people and how they're perspective has changed would be a good topic to start off with.

AM: Okay, sounds good.

ZM: Thanks again Alison. I appreciate it and I will talk to you tomorrow.

AM: Okay, talk to you tomorrow.

ZM: Bye.

AM: Bye.

-----END OF SESSION ONE-----

ZM: This is Zach Mason. It is August 14, 2020 and this is the second part of my remote interview with Alison Moulding. I am again calling in from my home office in Baltimore, Maryland. Alison, yesterday we left off talking about your current work where you are responsible for getting all the scientific resources and documentation together so that management can help make important decisions with things like dredging projects and stuff like that. That's a really interesting responsibility to have. I wonder do most people that you put these packages together for, do they seem sympathetic at least towards what they are doing toward the environment or the potential impacts that they're having on the environment?

AM: The information that I gather is really for my office to make decisions. Of course, my office is sympathetic because that's their job. [Their job] is to protect species listed under the Endangered Species Act and their habitats. [For] the other applicants that come in for consultation on projects, some are more sympathetic than others. A lot of what drives projects is money. It seems like they are willing to do this if they aren't having to spend lots of extra money. And of course, a lot of things that we want them to do cost extra money. That's a point of contention. Of course, we want them to do their projects in the least expensive and in a way that will provide the most conservation. It's a kind of a back and forth. Trying to have both sides understand where the other one is coming from. It can be challenging for sure. Most of the time we seem to be able to work through it, so that's good.

ZM: That's good. I'm wondering, because money seems to be the most sticking point in a lot of these situations, are there any kind of – I guess they would be mostly government – programs that are designed to subsidize the losses that companies would take by adhering to any of your recommendations or guidelines?

AM: That's a good question. I don't think so because you have different types of projects. You have these huge projects that are permitted by, we'll say, the [U.S.] Army Corp of Engineers where sometimes [it's] the Corp themselves or sometimes it's the county and the Corp is just the permitting agency. But you can have an individual of property who wants to build a dock. Those are two very different types of projects and scales of projects. There are also different costs associated with those and who's responsible for [permitting?] for things. Particularly, with the [U.S.] Army Corp of Engineers, sometimes projects are funded by congressional



appropriations and there's not a whole lot of leeway that they have to increase costs because its money directed for a specific purpose in a specific amount. That can be where the challenge comes in.

ZM: Could you talk a little bit about the things you are working on right now? Maybe a project that you're passionate about or the favorite part of your job?

AM: I say one of the projects that has been taking my time lately and that is something that I had started and is kind of my baby and has grown is trying to develop a database that tracks restoration efforts. It started as just the two Caribbean Acropora species in U.S. jurisdictions – so Florida, Puerto Rico, and the U.S. Virgin Islands – and tracking where people were restoring those species and how many colonies they were planting. Sorry.

ZM: That's okay.

AM: Gosh, those amber alerts and they are just, “ah”. [laughter] Anyway, I had started going around the individual nursery operators and asking them send me their data each year so I could compile [it] in one place, which was very helpful because there's many organizations and many people all doing similar work, but there was no real way to track the cumulative effect and everything that they were doing. They all keep their individual records but there was no one place that centralized all the information. I started compiling that, like I said, just for two species and just U.S. jurisdiction and then, the Coral Restoration Consortium was formed a few years ago. That is an organization that tries to pull together people in the coral restoration community – researchers, managers, coral restoration practitioners. [It was created to] just to provide an avenue for people to communicate better and share information so we weren't repeating the same mistakes. [It] can [help us] learn from each other and all help each other out. Through that consortium, we expanded that database that I originally conceived of, so now it's turned into this worldwide databased and accepts information from anywhere in the world for any species of coral. Having that transition from a relatively small focus area and species to a larger, broader database has been quite the amount of effort. I've had help from other people in the consortium to try to build up the database. We've gotten it to a good place and now we want to try to put it online. [I'm] still the point person for when people send in their data. I have to compile it myself and put it in the database. I have been fortunate over the past couple years to have an intern who can help with that because it is quite a time commitment to put in all that data. [I'm] trying to move that database to be online so people can put in their own data and also be able to access the information more easily instead of having to contact me and send them the information. [I'm] trying to get that together and make it more accessible and hopefully, it will be more useful for people.

