

TRANSCRIPT

INTERVIEWEE: Lance Robinson

INTERVIEWER: David Todd

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David Todd [00:00:01] This is David Todd, and I'm very fortunate to be on the line here with Lance Robinson, and we are about to create an oral history interview. And with his permission, our plan is to record this interview for research and educational work on behalf of the Conservation History Association of Texas, a nonprofit, and for a book and a website for Texas A&M University Press, and finally for an archive, for permanent public access, at the Briscoe Center for American History at the University of Texas at Austin.

David Todd [00:00:42] And that is our plan. But he would have all equal rights to use the recording as well.

David Todd [00:00:47] And I just wanted to make sure that's OK with Mr. Robinson.

Lance Robinson [00:00:51] Yes, that's fine.

David Todd [00:00:53] Great. OK, well, then let's, let's get started.

David Todd [00:00:57] It is Thursday. I'm sorry. It's not Thursday. It is Monday, January 10th, 2022. It's about 1:10 Central Time. My name is David Todd and I am representing the Conservation History Association of Texas. I'm here in Austin and we are conducting a remote audio interview with Mr. Robinson, who is, I believe, also based in Austin area.

David Todd [00:01:27] Just as background, Mr. Robinson is a biologist who worked in the Coastal Fisheries Division at Texas Parks and Wildlife, starting over 30 years ago, and he worked his way up through the ranks and ended up most recently as Deputy Division Director before retiring. During his tenure there, he worked in a variety of capacities, researching, releasing, managing and protecting marine and estuarine fishery resources along the Texas coast. And a good part of his work has touched on the management of the oyster resources in Texas, so we are particularly interested in that. Today, we will talk about his life and career and especially focus in on his work in the field of oyster conservation and restoration.

David Todd [00:02:21] So thank you so much for being with us.

Lance Robinson [00:02:24] You're welcome.

David Todd [00:02:26] So we usually start these interviews with just a question about your childhood and upbringing, you know, hoping that you might tell us about your childhood and if there might have been any people who were a big influence in your interest in working with animals, and, you know, of course, for today's interview, oysters in particular.

Lance Robinson [00:02:47] Yeah, thank you for that.

Lance Robinson [00:02:48] You know, really growing up there wasn't, I guess, a lot of engagement from a natural resource standpoint, other than the typical things of a young kid does growing up. I spent a lot of time outdoors with the family. We did a lot of camping, hunting and fishing trips with my brother and my father as I grew up. I think that's, you know, the biggest role or the biggest impact that had on me, you know, kind of in the outdoors. Enjoyed that. But really, it was the, you know, from the marine side, I grew up in a town in North Alabama, you know, it was landlocked. It wasn't on the coast. But I had a desire to kind of get involved in saltwater biology. And, and I think that probably came from the many, many trips we made to the beach growing up and just spending time, you know, playing in the beach and walking up and down and finding shells and other critters on the, on the beach.

David Todd [00:03:46] So maybe you, to sort of fill in the picture here, what would be a typical trip to the, I guess this is the Alabama coast, is that right?

Lance Robinson [00:03:57] Right. Alabama and Northern Florida coast. Yeah, we would, some years, we would camp and we would go down, we'd tent camp at parks on the beach. And so we would, you know, you know, spend the time right there with nature. We usually would take a boat with us. My dad had a small boat and we would fish while we were down there in the, in the Intracoastal Waterways or the sounds along the Florida coast, primarily near Pensacola, Fort Walton Beach area. When we went and stayed in a hotel, you know, we, but this was back, this would be back in the '60s, early '70s. And so, you know, it was well before internet. So we'd, we'd spend our time, you know, outside, at the beach. You know where the parents would pretty much turn us loose when we got there, and we had a kind of free rein along the beach, and just came home back to the camp or back to the room in time for dinner and, and usually would go back out afterwards.

David Todd [00:05:01] Wow. So a full day on the beach and in the ocean.

Lance Robinson [00:05:06] That's right.

David Todd [00:05:08] Well, you know, this is moving forward a number of years, but it'd be interesting to hear about your formal education. I understand that you received a B.S. in Zoological Sciences from Auburn and then went on to get an M.S. in biological sciences from Fairleigh Dickinson. I was hoping you could talk a little bit about that and if there might have been any classmates or teachers or field trips, you know, any other kind of events, that might have led you to your interest in nature, science and marine issues - oysters?

Lance Robinson [00:05:44] Sure.

David Todd [00:05:45] You name it.

Lance Robinson [00:05:47] Yeah, sure. Well, you know, I once I, you know, decided and I decided from, you know, a pretty early age that, you know, I wanted to study marine biology in some capacity. I got my SCUBA certification, I think, when I was about 16 and made several trips. And that just kind of, you know, ingrained that desire in me, that this is what I wanted to do as a career.

Lance Robinson [00:06:12] And so I decided to pursue that degree at Auburn, a degree in zoology, with a focus on marine biology. And, and I think there was certainly a professor there that that really kind of opened my eyes to what was really available. And it was Dr. Ann

Williams, Dr. Williams, had, you know, come into that program as the department head of the Marine Biology Program. She was an advisor. We sat and talked at length. We talked about, about the career, about the field she got. She was very engaging with her students, got students involved with reading scientific papers and we would all get around on a Friday afternoon and after classes and just sit around and discuss a particular paper that she assigned for us to read. And this was all voluntary. It wasn't a class. It was just a group of students that, you know, had a desire to learn as much as they could, and she was very engaging in that aspect.

Lance Robinson [00:07:12] And as I, and as I worked with, with Ann, one of the things that, you know, I expressed to her is my, my interest in marine biology was, was really in coral reef ecology. I mean, that's really where I had kind of set my early goals of, you know, I was going to work in some tropical locale, the Caribbean or something. And dive and do all this, you know, clear water stuff.

