

08-05-2016

Richards, Anne ~ Oral History Interview

Joshua Wrigley

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Recommended Citation

Richards, Anne. Interview by Joshua Wrigley. *Voices from the Science Centers*. Voices from the Fisheries, NMFS, NOAA. 5 August 2016.

This oral history was produced in 2016 as part of the *Voices from the Science Centers Oral History Initiative* conducted by *Voices from the Fisheries* with funding by the NMFS Office of Science and Technology.

> Voices from the Fisheries 166 Water Street Woods Hole, MA 02543

Interview with Anne Richards by Joshua Wrigley

Summary Sheet and Transcript

Interviewee

Richards, Anne

Interviewer

Wrigley, Joshua

Date August 5, 2016

Place

Social Sciences Branch Falmouth MA

ID Number

VFF_WH_AR_001

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Biographical Note

Dr. Anne Richards was born the youngest of five children in Morristown, NJ on June 26, 1952 to parents from Ohio. She moved around a lot growing up and fell in love with New England when she lived here for a short time. Anne intentionally came back to New England to attend Colby College and studied marine Science and became interested in animal behavior. She attended the University of Rhode Island focusing on behavioral and ecological communities of fish in the Zoology department. The majority of her career has been spent at the Northeast Fisheries Science Center in 1985 as the Striped Bass Coordinator. She began work on Northern Shrimp in 1992 before moving to the University of Maryland for 3 years. She returned to the Northeast Fisheries Science Center in 1999 and began researching monkfish which she continues to study.

Scope and Content Note

Interview contains discussions of: Darling Center, community ecology, behavioral ecology, Northern Shrimp, predation, Northern Shrimp Fishery closure, Striped Bass and regulation, Emergency Striped Bass Study, cooperative research, Monkfish Survey, dovekeys, monkfish spawning and and egg veil spawing, Monkfish biology and monkfish regulations, cooperative research.

Anne Richard's interview is a description of her work studying striped bass, northern shrimp and monkfish. She provides a rich description of the biology of these species. In addition, she discusses the changes at the Center from a focus on biological research to a focus on at-sea data

and modeling. She also explains the funding challenges and how that impacts the ability to do relevant, necessary science.

Indexed Names

Boreman, Dr. John Chambers, Dr. Chris Clark, Steve Cobb, Stan Dorazio, Dr. Robert Edwards, Robert Goodyear, Phil Grosslein, Mark **Joe Idilian [spelt phonetically]** Murawski, Steve Rago, Dr. Paul Saila, Saul Shepherd, Gary Sissenwine, Michael

Transcript

Joshua Wrigley (JW): This interview is being conducted as part of the Voices from the Science Centers project funded by the Northeast Fisheries Science Center. It is also part of the Voices from the Fisheries project that is supported by the National Marine Fisheries Service by Office of Science and Technology. I am Josh Wrigley, Project Manager of Voices from the Fisheries, and I'm speaking today with Anne Richards at 15 Carlson Lane which is where the Social Sciences Branch is located and the date is Friday, August 5th, yes, August 5th. The time is about 9:30. So we can sort of jump into things here. When and where were you born?

Anne Richards (AR): I was born in Morristown, NJ on June 26, 1952, and I was the youngest of five children, and the rest of whom were born in Ohio. Both my parents are from Ohio, so we never, when I was growing up we didn't have a whole lot of connection with the ocean because of that.

JW: How did you find yourself moving eventually in the direction of Marine Science?

AR: Well, I never really thought I... I never really had any connection to the ocean. I think we went maybe two or three times when I was growing up. The first time, I think, I was four, and the only thing I remember is that I had a really nice red plaid bathing suit with a skirt on it. And when we went in the water, the skirt flowed out on top of the water and was utterly beautiful. And the other thing I remember is that I got caught by the undertow, and I distinctly remember being extremely surprised that I could not get up, that I was stuck under the water.

So those are my earliest memories of the ocean. I think we went maybe once or twice as I was growing up but I never really did go to the . . . we never went to the beach. I went maybe as a high schooler. We had moved to Western Mass near Springfield when I was 9, I guess. So I

went a couple of times in high school with friends, but the way I got connected to marine biology really was happenstance. I knew from a pretty early age, I think that I wanted to do something with biology. I just was always drawn to the outdoors and to animals. I remember when I was about 12 having an epiphany and it was that my parents would always ask us what do you want to be when you grow up? What do you think you want to do? And so I would think about it, but I didn't really have any answers and then finally I figured it out – I wanted to be a naturalist. That was a great relief to me to know what I wanted to be. So I always had the inclination towards biology. So when I went to college, I figured I would be a biology major.

JW: Where did you go to school?

AR: I went to Colby College in Waterville, Maine. And I did that because, I really chose that school because I wanted . . . by that time, my parents had moved to Michigan when I was in high school. We lived in Michigan and I was by that time, a dyed in the blood New Englander, and I didn't really like Michigan very well, so I chose my college to get out of the Midwest. And we had been going to Maine to camp in the summers ever since I was a kid, and I loved Maine. I loved Maine immediately when I first went there when we were six. In fact, the friend I made that summer taught me the Maine state song and we would go around the campground singing the Maine state song.

So I went to Colby and I did end up majoring in biology, but I really didn't know what aspect of biology I wanted to do. I knew I was never interested in physiology. We had so many physiology and anatomy classes in high school. I went to three different high schools, and every time it seemed like I had to repeat the same classes. So I liked ecology, and I liked whole animals stuff rather than cellular genetics and that kind of stuff. But I wasn't really sure what field I wanted to go into and then when I was a senior I took a class that introduced me to the field of animal behavior and I realized that was really what I was interested in. I thought, you know, that was what I liked. So anyway, I graduated, and then after graduation I got a job. I was just looking for a job and I happened to get one at the Darling Marine Center, which is the University of Maine's marine lab on the coast of Maine.

JW: Is that in Walpole?

