Dr. Jennifer Beseres Pollack

Interviewed by Dr. Jen Brown
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Transcribed by Maxwell McClure

[Jen Brown]: Um, okay, this is January 8th, 2021. This is Jen Brown. I am on video conference with Dr. Jenni Pollack. And, for the tape, do I have your permission to record?

[Jennifer Pollack]: Yes.

[JB]: Okay, and we're here to do an oral history interview and talk about your work with marine biology and oyster restoration. Um, for the tape, can I have you say your name and title?

[JP]: Yes, it's Jennifer Pollack and my title is Chair for Coastal Conservation and Restoration at the Harte Research Institute.

[JB]: Okay, thank you. Um, okay, well, you know, usually how these things start is we kind of talk a little bit about your background. So, can you tell me more about your family, your early life, and growing up?

[JP]: Sure, so I was born very far away from here, pretty much the total opposite end of the United States in Minnesota. So, I grew up not surrounded by the ocean, but surrounded by lakes. I was always interested in nature, just liked to be outside, kind of a curious kid. And, um, went to undergraduate, went to college outside of Chicago at Northwestern University where I was an environmental science major and just really trying to kind of find a place where my interests fit. And environmental science is a pretty broad degree program, so you can do everything from sort of environmental law all the way through, you know, bench science at the bench in the laboratory. I sort of carved out a niche for myself within ecology. There wasn't an ecology degree at Northwestern so I was sort of an ecological scientist within this environmental science program. I did a whole bunch of internships. I got paid nothing and tried to get as many different kinds of experiences as I could. So, I tried atmospheric science for example, and I found out that I really did not like atmospheric science and then, um, did an internship in marine science and really fell in love. After that, I taught for a year, an outdoor environmental education program at a graduate school on the East Coast at the University of South Carolina in a marine science program and then completed my master's and PhD before coming to, um, coming, actually, here to the Harte Research Institute for a postdoc in 2007 working with Paul Montagna learning about freshwater inflows, actually, and its impact on communities in the coastal bays in Texas.

[JB]: Oh wow, so where in Minnesota are you from?

[JP]: I am from a place called Golden Valley. It's a suburb, a northwest suburb of the Twin Cities, just touches Minneapolis in the northwest corner. Um, kind of the best of both worlds. It's quiet and suburban but it's also you can jump on your bike and be in the city really quickly.

[JB]: Um-hm, and so did you grow up kind of as a typical Minnesota kid where you're outside and hunting and fishing or what sort of things did you do?

[JP]: Yeah as a kid, typical kid, yes. We fished. Um, we shot bow and arrow was a thing that I did a lot. We just spent a lot of time outside. So, Minnesota is sort of like, you have to embrace all seasons because they're changing so quickly. So, um, I played a lot of sports. I actually went to college on a scholarship for softball. So, I played softball a lot in the summer. That pretty much dominated all of the warm weather months of the year. And then in the winter, it was things like, um, you know, sledding and ice skating and just getting bundled up and still getting outside and doing things.

[JB]: Nice, and why did you want to study environmental science?

[JP]: It just was something that I felt the most comfortable about. Yeah, you know, it aligned most with my interests. So, I remember super clearly like it was yesterday sitting in the office at Northwestern with the book of majors, you know. It was like, you didn't look things up online. You went to the book and flipped through it. And I just kept flipping through it trying to figure out which major was the right one for me. I sort of had waited until the final moment to declare, and I always thought I would be a biology major, but at Northwestern at that time, that was really much more suited to somebody who was pre-med, kind of pre-professional, or somebody who wanted to do, um, study evolution or molecular techniques and none of those things fit for me, and so I was sort of left not knowing where to go next. And environmental science, I just kept coming back to that page and reading that description and feeling like, "Okay, this the place where I need to be." But for me, so I got, my undergraduate is actually a Bachelor of Arts because that's where the environmental science program is seated within, um, the structure of Northwestern.

[JB]: And tell me about this internship and what drew you to the marine side of things.

[JP]: The internship that I did that was really sort of transformational in terms of who I, you know, ended up becoming, kind of the career path that I followed was at a place called the Wetlands Institute in New Jersey. It's on the southern end of the coast of New Jersey. It's a really, really beautiful and special place and so it sort of functions both as a public outreach and education center, kind of community center where people can come. You know, they have, at least at the time, they had exhibits and things like that that you could tour. But they also operated a summertime internship program that had a bunch of different topic areas. So, some people were studying, you know, the geology of the beaches. Some people were studying, um, looking for marine medicinal products, like, studying different algae and things to see if they are a potential for, um, developing medicines. I was in the fisheries group, and so we were interested in, or our topic area was to revisit a survey that was done on all the fish species that were collected within this inlet twenty-five years prior and to look at, you know, how have things changed over that twenty-five year period. So, we were doing things like pulling nets behind boats. We were counting fish, identifying fish. We were looking at their gut contents to try to understand "What is the food web of the fish in the system? Has that changed?" And it was just very, for me, is this chance of independence. You know, we were trained to drive the boats right away. So, we were really kind of given a crash course in being our own bosses and the leaders of

this program. And it was sort of left up to us to sort of succeed or fail. You know, we were going to get out of it what we put into it. And, you know, it was long days, hot, wet, and, it just, I loved it. Like, I loved every minute of it. I couldn't get enough of it. So, to me, you know, that's the thing you pursue, right? It's really easy to figure out what you don't want to do. It's harder to figure out what that thing is that gets you out of bed in the morning. And so, that was the experience that really then pushed me towards the types of graduate school applications I wanted to pursue.

[JB]: Um-hm, and I saw that you studied, um, shrimp in graduate school. Can you (laughs) tell me more about your kind of choice of topics and what you found?

[JP]: Sure, shrimp in South Carolina are similar to oysters in Texas in that they both constitute a very valuable commercial fishery. So, in South Carolina, that was really what was driving the commercial fishery landings. And I've always been a very applied scientist. I always sort of want my science to be used to solve a problem. And so, what we wanted to look at in the tidal creeks in South Carolina was just, "What was the ecological role of those shrimp?" So sometimes, you have these huge recruitment events in the springtime when the shrimp make their way into the estuary, just huge numbers where you see them jumping everywhere. Some years you have really, um, small recruitment events where you hardly can find any shrimp. And I was really interested what that was doing within the tidal creeks because when they come in, they are very voracious predators and they feed on all the little worms and clams and infauna that live in the sediments. And so, I was really curious about, you know, "If you have a really big population with lots of shrimp, what does that do to the carrying capacity of these creeks? Are there are fewer fish that those creeks can then support? You know, how does it really affect the dynamics of the systems?" So, that sort of was the structure of my dissertation work, a lot of different work related to that. But coming here to Texas, you know, the opportunity to come and do postdoc and work with Paul Montagna, it was very similar in the sense that area of expertise is benthic ecology. So, that's, benthic is studying the organisms that live on the bottom. And so, that's what shrimp are. Shrimp are going, they're not swimming so much as much as they are walking on the bottom and feeding on those organisms living in the bottom. So, I already was sort of focused on that area and it translated very well here. So, Paul was really interested in these questions of how freshwater inflows can affect, uh, estuaries and his interest for me coming in was to look at oysters as indicators. So, he oftentimes used, like, tiny little polychaetae worms and tiny little clams, you know, microscopic organisms as indicators of what's happening in the bays, like our canary in the coal mine. You know, the conditions are changing, but these things are fixed in place. And his idea was, "People understand oysters more than they understand these other indicators." So how about we try to scale up these approaches that Paul has been using to understand ecosystem health to include oysters as a better way of, you know, tying this to an important fishery, to something that people recognize value (phone rings). And um, so, I came here to do that and then during my time as a postdoc was when habitat restoration really sort of started gaining steam, and there was a lot of funding available. There was a lot of huge increased recognition of habitat loss in coastal areas. You know, a lot of what we had known before then was related to things like coral reefs, you know, where the water was very clear, people are diving in them a lot. You can see really see visual changes if you look at photographs over time. And here, you know, as you see in Texas, the water is really turbid and muddy and you don't see what's happening below the water and that's the case in most of the places where oysters live.

