Molly Graham: [00:05] This begins an oral history interview with Dr. Quay Dortch for the NOAA Heritage Oral History Project on May 16, 2023. It's a remote interview with Dr. Dortch in Washington, DC, and I'm in Scarborough, Maine. Last time, you had walked me through your education and the beginning of your career. You were talking to me about your work at the Bigelow Laboratory in Boothbay Harbor, Maine. Was there anything else you wanted to say about your time at Bigelow before you moved on to these other projects?

Quay Dortch: [00:41] Not that I can remember.

MG: [00:45] You described how you were on a project that was taking you to Seattle and on some research cruises.

QD: [00:52] Yeah. I spent about half my time at Bigelow going to other places because that's all I could get funding for. I think I mentioned that that was basically very hard on my marriage, so we ended up getting divorced. It was a very small lab and small town. Even though we were fairly amicable, it was better to get out of town. So, I applied for jobs and got a job at Louisiana University's Marine Consortium [LUMCON], which was just being built; it was brand new. It was, obviously, in Louisiana, a consortium of what I think then was twelve universities. They were unclear at the time what the role of LUMCON would be as a consortium. Was it just a place where they sent faculty and students to teach and do research? Or was it to be an academic entity in its own name? They hired faculty, which sort of led them to develop an academic institution in its own name, although we all had adjunct appointments at multiple other universities. By the time I left, I was an adjunct at four different universities, had students from all of them, and taught at one of them. No, that's not true. Because we started teaching by remote video from LUMCON. This would have been in the early – it would have been sometime after 1995. We set up this room for remote video, and we talked to all the different universities in the state. There would be as many as three or four universities on at a time. Back then, it was really cumbersome, and we had one person devoted to it. But at the beginning, we just physically went to whatever university it was where we were teaching, and it would be a three-to-six-hour drive to get there. It was challenging. That meant, of course, that I had to start all over again with new funding and new research projects. I sort of lost credit, in essence, for all the years that I'd been at Bigelow, which was only four years, when it comes to promotion and tenure. I had gotten some funding. No, actually, by the time I came up for promotion and tenure, I had quite a bit of funding and a fairly large research group, not huge in terms of medical sciences because those are huge but certainly substantial and as much as I could manage. I and another person at LUMCON, Nancy Rabalais, who has since gone on to win the – what's it called? – the MacArthur Genius Award, for example, but several other prestigious environmental awards, and she may also be a member of the National Academy of Sciences. So the two of us came up for promotion and tenure at the same time. And we were turned down for not having enough publications and for not bringing in enough money. We both had more publications and more money than some other people at LUMCON. But there were so few people at LUMCON; there was really nothing to – it was hard to make comparisons. Of course, the ones that eventually got promoted were male. It was not that obvious, though, at that point because the two females had come up for promotion and tenure, and then a male came up in the middle of our long, protracted process. We got turned down, and we tried again the next year. We got turned down again. The bad thing about it was if I remember correctly, and I may not remember

correctly, both of our committees had said yes, we should be promoted, and it was the director, Mike Dagg, who had said, "No, you should not be promoted. The letter from the committee is not strong enough," etc., etc. Basically, he didn't like either of us. One could ask why he didn't like either of us. But those were the things that were not talked about. The second time, that means you're out. We appealed it to the LUMCON board. Before we went to the LUMCON board, we both together consulted a labor lawyer because we were preparing a discrimination suit. The appeal was decided in our favor, fortunately. But this process went on for approximately two years. Obviously, both of us have gone on to have outstanding careers. At the time, it was just emotionally wrenching. I mean, whatever happened at Indiana University was painful, but nothing like this was. This was just year after year of just feeling as if you'd been rejected in every way you could possibly be rejected. I know it scarred both of us in many ways. But at that point, I had a great research program, I really enjoyed the research I was doing, I had lots of funding coming in, I was working with a lot of different people on some very interesting projects, but I think that sort of soured me on LUMCON in a way. And we were tired of hurricanes. We were tired of the political climate. We were tired of living down the bayou where, if you want to do anything, it's a three-quarters-hour drive to the nearest small town, medium-sized town, and an hour to an hour and a half to New Orleans. That's where NOAA came in. I got recruited for the job that I ended up with.

MG: [08:07] Let me just ask you a few follow-up questions about this time with LUMCON.

QD: [08:10] Yeah, that's why I paused.