AR: Yes, it's in Walpole. And back then, it was called the Darling Center, it was a real small place and I had a job . . . Wow, I can't believe anyone could do this but I basically was a person who identified macro-zooplankton – so mostly amphipods and this is from a monitoring project of the nuclear power plant in Wiscasset. So as part of their permitting process, they had to do monitoring of the water around the plant and so as part of that project, there had to be all this work done. So, I can't remember how often the samples were taken but there were endless supplies of samples and there is one guy who sorted the amphipods, he sat there all day and sorted the amphipods, and then he'd pass them on to me and I would take the amphipods and I'd look at them one by one under the microscope, looking at all their various features and identify them to species and then I'd write down the species, and count them and so forth. So that was what I did 8 hours a day which to me is unbelievable now. It was hard. It is hard to do that kind of stuff.

JW: And this was just coming out of undergrad?

AR: Yes, this was just coming out of undergrad. So at the Darling Center, it was really small and there were a bunch of grad students, of course, and of course I became, I hung out with the grad students but I also was able to go to seminars – you know, just be there in the life of the lab and know what was going on and everything. So after about, think I was there for about 10 months, I decided to apply to graduate school – but I was still thinking I was going to do animal behavior or behavioral ecology or something, but because of influences at the Darling Center, one of the places I applied to was the University of Rhode Island, which has a really strong Oceanography School, but I applied to the Zoology department and I applied to work with somebody who was doing, he called it behavior. It was behavior at some level, but anyway, so that's where I ended up going to grad school.

When I got there, and I really understood more of what was going on in that lab, I realized I really was not interested in what was going on. They were working with small mammals so a lot of what they were doing was going out and trapping mice and voles and moles and then we would dissect them and see how many embryos, what stage of reproduction they're in and so forth. And he was looking at trying to maybe look at, I'm not even really sure anymore, maybe density dependent effects on reproduction, or things like that. I wasn't interested in killing little fuzzy things and looking at them. I was more interested in killing fish. But anyway, so it just so happened that there was a professor in the zoology department who was a behavioral ecologist and I guess I took a class with him or maybe just people were telling me about him. Anyway....

JW: What was his name?

AR: Stan Cobb - C-o-b-b, and it turns out that he was working on lobsters and crabs, so he was marine oriented but he was animal behavior. So, I switched to his lab and that was fabulous! He was a wonderful man and a great mentor and so I ended up working on lobsters and crabs. I did sort of community ecology of these critters; competition and predation and so forth. I kind of sort of through happenstance went back into the marine stuff but I was also able to get the behavioral ecology and the community ecology and so forth. It was really lucky, but that's how I got back into marine stuff and I did take some fisheries related classes. I took courses from Saul Saila who was really wonderful important man in the Oceanography department who did fisheries work in top population dynamics. I wasn't really thinking about going into fisheries. I did take a class that was taught by the Northeast Fisheries Science Center. They came over to URI once a week and gave lectures, and I remember Bob Edwards coming because I just remember he was such a, sort of an actor, he put on kind of a show while he lectured, not a show but it looked like he loved the limelight and was telling us all these grand things, and it was funny. But anyway, and I'm sure Mike Sissenwine must have given a lecture probably, and Mark Grosslein gave a lecture. So people would come over once a week and talk, but that was pretty much it for fisheries.

JW: Were there a lot of people in your cohort who were looking to go into fisheries and environmental management and other aspects?

AR: No. I wouldn't say they were looking to go into fisheries; they were probably more community ecology – so more going into probably an academic kind of thing, although I mean one of my cohorts works for NSF [National Science Foundation] now, and he was a professor for a while. Another one has retired from a career teaching science at a private school somewhere in New England. A lot of them went into academia, I'd say. One of them works for NOAA, although she wasn't actually in our lab, she was in the botany department but married to somebody in our lab. So I wouldn't say very many of them ended up in government, but the reason that I was able to. . .so after I graduated, I actually went to Panama for a few months because I had a little Fellowship with the Smithsonian, which was awesome!

JW: What was that focusing on?

AR: I was focusing on the lobsters, the lab was, on the north side of Panama and the Caribbean side, the lab was situated on a reef that the top of it was really close to the, it was really shallow and it was the top of it was basically dead – the coral itself – but of course, there were lots of things growing in and on it and so forth. I was studying the spiny lobsters there and it was just wonderful because I had finished my dissertation, everything was wrapped up and I didn't have any leftover projects or anything that had to be done. I could just go down and focus on this one little batch of research and I was tagging them. I was putting electrical ties on their antennae and trying to look at their home range.

JW: Was that part of a population assessment?

AR: Well, it wasn't really a population assessment, and I don't think it's ever really happened, but it could have been used to try to estimate population size by the re-sightings of the tags and so forth but it was really fun. So anyway, when I came back here Mike was already working here, my husband, we weren't married yet. So I came to hang out in Woods Hole and started looking for jobs.

JW: What year was that about?

AR: That was 1985. So I came back here in the last week of 1984, right before Christmas. So I would go down to Woods Hole and go to the library, the Lilly Library, and work on writing papers for my dissertation and I was looking for jobs and that spring, there was a job opening for a Striped Bass Coordinator at the lab, and so I applied and I got the job, which was really nice. John Boreman hired me, I don't know if you know who John Boreman is, but he had been the striped bass guy at the lab and had done a tremendous amount of work in striped bass management and fighting for protection for striped bass when they were really in bad shape. He wanted to move on, he wanted some relief, and he said he wanted to hire somebody with more of an ecological background than fisheries, so that's how I was able to get into that job.

JW: This was at a point when the striped bass stock was still in the period of decline, right?

AR: Yes. The striped bass stock was in very bad shape, but the decent sized year class had appeared out there, in I forget, maybe 1982 - I get it too mixed up with the other species. Just as I came in, John Boreman and Phil Goodyear, who had been the stalwarts of this whole thing

were getting out, but they had – I remember the first meeting I went to was the vote about...well, the significant thing about striped bass management was the decision that was adhered to by all the states to raise the size limits every year to stay ahead of the growth of that year class, until the females could reach spawning size which makes only sense. But anyway, I was there for the first meeting when they made this decision and that's what really turned the whole thing around was protecting that year class to protect the spawning. In the bay, the size limit used to be 12", which is a 2 year old, and the females aren't 100% mature until about age 8 - that's a big difference, a really big difference.

JW: How much consensus was there between the scientific community and the industry then, regarding that policy change?