And so, people didn't recognize the changes that were happening under the water. They weren't as obvious. It started to really, um, decode, you know, people start to increase the recognition of habitat loss for oysters reefs, and restoration, habitat restoration, became a new tool that people were trying to use to ameliorate the effects of this habitat loss. And so, I sort of merged together the oysters as indicators work. I was there with Paul with this interest in habitat restoration and that's sort of where my research interests have continued along that path.

[JB]: What do you think, um, led to this increased recognition in habitat loss?

[JP]: There were a couple, you could almost put your finger on it, there were a couple of publications that came out in maybe between like 2008 and 2010, '011, somewhere in there that really quantified habitat loss. So, they went back through, you know, it was an enormous effort going back through historical documents all across the globe. So, they were looking at any native shellfish populations that were just trying to do a survey of change. And that included the eastern oyster that lives here in these estuaries. And these publications created maps that shaded things, kind of a heat map that showed, you know, "These are the areas in the best condition. These are the areas that are in the worst condition. These are the historical commercial harvests that came out of these systems. This is where we are now." And it really for us here in the Gulf of Mexico, it just really put a lens on the Gulf of Mexico for a couple of reasons. One was that compared to the East Coast, the Gulf of Mexico oyster populations are still, they're in bad shape, but they're in much better shape than on the East Coast for example. The West Coast of the United States doesn't have the same species of oysters, so it's a bit of a different story. But, so there was this feeling that if you're going to be successful at restoring habitat, you should put your money in your best places because you have things that are too far gone. So, a lot of focus and funding was directed towards the Gulf of Mexico because we are in better shape, better chance of success. But the other thing is that that was explicitly called out as well in some of these publications saying, you know the Gulf of Mexico is probably the last best place in the United States for achieving sustainable harvest of oysters and sustainability of this habitat.

[JB]: That's really neat. So, that's really, you just decided, "That's what I'm going to dedicate your career on," or, I mean, how did the decision-making process roll out?

[JP]: So, my interest broadly at this point is in habitats, in coastal habitats and although most of my work has focused on oyster reefs, um, we've also done work in salt marsh habitats. We do work, we've done some limited work on offshore oil platforms. Um, we have a large project that we've been doing now for, working on for, I don't know, almost eight, maybe ten years now down in Baffin Bay looking at the serpulid worm reef habitats down there, which are incredibly unique, only exist in a handful of places around the whole world, and we're just lucky enough that one of those places is here in South Texas. So, broadly interested in all sorts of kinds of habitat. So, oyster reefs for me as a scientist are incredibly interesting and special kind of habitat in terms of researching because they are both a habitat and a resource. And so, if you're going to harvest the oysters, you are necessarily harvesting their habitat as well. So the way that an oyster reef grows is that you have planktonic larval oysters in the water column that need to attach to something, so something hard, um, before they go through their final metamorphic stage and then they look like the oysters that we would recognize and grow that kind of adult, juvenile, and adult shell and get larger. So, they'll attach to anything. They'll attach to a grain of sand. They'll

attach to, you know, a duck, or anything, you know, some rope in the water. But the most successful place is going to be for them to attach on the shells of the older generations of oysters that are in the water already because those are already growing in the places where the environmental conditions are the best. So, you essentially have like the shells or the oldest oysters is in the center of the reef and then have a veneer of living younger oysters on the outside of the reef. And so, that's the habitat that's necessary for sustainability of oysters, but we dredge that habitat to harvest the oysters. So, there's no way to get the oyster without taking the habitat of those shells with you. So, it really creates a much more complex challenge in terms of restoration, thinking about restoration, conservation management. It's really, like, a larger continuum to consider. Uh, whereas some other habitats, to give you salt marsh or seagrass as an example, you're not going to remove the salt marsh when you're harvesting the shrimp or you're not going to remove the seagrass when you're harvesting the red drum. And so, it's a little bit easier to deal with each of them separately. Whereas with oysters, you can't do that.

[JB]: Um-hm, yeah, well, can you tell me, um, so you started the postdoc and that's where you started the oyster recycling program, right?

[JP]: Yes, that's correct. So, this is, the oyster shell recycling program has been a really important part of what we do. Um, when I came here from the East Coast and was a postdoc for Paul, um, Brad Lomax, who is a local restaurateur in town as you know, approached Paul with this question, and another colleague of mine, Joe Fox, was involved in this early conversations as well. Essentially, he said, "I have all this shell in my restaurants, shucked shells from, you know, the Raw Bar. And it's very expensive for us to deal with because they get charged by the weight and the volume of their, you know, their trash removal services. And the oyster shells are obviously heavy and they're bulky, you can't really compress that in your trash bags. So, he said "There must be something that you can do with the oyster shells. Like, is there a need for oyster shells?" On the East Coast in the Carolinas, there are really well-established oyster shell recycling programs there. They're connected totally differently than here because in, uh, the Carolinas, you have really strong tides. And so, individuals just go out at low tide with a bucket and can harvest oysters. And so, their oyster shell recycling programs are just dumpsters that are at different locations that you can just go drop your shells, just go toss them into the dumpster just like a recycling dumpster. So, we wanted to, we took that idea and we wanted to create something here on the Coastal Bend that made more sense for the way that the shells are produced, which is the majority of it is from restaurants. Although, we do work with some seafood festivals as well. And so, um, along with Gail Sutton, who is the, um, Associate Director here at the Harte Research Institute, we got together. We identified a partner within the Port of Corpus Christi where could stockpile the shells and we developed this program, which is essentially the oysters are harvested. They go to the restaurants. At the restaurants, people eat the oysters and they separate, then, the shell from the trash. So, they put it in a separate special bin. They put those bins outside, and then as often as once a day, if they need us to, we go out there and we pick up those oyster shell bins and then take them to the Port of Corpus Christi where we stockpile the oyster shells, which has to be done for six months in Texas just in case of, you know, removing any sort of, like, invasive species or anything that could have been present on those shells. And then once we've stockpiled enough of them, that's the substrate that we can then use to restore reefs. So, you know, Brad Lomax a long time ago said, um, "This is oyster shells in the landfill are a resource out of place." And that's exactly how we feel. So, we take that

important resource and we put it back in the bay to provide those fundamental building blocks for those larval oysters to attach to and then to contain or maintain existing reefs or restore degraded reefs. Or even build new reefs in areas when they're totally gone.