ZM: There's a lot going on there and actually, I have that up on another tab right now. Consortium is a big term. There are a lot of different groups and entities here, right? Can you talk about who is participating in this project? Who is sending you data?

AM: From my specific database, is that your question?

ZM: Yes.

AM: I still reach out to all the US jurisdictions individually, because that's where we have the greatest management impact. I do put in more effort into trying to get data from people in U.S.

jurisdictions, but we put out a data call. There's a monthly newsletter that goes out for the restoration consortium, so we try to promote it in the newsletter and get people to send us information. I find I have more luck if I reach out to people individually, which is still time consuming and only feasible for people that I know are doing restoration. People have submitted data mostly from the Caribbean. We do have some people submitting from the Indo-Pacific, but I think once we get it online, it will be more visible and accessible, and people will understand the value of it and hopefully more inclined to submit data. It is sensitive information for people. They don't want to have public to exact coordinates to their nursery or restoration sites because then we have a lot of people coming to visit and it can impact your work. Hopefully by having it online, people will see the value of having it. It is a bit of effort to send all the data. We do ask for quite a lot of information, so we can use it to the maximum extent for management purposes. I'm hoping once we get it online, it will be more accessible and more visible.

ZM: If you don't mind listing or giving an idea, at least for Florida, what organizations are sending you data?

AM: There are several different organizations in Florida that have coral nursery efforts [including]: Nova Southeastern University, University of Miami, Mote Marine Lab, Coral Restoration Foundation, Florida Fish and Wildlife Conservation Commission – which is a state agency – has one and then, Reef Renewal. I think that's all. Oh, and The Nature Conservancy co-manages a nursery out in the Dry Tortugas with Dry Tortugas National Park. Those are all, I think, the organizations that have offshore nurseries. The Florida Aquarium has some land-based nurseries. I keep my memory when I started going through the list. I need to start reaching out to them. They do work in concert a lot with the coral restoration foundation so their data might be included in the coral restoration foundation. Those are the ones I can think of off the top of my head.

ZM: That's a good number of groups sending data especially just for Florida. Do you have a standardized template that they fill out or do they just send you whatever they have, and you have to put it in standardized format?

AM: I do have a standardized template. Some people have so much information that I find that they are more likely to submit if they just submit a data sheet that they put together themselves that has most of what we're looking for in the format that they track their own stuff because it would be too much time and effort to transfer over to my template. I've been able to work with people so far doing that, but we do have a standardized template where we have drop down menus where people can choose things. It helps with standardization of data entry and reduce mistakes.

ZM: Related to that, so many different organizations are sending you data and that's more effort on their part, so they clearly see some value in this. Can you explain why is this helpful? Why are you doing it? What's the motivation behind it?

AM: My personal motivation is to understand what is going on where to track what sites people are restoring corals, how many colonies are they restoring, what species are they restoring, and some of them have genetic information which is also very helpful. For *Acropora* recovery, these are all things we need to track for the status of the species. It helps to inform some of the recovery criteria we have developed. Abundance is one of the recovery criteria. We have one

on genetic diversity, so this type of information is very helpful in one place when we are evaluating the species and its status. [It helps with] the progress toward recovery.

ZM: It really strikes me that there is no real centralized way of tracking all of this. When did you start developing this project?

AM: That's a good question. Probably, not too long after the recovery [claim?] was done, so maybe 2016, I'll say. [It was] maybe around that time, but I don't know exactly when.

ZM: That's okay.