Lance Robinson [00:07:40] And Auburn University, at the time, they required all students pursuing a marine biology portion of that zoological degree, required them to attend a marine lab over the course of a summer and to take classes there. And Auburn was affiliated with two labs - one in Dolphin Island, Alabama, and then one in Ocean Springs, Mississippi. And they were both excellent marine labs. I knew a lot of other classmates who went to each of those.

Lance Robinson [00:08:14] But as I talked with Ann, one of the things that, you know, I tried to impress upon is that I really wanted to work in coral reef ecology, and that was her background. She had done her dissertation in Jamaica with sea urchins and a small damselfish. And so she was very helpful in kind of helping me pursue that path, and we looked around and found a, a marine laboratory that offered classes in the summer that I could take and the University, Auburn, would give me credit for taking those classes. The lab was a component of Fairleigh Dickinson University out in New Jersey, but the lab was in St. Croix in the U.S. Virgin Islands. And so we, she talked with the director at that facility and one of the one of the things I was lacking: there wasn't enough class hours to meet the requirement of Auburn. And so we pursued doing a special project, kind of an independent study, that would give me some additional hours' credit. And Auburn, the department head, accepted that as a, as a component of that requirement.

Lance Robinson [00:09:35] And so I spent the summer in St. Croix, taking classes down there, diving every day, did an independent study, which was really a study that was some, some territorial behavior work with this damselfish that kind of duplicated a little bit some of the work that Ann had done in Jamaica. And so I spent an additional five or six weeks over there after the classes finished working on that, that research project, completed it.

Lance Robinson [00:10:10] And then she certainly, you know, pushed us, her students, because I know I, I got back, back to campus and she told me there was a there was a meeting that that she always attended. It was a benthic ecology meeting, primarily held along the East Coast and the Gulf of the U.S., and she always attended that meeting, and had been doing so for many, many years. And so she told me that, that she wanted me to present the results of my independent work at the upcoming meeting that year, which happened to be at Harvard. And it was quite a, an intimidating position to be in giving, you know, as a, as an undergraduate senior in college, giving a presentation to researchers, you know, at that, at that institution. But she, she probably was the biggest influence on me and certainly helped me pursue the goals that, that I was initially kind of looking toward.

Lance Robinson [00:11:14] Obviously, when, when it came down to looking for a job, there were ... but at that time, I had a family that were stateside, and it was just, you know, going to be kind of cumbersome to try to make that happen. So I came back stateside. Before I left, I reached out to a professor in the Department of Fisheries at Auburn who, who had posted an advertisement for, he was looking for somebody to run a program on a reservoir in Alabama that would be tracking grass carp with radio telemetry. And it kind of piqued my interest, and I went ahead and applied for it, primarily because I had some background in telemetry work while I was in St. Croix. I was doing some extra work on the side with the, with the chief biologist there tracking juvenile green sea turtles around coastal lagoons there on the island using radio transmitters. And, and so I reached out to the professor in the fisheries department, Dr. Mark Bayne, and he told me that he was really looking for someone that was closer to being completely finished with their degree, finished writing and everything.

Lance Robinson [00:12:38] And, but he encouraged me to reach out to him when I got back to the states. And, and I did. And that led to a, a position with Auburn working in coastal Alabama on some estuarine fisheries work down there.

David Todd [00:12:58] That's interesting. So this is in that interlude between college at Auburn and then going on to, to Fairleigh Dickinson. Is that right?

Lance Robinson [00:13:10] Well, I was. Yeah, that's right. I was. Well, I take that. Yeah, that was. I take that back. I got to back up a minute. I did that first summer as an undergraduate and I came back to Auburn, finished the, finished the year, my degree up. And I continued to attend those meetings, benthic ecology meetings. And my first summer in St. Croix, I met a, a graduate student, a Ph.D. student from the University of Georgia, that was doing some work also on sea urchins. There had been a mass mortality event of sea urchins throughout the Caribbean. It was a species-specific mortality event. And during that meeting, later in that year, he reached out to me and asked me if I would be interested in going back to St. Croix the following summer. This would have been after I would have graduated with my undergraduate degree and, and I did. I went back and spent another summer over there working specifically on the sea urchin work.

Lance Robinson [00:14:13] And then came back stateside went into the, into Fairleigh Dickinson for the graduate program. I did a residency in New Jersey and as I was working on a kind of research plan and what I was going to look at doing and try to find funding for my graduate work again, I ran into this professor and he was a professor, at that point, I was working at the Smithsonian, Dr. Bob Carpenter. And I, and he reached back out to me at one of these meetings and said that he had gotten a National Science Foundation grant or a National Geographic grant to continue some of this work with sea urchins and wanted to know if I would be interested in, in kind of leading the field effort of that work. And any of the data that collected there, I could use that toward my thesis.

Lance Robinson [00:15:05] And so I did take him up on that and spent, then went back, for the third time, to St. Croix and spent a year over there doing that, doing that research work. So I got a wee bit out of order when I told you before, but that was kind of the sequence of events. And it was at that point when I was wrapping up that one-year stint in the Virgin Islands, when I was beginning to look for a job, that I reached out to Dr. Mark Bayne, which ultimately led to the position with Auburn University, Department of Fisheries and Allied Aquacultures, working on estuarine communities and fish communities in coastal Alabama.

David Todd [00:15:49] I see. OK, well, so you told us a little bit about your work with Auburn and Fairleigh Dickinson and then this this research stint in the Virgin Islands - a lot of field work and classwork and formal education, I'm sure. You know, a lot of times people also point to, kind of the popular culture. And I'm just curious if there were any books or films or TV shows, anything of that kind, that was influential for you in your early years.