[JB]: So, when you came up with this recycling idea, did you, in terms of getting the logistics of getting the shells from the port to wherever they're going, did you always envision it as kind of a volunteer activity?

[JP]: It's not a volunteer activity. It's grant-funded. So, we pay, I mean we pay folks to go pick up the shells. We don't pay the restaurants specifically, but the restaurants are gaining, have a financial gain by not, you know, by not then having to pay for the trash removal. But yeah, this program, I guess I should mention that since the very start, our oyster shell recycling program has been funded through the Texas General Land Office, their Coastal Management Program. So, they have been really key partners in getting this program up and running and then continuing it through time, you know, continued support over time. And their support, you know, that funding has been so critical for us because it allows us then to write grant proposals for external funds to do these larger scale restorations because we can say, "We have the material on hand. We have the natural preferred substrate for restoring reefs, which are these shells. You know, we can use the natural (laughs) reef builder itself and put it back in the water." So, it's really helped, uh, expand our ability to restore habitat by doing that simple reclamation action for all these years. I mean, we've been doing that since 2009, and we've restored over 25 acres of reef now using those shells. So, we're just one small program in one part of Texas and you can, you know, look at Google Earth images of the bays and I can show you, you can see from those images where reefs have been restored. So, it's really made a measurable difference.

[JB]: Um-hm, so someone's job just to go, do they just go weekly and pick up oyster shells during the season?

[JP]: Yeah, we have students. So, it's a student job. Um, we pay them well because, as you can imagine, in the summertime, going to pick up oyster shells (Brown laughs) that have been sitting outside is not a very desirable job. But, um, yeah, so they'll go, they go really frequently. So, we have several restaurant partners all the way from Port Aransas to Padre Island and in Corpus Christi right now that we pick up from. And so, they have to coordinate their schedules so that they can hit all of those places. Um, and then we have a flatbed that they tow, a flatbed trailer that they tow behind a truck. And so, we have a capacity of picking up I think sixteen hundred pounds of oyster shells on that trailer. So, if there is more than that, or if there is less than that, they can pick up more than one place and they'll do that. But they kind of coordinate their schedules and then we stay in good communication with the restaurants to figure out if they, you know, there are definitely times where they need us to pick up more frequently and times when we can pick up less frequently. But I will say that Gail Sutton, who is sort of my co-partner-in-crime with all of this work, she is the brains behind the shell recycling program. So, I am talking about it like I know what I'm talking about, but she has—it is much more complicated, you know, how the sausage is made in terms of how all that runs is definitely her brainchild and not mine. But, um, but yes, one of the benefits of working at the university is having students that can help on these projects as well.

[JB]: Yeah, I imagine the logistics is pretty crazy.

[JP]: Yes.

[JB]: Um, so, when you decide to restore a reef, how do you decide on location in terms of, I mean, the whole coast was dredged at one point, right? So, how do you decide which location should be the one to focus on?

[JP]: That's a really good question. So that was one of the first questions that we started to ask. I think we published our first paper on this way back in 2010 or eleven and our question was, this is when we were recycling all these shells, but "Where do we restore?" You know, there's certainly better places where we can be more assured a success than other places. And, we want to put our money in those places. So, what we did was we, and this is again when I was a postdoc with Paul, we worked with a student from the geography program, and we took Texas Parks and Wildlife monitoring data for oysters and water quality. So, things like salinity, temperature. We brought in depth data, um, we looked at oyster recruits like the new baby oysters that were attaching onto reefs. We looked at the adult oysters, we looked at the size of the oysters. So, we took all of this Parks and Wildlife data, which at that time was maybe thirty years of data all up and down the coast. We first focused in on the Mission Aransas estuary, which is about forty-five minutes, you know, up the coast from here, and we developed this kind of heat map to say, "So, if we took each amount of data or each letter of data, if you will," so, salinity, for example, we had it for lots of points all over the bay. So, we could create a map and say that "These are the place that have the best salinities for oyster survival and growth. These have the worst salinities for oyster survival and growth. And then we'd need a layer we could shade that." And then we basically layered all of the different variables on top of each other in a map and we were able to visualize, "These are the places that have the best conditions for oysters. These are the conditions that have the worst conditions for oysters." And we created this tool that could be available to anyone who wanted to restore oysters in that system. Say, "If you have money to restore, these are your best or sort of least risky places based on historical data, and these places would be, you know, there's higher uncertainly of our success." And then in the past, I think last year, we finalized, we scaled that up to the whole coast. So now all the way from Louisiana to Mexico, if you want to do oyster reef restoration, you can go on our freely available website, which is oysterrestoration.org and folks can pull out a map for any of the bay systems that is shaded like that. They can look at what the conditions on current oyster reefs are. They can look at the water quality conditions. And the idea is, "We want support anybody's efforts to restore habitat, and give them all the tools." And so, that's another thing that's really been beneficial I think and has really allowed us to be successful in our habitat restoration efforts is that we have a very—we know that site selection is critically important. I mean, you could do everything else right, but do it in the wrong site, and it's not going to work. And we've really spent so much effort and time looking at what those, um, fundamental conditions need to be, and, um, we want to share that with other people in the state as well.

[JB]: Um-hm, that's really neat. Um, so can you kind of walk me through the steps of once the oysters are stored and then you've picked a location, what happens?

[JP]: Sure, so, we have our shells that are stockpiled. Let's say we have enough shells stockpiled that we want to restore an oyster reef. So typically, you know, this is going to be a grant-funded exercise. So, we've gotten funding from an organization, um, you know, to solve this need of habitat loss. Or, it could be water filtration, improving water quality. It could be shoreline protection. There's a lot of different benefits that are promoted, you know, for restoring oyster reefs. There's at the time of building the reef, there's typically two different approaches that we use. So, the large-scale approach that we use would be working with a marine contractor who would essentially barge all of our oyster shells out to the project sites and place them in the water according to our design specifications. So, before that happens, what we would do is have lots of meeting with the marine contractor. We're providing them maps, GPS coordinates, you know, explanation of the bottom conditions, depth, et cetera. We out there ahead of time and we put PVC poles all throughout the project area that are color coded so that when they get out there, they know where they're going to be operating. And then essentially, we've created a map for them. They go out and they start, what they do is they use a kind of a crane, what they call a drag-line, so it has a bucket on the end and they scoop the oysters off onto the barge and then they place them in the water. And the design that we typically want to use when we restore reefs is take a higher vertical relief so that it can mimic an undredged natural reef. So, not something that's just sort of like a paved reef that's really, um, just right at the surface of the sediment. We want something that sort of hills and valleys are part of the design element. That also provides better habitat. You know, there's more physical complexity for other things like fish, and crabs, and shrimp and things to utilize as well. So, we use that sort of more natural model. And, um, as they're building it, we go out there. Um, we're checking on their design, "Is it accomplishing what we've wanted to accomplish?" And then, for example, one of the reefs that we just, that we had built this past year, we went out and then used side-scan sonar to look at the reef development after it was built. So, there's a lot of stages to that larger scale restoration, and when we're doing those, it's on an order of acres. It's acreage of reefs that's being restored. And so, the benefits of that are you can restore a lot of reef. The drawbacks of that are that, for the main drawback, is that unless you happen to be on the shoreline that week that the reef is being constructed, you don't even know that it's happening because again, it's below the water. It's a below the water feature. So, the other way that we restore reefs is using people. So, this is where we use our community habitat restoration events. We invite anybody who's interested from the community, tourists, schoolkids, anything, to come out and join us and have events that usually last about three hours. People come out. We use shovels to bag up some of that recycled oyster shell into mesh bags. We right now have a project where we are evaluating different types of biodegradable meshes, and then those bags of oyster shells serve as those fundamental building blocks, so kind of the nucleus for the building blocks of the reef. So, we then carry those bags down and place them in an area of the water that we've predetermined and kind of pre-staked out, and we sort of build a reef, just like you would kind of put tile on the floor. You put bag after bag after bag and then build up the vertical reef that we want with those bags. And so, the drawback of that one is that you're not getting very much acreage. You know, you're not able to restore a huge area. But the benefit of it is that you have hundreds of people who are involved who know what's happening. You have this kind of stake in the success of that reef. It brings this sort of culture of stewardship, of environmental stewardship we've seen, um, for the schoolkids that come. The teachers often build something else or other things into their curriculum as well. So, we've then supported our teachers to put oysters in tanks in their classrooms that students can feed the oysters and watch them grow and, you know, just have more of a connection. You