MG: [08:13] First of all, how did it work funding LUMCON with twelve universities as part of the consortium? Where did the funding come from? How was it allocated?

QD: [08:24] It was a line item in the Louisiana budget. Every year, the director of LUMCON had to go before the legislature, just like the head of NOAA goes before Congress, to talk about the budget. Our money, fortunately, did not come through the universities, which gave us some level of autonomy. Initially, it started out with a twelve-month hard money salary which was part of the reason that I would even consider moving from Bigelow, which had been a hundred percent soft money. Louisiana was not where I would have chosen to go. I am not a warm-weather person. I arrived in the middle of July. But I, fortunately, had gotten air conditioning in my car before I came because I knew it was going to be terrible. And it was. But that is also where I met my partner – at LUMCON a year or two later. He has been with me ever since. Anyway, that doesn't mean that the universities didn't try and influence through the board how LUMCON was run and what it would be, and I think it's still a fight.

MG: [09:57] Yes, it sounds like there are a lot of cooks in that kitchen.

QD: [10:01] Yep, yep, there were a number of university presidents who thought that LUMCON should be part of their university, which made it even worse.

MG: [10:13] Can you say again what LUMCON stands for?

QD: [10:15] Louisiana Universities Marine Consortium.

MG: 10:21] It sounds challenging to be an adjunct for so many different universities. Can you describe that dynamic a bit?

QD: [10:30] Well, it's really not much of a problem because, as an adjunct, they aren't paying me. It's just so the students could get credit when they took a course from me. They had no control over me at all. I didn't have to participate in faculty meetings or anything like that. The two that I was closest to were Louisiana State University [LSU], which is the one I started being an adjunct at, and I physically taught classes there for many years the whole time. I would teach a part of biological oceanography there. Then the one that I got the most students from was Nicholls State University, which was the nearest one physically to us in Thibodaux, Louisiana, which you've probably never heard of Thibodaux or Nicholls, but it actually had a great undergraduate biology program. I would get a lot of student undergraduate interns from that, some of whom later became my technicians. It was a great pipeline. I did research projects, both with people there and at LSU, as well as at other institutions, including NOAA. A couple of people I work(ed) with now at NOAA, Greg Doucette and Fran vanDolah, I collaborated with at NOAA before I came to NOAA, so I'd known them for a long time.

MG: [12:07] Were you developing your research focus or your interests during this time? Were you looking at harmful algal blooms [HABs] at this point?

QD: [12:15] Yes, so the work that I'd been doing up to then had to do with how phytoplankton took up nutrients. There were enough people in that field that it seemed like getting funding was really difficult. I switched focus quite a bit when I went to LUMCON and was focused more on the processes that caused hypoxia in the plume in the Mississippi River, which has to do with nutrients, but it was not specifically focused on individual phytoplankton and how they took up nutrients, but what was the limiting nutrient. Then I got interested in the phytoplankton species for several reasons. One was because of HABs. But the other was that we recognized from work with sediment traps that certain species of phytoplankton just sank out like little rocks when they ran out of nutrients. So the hypoxia was actually related to blooms of specific kinds of phytoplankton. I worked on those two things. The question of limiting nutrients and how that affected phytoplankton, and then what HAB species were present. When it started out, everybody said, "We don't have HABs in Louisiana." Well, when you look, there's always HABs; they just hadn't caused problems there. Initially, it was sort of a sideline because if you're counting things, you might as well count the HAB species and keep track of them. But then, in 1996, there was a huge bloom of the Florida red tide that came all the way around from Florida, Alabama, Mississippi, and hit Louisiana. The guy in Louisiana who was the head of the shellfish safety, I had been contacting him up before then, saying, "You realize you've got HABs in Louisiana waters." Because they weren't really causing problems, he was not extremely interested, but he knew to call me when things went bad, which they really did. Shellfish were closed – oysters – for six months east of the Mississippi River, which covered the Thanksgiving/Christmas period, which is when people most often eat oysters. It woke them up at the time. But what I was seeing in my samples was another harmful algal bloom that nobody was worrying about. And I was seeing it in the highest numbers anywhere in the world in the plume of the Mississippi River. And it was toxic. The first question was, is it toxic? Yes, it's toxic. Why is it not making shellfish in Louisiana toxic? I left before I finally answered that