Lance Robinson [00:16:24] Sure. Yeah. Interesting enough, I mentioned before a lot of my development was pre-computers. And so we, you know, we were, you know, constrained by whatever was on TV. And I certainly, you know, spent my fair share of time sitting in front of the TV watching the Undersea World of Jacques Cousteau. I mean, he was probably the, you know, from a, from a popular figure was, was, I mean, I was always amazed at the films and the work that they did on that TV show and that just helped fuel the, you know, the desire and the fire that that, you know, hey, this is something I'd like to figure out a way to get my hands on in some capacity.

David Todd [00:17:08] Yeah, I could. I could see that being really inspiring - offshore and on the Calypso, diving and, you know, seeing these incredible creatures.

David Todd [00:17:20] Well, and speaking of creatures, what was your first introduction to oysters and oyster reefs?

Lance Robinson [00:17:29] Yeah, sure. While I was working at Auburn in the Department of Fisheries, the University had decided through some, some public outreach efforts that they had performed that the University's presence along coastal Alabama was waning a bit. They just didn't have as big of a presence as a state land grant university. And so the, the department head of Fisheries called me into his office one day and told me that he, they were going to be reassigning me to, to the coast, because I had a coastal background. And actually I lived in Mobile and commuted up about 200 miles up to Auburn and would spend the week on campus with, where my office was. And then, and then when I wasn't doing field work, I'd drive back on the weekends. My field work was on the coast, so I was living at home at that point.

Lance Robinson [00:18:24] So they reassigned me to the, to a new facility that was developed called the Auburn University Fisheries Research and Extension Center. And it was a, I mean, they say it was a new program. It didn't even have any equipment - no boats or any things like that, no net, no sampling gear. And so we basically built that up from the ground up and, and my first involvement with oysters was within that program. We were, we had an individual there in that coastal Alabama area that, a property owner, that had property adjacent to one of the, to the Mississippi Sound, which is a body of water just between the mainland and one of the barrier islands there off of Alabama. And, and he had an idea that he wanted to explore the possibility of growing oysters in a pond.

Lance Robinson [00:19:23] Oyster mariculture, or oyster aquaculture, had been done, to some extent, even at that early stage, certainly overseas and in Japan and other countries. They were well along the way doing oyster aquaculture and mariculture. Here stateside, there was a little bit of work that was beginning to be done in Florida and up in the Chesapeake, but it was all in natural waters, either on-bottom or off-bottom, in, within the public waters of whatever state that were doing that.

Lance Robinson [00:19:54] But this gentleman had the property, had an idea that he wanted to have a land-based pond and pump water, because he had direct access to the bay, and

wanted to pump water into that pond and look at growing oysters. And what sold him on that was, I guess, he had a conversation with someone, and again, this was back in the mid, mid-'80s or so late-'80s, and he had talked with somebody up on the East Coast, and they were telling him that if he could grow oysters, singles, individual oysters, that would be destined for the half-shell or the raw oyster market, that they would pay him a dollar apiece for those oysters. And that was just unheard of for, you know, that much value for, for an individual oyster.

Lance Robinson [00:20:47] And so we worked with him for a couple of years trying to kind of work through the, the different bottlenecks that we invariably ran into trying to do this in a pond. I think at the end of the day, the, the, they, he abandoned the effort, primarily because the challenge was providing enough food for these oysters to actually live and grow. In a pond setting, you were constantly having to grow your own algae and add it as a supplement in there because they would just, you know, filter everything out of the water column. And that became the real challenge there. And he really didn't have a, a good setup to run a, an algal culture facility as well. It needed to be kind of enclosed and his stuff was all outdoors. So, so they ended up kind of letting that go.

Lance Robinson [00:21:44] But that was really kind of my first exposure to oysters looking, you know, we bought seed oysters - very small, a millimeter or so in size, and, and then grew them up to, you know, market-size. But it took a lot of effort.

David Todd [00:21:59] Well, that is fascinating, and I know that here in Texas and with Parks and Wildlife and other partners, there's such an effort to try to get mariculture started here, so maybe we can return to that later in our visit.

David Todd [00:22:16] So I think you've talked a little bit about the, this, the oysters in a pretty special situation, you know, in a pond with water being brought in and, you know, having to grow algae for it and then produce these, I guess, spat oysters, very small oysters, seed oysters, to get them started. Well, maybe you can sort of take us back to what the traditional life history of an Eastern oyster might be in more, you know, traditional kind of circumstances in or on a reef?

Lance Robinson [00:22:51] Sure. Yeah. I think one thing that it's important for listeners to understand about oysters is that they are incredibly resilient. If you think about it for a minute, you're talking about an organism that is sessile. It does not move. It sits on the bottom. It grows on these structures, these reefs, and, and therefore it cannot move away from the environment in which it lives. Fish can swim away when freshwater floods come in or temperatures go down. You know, fish can go to deeper water. Oysters can't. They are stuck in the environment in which they ultimately settle as a larvae and then develop into as an oyster.

Lance Robinson [00:23:33] The environment they live in are shallow bays. So they're, they have highly fluctuating temperatures and salinities. There's a lot of sedimentation, turbidity, within the water column as well. So, so that I think is a real important take-home is that these animals are incredibly resilient to have lived for millennia in these environments and have thrived in these environments as well.