AM: It's been several years. [It was] maybe even earlier than that. It's been several years that we've been tracking it now. Most people kept records of what they were doing, so [we try to collect data] going back as far as we can with not just when I started collecting the data but since they started doing. [We are] trying to get that information.

ZM: That leads into my next question. Does restoration seem like a new thing? The more people I speak to, at least within the last decade, it seems like restoration has been a thing scientists are trying now but wasn't really around as much before.

AM: Restoration has been going on for a long time in terms of trying to repair damage from a particular instance, so like if you have a ship grounding. I think that kind of restoration has been around for a couple decades now. In terms of doing restoration just for the sake of trying to increase coral populations, I think that's the new concept. Not necessarily trying to repair a specific injury, but really trying to enhance the population. That has been around maybe ten years or so. There were definitely earlier efforts and in other parts of the world, not just Florida. I think things really got off the ground about ten years ago.

ZM: What do you think was the reason of that change?

AM: The Coral Restoration Foundation was one of the first groups in Florida, I think it was the first group in Florida, to start doing coral restoration. They proved that it was successful and that it wasn't necessarily as difficult that it might seem. They started with the two branching *Acropora* species. Being able to take a small piece of a colony, break it off, and make more corals from that small piece that you've broken off was a new idea and concept. Those pieces grow pretty quickly, like a lot of coral species. You could produce many more corals in a small amount of time than maybe people initially thought. That and there were also groups starting to try to get into coral restoration. Some of them were for research, I'd say most of them were more for research, instead of pure restoration of in and of itself, but trying to improve restoration science. And then there was some federal money that was awarded to increase the efforts of coral restoration in Florida, in particular. [Actually,] I think it was for all the jurisdictions. I can't remember if it was for all the jurisdiction or for just Florida. That really provided some funding to get people thinking a little bit bigger.

ZM: You already touched on it, but is there evidence that these more recent restoration efforts have been successful in Florida?

AM: They definitely brought back the species in places that they had been lost. That's, in my mind, a big success. They've also helped with conservation of what we currently have. I think

there is success, but it's not success in terms of "it's the big solution to all of our problems". It has shown very [good?] progress. We've been able to [outcrop?] more species and more corals. They've lived, but we'll have something come through like a hurricane and it'll knock things back. That happens in nature too. There has been success, but I say it's a small drop in the bucket of what we really need the corals to look like.

ZM: I read an article that said no matter what we do as far as restoration goes, corals need time to regenerate on their own and we will never be able to restore a damaged area of reef artificially as much as we would like to when one of these big events comes around and knocks them back or something like climate change inhibits their natural growth and things bring them back down. It's tough. People look at restoration as "that will fix it" but that's really not it, right? We need to also fix the environment that they corals are in, is that right?

AM: We definitely need to work on different fronts. Restoration is a great tool. It's not the only tool and it's not what's going to ultimately work in the end to – it's not going to be the solution to helping corals recover. The way I see it, it's a way to get corals to give them a little bit of a jump start so they can reproduce on their own and that's going to be a much more efficient way for them to recover. If we can get the populations big enough so that they have that ability to start trying to recovery themselves. But there are many threats that hinder that recovery, like you said climate change, water quality, periodic storms and disease. There are many fronts that you have to fight the battle.

ZM: Let's see. I'm sure working with the database takes a lot of your time right now. Is there anything else that you're working on that you'd like to talk about? Are there any other big projects?

AM: One of my other big responsibilities is to be the liaison between the Acropora Recovery Implementation Team and NOAA Southeast Regional office. The Acropora Recovery Implementation Team is the team that the [NOAA] Southeast Regional office put together and invited to participate as kind of an advisory group to the regional office to help implement the recovery plan and advise the regional office on how best to recover these species. The team is made up of stakeholders from various organizations or agencies, state or federal [like] nonprofit organizations, researchers who had expertise in the two Acropora species or had a job that conservation of corals in there their purview. That team meets generally once a month over phone and then we have an annual meeting each year where the team discusses issues, makes priorities of what we think is most important to accomplish in the next year, identifies projects that would be great if there were some funding for the regional office to fund, and we also track implementation and recovery plans. There are a lot of researchers and other people out there that are doing work that supports Acropora recovery. So [we're] tracking all those efforts and trying to get a handle on what those outcomes of those projects are.