AR: Well, it's really interesting because it's such a different thing because striped bass is dominated by the recreational fishery, so their livelihoods aren't really dependent on it the way the commercial industry is. And the other thing was that it was so clear to so many people that the striped bass were in really bad shape that it was politically, it was much more unified to get behind it and say that you know something needs to be done. But it also was difficult because it's a state managed fishery and you have all these different entities that have to agree, and there's different political pressures from different states and so forth. Some states were highly political, other states were much more conservation oriented and so forth and there was a lot of "watching out for myself" among the states. It was a really different situation than what we see with groundfish fisheries, say, which is primarily commercial.

So the whole thing really hinged on getting everybody to sacrifice and to feel like they were sort of sacrificing equally – you know, nobody's being more harder hit than the other. So, there was a law passed that's called the Striped Bass Conservation Act and it basically said that the states had to comply...if the regulations were passed, the states had to comply and if they didn't comply that the federal government could come in and put in a moratorium on striped bass fishing in that state which is a really big deal.

JW: So was that around 1984?

AR: When the act came in . . . something like that. I think it was passed before I came in. But anyway that was absolutely critical because it provided clout to the ASMFC [Atlantic Marine Fisheries Commission] plan. So there were a couple of times when a federal moratorium was either threatened or put in place. I think there was one put in place in New Jersey for like one day. States don't want the feds dealing with their stuff.

The idea was that everybody was sacrificing to protect these things. There was sort of a rallying around the species and a real support for this program. Part of that too was I think that it was very clear what the objectives were and when they were going to be met, and the objectives were common sense – protect this hope, this one year class, protect it until it can spawn. Anybody can figure out that if you don't have spawners, you're not going to have babies. That's a very clear, very intuitive goal. It also had a very clear endpoint which was when the juvenile index in Maryland, which was the biggest component of the recruitment reached a certain point and that

was based on the historical time series. So there was a deal struck "Okay, once it reaches this point, the fishery will open again."

I think the simplicity, the intuitive, the common sense of the goal, and the defined end point all combined to make it, plus a lot of recreational fishing combined to make it...to garner public support. That's really important especially with the recreational fishery because it's hard to do enforcement for the recreational fishery, so what you really need is to have people believe in it so they do it willingly. It worked. The juvenile index trigger was met, not in a way that we anticipated, but the deal had been struck so the regulations were relaxed. It's a real success story, but you never know whether a stock is going to come back because you take off the fishing pressure, so it's lucky that it did.

JW: Well, that's interesting that you say that the recreational community kind of recognized that fishing pressure was one of the main drivers behind the collapse. I'm wondering did it inspire at all any sort of conversation about water quality and spawning habitat as well?

AR: Yes. Well, of course, it was not that clear. It was a tremendous amount of controversy over what the source of the problem was and, in fact, one of the major part of my job – so Congress funded studies called Emergency Striped Bass Study – the emergency went on for, I don't know how long, a decade and a half something like that, but there was research money allocated each year to do research and the purpose was to try to figure out what was the cause of the decline. So, there were studies going on on acid rain and also to do other mitigation like stocking which was a joint study by NMFS [National Marine Fisheries Service] and U.S. Fish and Wildlife. The Fish and Wildlife side did a lot of stocking of hatchery fish and so forth to try to rebuild.

JW: Was that mostly down in the Chesapeake?

AR: Yes. I'm trying to think if they did any elsewhere? I don't remember.

JW: Sounds almost like something the U.S. Bureau of Fisheries would have tried to do back in the progressive era.

AR: Yea, in the olden days. There was a lot of controversy over why the stocks were down, and there was a lot that can be used for obfuscation – it's acid rain, it's the oxygen squeeze in the Chesapeake, it's PCBs [polychlorinated biphenyl], you know; it's all kinds of stuff. We were funding studies to look at that, but also to start some monitoring programs that weren't existing. The thing that really was critical was Phil Goodyear and John Boreman did some work, and there's also logic here too, but the point was say it's acid rain. If it is acid rain, we can't really do anything about that on a short timeframe. The only thing, whether it's fishing pressure or not, the only thing we can do to immediately effect things is to reduce the fishing pressure because even if it's acid rain, if you take away the fishing pressure, you're going to have a positive effect.

They made that point really well and people understood that. So that was a really, it was an logical thing, but logic doesn't always prevail and so they made that point well and got it across. There was a lot of question about whether it was other things. Of course, we always as humans,

I think we always want to have one explanation. It's this! It's that! In fact, most things are a combination of factors, but the thing is when we did remove the fishing pressure, we saw a huge change so it kind of suggests that fishing pressure was important whether it was the only cause of the decline or not, you know. So how's the striped bass fishing now?

JW: I'm seeing a lot of very small fish. I fish from shore as a fly fisherman. But when I go out in the mornings before dawn, I'm mostly catching fish that are about 12" long at the most – I think the largest fish I've caught this year has probably been maybe 25"—26" around there. So nothing huge.

AR: Do you usually catch huge ones? I remember seeing some pictures of you with big ones.

JW: Well, I don't usually catch huge ones either. I can't overinflate myself.

AR: I remember that picture I sent to my brother. It was you with a really nice big fish, when I was trying to get my brother to move to the Cape.

JW: That was the nicest fish!

AR: Alright.

JW: Although that was one of the smaller fish of the fish I saw caught that day. There were probably fish up to 45" feeding in that one school in about 2' of water. It was quite a sight, it was very dramatic.

AR: Really? That's awesome. So cool to see!

JW: Right now, in the marshes where I fish, it's mostly fish, maybe even smaller than 12". I think the smallest I've caught this year has been about 8". There was actually a little feeding event yesterday in Great Pond when I was down there in the morning under the bridge as they were chasing what looked to be either very young menhaden or maybe silver sides – right into the ebbing current.

AR: Cool. That's neat. Nice to see.

JW: What do you think sort of explains that appearance of the small fish this year? Because last year, and talking with a number of other anglers, they didn't encounter any fish below maybe 20-24" or at least very few and far between.