Lance Robinson [00:24:00] They typically live, if in captivity, they have documented these oysters living as long as 20 years. But in reality, when they're out in the wild, that, that's, that's not typically the case there. If they're not harvested and consumed by, by restaurant goers, or

then they may fall prey to predators or disease while they're in the wild. But, but typically, it's not uncommon to see oyster in the wild, if it's not been harvested, it's in a protected area, maybe where harvest is not occurring, you know, it could certainly get up to 10 years pretty, pretty easily.

Lance Robinson [00:24:36] In Texas, the, the legal harvestable size for an oyster is three inches, and it takes the oyster about two years to reach that in the wild. And that certainly is an important aspect when you start talking about aquaculture and mariculture, and we can touch on that in a minute. But, but two years for an oyster to reach that legal three-inch size.

Lance Robinson [00:24:57] When the oysters spawn, they, they're broadcast spawners. So sperm and eggs are released into the water. They come together and form the, the, the larval oyster, which is free-swimming. It spends about the first two weeks of its life freely swimming in the water column so it can move around the bay a bit. The oysters will seek out chemical cues in the water that are produced by microalgae that grows on hard substrates. They have to settle onto something hard in order to metamorphose into what we all kind of know what an oyster kind of looks like, with the hard shell.

Lance Robinson [00:25:36] So they look for these chemical cues in the water, and when they pick that up, they kind of home in on that, swim down and they will land as a, as a free-swimming planktonic larvae, land onto that hard substrate. They will use their modified foot to kind of crawl around, find the place they want to kind of attach, and then they will cement themselves and then metamorphose into a hard, you know, attached, cemented oyster that's growing on top of typically other oysters.

Lance Robinson [00:26:08] So, you know, it's, it's a filter-feeder.

Lance Robinson [00:26:11] Another interesting thing about its reproductive strategy, and again, part of the reason that, that makes these animals so resilient is that they are, they can change their sex. Typically are born as a male and as they get older, they will transform into females, but they have a unique ability that they can actually reverse that. And they, they take these cues on sex change based on the environment and the reef structure in which they reside. So, so if they're in a reef complex that is a majority of females, then that bigger oyster can revert back to a male to help propagate the species.

Lance Robinson [00:26:53] As I mentioned, they are filter-feeders. A single three-inch oyster, and this kind of goes back to our experience with aquaculture in Alabama with oysters, a single three-inch oyster can filter up to 50 gallons of water in a day, which is just amazing, that they will filter that much water. Back during, in Texas, and when Hurricane Ike came through, we were doing some work looking at a grant to do some restoration work. And in part of that we were kind of calculating, you know what the value of this restoration effort might be, you know, from a water quality standpoint. And what we calculated is that if you took one hundred and thirty acres of oyster reef in Galveston Bay, that that one hundred and thirty acres would filter about 260 million gallons of water per day.

Lance Robinson [00:27:43] And to kind of give it context for the public, we kind of looked at some comparisons and we found that in, and this is back in like 2009 or '10, something like that, and so we looked at the City of Houston, huge metropolitan area that it is. They had 39 wastewater treatment plants and the combined daily, average daily, wastewater treatment flow that they had through those 39 wastewater treatment plants in Houston, Texas, was two hundred and fifty two million gallons a day. So granted, the wastewater treatment plant is

doing more treatment of the water, but the volume of water that those plants were dealing with on a daily basis, one hundred and thirty acres of oyster reef were filtering, a little different type of filtering, but were filtering that much water on the same day.

Lance Robinson [00:28:34] So it's kind of phenomenal that their filtering capacity. And that plays into some other things, as, you know, that we look at with certainly aquaculture and even, even in the wild harvest on how we help try to manage some of these things.

Lance Robinson [00:28:49] But they're very selective in the food that they eat, very size-selective. They'll reject larger particles that are kind of encapsulated in a mucus layer that, that they, that they generate inside the oyster and it's not digested. They just kind of wrap those bigger, they shunt the bigger materials off of their gills into this, and they kind of encapsulated it, call it a pseudofeces. It's not digested, but that packet of algal material that is too big for the oyster to ingest is then shunted out of the shell, kind of falls out. And, and then those packets, those pseudofeces are then consumed by, you know, the many, many species of small shrimp and crabs that live within the reef matrix alongside the oysters.

Lance Robinson [00:29:37] So, and that's another important point. I think that that people I think have to recognize is that oysters are certainly valuable from a commercial fishing standpoint, and a lot of people like to eat oysters, but they are also habitat. And that's been part of the challenge in managing that resource is that you're removing habitat from the bays and, and in more recent years, with the impacts from hurricanes, we will, you know, we have seen what that impact can do and we can certainly talk about that in a bit.

Lance Robinson [00:30:09] But that kind of, in a nutshell, kind of gives you a little bit of information about kind of the life history, basic life history, of that animal.

David Todd [00:30:17] Yeah, no, that is super helpful and I love the way you, you can sort of key this into some, some sort of benchmarks - the, the idea of, of Houston's 39 wastewater treatment plants be equivalent to 130 acres of oyster reef. I mean, that's, that's something they can really stagger your mind. That's, that's amazing.

David Todd [00:30:41] So but I think you said that that the, the increasing understanding that these oysters are important as habitat, has maybe shown that there's, there's, you know, concern about the trends for, for these oyster reefs. And I was hoping that you could talk a little bit about that. I think that from 1991 through 2002 that you, you did some important research on just data about fisheries in the Galveston Bay ecosystem. And I was hoping that you could talk about the, the status and the trends of these reefs, certainly during that time. But if you know about the earlier periods of time, that would be really interesting too, because I know it's, oyster reefs, have been such an important resource and, you know, have supported a lot of industry down there that it'd be good to know, you know, what sort of impact dredging and other activities have had.