question. I still don't really know the answer. The problem is that what it does is in big doses, it causes something called Amnesic Shellfish Poisoning, where you lose your memory. It can kill you. And it did. The first time there was an outbreak of it in Prince Edward Island, Canada, several people died, and a number of people lost their short-term memory permanently. But the low-level effects are not quite so – and we now know what some of the low-level effects are. In the state of Washington, they recommend that people not eat more than twelve razor clams a month because they're always contaminated with a low level of domoic acid, and it affects your memory. They've been able to show that. I don't know if Louisiana has a problem like that because nobody's ever taken up that. They don't want to know, basically, is what the real thing is. It's one of those catch-22s. You don't worry about what you don't know you should worry about. And they've got some other issues, too, that they should probably be worrying about. I still provide advice to people in Louisiana, sort of on the side. Just last month, there's an FDA [Food and Drug Administration] person who oversees shellfish harvesting in Louisiana, and he asked me to write a risk assessment for Louisiana, just an off-the-cuff one, which I did because I hear about blooms and what's going on. Even though I'm not there, I do know still some about what's going on in Louisiana. Louisiana has an interesting problem because right now it doesn't have a lot of active blooms that they know are a problem. It's got several things like the *Pseudo-nitzschia* that I just told you about that are potentially problematic. If they were to really look at it, they might find that they have more problems than they realize. The other one is cyanobacteria, the one that you might hear about killing dogs. The low-level effects of that may have to do with liver cancer and something called non-alcoholic fatty liver disease. But those are things that occur chronically, they happen very slowly. Again, like the domoic acid at low levels, the problems could be there, and you're not seeing it. Someday, somebody will work on this and see what is happening in Louisiana. But I left at the point where we were doing studies with oysters trying to see if oysters ate this organism called *Pseudo-nitzschia* that's long and skinny and sharp. The oysters we were working with didn't seem to eat it. But others have found that they do eat it. And I left at that point. That's where I would have taken up the studies. But I moved on to other HABs permanently.

MG; [18:31] So it's not clear how it's caused or what accounts for the high levels in the Mississippi River?

QD: [18:38] Well, the organism is present because of the high nutrients in the Mississippi River. That's pretty clear. What's not quite clear – I have an opinion, but this is the part that I never wrote up – is which limiting nutrient causes them to sink out. I think it's the availability of silicate which forms their shells. They have a silica shell. So, when they're not happy, they sink out. But it might have been more complicated than that, and I just never finished that part of it. But offshore, that's not where they get the oysters. The oysters are harvested inshore between salinities ten and twenty. The next thing I would have done is go look at oysters at that salinity range and see how much toxin was in them. At that time, it was very hard to measure toxins. Now, there are methods for measuring toxins that we could have done a scan of that sort of thing to get a preliminary idea. The technology has really moved on, and this is something that would be possible to do now.

MG: [19:51] Well, that's so interesting. This is something I'm going to bookmark and read about later. During this time in Louisiana, where were you based? Where were you living?

QD: [20:02] So the lab is in Cocodrie, Louisiana, and you can look that up on a map. It's at the end of the road, south of Houma, Louisiana. It's about a forty-five-minute drive from Houma, which is the nearest medium-sized city. There's some small towns along the way. I lived at first in Houma, then I moved to Montegut because that drive was a long drive on a two-lane road, often with drunk drivers in the evening. We moved to Montegut. I bought a house in Montegut, which was a very down-the-bayou house. We lived on the second floor because of the flooding and had porches all the way around. It was a lovely little house. But the problem is, it flooded in Hurricane Andrew. It had flooded before I owned it in hurricane Juan. I got flood insurance on it by accident. I didn't know I was doing it. I accidentally bribed a site surveyor. He was surveying for the house across the street, and I asked him what it would do to get a flood certificate for our house. He said, "Oh, I can do it if you give me fifty dollars." So I gave him fifty dollars, and he did it. He was a bonafide surveyor. He worked for a company. I didn't even realize until years later that he probably was doing this under the table. A year later, Hurricane Andrew hit and flooded our house to about three feet in the lower part of the house. We remodeled the house. I lived there for quite a few years longer. But living down the bayou, we got tired – because we knew it flooded, we got tired of having to leave. Every time there was a hurricane, we'd have to pack up the lab because in Hurricane Andrew, the lab got badly damaged. My part of the lab was intact, but other parts were really damaged. We had this whole hurricane plan for the lab. Then you had a hurricane plan for your house. I'd been away when Hurricane Andrew hit – or when Hurricane Andrew hit Florida. Then I came back in time for it to hit Louisiana because when I saw the footage in Florida, I thought, "Oh my god, looking at that track, it's going to hit." I know now that there was no way I could have known at the time. Nobody could have told me. I don't know why I got on a plane and headed to Louisiana, drove down the bayou, did the lab thing, then came home, and then went up the road to Baton Rouge. Anyway, we got tired of dealing with hurricanes. We also got tired of – I don't know how to phrase it – the colorful life down the bayou in Louisiana. We had neighbors that were absolutely crazy. Guns going off. Target practicing. The neighbor was target practicing drunk with steel-tipped arrows hitting our shed door. We had two dogs. He'd come over drunk and say, "Can I get my arrow out of your door?" There were other even worse things that went on. We finally decided that we had to move, so we moved up to the highest land in the parish. A parish is the equivalent of a county in Louisiana. We moved up the bayou, and we were at twelve feet above sea level. That was the absolute highest you could get. It was this huge sprawling ranch house. You couldn't buy a nice little house because everybody there who could afford it had big houses. We were there for about two years, and then when the option came to move to DC, where I'd grown up, we just decided we were going to go.