AR: Well, I really haven't followed what's been going on with striped bass so I don't know what the recruitment indices have been, but in our part of the world, we see fish both from the Chesapeake Bay and from the Hudson River and so you know, during the summer, but that's pretty small. I don't think we usually see them that small. 8" seems really small. It could be all kinds of things, maybe there was a huge recruitment in the Hudson, or maybe the conditions were too warm in the Hudson, so they moved out ahead of time. I don't know—speculation – I

don't know, it's interesting though. I'll have to ask Gary. He's the one who's keeping up with striped bass, so. . .

JW: In terms of the Hudson River fish, what was the extent of their range really? Would they come this far north, or mostly sort of remain down on Long Island Sound?

AR: Oh yea. Well yeah, we think so. In fact, I think if I remember right, the Hudson fish migrated out at an earlier age than the Chesapeake fish I think, so yeah, they are definitely along our coast. It's a mixture of the Chesapeake and the Hudson.

JW: So, as striped bass coordinator then in 1984 was it?

AR: I started in 1985 and I think I...

JW: Oh right, because you arrived in the tail end of '84.

AR: Right. Right. So I started working at the lab in June of 1985. I think I switched out of that job in probably around '92, something like that – I'm not real sure exactly. So I did that for maybe 8 years, 7-8 years something like that. So what were you going to say?

JW: So is that mostly doing striped bass stock assessments then?

AR: Yeah, we didn't really have a whole lot of stock assessment work. I mean mostly I was doing research coordination. Paul Rago and Bob Dorazio at Fish and Wildlife Service were trying to develop a model. It was a little hard because there was not, you know, as is often the case, there's not enough information to do what you really want to do as far as understanding the stock dynamics especially with this, where you've got very distinct stocks that are then mixing along the coast and they're being exploited inland and on the coast and so forth. My job was mostly research coordination at that time and being involved with the technical committee.

JW: And was your office down in the main lab in the building on Water Street?

AR: My office was in, well when I arrived they had just, population dynamics had just moved up into the second floor above the aquarium, so brand new. The carpet still smelled. That's where I sat. I had a little cubby in the hall, and I actually for a while shared it with Gary Shepherd who also was there at the beginning as a new employee. I was in that building from the beginning.

JW: And then in 1992 how did you transition?

AR: I decided I wanted to do something different. The excitement of striped bass was waning in a sense. It was looking pretty good. I just wanted to do something different so I talked to my boss and I guess...Well, Steve Clark had always worked on Northern Shrimp, and he was moving into a more administrative role and so they asked me if I wanted to work on shrimp and I said "Sure, why not?" So I passed the striped bass ball to Gary and I started working on Northern Shrimp which is a really interesting species and I really maintained an interest in it ever since

then, even though for some years I was doing other things. Probably about 10 years I was doing other things, but I still continue to do research on the side on shrimp. They're really interesting critters they – so this is Northern Shrimp, pandalis borealis, and most of these shrimp occur in more northern waters. We have the southernmost population in the Gulf of Maine. They're interesting because they're sort of sensitive to temperature so before the climate was really changing much, you could see their sensitivity, so they're good model species to look at in the face of climate change. They also have a very interesting life history – they're sequential hermaphrodites so they start out life as males and they mature as males, mate once and then they realize what a mistake they've made and they turn into females.

JW: Interesting.

AR: Yes! And so then they reproduce as females for two years and then they die. And they're little, I mean, they get maybe total length, they get to be maybe 4" long, but they live for 5 years we think, so it's pretty amazing and they're very tasty. So, we have this small population in the Western Gulf of Maine and we also have a really good survey for them so it's really nice. There are good data for it and so I've been interested in...Oh, I've done work on their sensitivity to temperature and how that effects the stock recruitment relationship, and recently I was looking at – the other thing is that everybody likes to eat shrimp, not just humans, and so I've done some work recently looking at predation on them and how that impacts their population and the stock assessment and so forth.

JW: What are their chief predators?

AR: Well, in the Gulf of Maine, there are a lot of things. In the more northern populations, Cod, Halibut are really big predators, but they are much more simple systems than ours in the Gulf of Maine. The food web in the Gulf of Maine is much more complicated and involves many more species, so in the Gulf of Maine Cod is/was important – the Hakes are really important. A number of skate species are important, redfish is really important. In this work that I did a couple of years ago, I think I identified 21 species of relatively important predators that needed to be accounted for in the stock assessment. When I incorporated information on the predation pressure into the stock assessment, the model behaved much better, so the natural mortality is an important thing for these shrimps.

And then I've also looked at, I've used satellite data on phytoplankton to look at, and the information from the survey to look at, when in the early life history there's some sensitive to temperature and things like that. So it's been really interesting from sort of an ecological point of view. In 2012, there was a sudden decline of the shrimp. This survey we have is really good so you can pretty much predict what you're going to see for the older year classes from what you saw the year before and the younger year classes, so they persist over time. Only the females are subject to the fishery—but in 2012, we saw everything just wiped out, the ones that are too small to be in the fishery, the males, and all the females. The fishery's actually been closed since – when did they close it - I think we're in our third year of closure now, I think it was 2014 was the first year.

JW: What were some of the factors you think responsible for that decimation?

AR: Yeah, well you know, I've been looking at that and it's something I need to do more work on, cause I'm supposed to give a talk on this next month and I keep not having time to do it. [laughs] From what I've done so far it's really interesting, there doesn't seem to be. . .I haven't found the smoking gun. I mean it looks like because all the sizes were wiped out at the same time, it looks like either predation or disease, or wholesale movement out of the area. So we've been able to look at whether they have gone somewhere else and have not found any evidence of that, and it wouldn't make sense because where they are now is already the coldest part of the Gulf of Maine, so and we have no evidence, no anecdotal observations, no observations from survey that would suggest that they had a big diseased event. Of course, we're only out there a few times a year, but fishermen are out there and other fishermen get shrimp, and you hear things, and it doesn't seem to be so.

It seems like it must be predation, but when I look at the predation pressure index, there wasn't a big spike in 2012, but if I look in a little more detail it seems like there was more shrimp eaten per predator possibly in that year. So, one of the things I want to look at now is whether. . . 2012 was a really warm year in the Gulf of Maine, it was the warmest year on record. So it didn't seem from the data we have, summer distribution data, that the shrimp were in a temperature squeeze. They didn't seem like they were bunching up in little pockets of cold water. Even though it was warm, it wasn't too warm for them, but I'm wondering whether temperatures caused the fish predator distribution to shift and maybe overlap more with the shrimp and so maybe there was more predation. . . something like that I think had to have happened, but I'm still working on that. So that's what I'm trying to look for next month.