Lance Robinson [00:31:44] Sure. Yeah, we, the Texas Parks and Wildlife Department, has a fishery independent sampling program, which basically involves staff utilizing a variety of sampling equipment and gear to sample the resource then, and in the case of oysters, it's a targeted sampling effort, program - uses a small dredge, much like the commercial dredges. And for those that don't know, these are really, a good analogy is that they're like a big rake. The commercial dredges are about three feet wide. Have, they're made out of steel. Very heavy. They have teeth that extend down and as they drag these, these dredges across the reef, those teeth kind of break up the oysters that are growing in clumps on top. And then

those oysters are kicked into the dredge and there's a chain mesh bag that collects the oysters. They bring it on board, and then they will cull them to the appropriate size and throw the other undersized back in the water.

Lance Robinson [00:32:49] So we do the same thing, with just a smaller version of that commercial dredge. We, the sampling programs in Texas, were and I and I feel very fortunate in fact that that I was, was able to work with a, with an agency that had the foresight, well before I started with that agency, but the, our previous leadership there decided that they needed a program that would allow the Department and the State of Texas to better manage their resources. And so back in the mid-'70s, they developed a sampling program that to this day is the largest fishery independent sampling program in the U.S. We have got millions and millions of data records. It is just unprecedented. And the sampling has been done the same way since the mid-'70s in every bay system on the coast, which gives that data an incredible amount of power to be able to compare between bay systems and even between reefs.

Lance Robinson [00:33:45] And so, so that was part of our, our effort there. We would, we would collect samples from those oyster reefs, and then we would process them based on the size, market size oysters, the smalls that were about one inch up to, I'm sorry, one inch up to three inches, and then spat, the juveniles, we would do counts to get an idea of recruitment for those oysters.

Lance Robinson [00:34:16] So that sampling program had been going on for a long time. And so we had the luxury of looking at what the resource looked like in years past. And you know, when I, when I was there during that period, the resource was doing quite well. And, and it was kind of unique in that the oyster distribution, there are oysters that occur in every bay system along the Texas coast. But the, the, the majority of the oysters during that period of time were, were in Galveston Bay. And there was a number of reasons for that. The, you know, the water had a lot of nutrients in it from the freshwater, the river inflows there. The salinities, because of the freshwater inflow, were optimal for production and growth for the oysters. And although we had oysters, we even have oysters down in the Laguna Madre in that very, very clear, clear water. There's just not as much food resources for the oysters that partake down there, so their abundance just isn't as great. And so the oysters in Galveston Bay were certainly the, you know, kind of the main focus of the industry, as well as the resource in the State of Texas, up until Hurricane Ike. And we can certainly talk about that a little bit. That changed, that changed the whole, whole dynamic with oysters in Texas. And I'll get into that, maybe in just a minute.

Lance Robinson [00:35:44] Kind of going back to your other question about, you know, other uses of oysters. One of the things that, you know, when a commercial fisherman harvests the oyster, if they're just taking the meat from the oyster, they're shucking the shell. And that shell goes into a big pile outside of their particular plant. And the way the state laws were established in Texas, when the fishermen harvested the oyster, they owned everything. So they own the shell, even though that wasn't the part they were harvesting (they wanted the meat). But because of the way the laws were structured, they owned the shell as well. And oftentimes they would either sell that shell as roadbed base in some cases.

Lance Robinson [00:36:31] Or they would sell it as a, to the poultry industry. They would use the calcium carbonate in the oyster shell, grind it up, and it would be an additive to poultry feed. And so there was a lot of, I know a lot of the, the oyster fishermen, the big dealers, the shucking houses in Texas, sold a good bit of that product to Purina and some of the other feeds operators.

Lance Robinson [00:36:57] But there's also the, the roadbed construction. There was a program, and this was again before my time, but my predecessor, my, my mentor, if you will, at Parks and Wildlife, Lynn Benefield, who, who started with the Department in the '60s, came through that whole program with the shell dredging operators. And, and some of the tales that he would tell about that, and some of the challenges that they faced with the shell dredgers were just incredible: that there were some very specific rules about what, what shell beds could be mined or dredged by the shell dredgers. They couldn't be alive. It was really more archeological shell. But there were all kinds of challenges that, you know, they would kind of get outside of their boundary, and entire reefs would be gone before, you know, living reefs, would be gone before, you know, people really knew about it.

Lance Robinson [00:37:51] We kind of ran into a, and they were able to see an example of, of some of the impact from, from the dredges during my tenure. And again, this was after Hurricane Ike. We were doing some survey work trying to determine the, the magnitude of resource that was lost. And we were using remote-sensing technology, side-scan sonar equipment. And we had contracted with a geologist at the Texas A&M University, Galveston, to do some sub-bottom profiling with some other remote-sensing equipment that he had. And we were looking at it really to determine, the goal of the project was, to determine how much sediment overburden was over these reefs so that we could then focus our restoration efforts to that low-hanging fruit, and, and kind of go after those areas that had a very thin lens of sediment overburden.

Lance Robinson [00:38:44] But in the course of doing that, we, we found an anomaly that on the, on the imagery, that we just couldn't explain, and it was in East Galveston Bay. And we kept looking around and trying to figure out what this, and it was a very, it was, the way it was showing up on the imagery, was it, it certainly had the, the, the fingerprints, if you will, of something that was manmade. And so we were kind of looking at it, trying to figure out what it was.

Lance Robinson [00:39:10] And just on a lark we had in our office there at the Dickinson Marine Laboratory there off Galveston, we had had a guy, a gentleman, stop by in years prior to that, and had dropped off some old Mylar maps that he had acquired. And these were Mylar maps from Parker Brothers, the dredging companies. And, and they were kind of hand-drawn, but it kind of showed some of the areas that were, where they had been working. And we had had those maps digitized so that we might, didn't know if we'd ever need them for anything, but went ahead and had them digitized so we could get to them in an electronic format.