know, people have told us they love those events so much because a lot of people, you know, who live on the coast are looking for a way to get involved. A lot of folks do the beach cleanups, which are wonderful, but they're looking for a way to get sort of, like, in the water and get dirty and really do something that's, I don't know, helping the habitats of the bay, and this gives them another way to be able to do that. And so, we just get such a positive response. I think of all the things that I do, the thing that people talk to me most about if I'm out and about in town, um, it's the shell recycling and, um, community reef restoration parts of what we do.

[JB]: Um-hm, can you tell me maybe some specific feedback that you've gotten from people?

[JP]: From the restoration events?

[JB]: Yeah.

[JP]: You know, it's great. We have, you know, there's—I'm somebody who, like I said, has always kind of been curious and been an outdoor person, um, but there are lots of people who aren't like that as well. And so, people can have grown up right here with the bay in their backyard, but if they didn't have a boat, or maybe don't have interest in fishing or something, they may not have a real personal connection to the bay. It just sort of is in the background, and so people have told me, "I've never gotten into the bay before. I've never gotten into the water before." People have told me, you know, "I didn't realize that the oyster was an animal that living inside of the shell. I thought it was just the shell." Or they'll say, "I see, I do see these shells on the beach. These are oysters?" Or, um, you know, we'll take some oyster reef out of the water and we'll put it into some clear tanks while we're out there so that people can see all of the fish and shrimp and crabs and things that are living in the reefs so that they understand it's a habitat. And I mean everybody, it's adults, kids, everybody just get such a kick out of seeing what's out there. And so, I think it does make, I mean constantly people are telling me the excitement that they have, you know, where they just want to keep on looking at it and not move on to the next part. You know, there's just this, it sort of reveals this whole world that's been right there but hasn't been, um, something that they've had access to until now. So, it's really, it's super rewarding. I know it sounds like a cliché, but it is super rewarding because it's fun to kind of share your world and the things that you love with the people who are here and can experience it more on their own now that they've sort of seen what's possible and what's out there.

[JB]: Um-hm, how many people, or where did you get the idea, I guess, to include people in the events?

[JP]: So, I would be happy to claim that I was the first person to do that, but having oyster reef restoration events, it is a, um, sort of an established practice on the East Coast, again, where they have these strong recycling efforts. We've had to be a little more creative in how to have restoration events here, again, because of the tides on the East Coast. So, on the East Coast, you have real, you know, you have six, nine plus feet of tide, and so you can schedule an event at low tide and people can come out and never get wet if they don't want to. You can build a whole reef on the dry bay bottom until, and then wait for the tide to come back in and inundate it. Here it's a little more challenging because everyone has to get in the water. You know, all of our oyster

reefs are subtidal. They're always submerged. And so, we adapted what was being done in the East Coast to our area here. Some of the things that are common now still are, you know, bagging things up with these mesh bags. Um, building a reef with those bags with, you know, some vertical relief so that it doesn't get sediment in it by all of the mud and things that washes back and forth in the bay. Um, monitoring those reefs by coming, pulling the bags back out and looking at the, um, development of the reef over time. That's pretty common. Um, but, you know, we had to—in the very beginning, it was a little bit challenging because you can't pick an area that's too deep because you've got kids that are going to go into the water. Um, you have to pick the right time of year. You know, for us, here the right time of year is the spring and that's because that's when oysters are spawning and then the larval oysters are really abundant in the water. And so, we want to put material out there to maximize the ability of those oysters to attach. We could really do it in South Texas any time of year, but you may get, you may hit the time of year where there's a bunch of barnacles that recruit to your reef or lots of, um, mussels that attach to reefs. So, we, you know, figuring out the right time period to restore was important here as well, but, um, the success of these sorts of community efforts was certainly well acknowledged before we started doing it here. We've just been able to, you know, use those benefits to our advantage.

[JB]: Um-hm, can you talk more about the success of the actual restoration events? Like, what happens once the oysters get in the water?

[JP]: Yeah, so, that's a good question as well. You know, for me as a scientist, this is kind of the most exciting part because that's when we can start collecting some data. We've always really been focused on making sure that we are, if we're going to restore a reef, we want to create something that mimics that lost natural habitat as much as possible. So, we don't want to restore something that's different. You know, we want to restore something that's doing the same job. And that may mean it needs to look a little bit different than a natural reef would or we need to restore in a different way. There's different things to think about. So, post-construction monitoring is a super important piece of this, and this is where a lot of graduate student research, um, has also come out of with questions. So, we always go back and monitor. We typically monitor fairly rapidly right after the reef was built. So, we might monitor, say, within two weeks, within a month, within two months just to look at root development. "Do we see oysters recruiting to the reef? Are we seeing the trajectory is going the right direction?" And then typically, we change our monitoring to being seasonal. So, we would then do like spring, summer, fall, winter. And what we're looking for during those monitoring events are looking at the structure and function of the reefs. So, we're looking at density of oysters on the reef, the size of those oysters, we're looking at their organisms that are using the reef for habitats so typically collecting those using sampling trays and things that we embed into the reef. Um, we could, um, look at things like making calculations of filtration capacity of the reef over time. And then, we're typically using a reference, which would be our natural reef habitats, to engage success. So, "Are we seeing that the oyster size or oyster growth rates are similar to that in the natural reefs? Are we seeing a similar community of organisms?" And that's really helped us define success. So, we can say, "Okay, one year after reef construction, oyster size was representative of that that we find in a natural reef. Or two years after restoration, we see that the community of organisms, the biodiversity, is similar between the restored and natural reefs. And that really

helps us, too, in terms of thinking about making predictions for the next time we restore something: "When can we expect to see different things fall into place?"

[JB]: And what have you found? How long does it take?