ZM: That leads me into this next question. Besides what you just mentioned, is there a lot of cooperation between federal, state, and local agencies? Is there a sense that you're all pulling together for a common goal or stove piped, as they tend to be with some government side of things?

AM: I think everyone is working toward the same goal, it's just how we get there can maybe vary between organization to organization, but the state and territorial agencies are really

important to us. [It's important] to have those partners because a lot of the on the groundwork comes from their efforts. I feel like we have the same goals overall, but like I said, sometimes priorities might be somewhat different. I do feel we're working toward the same thing, so that's good.

ZM: I'm wondering if we could take a little bit of a step back and look at some things that happened in the past. You said, you grew up in Florida – I mean you moved there when you were three, I think.

AM: Yes.

ZM: You probably were really young when this happened, but in 1990, the Florida Keys National Marine Sanctuary was established. Do you remember how people felt about that? At least looking back on it now as an outsider, it looks like there was a lot of friction. I found a news article that was talking about Billy [Cossy?], I think he was the director of the sanctuary at the time, being burned in effigy somewhere. Can you talk about what it was like to be living during that time period?

AM: Sure, I was in high school. I honestly wasn't aware of it at the time. I lived in north Florida and this was happening in south Florida. I don't remember anything from when it actually happened. I have heard the same things. I think there was a lot of pushback on trying to form, I don't know if it was the sanctuary or just that they were going to have restricted use, and I think that that's what people get all worked up over. I think for the most part, people in Florida realize the importance of conservation and support conservation, but when that means putting limiting on what you can do, they're not as eager to pursue those avenues. I'm not sure why. I don't know if it's just people feeling they don't like being restricted in what they can do or if they just don't understand how those actions really can affect conservation. Maybe it's a little bit of both. There is almost always tension when you try to put restrictions on what people can do. I mean, not just the sanctuary. That happens when you want to list species under the Endangered Species Act. You have people who just don't want restrictions on what they can do. That's just how some people feel.

ZM: I heard that there was a proposal in the southeastern Florida region recently for some kind of a restricted use area, but I think it was shot down. Do you remember hearing anything about that?

AM: Yes. Again, I wasn't part of that process. It was going on after I had moved to south Florida and over to St. Petersburg. Again, you have people who are very supportive of it and people who didn't want to have 'no fishing' zones or restricted use areas. I think ultimately, it came down to a political decision, they didn't have the backing of the Florida Fish and Wildlife Conservation Commission, which is the agency that manages fish and wildlife for the state of Florida. The commissioners for that are appointed by the governor. It was definitely a very political aspect. Because I wasn't involved, I don't know the level of community support for it. I'm sure, like I said, there's always people who are going to support it and the people who don't. I don't really know. I'm pretty sure the reason it failed was because wasn't enough political backing, but I don't know how the community felt overall. I don't know what the general sense of the community was and if they supported it or not.

ZM: It seems like you really had a good idea of what you wanted to do from a relatively young age or at least a general idea, more than most people I'd say. Did it feel like that way while you were going through this process or did you feel like you were making it up as you went along?

AM: No, I feel very fortunate. I didn't know what aspect I wanted to follow but I knew marine biology was what I was interested in and what I wanted to do. I've never really had any doubts about the path I've taken. Of course, there are always times when you're going to get overwhelmed and frustrated and things aren't going the way you want, but, no, I've been very happy with my decision. It's what I love and it's really a privilege to work with what you love on a daily basis.