Lance Robinson [00:39:48] And so we, just one day, were just playing around with some of these files and we overlaid those Mylar images, or at least the electronic digitized version, onto the, the sub-bottom profiling maps that A&M had generated for us. And one of the areas matched up exactly. And, and what we ended up discovering as we kind of looked into a little deeper, is that the, this was a dredged site that, that the dredge company had been mining oyster shell, and, and it extended down about 35 feet below the typical mud layer. And but it had filled in with mud over time, it had filled back up. But the mud that had filled up was obviously newer, certainly down in the deeper recesses, was newer mud, that was more, more similar to the stuff that was up near the surface. And so it was just fascinating to see this anomaly show up on a, on an image that we were looking at with the sub-bottom profiling. And then to find out that, you know, the dredge and cutting heads. And we found out later that these cutting heads, that 35-40 foot was the typical range that they could go down and mine the, mine that archeological shell below the mud line. So they would take it all the way down

to to that 30-, 35-foot level below the, below the mud line and take all that shell and, and use it for construction purposes. So that was really kind of interesting sidebar.

David Todd [00:41:24] Wow, that's impressive. I mean, I guess we all knew that that these reefs that were mined were many acres in extent, but the idea of how deep they went is a, boy, that's a real eye-opener. That's, that's tremendous.

David Todd [00:41:41] Well, you know, I also noticed that you, I think from 2002 through 2014, you were part of the federal NOAA national biological review team looking at Eastern oysters in the light of the Endangered Species Act. And I was curious, you know, what that taught you about just the sort of national trends for oysters, you know, of course, in Texas, but also in other states.

Lance Robinson [00:42:06] Sure. Yeah. We we knew all along going, I mean, when all of this was going on. The Chesapeake Bay oyster population had pretty much crashed many years ago, and the population really hadn't, at that point in time, really rebounded very well. And it was due to a number of reasons - overfishing, water quality issues and things like that. And there was an organization in the, in the Chesapeake Bay area. I think it was a nonprofit, Waterkeepers Chesapeake, that petitioned the National Marine Fisheries Service to declare that oysters in the Chesapeake Bay were threatened, that were, under the Endangered Species Act. And so the, the Eastern Oyster National Biological Review Team was convened, was pulled together and established, and they were, we were tasked with reviewing all the literature and scientific data regarding the status of oysters in the Chesapeake, and even in some other coastal areas as well.

Lance Robinson [00:43:06] And the, the, the real take-home, I guess, from it, it was kind of an eye-opening from my perspective in that, you know, at that time, there certainly were some problems with, with the population of oysters in the Chesapeake. But the other areas around the country, and especially because it was Eastern oysters, it was primarily the Gulf Coast and then the southern Atlantic coast, those populations were doing OK. I mean, the populations were still healthy and strong.

Lance Robinson [00:43:36] And what ended up happening is they basically denied listing for oysters because, under the Endangered Species Act, when you list an invertebrate species, that listing applies to the animal to the animal throughout its range. And so had they listed the Eastern oysters in the Chesapeake, it would have also made them threatened in Texas. And so obviously there were some concerns about that, and under ESA, they were not allowed to carve out a specific geographic area, like they can do for mammals and other, other species. Invertebrates - they just they don't, they don't allow them. So at the end of the day, they did not list it.

Lance Robinson [00:44:26] And you know, there is a, there is a positive to that in that the oysters, Maryland and some of the other states on the Chesapeake have made some pretty significant changes in their management strategies. And, and I think the resource is, you know, is coming back. I mean, I think they are, they've figured out some things that that are beneficial to that species and they are seeing some, some improvement.

David Todd [00:44:54] Well, that's encouraging.

David Todd [00:44:57] So I think we talked a little bit about the, the oystering industry and I was hoping that you might be able to talk about, you know, the different approaches to

managing it in, in Texas. I think that from 2002 to 2014, this same period, you were also managing the commercial oyster lease fishery. And, and from what little I know, it sounds like Galveston has these, these private leases. But other parts of the, of the Texas coast bays, you know, further South are more managed on kind of an open-access system.

Lance Robinson [00:45:40] Yes.

David Todd [00:45:40] Is that right?

Lance Robinson [00:45:41] Well, in a way it is. There's a lot to unpack here. What really, what, what happens, private, these, these leases that everybody gets to call them, they're really under, in statute, they are classified as "certificates of location". And what that means is that individuals can apply for a location and, if granted, they are allowed then, to place oysters into this geographic area on the bay bottom. And then they are allowed to, they become private property once placed there, and they are able to manage that resource and harvest it whenever they want to. So it is, it is a, it's a location, it's really, you know, I've talked with a number of people and when you really get down to it, it's really more of a, what we call, what I would call, "passive aquaculture", because it's a private property. It is, they are managing that resource. They harvest it, you know, when they deem it appropriate and suitable for their particular operation.

Lance Robinson [00:46:42] And historically, these locations have been in Texas since the, I think the oldest one I've seen was, was from 1891. And, and they have been in every bay system along the Texas coast. But they, at that time, they were, they were, they were putting down some, some cultch or shell or something trying to catch or capture wild spat. It wasn't very effective in many areas. At the end of the day, at just about every one of these locations, leases were returned back to the state. They just gave up on them and they quit using them.