[39:53]

[JP]: Well, we're pretty lucky here in South Texas because it's so warm. The oysters grow pretty rapidly, um, compared to, you know, if you were in Maine or something where you're going to have oysters only growing during the summer months and temperatures being typically lower than here. So, our oysters can grow to, uh, market size where they can be harvested within about eighteen months, even faster than that, maybe twelve to eighteen months depending on the conditions. So that's incredibly fast. So, if you have an issue, you know, like, a drought or maybe a big hurricane that comes through and drops the salinity in the bays and you have a really horrible year for oysters, you can recover if the conditions return to normal. You can recover, those populations can recover pretty quickly, um, if an oyster—so, the oysters that spawn where they typically can spawn, like, from the spring throughout the summer and into the fall. So, an oyster that was a brand new tiny, you know, less than five millimeters oyster in the spring that attached onto the shell of a reef and started to grow, by the fall, you know, within a few months, that oyster has grown enough that it can now spawn itself and contribute to the reef population. So, we see, um, you know, within a year, like I was saying, within a year, we typically see the oyster, densities, densities of oysters on the restored reef matching those of the natural reefs or even sometimes far, far exceeding that on the natural reefs because they're not subject to harvest pressure right away. And, as you can imagine, when you restore a reef, the first thing that you get are many, many, many teeny tiny oysters. And so, typically as they grow, you're going to see oysters, but larger oysters, so we see changes like that. Usually within a couple of years, we'll see the biodiversity represented what you see in the natural reef, but we also have some really interesting, um, results that we have been looking at from our longer term monitoring, so looking at five years of monitoring on a reef. So, "How resilient is a reef to storms and things like that can come in?" And, um, the answer is that "It depends," um, but one really cool thing that we've seen is that there is a clear El Niño signal. So, you know, here in South Texas, if it's an El Niño year, you know you're going to have a super wet, kind of cold winter or year. And if it's La Niña, it's going to be hot and dry. Well, the oysters track that, again, as indicators. So, we see that in the restored reefs. Like, we see really kind of boom bust years of oysters reappearing each year on the reef depending on those large-scale global climate cycles. And those give us a hint of what can happen with future climate change as well. So, it's really interesting to use that monitoring data to make all sorts of predictions about how these things will change over time.

[JB]: Yeah, it's kind of interesting because you're talking a lot about the variability between the years and stuff. So, how do you decide, like, "I'm going to restore back to when?" Right? I'm thinking of the history of it, um, in terms of how many oysters, where, you know, that sort of thing.

[JP]: Like what constitutes success?

[JB]: Exactly.

[JP]: Yeah, so, we, that's a great question. I teach this in my marine restoration ecology class, but there's a lots of ways that you engage success. You can have baseline data that tell you back one hundred years ago, "This is how many oysters you would expect to find in this place." The problem with that for oysters is that we know that there have been such severe declines in oyster populations that essentially, we could restore forever right now to get back up to where we were in the past. And so, anything in the positive direction is good right now. So instead of that, what we typically what we use are reference reefs like I described. A reference would be, well, an ideal reference for us would be a natural reef located nearby that's subject to the same environmental conditions at the same time as our restored reef so we can compare what the optimum, you know, what the best that we can expect would be, but we also use restoration targets and, so, we would use those. Say, we would calculate those from, say, the Parks and Wildlife Fisheries' independent monitoring data. Well, we can say, "Okay, over the past thirty years in this area, oyster densities have ranged between this and this." Um, the density of those new recruits are what we call oyster spat, those larval oysters that have attached, has ranged from here to here. So, we can say, "All right, well, maybe within two years of restoring a reef, we could expect to achieve, you know, ten percent of that target within that short period of time since these natural reefs have existed for, you know, hundreds of years." And so, we typically constrain our success using those data points more than we do sort of a historical baseline just because so much has changed. And, you know, one other thing about historical baselines that's the challenge is the places like Chesapeake Bay where you hear about, you know, that was the oyster heart of the United States at the turn of the twentieth century. And the conditions there have changed so much because the oysters have been removed, but then the water quality changed, the hydrodynamics changed, and so the Chesapeake Bay of today is a very different system than the Chesapeake Bay that used to host that many oysters. So, it's also challenging to say, "If we just keep restoring oysters and putting them back, it can take us back in time." Um, so, yeah, so we used more kind of contemporary measures of success.

[JB]: Um-hm, well, in terms of what's changed in South Texas, what are the, um, factors that lead to kind of rises and declines in oyster populations?

[JP]: So, things that have changed in South Texas, you know, one of the big ones would be shell dredging, historical shell dredging. So we know that, you know, in this area, we don't have a good source of rock or gravel that can be used for road building construction purposes, and so there used to be a very vibrant industry on a lot of the oyster bays in Texas that they would dredge what they would call "mud shells" and they would not be dredging just for the oysters. They would be dredging for that matrix, like the scaffolding of the reef. So, they were digging way down and removing those shells. And if you think about a reef kind of forming like an iceberg where, you know, you're going to kind of see the tip of it, the rest of it is down under the sediment. So, that part is critically important to holding that reef in place. When that gets removed, you can imagine how the deadly mix of reef sustainability and then reef recovery are changed. I mean, in some places there was just no chance for reefs to continue to persist. So that was a big one. There are maps that show the roads that were paved with oyster shell and they go from, you know, Corpus Christi to, um, the border of Louisiana, Houston, Beaumont. It's really incredible how much shell was taken out. So that was a huge thing. Another big change has been changes in freshwater inflow to the bays. So, these oysters are not like fish or shrimp. They are

not going to be able to get up and move as the conditions change. They're fixed in place. So, what we see is that when you have higher salinities in our bays, you have an increase of things like marine predators that are going to come, they can make their way farther into the bay because the salinities are suitable for them, the more marine salinities. So, those can have an impact on the oysters, partially the young oysters. We also know that there is oyster disease, which can cause severe oyster mortalities in the Gulf of Mexico and that disease really proliferates and is most severe in higher temperature, higher salinity conditions. And of course, South Texas, it's always hot, so when you add that extra piece of higher salinities, um, oysters can be really susceptible to disease. The diseases won't affect us, it doesn't affect humans at all, but it does affect the oysters in that it gets accumulated in their tissue over time. So typically, your larger oysters are carrying more of a burden and if you have something like a storm comes in, or you have a drought, if you have any sort of extra stressor, you lose your biggest oysters. And those are the oysters that form the basis of the fishery. So, they actually went through a process to lower the commercially harvestable size of oysters. So, it used to be three and a half inches, down to three inches because they were losing so many oysters before they would even make it to that harvestable size. So, technically, you know, the freshwater inflow changes have had really strong implications for that fishery and for the way that, um, oysters reefs exist today.

[JB]: Um-hm, well, so, I guess one of the other questions I had about that is what about Hurricane Harvey? Did you see any major changes? Or did it affect any of your, uh, restored reefs or anything?