JW: And the shrimp have been a commercially important species for quite a while, right?

AR: Yes. The fishery started in the 1930s and it's not a huge fishery in the Gulf of Maine, but it's important locally because it's a winter fishery. In the winter, the females who are carrying eggs on their abdomens, very much like lobsters do, they migrate from offshore areas in close to the shore to release the larvae. So larvae hatch out closer to in shore, in relatively shallow water, so it's very convenient because the largest shrimp moving close to shore during winter when the local small day boats can go out and scoop them up. And it's good because they're separated from the males which remain offshore so the future of the fishery is out of the picture, so it's really kind of a pure fishery in that way.

JW: Ideal in some ways, I guess.

AR: Yes, but it's not ideal in a sense that what they're doing is collecting the females that carry eggs, and if they wait until they hatch the eggs, the females molt after they catch the eggs so that they're kind of mushy kind of like soft-shell lobster, soft-shell shrimp, so it's not a good product and further more they start migrating offshore and mix with the males again. So the fishery is on the females that have the eggs, so that's a dicey situation and it really depends on letting enough of them escape to produce the next batch of shrimp. So it's a very interesting fishery.

JW: What about monkfish? Because that's also been a major focus of your research too, right?

AR: Yup, yup. So in the late, I guess in 1996, my husband and I decided we should try something different because we had both come here right after grad school and we said "Jeez if we don't go do something different, we'll spend our whole careers here. And we should go do something different." So we got jobs at the University of Maryland in the Chesapeake Biological Lab and we went down there.

JW: Is that down in College Park, or is that a satellite campus on the bay?

AR: Yea, it's a satellite campus, it's in Solomons, Maryland and it's on the western shore of the Chesapeake Bay, and almost into Virginia. So we went down there and we stayed for a while, we stayed for about 3 years, and then we decided to come back because we weren't really all that happy with. Well, it was a real cultural shift moving down there from here, this liberal, highly educated community to this little town out in the middle of nowhere in southern Maryland and we weren't all that wild about certain aspects of the academic life either.

JW: What was the transition like there going from sort of a mission oriented scientific institution to teaching and research and academia?

AR: Well, actually I was on a research appointment, so I was only doing research. Our children were little so I was trying not to work fulltime.

JW: Was Mike teaching?

AR: Yea Mike was teaching and he enjoyed it a lot. He's a really good teacher, I think. So that was good but I just think there's really problems with how science is funded in the U.S. and there's so much pressure to get another grant that I feel like that's the goal, rather than doing the science the way it should be done.

JW: In the academic world?

AR: Yeah, yeah. I just think there are problems with that in general and when I hear our administrators say "Oh, we'll leave that to our academic partners," I just shake my because you know they're not interested in doing the kind of research we really need, to an extent, in certain areas, and getting the answers we need. Their priorities are to get more money, to support their students and their research and to get the flashiest publication they can, and that doesn't necessarily produce the best science or the most quick science for use in application, so I was frustrated with that. It's not, there were really good people in academia, including that lab, but you know the pressure in science, I think, for a lot of people, produces not the best science.

JW: Publish or perish, right?

AR: Yeah, publish or perish, yup. Anyway, so we ended up deciding that we didn't want to stay down there and we got our jobs back basically. I mean, I got my job, my exact job back because they hadn't refilled it and they just reinstated me – it was a little under three years that we were gone. This is a long way of getting to Monkfish, but Mike came back under a different job, anyway, so we came back, out of body experience, came back into our old. So when I came

back, Steve Murawski who was my boss, this was in late 1999. But when we were arranging to come back he said "Oh yeah, you can come back and work on shrimp again," and I'm like "Yea! That's great!" So I came back and he goes, "Anne, how would you like to work on monkfish?" and I'm like "Aahhh, OK. . ." So they put me on monkfish and gave shrimp to Joe Idilian [spelt phonetically]. So anyway, I wasn't working on shrimp anymore but monkfish of course has turned out to be really fascinating too. I basically have two weird species: I've ended up with shrimp again when Joe retired, so a few years ago.

When I came in in 1999, monkfish had been considered trash fish, and it was mostly thrown back or maybe brought back for personal consumption – it wasn't really, it's no clear how much of it was actually kept or caught or anything, but in the mid-80s the interest in monkfish started to increase a little bit, but in the early '90s when the groundfish were really taking a hit and going downhill, monkfish became economically a replacement species because the Asian markets really developed and they are very interested in monkfish, and so monkfish landing skyrocketed – the size of monkfish landed became smaller and smaller until there was a market category that was called "Peewees."

JW: How small were they?

AR: Well, some people also called that market category "drumsticks." So they were little, like a drumstick.

JW: Oh, that small?!

AR: Yea, so they were landed as tails and so the. . .

JW: Because the tail would be...

AR: The size of a drumstick basically. So that's pretty small, I don't know, maybe that would be....I don't know how big that would be, it might be a two year old monkfish, maybe.

JW: So the fish as a whole would be maybe a foot long then?

AR: Maybe. Yeah, maybe a little longer, but about that. Anyway, so there was a lot of concern and because of that concern, a management plan was developed by the New England Council, and there hadn't been any management of monkfish at all, there was no management plan . So the management plan was put in November of 1999, which is right about the time that I started, but there was a tremendous amount of concern in the industry because...well, there really was very poor information on monkfish. It was hardly known biologically, there were maybe two papers published on the population biology. We didn't catch it very well in the Albatross [NOAAS Albatross] surveys the way our net fished and the speed that we fished, and so forth. The management plan had set up a plan that would effectively close the southern fishery in three years, I think it was...no, actually it was about 2001, a couple of years. If something didn't happen, so there were some dramatic measures that were going to be put in place, but there was very little information to go on, so it was highly political.

JW: Why were they considering instituting these dramatic measures?