Lance Robinson [00:47:22] Except for Galveston Bay. And there was a reason that Galveston Bay has remained, at least up until, during my tenure, the one area where those locations occur. At the time when I started with the Department, and even before then, Galveston Bay produced the lion's share of oysters in the state of Texas. When you look at Eastern oyster production in the U.S., Texas accounted for about 20 percent of all the Eastern oysters produced throughout the country. Louisiana produced about 40 percent, and then it went down below 20, depending on the state and quite a bit below 20, as you looked around the country, where throughout the range of that species. So 20 percent of all the oysters produced in the United States were coming out of Texas. Ninety percent of those oysters were coming from Galveston Bay. So Galveston was really where the lion's share of the production occurred.

Lance Robinson [00:48:25] And one of the things that that this location program, this lease program, kind of transitioned into back into the, in the '70s, was a program when, when the public season is open (the public season opens from November the 1st through the end of April of the following year, so a six-month season). And one of the things that our law enforcement staff have had challenges with is, you know, the illegal harvest of oysters or oysters growing that and from areas that water quality is, is poor.

Lance Robinson [00:49:01] The oyster management is kind of, to diverge for just a second here, oyster management is kind of jointly conducted by Texas Parks and Wildlife Department, who has responsibility for, for stocks and managing the fishery and the resource. But the Texas Department of State Health Services also plays a critical role in oyster

management. Oysters, because they are oftentimes consumed raw, can pose a health risk to humans because, as I mentioned before, oysters are prolific filter-feeders and whatever's in the water around them, they can intake that and they can bioaccumulate those compounds in them. But oysters also have a very unique physiology, in that if you take an oyster that's been growing in an area that has high bacteria levels that could cause people to get sick if they were to eat them, or even if they were growing in areas that had carcinogens in the water. If you take that oyster and you physically move the oyster to an area where the water quality is better, after a period of time, depending on the contaminant, that oyster will purge itself of that, of that either bacteria or even the heavy metal.

Lance Robinson [00:50:16] And so, so the location program: we decided that, the Department decided that, that we were going to exploit that physiology and also try to help with our law enforcement because, again, we were trying to protect public health and safety as well, and try to minimize that, that illegal harvest of oysters during the public season of those oysters that are growing in those restricted waters. And so the lease or location program kind of transformed into a relay operation where, under special permits issued by Texas Parks and Wildlife Department, these location holders were allowed to go into these restricted areas. It was outside of the public season, typically in the spring or summer. They could go into these areas under special permit. They were allowed to collect the oysters growing in those areas and then transport them back to their locations, and they pushed them over the side of the boat onto the bottom and then, working closely with the state health department, we would let a period of time go by, usually it was about two weeks for bacteria, and then the health department would give an all-clear, and we would notify the location holders and they could then harvest oysters, if they, that was what they wanted to do.

Lance Robinson [00:51:36] And so the whole idea behind that, that program was: 1) to kind of reduce the incentive for illegal harvest during the public season. If you go into these areas in the spring and summer and you thin down the population in these restricted areas, then that incentive for boats to go in there on their way back to the dock or just target that before daylight and put a lot of contaminated oysters on into the food pipeline, we felt like, you know, this would be a way that would, would help mitigate or minimize that risk.

Lance Robinson [00:52:09] It also provided, at that time, a availability of a resource that otherwise, from a commercial standpoint, was, was not being utilized. And we've obviously found out since then that that those oyster reefs in these restricted area serve another purpose that, that has come into our management strategies in more recent years, trying to protect those, those shallow water reefs and those reefs in some of these protected areas. But, but that location program has, has been around, at least in its current format, has been around since the '70s. It still is active, even though the, the need for such a program is probably not as important today as it once was because the fishery has changed and the distribution of oysters has changed, primarily because of some impacts from hurricanes. And so that's a little bit about that program.

Lance Robinson [00:53:09] OK, well, so one of the things I thought was, was interesting, and I think this is from talking to one of your other colleagues, maybe was Mr. Balboa or Mr. Rodney, and he was saying that one of the, the challenges to regulating oyster harvest now is that those reefs that are further south on the coast that aren't under this sort of private system of management can get a lot of pressure with boats moving up and down the coast, you know, responding to, you know, maybe there's a shortage up the coast and they move down the coast or vice versa.

Lance Robinson [00:53:45] Right.

Lance Robinson [00:53:45] And, and, and so I guess the question that comes to mind is why are these open-access areas retained if, you know, they are vulnerable to those shifts in the boat fleet?

Lance Robinson [00:53:57] Yeah, no. That's an excellent question. Really, what, what has happened in the oyster fishery in Texas, as I mentioned earlier, was, you know, the Hurricane Ike was the bellwether, if you will. It changed the whole dynamics of the Texas oyster fishery. Hurricane Ike came through, let's see when was it, 2005, I believe it was. And at that time, prior to that time, you know that, that breakdown of production - 90 percent of all the oysters harvested in Texas came from Galveston - was still very much, you know, the reality that we all were working with. And the fleet has always been mobile, but they never really moved much. The majority of the fleet was located in Galveston because that's where the oysters were. When Hurricane Ike came through, overnight, we lost over 50 percent of the consolidated oyster reefs in Galveston Bay, and in some bay systems, East Galveston Bay, for example, it was over 80 percent: gone overnight.

Lance Robinson [00:55:08] And it was because of sedimentation. The storm surge that came up with that storm, the eye and the major storm surge, came across the Bolivar peninsula. There was a lot of that sediment just dumped onto the reefs in East Bay, and then it also kind of swirled around on the east side of the Ship Channel. A lot of the reefs were, were inundated and it just smothered the oysters there. They were just gone.