MG: [24:57] This is you and your partner you're talking about.

QD: [25:00] Yeah, yeah. He, Ben Cole, worked for Nancy Rabalais at the lab, which is how we met, the person actually who was with me through the whole promotion and tenure fight. She and I did a lot of work together.

MG: [25:17] Can you talk to me a little bit more about that time period? It sounds really stressful and complicated. How were you treated at work?

QD: [25:26] Oh, it was very complicated. The director, Mike Dagg, had his office next door to me. For. I had to tell the postdoc, "It will ruin your career if you do any work with me." For example, he had a postdoc who came and expected to work with both him and me. Because it was clear that Nancy and I were both persona non grata. Fortunately, Mike and his family lived in New Orleans, and he was only at the lab a couple of days a week, which made it somewhat more bearable. It was hard because he would have been a natural person for me to collaborate with, and it had just never worked out for reasons that were entirely unclear to me. People took sides. Nancy and I and Mike collaborated with lots of people in Louisiana. It was hard for everybody because everybody knew about this. It wasn't as if this was private or anything. I mean, there were some people who managed to not get tangled up in it. But it was unfortunate in such a small world because – yeah, it was stressful.

MG: [27:05] I imagine that winning the suit was still sort of bittersweet.

QD: [27:12] Very. Because my office was still next door to the guy. He did not remain director for a long time. The Board waited maybe about six months and removed him. They could remove him for whatever reason they wanted to remove him for. I am not sure why they didn't have a suitable alternative. So we were under a very strange arrangement without a director for quite a while. It was at that point that I left.

MG: [27:53] What happened after winning the suit? Did that mean you were promoted and tenured at that point?

QD: [27:59] It didn't actually go to a suit. We appealed to the board. If that had failed, then we would have brought the suit. We were preparing everything for that. But the board supported us. I mean, there was no way they could not. But things happen.

MG: [28:21] Yeah. You're very brave to make that case. It was obviously at great risk to your reputation and how you were being treated at work.

QD: [28:32] Well, at that point, we both felt like we had nothing to lose. Because if you lose your promotion and tenure fight, then where do you go? What do you do? It was unthinkable to both of us. We had both put so much into developing our research programs there. They were not portable. I don't know what would have happened. Maybe another university would have scarfed us up, I don't know.

MG: [29:08] Tell me a little bit about your partner, his background, and what brought him to the lab.

QD: [29:14] His name is Ben Cole. He started out as an English major. He wasn't, I think, really sure what he wanted to do with his life. He ended up working in the oil field. He'd been doing that summers when he was a kid because they had friends down here in New Orleans that he could stay with some of the time. He became sort of attached to the area. He started out working in sort of low-level jobs in the oilfield, but being a pretty smart guy, he got taken on to boats and became a boat captain very quickly. He did that for a number of years. And then, he got hired at the Louisiana Department of Wildlife and Fisheries. This was before I knew him,

first as a boat captain. Then he started doing science kinds of things for them and slowly switched over to the science side at the Louisiana Department of Wildlife and Fisheries, and then he applied for a job at LUMCON working with Nancy – at that point, we had not gone through this promotion and tenure mess. This was still while we were establishing our careers. That's how I met him. He worked for her the entire time that he was at LUMCON, not the whole time he was in Louisiana, and became the person who ran all of her cruises because she had a huge field program, managed her data, and kept her lab running.