[JP]: So, yes and no. So, um, in terms of our restored reefs, no. So, we actually restored a reef in Saint Charles Bay up near Rockport. We completed construction of that reef, which was maybe five acres. We completed it in, say, two weeks before Hurricane Harvey passed right over the top of it. And we were so (laughs), I mean, we didn't know what to expect. We just felt like it was this huge investment of time, and money, and energy to get this reef built and we just thought it was going to be gone. And we went back out there. I think we couldn't get back out there until about three weeks or a month after Harvey because, of course, people's homes were destroyed. And when we were able to get out there, we were so surprised and happy because not only was the reef intact, it was still there, but reduction of salinity from the rainfall from Harvey had seemingly induced the oysters to spawn, the natural oysters in the system, and so there were spat covering that reef. So, there were tons of live oysters that had attached to that reef within that short period of time probably because of Harvey. So, we did lose some of our sampling trays. Like, those were just swept away, but they were easily replaceable. Um, but I'll say that Harvey on our side of the coast, it moved pretty quickly over the top of us. It didn't stay and rain and rain and rain like it did up in the Houston-Galveston area. So, we had a real, like, success story related to Harvey. But up the coast, my colleague who works in the Galveston Bay system, I mean, there were huge loses of oysters in that system and it was because the salinities from all that water that rained and flooded Houston and Galveston, all of that rainwater had to go somewhere and it drained back into the bay, basically turned it into a freshwater lake, and oysters don't live in freshwater. You know, they can kind of clam up. They can keep their shells closed if the conditions are poor and wait for them to pass, but they can't stay closed forever. You know, they have to filter feed and, um, and open their valves at some point. So, massive losses up in Galveston Bay. Galveston Bay still hadn't recovered from Hurricane Ike in 2008, which the problem from Hurricane Ike was sedimentation. So, during Hurricane Ike, a lot of sediments

washed off of the land area surrounding Galveston Bay and smothered reefs under two feet, one foot of sediment in some cases. And so, you've got an oyster that's a filter feeder and a suspension feeder and it has to be able to access the water being totally buried. And so, it killed oysters that were there and it covered up the fundamental building blocks of the younger generations to be able to reestablish the reefs. So, they, you know, Galveston Bay is really, it's the heart of oyster harvesting in Texas, but it had suffered the most severe, um, kind of insults from things like hurricanes and spills and things like that have really made their oyster population struggle recently.

[53:16]

[JB]: It seems that, are oysters, I don't know what the word would be, uh, picky? Or, I mean, it seems like you have to have some salinity but not too much and, you know, you have to have some sediment but not, you know, like, there seems to be this range. And has that impacted any of your work with restoration? Have you had any, like, failures of reef restoration or that sort of thing?

[JP]: We, so the oysters, you're right. They're picky. They have a range over which they can survive. And that range is pretty broad, but once you get to the ends, like to the extremes, then certainly they are picky. One interesting, uh, area of research that we have been following with some colleagues from LSU and USGS in Louisiana has been to look at how the environmental expose history of oysters can influence their ability to survive changes over time. And so, Louisiana has freshwater inflow issues also, but theirs are the totally opposite of ours. So, they just have tons of water coming down (laughs) the Mississippi. They've got lots of freshwater that they're dealing with all the time. We would love to have more freshwater down here. So we're kind of on the extremes, and so we've been conducting, um, an NSF-funded project to look at taking oysters from low salinity estuaries in Louisiana, high salinity estuaries in Texas, and exposing them to different temperature and salinity combinations so to see, you know, "Does it matter? You know, is an oyster that's been grown in really low salinity waters picky, but pickier in that it wants low salinity waters?" And that's really what we're seeing is that it matters. You know, an oyster that's growing in a higher salinity environment probably is going to do better if placed in a higher salinity environment. So, it's going to survive a drought much better than an oyster in a low salinity environment. On the other side of the coin, we see that those high salinity oysters are super susceptible. We have big storm and flood events that drop, um, the salinity and then we also see that all of that depends on temperature. So, if it's really hot and it's in the summertime and its already stressful, then of course they're more sensitive to those changes. So, yeah, it's interesting. The oysters, you know, they are acclimating to their environments that they're grown in. And we're working with, um, another colleague at LSU who's trying to understand the genetic basis for that. So, is that something that's passed on to the young of oysters that are grown in high or low salinity waters, or does it restart again? So, it's really interesting to think about. Um, it's really sort of applicable to the new development of oyster aquaculture in Texas as well, so, if you're an oyster farmer, you probably want to know, "Well, should I be using stock oysters from right here or would it be better if I took from a bay to the south, or from a bay to the north? And so, these are interesting questions for developing that industry as well.

[JB]: Is it too soon to know the conclusions of, like, why that is? Because these are all the same species of oysters, right? So, what—

[JP]: —Okay. Yeah, we just think there's probably some local acclimation that happens, but in terms of, you know, "Do we know why that is?" we are still, the project has one more year left. So, we kind of have, the loose ends need to be braided together still, once we have all the data in hand, but there have been over the years using different kinds of biological tools, there have been a lot of studies that have looked at different populations of this same species of oysters. So, they've looked at the eastern oyster, um, you know, in New Jersey, and then they've collected some from Virginia, and Delaware, and the Carolinas, and Florida, all around the coast into South Texas, and they've tried to understand, "Are there genetic breaks? Are there differences, local differences in populations?" And the answer is, "Yes, probably even though they're the same species, there are some differences. And so, in Texas, actually, there's been some work done by Texas Parks and Wildlife to define where those population breaks may exist. Right now, they think that there's sort of a northern population. It's not formalized as a population, but there's a northern kind of connected group of oysters that maybe, um, switches over to a different group of oysters right around Aransas Bay. And then, you know, there are these pocket populations of oysters that live in places that they seemingly shouldn't. So, we just found an oyster on one of our sampling trays in Baffin Bay where the salinity, you know, can exceed sixty parts per thousand, um, which is two times as high as you have in the Gulf of Mexico. It doesn't seem like an oyster should be able to live in that, but for some reason, sometimes you find them. You don't find these huge reefs that can be commercially harvested, but you find these pocket populations that for one reason or another, they can survive in these extreme conditions. So, there's a lot of interest in trying to understand that in terms of supporting populations under a changing climate with higher salinities and temperatures predicted for our area in the future.

[JB]: Um-hm, has climate change affected any of your work or studies?

[JP]: Not explicitly, um, in terms of studies, yes, because, you know, we are interested in climate change, but what we're typically doing is we're using this natural climatic gradient of the Texas Coast where it's rainy and wet and cooler in the northern part of the coast, and it's saltier and hotter, and has different environmental conditions on the southern part of the coast. So, we typically are looking at, we're setting up research, you know, experiments and observations along that climatic gradient, and we're using it as a proxy to study what would happen under a change of climate. So, in that sense, yes, um, we are really interested in looking at some of these, you know, understanding over longer time periods how climate change can affect oyster reefs. For us in Texas, it will be interesting to see what comes out of this. I'll tell you in the East Coast where oyster reefs are largely almost predominantly intertidal, so they're located in that fringe that's submerged at high tide and exposed at low tide, that's a really well-defined space, right? You know, submerged at low tide and emerged at high tide. So, as climate change occurs and sea level rise, um, is part of that, we see that the intertidal zone, that area, is shifting. And so, for oysters that live in that zone, climate change, they are seeing differences already. They are already seeing changes in that those oysters can kind of be drowned out. So, if they're on the lower edge of an intertidal reef, and now they're submerged all the time, that part of the reef is probably not going to survive. Um, so we do see that climate change does have impacts on these

habitats. But for us here on the Gulf Coast where they're already permanently essentially submerged under the water, um, we haven't seen real obvious changes.

[JB]: Okay, interesting. You know, I think you kind of had talked about this, but just, maybe you could expand on it is, why is oyster reef restoration important?