ZM: It's not an easy job and it's tough to get into. There's a lot of schooling involved. And even once you get out of that, I feel like it's a competitive field. Any kind of marine science can be hard manual labor. It can be dirty, sweaty work. Looking back on everything, would you do it again? Are you happy with your choice?

AM: When I got accepted into graduate school, I got accepted into the PhD program because of a funding issue. I had originally applied to do a masters. I always say, "I think it was a good thing that I got accepted to the PhD program because after going through it ...[inaudible]" [I wonder] if with that experience, if I would have gone onto a PhD because it is a lot of work and it's time consuming and it's hard. At times, it kind of beats you down. I don't think I would do anything differently. I think if my life had been different it might have come out a different outcome, if that makes sense.

ZM: Could I get you to repeat the very beginning of that? It cut out for just a couple seconds.

AM: I don't remember what I was saying.

ZM: It was basically right after, I asked if you were happy with your decision and after it all went blank.

AM: I don't think I would have done things differently, but if things had happened in a different way, it might not have resulted in the same outcome as what I was saying. When I applied to graduate school, I had applied for a master program and because I was a state resident, I was able to get funding for a PhD, but not as a masters. I never got a masters, I went straight from my undergrad with a year between and into the PhD program. Getting a PhD is very hard and it's a lot of work and it takes a lot of time. I'm glad I did it, but if I had been accepted into a master program and experienced grad school at just the master's level, I'm not sure I would have gone on to a PhD because it is so much time and effort, blood sweat and tears. I'm happy with the path I chose. I don't think I would have done anything different.

ZM: Excellent. I've actually heard similar things from people who have gotten their masters, they decided not to go on to their PhD, and vice versa; people who have gotten their PhD, if I had just gotten the masters, I'm not sure I would have gotten a PhD. It's a lot of work and it's a big commitment. It seems like you're pretty happy with the way it all turned out. Another kind of related question. Things are starting to change now; I think I read somewhere that over 50% of graduate students in marine science are women. More women are getting into this field, but probably when you first started at least, it was more of a male-dominated field. As a woman in science, did you ever face any kind of adversary or challenges because you're a woman?

AM: Yes, I will say that you are correct that it's pretty evenly distributed between men and women who go into marine science, but at least in the academic spheres, it's still very much male-dominated. I don't think I had any female instructors in graduate school. There were faculty but for the classes I took, I don't think I had any female instructors, they were all male. When I started working at Nova Southeastern University after graduate school, I think they had one faculty that was a woman. It's still very much male dominated even though you have women who go through the program. I think that just a reflection of gender issues in science fields. It does take so long to get through school and right at the time you're finishing up are kind of your prime reproductive years. A lot of women tend to fall out because, it's getting better, but there's still not the support of having resources for women who want to have a family [and] children. For me, I was very fortunate. I have two children. I had my first one after I finished graduate school. My husband was still a graduate student at the time, and it was when I was working for Nova Southwestern University and I had worked there long enough that I had saved enough sick leave and annual leave to be able to take three months off. I think I was a couple weeks shy of that and I had some really great colleagues that were able to donate some of their leave time to me for that. I felt really fortunate to take that time off. It was really important to have pay during that time, because my husband being a grad student had very little money. When my three months were up, I had to go back. I remember just being crushed, because even at three months, things are just so small and hopeless and fragile. I remember just like a day before I had to go back to work, I brought in some stuff to the daycare that I was going to take him to, and I was just balling. I couldn't even talk to the people because I was just crying. They're like, "We promise we're going to take really good care of him" and I'm like, "I know you will." But it's just such an emotional thing for me. I think that I had had the option to take more time off, I probably would've taken six months off. It was the situation where I didn't have more leave and wouldn't have very much income just relying on my husband, so I had to go back. That was difficult for me. My second child I had after I had moved over to St. Petersburg and had started working as a contract employee for NOAA. This situation was different because I had just started a relatively new job and I think you had to be working for a year before you qualify for any kind of leave benefits for maternity leave. I did not have any. We had only two weeks a year of leave and I didn't even have the ability to even save up anything. Even if I had, I hadn't been working long enough to have enough to save much. I ended up taking three months off unpaid. I was able to do that because my husband was working and had a job that was bringing in income at this point. If it had been that situation in the very beginning and if we were still in school and I had been a contract employee and not had that ability to take time off, I think you get two weeks just for regular delivery. I think those challenges are very real for a lot of women. Faced with being a full-time parent and working full time is a real issue and a real challenge. Like I said, particularly with science. It just happened to fall, the time you're starting to think of possibly starting a family is the time you're starting to work. That can be very difficult.