MG: [31:10] Was he a nice support during this tricky time?

QD: [31:16] Oh, yes, absolutely. I would never have made it through this without him.

MG: [31:21] So it sounds like you were in Louisiana for at least ten years. Does that sound right?

QD: [31:27] Seventeen years.

MG: Oh, wow. Okay.

QD: [31:29] Yeah, it was a long time.

MG: [31:33] The mid-‘80s to about 2003. Does that sound right?

QD: [31:37] Yeah, I started NOAA [in] January 2003.

MG: [31:40] Talk to me about the connections you had with NOAA before being recruited.

QD: [31:46] Well, it's interesting, the person who recruited me was not the people that I was connected to, but they were – it's funny, they were all in NCCOS [National Centers for Coastal Ocean Science] or what became NCCOS. It wasn’t NCCOS at the time. I knew Greg Doucette from years and years earlier; he had been a graduate student at the University of British Columbia when I was a visiting scientist there. I didn't really know him well. But we would occasionally be at the same meetings, and we would have lunch together or something. It turned out that our research interests converged when I was at LUMCON because he was in a section of NOAA that was doing HAB toxins. I didn't have any capability for doing HAB toxins, so I worked with him. I still work with Greg all the time – probably talk to him at least once a week, if not multiple times a week – and another person who since retired, Fran VanDolah. He did one kind of toxin, and she did another kind of toxin. But I'd work with both of them. Greg was on a number of proposals that I wrote at LUMCON where he could get funding from outside of NOAA. He was in a part of NOAA where they were they could bring in some of their own funding to cover the cost of the research. That must have started at least ten years before I came to NOAA if not more than that. It was quite a while.

MG: [33:28] What was the official offer to come to NOAA? Who made it and for what program?

QD: [33:34] It was a program in the NCCOS, National Centers for Coastal Ocean Research. I have to say fast to get it right. At the time, it was changing from the competitive COP, Coastal Ocean Program. It had originally been an office in the Administrator of NOAA. When they formed NCCOS, COP was moved into NCCOS. It's gone through multiple reorgs. At that point, it was CSCOR, Center for [Coastal Ocean Research]. That same group is now the CRP, Competitive Research Program, within NCCOS. It's in the headquarters of NCCOS. But it's basically done the same thing all along. I was hired to be the program coordinator for the ECOHAB, the Ecology and Oceanography of Harmful Algal Blooms. At the time, it was a multi-agency program. I was coordinating the program across NOAA, NSF [National Science Foundation], NASA [National Aeronautics and Space Administration], and EPA [Environmental Protection Agency], five different agencies. I was recruited by the person who – there had been the first ECOHAB program. ECOHAB was formed in approximately 1998/1999. There's some debate over what is the correct year to assign it. We're coming up on what we think is going to be thirty years, and we're trying to decide what is the thirtieth year. He was an academic who came in and just decided he didn't like working in the federal government; there were too many restraints on what he could do. When he left, it was taken over by Sue Banahan, who is the person who recruited me. She was another program manager in that office and took over the ECOHAB program temporarily and actually trained me to do all the programmatic – the bureaucratic part of things that I didn't know. She started on me in the spring of 2002, maybe even earlier than that. Ben and I talked about it and decided that we were really tired of Louisiana. It would mean him giving up his job, and he would go there without a job. But it was something that I wanted to do, I thought would be a good fit, and that turned out to be true. I'd lived in the area before, so it was not like going somewhere you didn't know at all. My parents at the time were alive and relatively healthy. They lived about four hours away as opposed to eighteen hours away, or however long it takes to fly. It just seemed like a good move.

MG: [37:29] And it turned out to be a good move.

QD: [37:31] Yeah. And [Ben] got a job. It took him a little while to get a job because when you're a certain age, it's not easy. He got a job with the Maryland Department of Natural Resources. All these acronyms, I have to think about them.

MG: [37:53] It's tricky. Speaking of an acronym, something I think you put in your notes to me before the interview was HABHRCA, Harmful Algal Bloom and Hypoxia Research and Control Act.