[JP]: Oyster reef restoration is important for the numerous benefits that are provided by oyster reefs. So, there have been really active efforts to sort of catalog and even develop monetary values for these benefits. Historically, oyster reefs have been valued almost primarily just because it's a food source, right? So, oyster production was really the big value until oyster reefs, until really recently, were valued for, you know, the value of oyster reefs were just the value of oysters that were pulled from the bay each year. How much money did we make off of those oysters? That was the value of the reef. But now we've started to learn that biodiversity is enhanced greatly by the presence of reefs in the bay. We know that water clarity and water quality can be substantially influenced by oysters because they're filter feeders and they're removing phytoplankton, and excess nutrients, and waste, and things from the water, and making it cleaner and cleaner. We know that extends to things like nitrogen regulation. So instead of having to pay a certain amount of money to put, say, tertiary treatment on a wastewater treatment plant, we know that oysters were already removing that nitrogen just naturally being in the bay. Um, things like shoreline protections, we know that the oyster reefs, if they're oriented near a shoreline, can provide really good wave buffering benefit. Um, recreational fishing support, so we know that if you, you know, recreational is such an important, iconic part of our coastal communities and we know that fishermen target those reefs because those reefs have nooks and crannies where the prey critters live and the sport fish come in there and feed on those reefs, and it's a great place, um, for recreational fishing. And another benefit that we're just kind of the tip of the iceberg at starting to learn about is carbon sequestration. So, there's a lot of interest in, you know, planting forests or, um, protecting coastal marshes and things because we know that they can capture and store atmospheric CO2. We're just starting to learn about the role of oysters in doing the same thing. So they are, like I was saying, they're filter feeders, so they are consuming those phytoplankton that are taking CO2 out of the atmosphere and then they're transferring that, essentially, to the sediments at the bottom of the bay. So, it's outside of circulation with the atmosphere. And so, oysters, their role, which can be really potentially significant in doing this, we're just starring to learn about. So, there's a real strong area of research in it on a topic called ecosystem services. And these are sort of these non-monetary benefits that the environment can provide humans. And for oysters, the list is just very long of these additional benefits that can be provided.

[JB]: Um-hm, well do you think that, um, are you just going to be working on this for indefinitely or do you have any other interests scientifically with kind of marine environments and—

[JP]: —Yeah, well like I said, I'm super interested in habitats in general. And so, a lot of what we're learning from our work within oyster reefs can be translated to other habitats as well. So, we have some projects looking at, um, the wind tidal flats in Matagorda Bay, for example, and the algal mats that are present up there, and understanding the role of those habitats in food webs. You know, how do they support other species that live in the bays? And we can ask

similar types of questions that we've been able to ask oyster reefs and use sort of guidance of the results that we found from oyster reefs to ask questions in these other systems. There's a lot of interest in Baffin Bay and these serpulid worm reef habits that I was talking about. We know that those reef habitats, those warm reefs in Baffin, have also, um, experienced severe declines in terms of their distribution and their size. And so, we have some upcoming work that we'll be doing trying to understand, "How can we apply some of our restoration techniques from oyster reefs to those serpulid worm reefs?" And so, really, the idea is just to kind of continue building upon the knowledge that we're gaining in the oyster reef systems to use that in similar habitats that also have been degraded or have suffered damages, and we can use habitat restoration to try to, you know, get some of those benefits restored.

[JB]: Um-hm, interesting. Um, what scientific questions remain unanswered in terms of oysters and reefs?

[JP]: Many, there are many (laughs). It seems like every time I meet a new, um, colleague who has a different type of expertise, you can apply that question to what's happening in oyster reefs. So, we're really interested in connectivity among habitats, so like, how does, if an oyster reef is located near a sea grass bed or a salt marsh, you know, what kind of additional benefits are gained from that than if it's only located near oyster reef or only located out in the middle of the bay? Um, if you're going to, that can then extend itself to restoring reefs. So, "Should we be restoring reefs based on adjacent habitats, or should we be resorting reefs closer together or further apart? Like, how do we best, um, maximize those diversity benefits that come from reef restoration?" Like I said, questions about the ability of oysters to contribute to, um, to storing carbon from the atmosphere. That seems like it's going to become even more important. There's a lot of demand for that information from a number of different types of groups. So, not just, um, scientists, but conservation groups who want to make targeted restoration investments from businesses who want to direct investment in habitat restoration. But, like, groups from, you know, the energy industry for example, they would also like to be to be able to contribute to draw down of carbon that may have contributed as part of their activities. So, I think that's going to be a real active area of research. And then, you know, people are constantly developing new types of molecular tools, which is not my area of expertise, but that help us understand a bit more of the patterns that we're seeing out in the marine environment. So, you know, partnerships between different types of biologists are revealing new answers and also probably the biggest thing that we see, the biggest trend, is really working across disciplines. So, trying to understand for example, how reef restoration may impact a community. You know, "What are the social aspects of the work that we're doing?" So, really trying to understand across disciplines how this work is impactful is another area that I think is going to grow in the future.

[JB]: Um-hm, and so you've started off as a postdoc at HRI and then you were in the, um, the College of Engineering and Science and then back to HRI?

[JP]: Yeah, so I became an Assistant Professor in Life Sciences, and then until, two years ago? Two years ago, I became a chair here at HRI.

[JB]: And has your shift back to HRI like in terms interdisciplinarity like changed some of the question or changed some of your work?

[JP]: I feel so lucky to be back at HRI just because of, you know, as a postdoc, I was sort of trained in the HRI model, which is to be thinking about different perspectives of like law and policy and socioeconomics as well as natural and physical sciences, which is where my training is. And so I think that I was scientifically in that, and so I kept that with me in my time in the Department of Life Sciences. So, I continued collaborating with colleagues over here at HRI and continuing to ask those types of questions. But it's so nice to be back because now I feel like I'm in an institute where there are lots of us who have similar perspectives in terms of our mission is studying problems in the Gulf of Mexico, but we're set up where I can walk down the hall and talk to the economist and say, "Hey, we're thinking of doing this study, you know, having an evaluation component would be super interesting." Or, you know, a student can work with one of my colleagues to develop maybe a policy perspective to their thesis. And so it's, you know, all under one roof having that diverse set of perspectives. I think it's really unique. There are some other institutes that are following this model that we see that are starting to develop around the coast, but HRI has really been at the leading edge of this kind of, um, diversity of perspectives. So, yeah, I'm happy to be back because I love the approach. I think it makes so much sense, that sort of holistic view, and it's valued here as well.

[JB]: Um-hm, well, one of the things I wanted to ask, and this is maybe a silly question, but, you know, normally I do these oral histories and the demographics are much older (laughter) than you, but you've been very productive, like, extremely productive. So, what do you think accounts for your success?