AR: Simply over concern over the size of the monkfish that were being landed which suggested that the large ones were gone, but there was very little hard information, you know, it's just...Monkfish are really weird critters. They're totally different than other fish. They're bottom dwelling angler fish, so they kind of settle into the bottom and they raise a fishing lure - first dorsal spine which looks like a fishing pole with a lure on the top one which detect another fish coming by that they want to eat. As a result of that, they're non-schooling so they're spread out all over; they're very evenly distributed across the bottom, so they're odd in a lot of ways. They're odd biologically – they don't have scales, they don't have swim bladders.

JW: And they prey on dovekeys too? Right?

AR: Yes, they prey on dovekeys, yes. Well, their other common name is goosefish, and that probably comes from people finding birds in the stomach, so yeah, with the dovekeys, you read that paper? You saw that paper?

JW: Yup.

AR: Well, that's a really interesting thing, so at the time people thought monkfish really didn't move much, and we didn't know whether there were two different populations or just one, and all kinds of stuff was unknown, and some of it is certainly still unknown. But one of the things that we think now based on some of the tagging studies is that monkfish actually do move quite a bit and they probably are riding currents. So the dovekey example was that fishermen were finding monkfish with dovekeys, which are offshore seabirds, in their stomachs, gill netters were. And so ornithologists from the Fish and Wildlife Service started studying this and then he brought me in on the project as someone who knew a little bit about monkfish.

What I think is going is on is that during the migration periods for monkfish, they're coming up into the water column to ride the currents and the dovekeys are off - this is on the outer part of the continental shelf, it's not in close to land - and the dovekeys are going down and diving for food, and the monkfish happen to be there cause they're up there riding the currents, and then dovekey is in the stomach. They'll eat anything. I've seen them with coke cans in their stomach, work gloves, you name it. You find all kinds of stuff. So I think what's happening is that if they're hungry and something bounces by and makes vibrations or whatever, that they just eat it.

JW: They will respond to it.

AR: Yeah. They don't chew their food, they just . . . they have like a conveyor belt system that moves the food down into their stomachs.

JW: So when they're in the upper water column like that is that because they're spawning or just on route from one location to another, following forage?

AR: Well, we don't really know. The only real evidence we have for that is, I think they probably do go to the surface to spawn, but the only evidence we have is one observation that

came from our Sandy Hook lab in those huge tanks we have. Chris Chambers and a post-doc were keeping some monkfish – a female and a couple of males, and she spawned, and so when she spawned, she went to the surface and the two males followed her, so she spawned at the surface. Monkfish don't just spawn eggs, they spawn what we call an egg veil which some people call it a scarf which is sort of what it looks like. . .so it's a thin, sort of mucoid scarf in which are little tiny chambers, and inside each chamber is an egg, so this scarf is very thin and maybe it's, oh, I don't know, two or three millimeters thick and it can be a couple of feet wide, two or three feet wide, well two feet wide and it can be maybe 20 feet long.

JW: Really?!?

AR: Yeah, so it's really big. It's huge. But it's very thin. It's really cool. When you see a female monkfish that's getting ready to spawn, she has a huge distended belly and there half of their weight can be the gonad and so this huge egg veil was spawned, [snap] just like that, so all of a sudden this egg veil pops out in the water and the males that are tending her spew their melt and probably what's happening is the changes in the osmolality from inside the ovary to the seawater causes the melt, the sperm, to be sucked into those little chambers and fertilizing the eggs, and then the larvae develop inside those chambers for a couple of weeks, and then the egg veil sort of breaks apart, but, it's a really interesting, weird thing.

JW: Does it settle to the bottom during that time? Or is it just continuing to float in the upper water column?

AR: Yea, it's semi-buoyant. So I think probably the females go up there, spawn the egg veil, and then the egg veil drifts in the currents for a couple of weeks, so there's another mode of moving around, and then the larvae hatch and they're bizarre looking larvae with huge pectoral fins, so they're probably riding the currents like crazy. Somebody recently sent me video that they had a camera following a leatherback turtle and it came up on a monkfish egg veil and it started chomping on it, and it kind of opened its' mouth and backed away, like "ewww" as if you know, "this tastes bad." So that was really interesting cause one of the theories about the egg veils, is that aside from visible protection, that maybe they taste bad and protect larvae that way. But monkfish are very difficult to keep in the lab, and so that makes it really hard to do biological studies.

JW: Why is that?

AR: They just die. They don't have scales, they only have a mucus coating . . .

JW: Are they susceptible to infection?

AR: Yeah, they get a skin disease. They get these lesions all over their body and their tails start to rot away and then they just die. It's really a horrible thing to watch happen.

JW: It sounds gruesome.

AR: Yea, it is kind of gruesome actually. I had a whole bunch of monkfish in the tank at MBL [Marine Biological Lab] one year and we were doing a tagging feasibility study because nobody thought that monkfish could be tagged because it's well known that they couldn't be kept in the lab, so it was assumed that you couldn't tag them successfully because they'd just die. So we were trying to see whether it could be feasible to do that. So I had all these monkfish that I had gotten from gill-netters and we'd been really careful, you know, took only the best ones and kept them in really good conditions all the way back to the lab and everything, but nonetheless, I probably had 30 monkfish in this huge tank to begin with, and we tagged them and treated them very well, and still they got this wasting disease and were looking just horrible. The thing is that the skin would rot away from the tail and they'd be left with the tail bone sticking out. I mean, it was really gruesome. So this was at the Marine Resources Center in MBL, and I remember one day, one of the people over there said "Anne, how long are you going to be keeping these monkfish?" and I'm like "Well. . . we're trying to get, you know, as long as can." Because they were having some congressional delegation was coming through next week and this tank was right in the middle of their set-up and they were like "Oh man, we don't really want people to see these things." And I couldn't blame them at all. Such is monkfish.

JW: They wind up going back to sea before the delegation arrived?

AR: I don't remember. I don't think so. I don't really remember, but anyway . . . It's hard to keep them in the lab so it makes it hard to get a handle on the biology, but we are improving. We're working on things. We ended up doing, because of the controversy over these management actions in the early 2000s, we ended up doing, and actually I think it's the first cooperative survey, certainly the first cooperative survey in the Northeast in -2001a cooperative monkfish survey. So we used industry books to do the survey because they were very up in arms about the regulations and, you know, the fact that the Albatross really didn't catch monkfish well at all. So we did a survey of the whole Northeast Shelf using two fishing vessels.