QD: [38:06] HABHRCA, yes. There's no real way you would know how we pronounce that. Yeah, it's a mouthful. That bill was passed in 1998. It was the Snowe-Breaux bill. It was two senators. Senator [Olympia] Snowe from Maine and Senator [John] Breaux from Louisiana. She was interested in HABs; he was interested in hypoxia. They got together. It's a very simple bill. It does three things. It establishes an interagency working group on what's now called HABs and Hypoxia. It's gone through several names. It was called a task force at the beginning. It establishes the programs in NOAA that currently exist. It took a while to get them all established. They didn't all get established right away. ECOHAB was the first one. It also required that NOAA do certain reports about HABs and hypoxia. It's been reauthorized three times and basically kept the same structure, although all sorts of things have been added to it.

MG: [39:31] Can you kind of characterize NOAA's efforts and the discoveries you've made as part of this group? How has that work unfolded?

QD: [39:40] There's two parts to what NOAA does. NOAA has intramural research. It's actually scattered throughout NOAA, but most of it is in NCCOS. The part in NCCOS is focused on HAB forecasting and HAB monitoring and assessment. We actually have two branches in NCCOS that are called that. Then the part that I'm in provides funding for anyone, and that includes people at universities, people in companies, or people in federal agencies, to conduct research. The [funding] allows groups to get together and collaborate – the right combination of people – by having it be [as] broad as it is. I think what these programs have accomplished – I referred to the fact that now there are methods for measuring some of the toxins. We still need more methods for measuring the toxins, but we have many more capabilities now than we had when I first got into the field. There are many more capabilities for counting the cells automatically that are just revolutionizing the science. We understand the impacts of the HABs much greater, and you can't manage something that you don't understand the impacts or the causes. We have made great strides for some HABs. But what's happened is that new HABs have emerged. So in the period of time we've been studying this – and these are not things where people say, "Oh, I see this, and maybe it's causing a problem." This is where people get sick or they die, and we need to deal with this problem. We have addressed those issues. We have also made amazing strides in predicting some of the HABs. There's the whole question of HAB control. Everybody would like a magic pill that you drop in the water and it goes away. We are working on HAB control methods. But the problem with that is that those are not realistic for these big-scale blooms. The environmental consequences of using them sometimes are not great. They're expensive to use on a large scale. Realistically, the best you can do is prepare for the impacts. That requires that you be able to predict when they're going to occur. We're working on both short-term predictions and long-term predictions. This year, will it be a bad year or a good year? Or an easy year? Next week, will I be able to go to the beach when I go to Florida? Tomorrow, will I be able to go to the beach, or would it be better to go today? We have successfully addressed some of those issues.

MG: [43:02] Yes. In my notes, I have something about how you worked on operationalizing observation systems. What does that look like? What does that mean?

QD: [43:15] What we're aiming for – we're not there yet; we're working on it – is the idea of having a national HAB observing network, where some amount of funding is provided to NOAA, which then NOAA distributes to the various (IOOSs [Integrated Ocean Observing System]?) regional observing associations and others who put all these new devices out. Or, sometimes, just pay people to do HAB cell counts and measure toxins and to have routine measurements that way of HAB cells and HAB toxins, and to have others who are doing it, say for the states, for protecting shellfish and public health also providing their data to these systems. So all this data can be put together. It can be used for predicting future HABs, depending on whether you mean next week or next year. But also to look at all that long-term data and be able to understand what's causing some of these HABs better. We are at the process of – Congress has asked us to write an implementation plan. We are all hoping that that is a preliminary to providing the funding. They're providing a small amount of funding for pilot projects. And

we're doing those pilot projects now. Some are being funded through research through our programs, but that's not operational. Because if you're dependent on research programs, then when the research program goes away, the observations go away, or the predictions go away. That's a way to develop new things, but it's not a way to maintain new things. You need funding for the operationalization of these observations and forecasts.

MG: [45:10] The way you're talking about HABs reminds me of how meteorologists talk about hurricanes.

QD: [45:20] Yeah, you can't make hurricanes go away. But the better you can predict them, the better you can protect people.

MG: [45:30] Over the course of your career with NOAA, what major HAB incidents stand out to you, or what were some events that you helped out on?