[JP]: Oh my gosh, I wish that I knew what the magic formula is for success because I would mix it up and (laughs) sprinkle it all across my future, but I don't know, you know, I think in a lot of ways, you know, I'm trying to be flexible and adaptive so that as problems are coming up that are being identified by groups like resource managers or conservation groups that I can be flexible and on my toes and think about, "Okay, that's a problem you have. These are tools that we use that could help provide a solution." You know, in science, like, the exciting thing is there's probably multiple factors that are contributing to any kinds of problems. And so, using your tools to try to tease apart what the role one of them may be is important. So, I think that I've been successful in part due to that flexibility and adaptability. Um, I think I'm also a really competitive person in general. So, like I said, I played college softball, and I, you know, I think I bring that competitiveness to proposal writing. I mean, generally, people work really hard on them. I worked really hard on them also, but maybe that's part of it too is like I commit myself to those things. I will also say that one of the biggest keys to my success though is that I have really good people that I've been able to surround myself with. So, my research staff, I mean, I tell them every day that I could not do what I do without them. I trust them one hundred percent, you know. I tell my students that what they say is my voice as well and, um, I think that there's something to be said for recognizing that you don't have all the answers, but that you could put really good people around you and, collectively, you can be really successful. You can accomplish really much more than you can accomplish on your own. And I am one hundred percent (laughs) comfortable with acknowledging, and recognizing, and, you know, calling attention to the fact that this is not just me. This is really a great team that I have that I get to work with. And that's part of what makes me successful.

[JB]: Um-hm, and the other thing I wanted to ask, reflecting on this moment, right, for future historians and researchers and stuff, we're in the midst of the COVID-19 pandemic, so can you talk about if its disrupted your research, how its impacted your research, and then kind of reflecting as a scientist on some of the kind of cultural views of science right now? Could you just tell me more about that? [1:13:45]

[JP]: Sure, yeah, COVID, I mean, at the beginning, we just didn't know what was going to happen to all of our research projects. Most of our research requires really timely sampling. So, we're looking at seasonal changes or we need to capture a certain event in order to capture the next event to understand what's happening. And so for us, we really kept going during the pandemic. We worked really hard within the safety guidelines to modify our approaches, you know, fewer people going in the field, more vehicles for those people so people are spaced out. You know, not spending overnight trips. Um, just going out for daytrips and accomplishing, you know, it may have taken us ten field days to accomplish what would normally only take us two field days, but we were still able to move forward. My funding agencies have all been really great in terms of proactively reaching out to say, "Do you need more time?" You know that this has slowed science down. And so, the dialogue has been very open about the fact that, you know, students are around less often now, or people are working from home, and, you know, that has an effect on your timeline. It doesn't seem like that's been a problem at all. I think for me as an associate professor here at the university, you know, one thing that's been really interesting to think about for me has been, and as a female faculty member, has been the effects on trajectories of tenure and promotion. And so for me, I'm tenured, and so, it's not something that personally will affect me, but for a lot of people, you know, we see a lot of articles about women faculty members who are really struggling with taking on additional responsibilities if they have a family, also trying to have an incredibly productive five years of their career. You know, the most incredibly productive five years of their career to get tenured. And so, I've been very sensitive to that in my department chair within Life Sciences, Cherie McCollough, and I have had many conversations about what can be done to support female faculty in this time. And so, and I know [1:16:02] that that's something the university seems to also share interest in. So that's something that I've, you know, is not directly related to my research, but something that I've been really concerned about. At least in sciences, and in the natural sciences, I should say, the physical sciences, we don't have a lot of female faculty, and so removing roadblocks that can be dealt with proactively is something that's important to me. Like, keeping the female faculty that we have and supporting them whenever ways that they need. So, for me, COVID has had that impact as well.

[JB]: And have you dealt with some of those similar issues, um, that a lot of female faculty have been struggling with childcare and that sort of thing?

[JP]: Sure, yeah, sure, I have I mean, I think that it, you know, I have two kids. I think it's totally possible to have a career and have a family. I think that it just, you know, there are so many hours in a day you just become really efficient (laughs) at how you're going to allocate those hours. But it can be a challenge, you know? A lot of my male colleagues had kids while they were in graduate school, and so, it wasn't while they were trying to establish themselves in a faculty position. And of course, as a female scientist, going to school would not have been a good time to have children either. I find myself sometimes in a sort of a de facto role where I'm

advising female graduate students on questions like this because they don't have a lot of other people to ask, you know? Like, "How does it work? Is it possible? How did you do it?" There were some people that I could turn to ask questions about. I think, in the past, it may have been more common that female faculty would have just taken a step back and then returned to the faculty. That's a bit harder now. I think particularly for a research-focused faculty member, it's really hard to kind of break your productivity and to come back to it again after having children. But I don't know, I found a way to make it work, and it has worked. I found that the people around me have been incredibly supportive. I've never felt not supported here at all. I had my first child when I was a postdoc for Paul, and he was incredibly supportive. It was, like, "I'll see you in twelve weeks." And I said, "Great!" So, you know, there's a way to make it happen. I have had multiple staff and students who also had children, and we just, we adjust and adapt and accommodate what is needed (laughs) right after you have a child, and you're not here, then we find a way to get back on track again.

[JB]: Um-hm.

[JP]: So, I don't know. It maybe brings a unique perspective for me on how to deal with those events because I've gone through it myself, but it's worth figuring out (laughs).

[JB]: Um-hm, as a woman in science, you kind of mentioned you had a lot of male colleagues. Um, can you talk more about your experiences as a woman in science?

[JP]: Sure, um, gosh, that's such an open-ended question. So, (laughs) I had, I'll start in graduate school. I had majority female graduate school cohort, you know. There are lots of female graduate students in the marine sciences. The problem is that you see this attrition and you don't see female graduate students sticking with it and sort of moving sort of into the higher level positions, like getting a PhD, doing a postdoc, moving into a faculty position, or moving into higher administrative positions within agencies, or NGOs, and things like that. So, there's always been this question that now is really coming much more to the fore I think where there's been such a focus in the past, I don't even think decade, but past maybe five years about improving and supporting diversity, equity, and inclusion in female—women in science has been a focus of that as well as all underrepresented groups in the sciences and in STEM fields. Um, so, there has been more of a focus now on developing concrete actions that can help support women but other groups as well. We actually at HRI, this is something that we have been developing recently is putting together, we're sort of like in the very, very early nascent stages of developing a diversity committee here to understand, "How can we support diverse groups in the sciences that have unique needs?" And so, that extends to women, of course, but also extends to like the community that we serve here in South Texas. So, the majority Hispanic community that has unique cultural expectations of their young people and their children and their families in terms of going to college and graduate school, and finding a way to create success for them within the field of science that may not be a field that their parents or their grandparents were in. So, we're trying to work towards supporting all of those groups. Um, for me, I've done a lot of seeking out different types of trainings that talk a little more about women-specific challenges to being a leader, or being a scientist, or, you know, career, work-life balance sort of questions. So, I think that now more than ever before, there are more resources available. Um, I'll say that I have great colleagues, though. I don't ever feel like in my career that I was ever a woman scientist among

men scientists. I've always felt like I was a scientist among scientists. But you read stories and you see that that hasn't always been the case, so I think that I was lucky in that sense, but I'm also really working hard to try to understand the stories where that wasn't the case so that we can make sure those things don't happen again in the future.

[JB]: Um-hm, thank you. Is there anything that I missed? Is there anything that you think is important to discuss in this conversation or for the historical record? Any topic at all?

[JP]: Nothing comes right to mind. Maybe when we're away from this when I step away from it a little bit, something will pop back into my head, but, no, I think that we can sign off.

[JB]: Okay, I'm going to turn this recorder off, then, but thank you very much.