JW: Where were they based out of?

AR: One was from New Bedford and the other one was from Portland. The Portland boat did the Gulf of Maine and Northern Georges Bank, and the one from New Bedford did the southern – North Carolina through Southern Georges Bank. So that was actually a really useful survey. We learned a lot about monkfish on that survey.

JW: Were they both gill-netters?

AR: No, they were trawlers actually. Even though, you know, the fishermen thought they were going to go out there and show us that there were a lot more monkfish than we thought there were, but it really didn't turn out that way. But because it had been their boats and their methods, and we had them choose the survey design, we presented several different designs that could be scientifically defensible and they chose the stratified random which is what we use, with a little modification. It was easier to accept the change in regulations because it had come from their boats. It didn't really say anything different than the Albatross survey did, but it's psychological. So, anyway... that's how we started out with cooperative research, and this was before the cooperative research program was existing.

JW: So, looking at sort of the long arc of your career then, what sort of I guess, changes have you seen in terms of the research focus of the branch or data collection and gaps there, and things like that, you know, during your time at the center?

AR: Well, there's been a lot of changes. I mean I think one of the things certainly in our branch that has changed a lot is well, I think in the lab as a whole we used to be able to do more fundamental research which we're not really set up to do anymore.

JW: Biological research?

AR: Yea, biological research, I mean we do have a group doing fish reproduction which is pretty interesting. But we used to have things like an underwater, undersea group, and a diving group, and it seems like we're more strictly involved with at-sea data stream. It's harder to do research. It's really hard for someone like me who's interested in doing, like I would like to do things like tagging studies and so forth, but it's really hard. I don't know if this is a change from when we came in, there probably was more internal funding available when I first started for special projects that you might want to do to get at a particular question that you need to have answered. So we can write grants to get funding from the outside, but it's really hard as a federal employee because you're not allowed to apply for most of the types of grants. There are very few grants that you can apply to because a lot of the money comes through NOAA, so you can't apply for it. The only way that you can get some of that money is by partnering with people from the outside, but the problem with that, like I eluded to earlier is that a lot of timesyou can be in a co-PI and a grant, but you know the money goes to them and they basically oversee the project, but they don't, I think a lot of times they lose sight of the important aspects from our point of view and so the project doesn't get done right, from the point of view of trying to get the information that we need.

So I mean, that's kind of an aside from the arc of how things have changed, but that has been one of my big frustrations is that we don't have a way to actually do research ourselves, and if we did it ourselves, it would get done right, it would get done in an efficient time frame. That's the other thing with academics, they get extension after extension after extension because you know they've just gotten another project in or they have to write another grant, or whatever, and so the work doesn't get done and done doesn't get done and it's been really frustrating thing to me.

I mean, the other thing that I've seen is a change in population dynamics anyway is increasing emphasis on hiring modelers—so a lot of people aren't really biologists, and don't really, I mean this may even not be entirely true, but so there's more emphasis on the mechanics of producing an assessment rather than a deep interest in the biology and the biological mechanisms that go into effecting the populations, so that's kind of a different thing.

Of course, there's been the whole computer revolution of course is huge. I mean, when I first arrived everything was your snail mail inbox. That was where a lot of your mail came from, either that or the phone. I was on the phone with that Striped Bass project and having money to distribute, my phone was ringing constantly and I actually, after a few years, I let it be known to everybody that I didn't answer the phone in the morning because I wanted to get some work

done – so if you wanted to call me, call me in the afternoon. I just stopped answering the phone in the morning, it was that bad. It would ring like every ten minutes; I was on the phone all the time. I was so happy when email started to take over, but now of course, you spend so much time on email.

I feel like when, in the olden days, our center had much more independence from headquarters – I think there was much more support for science at the administrative level than there is now – now it's become more influenced by politics and a lot of that's coming down from headquarters because they're the ones that are taking the brunt of political pressure, and with better communications and tighter communications and everything, that's been put down more on to the science level which is, I think, a really bad thing. And I was thinking of something else in relation to that . . . hmmm . . . I can't think of anything right now. Of course, having computers has made this so much easier.

JW: Gary mentioned the cards from the mid-1980s with lines of colors on them.

AR: Yea, have you ever seen that? Oh, you've never even seen it.

JW: No, he gave a great description of them though.

AR: Oh yea!

JW: He was carrying so many in a box.

AR: Oh yes, you have these boxes. Well, I had, for my master's thesis, I had three boxes of cards that I had to carry over to the computer center, but by the time I got here, the cards were done. We were done with that, but we had a terminal we would sit at if we wanted to do a computer program and you'd type in your program and you'd get this printout spooled out on this wide accordion paper. I probably still have some of that around . . . the thing I remember was when we first got PCs – personal computers, portable – the suckers probably weighed 30 pounds, I mean they looked like a . . .

JW: Just a big desktop?

AR: No, it was a portable computer and I think we had two or three of them in the branch, very exciting, and if you had a project that warranted use of the computer, you could have it in your office. They looked like, um, when they were packaged up, they looked like a "portable sewing machine", but a really big portable sewing machine. You'd lug this thing to your desk and I remember getting to write my reports to Congress on this computer and being absolutely thrilled that I could have this thing in my office for a few days! [laughter]

JW: Was that during your time as Striped Bass Coordinator?

AR: Yes. That was probably still in the late '80s maybe, I don't know. Things in that regard changed so fast, but in a way gradually. You'd quickly adjust to the next improvement, take it

for granted and then the next one comes along, and the next one, and so forth. When I think back to how when I first arrived, we had typists. So if you had...

JW: How many typists were there in the branch?

AR: Well, I think when I got there, there was only one left. But there had been two. I don't remember how big the branch was – maybe it was 25 people, or maybe not even that, I don't know. Yeha, so if you were writing a paper or a report, you would write it by hand, every other line on lined paper so there was room to cross out and make changes and so forth, and you'd write your arrows if you wanted to rearrange things and then when you were done, you'd bring it to the typist who would have to decipher all your scribbling, type it up and then yes, and then you'd sometimes do another draft, and she'd have to type the whole thing again – tables and everything! It's absolutely mind boggling to think about how hard that was, but it's just what you did.