QD: [45:40] One of the programs we have is an Event Response Program (https://coastalscience.noaa.gov/science-areas/habs/response-and-readiness/#event-response). And so people can – it's a small pot of money that sits at the national office at Woods Hole. We have a HAB National Office (https://hab.whoi.edu/) at Woods Hole Oceanographic [Institute]. There's a small pot of money that sits there, and we top up that pot every year. That's so a state or a researcher can call us up and say, "We've got a problem here. And we need help fixing it." Sometimes the help is just helping them figure out what it is and what they need to do or who they need to contact. But sometimes, it's providing them with money in order to respond to it. In our office, we all participate when we get these calls from people who want money. We all participate, and then somebody takes the lead in those. The ones that stand out to me are – there was a 2005 event in the Gulf of Maine, which actually – well, I guess it stayed in the Gulf of Maine, but it was really bad. It was more toxicity than they had seen, and it was spreading faster than the states were able to keep track of. The states wanted to know where the blooms were because they were lurking offshore and then coming inshore and contaminating the shellfish. We, NOAA, provided a huge amount of funding for that event, but also did a lot of work with them to help them figure out what was going on. It was two of us for about three or four months, who just spent – we hardly did anything else but that. I think we got a bronze medal for that one, the first time that – it was a major event.

MG: [47:57] What caused that major event in the Gulf of Maine?

QD: [48:06] We still can't really explain why it was so much worse than other years. And then it remained bad for a couple of years. What we know now is it goes through cycles. We thought it was a twenty-year cycle. That high lasted for a couple of years and then slowly declined. We're now in a low spot and have been in a low spot for quite a while. It doesn't mean they don't have HABs because they still have *Alexandrium* in the Gulf of Maine. But it's been fairly small and certainly within the scope of the state being able to deal with it. In the meantime, the state of Maine has had to deal with two new HABs that they never had before. Again, we provided event response money to help them in the case of *Pseudo-nitzschia* that turned up for the first time. It was never there, and then all of a sudden, it turned up in the late fall, winter, which is not a time they have blooms in the Gulf of Maine. They had a bloom of something called *Dinophysis*, that

turned out to have a brand-new toxin that we're still funding research to determine whether that toxin – how toxic it is. It's structurally similar to the ones that are toxic, but we don't know yet. The toxicology studies are still being done on that. Again, we provided funding to help with providing a quick test for the toxins, for example. But that's now over a number of years that that has happened. That didn't all happen in 2005.

MG: [49:45] We have a number of collections and interviews in the Voices Oral History Archives about red tide events, particularly in Florida. I think I read in an interview about an event in 1998, which was a stretch of HABs that was maybe seven thousand square miles. Does that sound familiar?

QD: [50:07] Well, it was before I was at NOAA, but that is what led to, among other things, ECOHAB being founded. One of the first projects that was funded by ECOHAB was to study the red tide off of Florida [*Karenia brevis*]. So, ECOHAB has two kinds of projects. One is called regional projects. There are five million dollars for five years. Plus, back in those days, we also had lots of ship time. In that case, I think it was NOAA and EPA [that] together funded one of those major studies of the Florida red tide. Then, there was a follow-on MERHAB project, Monitoring and Event Response for HABs, which I don't manage; somebody else in my office manages. But then there was another ECOHAB. There's now another ECOHAB. At each time, though, they've refined – the first one was looking at just what do we know, what can we figure out. It's like reaching into a shoe box and grabbing things because so little is known. But they learned a lot in the first one and then in the MERHAB. The second one was to answer the question of what nutrients are fueling the blooms, because there's been this whole debate about land-based nutrients. If it's land-based nutrients, then you can try to do something to prevent it. The conclusion of that study was that there were twelve different nutrient sources, and it's hard to point a finger at any one. Then, this third one is honing in on those nutrient sources, still looking at the land-based question, but instead of looking at what starts the blooms, which was the focus of the earlier studies, this one's looking at what stops the blooms because people want to know once it started, what causes it to stop, and whether land based nutrients – they may not be causing the blooms, but they may be keeping them prolonged while the blooms are pushed up against the shore. It's a very complicated oceanographic situation. Sometimes the blooms are offshore, and sometimes the blooms are inshore.

MG: [52:35] The other incident I read about, and I don't know if this is related to your work or if you'd be able to shed any light on it, but in 2013, there were scientists in Florida trying to figure out what was killing bottlenose dolphins in the Indian River Lagoon and suspected it was related to polluted waters or prolonged freezes which might have triggered algal blooms.