ZM: Do you know if there have been any changes in policy for taking leave since then or have things remained largely the same?

AM: I was a contract employee at the time. I think NOAA now does have paid family leave. I think that was something that was just enacted for all federal employees within the last year or so. I don't know the detailed. I haven't really paid as much attention because I'm done with having children. [laughter] It varies depending on where you work. I'm glad that the federal

government now requires that. I hope that it will become more accessible to people. I think the United States is one of the very few developed nations that don't have paid maternity leave or [inaudible]. The burden often falls on the woman because she bears the child but having your spouse there to help out is also very important. It can be very overwhelming, particularly as a new parent and you're not really sure what you're doing and everything is so new. You question everything. You can feel very isolated too. I remember feeling very isolated with my first child because I was just home alone all day with the baby. You're tired, you're not getting sleep, and you're not sure you're doing things right. Having that support of your spouse or partner is very important too.

ZM: Did you have any female mentors that helped guide you through this process, maybe somebody that had been there before? I know you said there was relatively few female faculty members.

AM: No, I mean, I mostly relied on my peers. I didn't have any more established women that I went to for advice. I think that the women that chose to be in science, often times chose not to have families because that's the way you were able to get ahead. It's really unfortunate and hopefully will change.

ZM: Have you had the opportunity to serve in that mentor role for anyone yet?

AM: I don't know. I do have students contact me a lot. When I was working at NOVA southeastern university, I had students of my own. It's something that I really enjoy. They asked me questions and I would always give advice or my thoughts. I hope that I have positively influenced people in that way, but I'm not entirely sure.

ZM: I know that you still have a lot more work to do, but so far, do you have a high point or favorite project or something that really stands out in your career to you as something that you're particularly happy about?

AM: That restoration database that I talked about earlier is kind of like one of the things I conceived of and developed and made it bigger and better. It's still not finished and it's still not in the place I want it to be, but it's kind of my baby. I hope that it evolves into what I have a vision for it and that it is useful for people and they are able to see the utility of it and get what they need from it.

ZM: Thinking all the way back to your first experiences with coral reefs up to your latest, I know you said you don't get as many chances to dive now as you used to, but have you noticed any changes in the reef for better or for worse? We touched on some things that were happening right now like stony coral tissue loss disease and some dredging projects. What were the big changes that you've noticed?

AM: From when I started diving in Florida, which was about 1997 until 2011, I definitely saw declines in just that short amount of time. What is that? Like sixteen years... fourteen years. I definitely saw decline of species that were a lot more common when I first started diving, I started not seeing as much. Some of the elkhorn coral, some of the very first dive spots I went to, I don't think exist anymore at those sites. I have seen decline in a relatively short amount of time, but I have also seen through restoration bringing some of those species back. That's really



excited to me to have those species return to the reefs where they once occurred through restoration efforts. Great and bad.

ZM: When you were diving, did you have a favorite dive site?