JW: Did each branch have a typist or was there just a corps of typists who served the entire center?

AR: The one we had was our branch typist, and I guess they must have had typists as well, I don't really know. It was really different and I wouldn't want to go back to those days, that's for sure. So, let's see . . . what else? The building has deteriorated. [laughter]

JW: Have there been any big changes in how population assessments are done, and the methods used, and the science?

AR: Oh absolutely. The availability of more and more powerful computing has allowed completely different kinds of methods to be used that you could have never contemplated doing just because of their computational intensity. So those things, and also just statistical packages that you can apply and...yeah, it's totally different. When I first came they were doing yield per recruit calculations on calculators, and Mike will tell you all about this too, but you know they had the magnetic cards that you slide into the calculator, and then you go through a sequence of key steps and then you would record those key steps and that was a program that you could run on the calculator.

JW: Interesting. I've never seen anything like that.

AR: Yea. I bet Paul Rago still has one of those. [laughter] Mike might too, I don't know. But that was fabulous to have that. Yeah, that was before we could run these things on the computer. So you can imagine that as these tools became available to make it easier and easier and easier, they're just grabbed immediately and you throw away the old method and move on because it's such an improvement. It's been pretty interesting. I can't think of anything else right at the moment . . . let's see. Well, things have gotten, you know in the . . . I don't know when it was, maybe around 2000 or so, or maybe that's because I had just come back from Maryland, I don't know, we started having these planned development teams for the management council and so we became more, we had membership on those, so we became much more involved with the management at that level. Before then, we were basically, the council would come up with the

management plan and then put it through us to review it – so we hadn't really been integral in the process of developing it. So they started these planned development teams so that they would involve people from the centers as well as people from the councils and so forth – which is I think a good thing.

JW: Were you working with the councils early on?

AR: Well, no, not really because striped bass wasn't a federal species so I was . . .

JW: That was ASMFC?

AR: Yes that was ASMFC and so was shrimp. Shrimp was an ASMFC species – so it wasn't until I was involved with monkfish that I started becoming involved with the councils. Like I said, I think it's a good idea, but personally, I dislike that aspect of my job because it just is . . . it's hard. To me, it's much easier to produce the science than figure out exactly how you should apply it in societal way, and politics comes in and a lot of times it's not entirely, it's not crystal clear that you should do one thing, and so the arguments that go into it. I never wanted to work with humans [laughter] and the PDT is working with humans, so for me I don't like that very well. It's come to be, that's a thing that's been a big change over time, is that more and more work comes to us from the PDT and sometimes that work can be not very useful, I think. If somebody gets an idea and says "oh let's try this," and you do it.

JW: This is in terms of upcoming potential management acts?

AR: Yeah, yeah, yup. So the consequence of that is that you have less and less time to do research that maybe you're interested in which, of course, for a lot of us that's what drives us is – for me particularly. I mean doing assessments is OK, but it's kind of like doing the housekeeping, you know? You do it, you get it all wrapped up and that's great, and then a few days later, with housekeeping anyway, you have to do it again. And it's not that you can't learn things from doing assessments, you can, and sometimes it is very useful from that point of view, but the real lifeblood for a research scientist is to do research, and do new things, not do the old things. So it's a requirement and you may learn things from it, and that's good, but it might not be what you'd like to be pursuing, and so with more and more of these requirements and demands for doing this and doing that and somebody else thinking you should look at this and look at that, you have less and less time to do your own research and that's not good. I mean from my point of view, you know, you need to stay motivated, and when you constantly have to do things not because you think they're important but because you're told you have to do them, you know, I mean . . . most of us didn't get here by doing that kind of stuff. That's a tough thing I think for the lab.

JW: Just to go back for a moment now, when you were talking about typing up Congressional testimony for the striped bass, what did that entail? Paul had mentioned something about this as well, where you would testify before Congress about the science of stripers.

AR: Well the thing that was actually referring to was that as part of this Emergency Striped Bass Study we were required to write a report to Congress every year about the results of the

study – what had been done with the money and what had been learned and so forth. So every year we were synthesizing all the research that was being done and so forth, so that's the one I remember getting to use the computer. Those are reasonably comprehensive report and so it was a huge help to have a computer. We did testify before Congress, Paul and I. I remember when I hadn't been - well, he hadn't either been working on it all that long – he didn't come on to striped bass too much before me, he was working for Fish and Wildlife Service, so he was my counterpart in Fish and Wildlife Service but we did go to testify before Congress. They wanted to hear what was going on with the striped bass population so we kind of afterwards we were like pet scientists because we actually came in, we were off the record before the hearing, and the hearing was probably on something like the continuation of the striped bass act or something like that and we each gave maybe a five minute talk about, you know what was going on with the striped bass population and trends and the research and stuff like that. I mean, there was a tremendous amount of interest in what was going on.

JW: What were the theories about the success of the 1982 year class? Since you mentioned that as being the first good one I guess to occur in a while.

AR: Right. I'm not sure. I don't know if they actually figured it out. I mean there was – the juvenile index was driven by extremely high catches at one station, I think it was only one station, and so whether something in the Chesapeake in the sampling this juvenile survey is done and a number of tributaries in the Chesapeake Bay, and they have certain stations that they visit every year. It was in the Choptank River and there was this one spot, I think it was called Hambrook Bar, and they caught a phenomenal number of striped bass. Because of the way the index was constructed, and the way the trigger was constructed, those tows completely triggered the reopening of the striped bass fishery. I don't know if they figured – there's been work done looking at things that are favorable, temperature, salinity and that kind of stuff but whether they really ever came up with why that particular spot was so favorable in that year, I don't really know. I don't know. They didn't figure it out while I was on there, I don't think.

JW: Interesting.

AR: It would be interesting Josh. Those things are interesting to know.

JW: Well, unless you have any parting words or final, final thoughts – you could always turn on the recorder again if need be. I think we've covered pretty much everything now.

AR: Covered my life in a nutshell.

JW: Well, thanks very much for coming in to do an oral history today.

AR: No problem.

JW: It's been a pleasure.

AR: Thank you Josh.