QD: [53:02] That whole period in the Indian River Lagoon was really interesting. Yes. We did fund a number of event responses not specifically related to the dolphins. I'm trying to remember what year. 2011 was what was called the super bloom, and that was the first huge algal bloom in the Indian River Lagoon. Basically, the Indian River Lagoon has extremely high nutrient inputs from land runoff, septic systems, and it's increased as the area has been built up. It just reached a tipping point in 2011. That was followed in 2012 by a brown tide and then multiple combinations of things after that, and not all years, but almost every year. That's made all the seagrasses die off, which has changed the Indian River Lagoon. It's like it went through a

tipping point with the seagrasses dying off. There's also been manatee deaths from starvation. That's because with all the seagrasses gone, they're starving. I don't remember that – I've been involved in a number of dolphin mortality event investigations that have to do with HABs and often get called in, or somebody from my office gets called in – the person who took over ECOHAB for me has done a lot with marine mammals too. All these things just work together. But there are studies showing fairly high levels of some toxins, biotoxins in various marine mammals in that area. The problem is we don't know what the baselines are, what is normal. That's a whole long story that I could spend an hour talking about. One of the wonderful things about this job is when I was in Louisiana, I had many students, and a good half of them wanted to do something with marine mammals. They would be distraught when they would not get accepted into graduate school in a program that had to do with marine mammals. I always told them to try and find a backdoor way. It turns out, I had nothing to do with marine mammals when I was in Louisiana, but when I came to NOAA, with the connection with – so by 2004, in St. Joe's Bay, there was a massive die-off of dolphins. I was involved in that investigation. That was shown to be due to brevetoxins, the red tide toxins. That was the first event where I got involved. I ended up, from that and subsequent events, learning an enormous amount about various marine mammals and how they do necropsies and all sorts of things that I never thought I would learn about. But an opportunity that would have never happened if I'd stayed in Louisiana.

MG: [56:28] Well, it sounds like you had so many opportunities at NOAA to do different things and different research, and you were supported in all of your work as well.

QD: [56:38] Yes, I really felt that way about it as opposed to everywhere else that I had been where everything had been a struggle. It's not to say there were no struggles because our programs had been really well funded at the point that I got there. And for reasons having nothing to do with me, just the general political climate, our funding went down and down and down and down. It wasn't until in – it went up a little bit because it's a nonpartisan issue. HABHRCA was not partisan. The whole issue of funding for HABs has not been partisan. So, it was beginning to go up because blooms occur in red and blue states. Then, in the first Trump term, our programs were zeroed out in the Trump budget. Then Congress would put back our funding but increase it every time. So we're back up now at very high levels of funding, which has been – one of the reasons I haven't left is because there are opportunities to do things now that there weren't before. It's a really exciting time to be there.

MG: [57:49] Oh, good. Can you say more about that? What's exciting? What's on the horizon?

QD: [57:54] Well, in NHABON [National HAB Observing Network], this implementation program I mentioned that I'm working on, which is taking a lot of the things that came from our research and putting them to use if this really comes to fruition. I've been one of the authors of this implementation plan, which is going through NOAA, and then it's going to go through Commerce approval, and then it has to go to OMB [Office of Management and Budget] and then to Congress. But I'm working on other things at the same time that are exciting. I'm also working on this South Florida report that I'm not quite so excited about. It's a congressionally mandated report. The congressional delegation from Florida passed the bill, the [South Florida Clean Coastal] Waters Act. It's not the Clean Waters Act, but it's an amendment to HABHRCA,

and it's requested an interim assessment of HABs and hypoxia in South Florida, a final assessment, and then an action plan for HABs and hypoxia in South Florida. I know a lot about Florida because I've managed many projects there. I'm on the governor's Red Tide Task Force. It's actually the governor's HAB Task Force, primarily focused on red tide. I know a lot about Florida, so I'm the logical person to help out with the writing of that. But it's not a report that anybody wants, so I'm not terribly excited about it, except the members of Congress. The people in Florida know what they need to do, so they don't need us telling them anything.

MG: [59:47] Dr. Dortch, we're a little bit over our time today. I only have a few more questions. Do you want to keep going, or if you have other things on your schedule, we can have another shorter session after this?

QD: [59:59] I think I'd rather have one more shorter session.

MG: [1:00:02] That's fine.

QD: [1:00:04] [inaudible] drag this out so.

MG: [1:00:06] Not at all. This is very interesting. I think we'll be able to wrap up in the next session, and we won't even need the whole hour, although I'll take it if you can spare it. Well, let me pause the recording, and we can take one more look at our calendars.

----------END OF INTERVIEW----------

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