AM: My favorite dive site, I have to say, is in Biscayne National Park, and it was a little patch reef, and it was colloquially known as [Alina's?] reef. It wasn't on a map that said, "This is [Alina's?] reef." It was just the name that was told to me when we went there. It was a very popular site for research. I think it's where the park would send most of their people when they wanted to do research on the reef. What I liked about it is it had these huge [Orbicella?] colonies around one of the sides. They were just the biggest coral colonies I'd ever seen. They were huge. I thought that that was pretty amazing, and I just spent so much time there because it was one of my research sites when I was in graduate school. I say that was my favorite just because I spent a lot of time there and it had some really cool colonies, really massive ones that were amazing.

ZM: Especially on that reef, did you notice any changes there over time?

AM: Not in the time that I was diving. I stopped diving there probably in about 2005. I haven't been back since. I'm sure that it probably has changed since then, but I couldn't tell you specifically because I haven't been back.

ZM: If you could give some advice to the new generation of potential marine biologists or reef scientists, what would you tell them?

AM: I would always tell my students two pieces of advice. The first was figure out what you think you might want to do in terms of what kind of organization you might want to work for. Do you want to work in academia? Do you want to work for the government? Do you want to work for a nonprofit? That's going to dictate what kind of education you need. Some of those you might be able to get away with just a bachelor's degrees, [but] you're probably going to need a masters. But some of them, you'll definitely need a PhD. Figure out what path you want to take and don't spend a lot of time on something that's not going to benefit you and it's going to be a lot of time and effort. That was the first thing I would tell them. The second thing I would always tell them was I would tell them to learn a specialized skill that would set you apart from other people. It could be something like learn a specific lab technique or becoming really good at statistics or having great GIS skills or ability to map. Something like that that will set you apart. It will help when you're looking for jobs to have a specialized skill. I think it also can help you [if] your path doesn't take you right where you think it's going to lead. I think those are marketable skills that can be applied in different situations and maybe different fields in case you need to go that [way]. Those are always my two pieces of advices. Figure out what you want to do so you don't over educate yourself and learn something that is kind of unique and specialized so that you can have that on your resume.

ZM: Out of curiosity, did you develop a special unique skill and what is it?

AM: Yes, my skill that I pursued is histology. That's taking section of tissue and looking at them under the microscope. You can tell a lot about a coral colony. I was trained in it in graduate school and we used it for reproduction to see if colonies were reproductively active if they were producing gametes. But it can also be used in the medical field if I had to go switch to human pathology, that's the technique that they use. That was one of the skills that I think

helped me get the job at Nova Southeastern University at the time because I was taking over a project that was using histology. That was my skill. I haven't practiced it in a long time. I probably wouldn't be able to use it now, but at the time it was very helpful. I felt that it gave me a little bit of an edge.

ZM: I know that in the NCEI, National Centers for Environmental Information, archive we recently figured out how to archive coral histology slides, which is pretty cool. I do not know how to read them. Do you think you remember enough to give a brief overview what someone would see if they open these slides up and zoom in, or is that too much?

AM: Possibly. I have some other people who have been doing it more recently and longer who would be better, one of whom is a NOAA employee. I could if needed, but there's probably people who have been doing it more recently than I have that could also fill in that role if you need it.

ZM: I might be reaching out. [laughter] I think we've covered everything that I had. Is there anything that you think maybe we missed, or we should go back and discuss a little bit more?

AM: I feel like we've covered so much ground. I can't imagine that there is anything that we missed. But if you think of anything else later, always feel free to reach back out and I'd be happy to continue the conversation if you'd like.

ZM: Okay, awesome. Alison, thanks so much. I had a great time talking with you. I know it's a big time sink to volunteer for this project. I literally cannot offer anything in return, but I appreciate it. I've learned a lot and I think this will be really useful.

AM: Well, thank you. I appreciate that you asked me, and I had a lot of fun too. I hope the project turns out really well and people enjoy it.

ZM: Thanks, I hope for the same things.

AM: Okay, sounds good. Thank you, Zach.

ZM: Awesome. Thanks again. Have a nice weekend.

AM: Thank you, you too.

ZM: Bye.

AM: Bye.

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