Lance Robinson [00:55:34] And so what happened was: the fleet is mobile and, and so the fleet started looking to where the oysters were. And at that point in time, you know, there was a few boats that, from local fishermen, that, that lived in the Matagorda Bay area or lived in the Aransas / Copano Bay area. And they would fish in their home waters. They never really would, would leave. And then when the, the majority of the oysters from Galveston were lost, the boats up in Galveston started moving down the coast and taking advantage of oysters in these other bay systems.

Lance Robinson [00:56:11] And it was just too much, you know, for that resource to handle. I mean, as I mentioned before, we've had oysters in every bay system along the coast, but, but they're just not as prolific as they are in Galveston, primarily because of, you know, the food availability, fresh water, lack of freshwater inflows, which puts them at risk for disease and predators and things like that. So the oysters grow there, but they they're just not as abundant as they were in Galveston.

Lance Robinson [00:56:42] And so we went from a situation, because of Hurricane Ike, where 90 percent of the oysters in Texas were coming from Galveston Bay to the following year, and subsequent years since then, now it's about 30 percent of all the production comes from Galveston Bay. Thirty percent from Matagorda / San Antonio Bay and another 30 or so percent from the Aransas / Copano Bay area.

Lance Robinson [00:57:07] And so that has, that has increased that harvest pressure and therefore impacts to those resources. And you know, and I think part of the, the challenge, you know, that the agency certainly has is trying to ... the fleet is, the industry is over-capitalized. There are, there are too many, there are too many boats in that fishery really to support it.

Lance Robinson [00:57:29] And, and the Legislature and the Parks and Wildlife Commission have been very, very active in and recognizing that, that oysters are such an important resource and they've made some changes to regulations to try to get a handle on this. And one of those is this over-capitalization, over-capitalization of the fleet. In 2005, again, right after Hurricane Ike, or just before Hurricane Ike, the Legislature passed Senate bill, I think it was, 272. It basically created a license management program or a limited-entry program for the oyster fishery.

Lance Robinson [00:58:07] Limited-entry programs have been used in other states, and certainly in Texas, very effectively to help control growing effort in a fishery that is not supported by the available resource. Shrimping is a good example. In Texas, the shrimp fishery has been under a license management program since the early '90s.

Lance Robinson [00:58:27] So in 2005, the Legislature created a license management program for oysters. And the problem we ran into with that is, is that the industry was very, they were very hesitant about this particular type of program. They didn't want to lose their access to the fishery. They felt like they were going to be cut out of the fishery. And so there were some changes in language made in the final elements of the bill. And for instance, there was no control date set on when the bill would become effective. And so we had been talking to the industry about a license management program for almost a year. And, and so they, they had an inkling, you know, that this was coming. And typically in these fisheries, you set a control date so that you don't get speculators that buy into the fishery ahead of the time that the cap is established. And, but in this particular case, there was, there was no control date set. So the governor signed the bill in June and said that as long as you have a license, an oyster commercial oyster fishing license, by August 31st of that same year, then you were in the fishery, basically.

Lance Robinson [00:59:44] And so we had been monitoring and looking at the number of licenses being sold every year in this fishery for some time, and it averaged around 300 to 350 licenses. Now that license can be put on any particular type of commercial oyster boat. Some of them were just converted shrimp boats. Some of them are the big luggers that, that are, you know, just very specific for oyster fishing. But there was also no vessel limitations on that bill. In the shrimping industry, there were some constraints so that the fleet wouldn't grow "fishing power", as we oftentimes referred to, wouldn't, wouldn't go up. Fishing power certainly can apply to the size of the engine. A bigger engine gives you more lugging power, more power to pull that dredge.

Lance Robinson [01:00:35] But fishing power can also be a bigger boat. If I'm, if I'm in a fishery, you know, and I've got a 30-foot boat and I get rid of that boat, and I buy a 50-foot boat, the fishing power, my fishing power, has gone up, because on days that were marginal, and I couldn't go out on the water on a 30-foot boat, I can do it much more comfortably on a 50-foot boat. So that's the fishing power component.

Lance Robinson [01:01:02] So there was no cap or no limitations on power fishing power. And so what we're seeing is some of these boats now have gotten very big. We've got some luggers in Galveston that are pushing 80 feet in length now - huge boats. And so, so there was no constraint pushed on that.

Lance Robinson [01:01:21] And as I said, we were seeing about 300 to 350 licenses per year that were being sold in that fishery. When the bill passed and was signed by the governor at the end of August of 2005, we had over 760 oyster boat licenses in the fishery. People went

out and put a license on basically anything that floated. We had oyster boats that were 12-foot aluminum giant boats that had an oyster boat license on it. We had, I talked with some of our game wardens who are, who sell licenses in their offices there in the Galveston area, and one of them was sharing with me that they kind of drew the line and said, "Nope", they weren't going to sell an oyster boat license to a guy who wanted to put it on a jet ski.

Lance Robinson [01:02:10] I mean, so, so they were really trying to just put a license on anything that floated in with the expectation that those licenses would be worth something in the future. Since there is a limit on them now, there's no new licenses being issued by the Department. And if you don't renew that license every year, it goes away. You cannot, unless you buy one from somebody who already has a license. There's no constraints on transferability, so they move them back and forth between boats, even though they have to pay an out-of-state fee for a boat in Louisiana. They will do that. They will put a resident license, pay that higher fee for a non-resident and put that license on a Louisiana boat that will come over and fish for a Texas dealer.

[01:02:58] So, so I think for the fishery, that's one of the big issues is that that there is an over-capitalization in the fishery. The bill did create a funding source to help retire those licenses. The way the program is structured is that when the fisherman gets ready to maybe get out of the fishery, they can offer, the Department will offer to buy back those licenses and permanently retire them from the industry. It's a reverse-bid process and so we'll have an open round and fishermen, if they want to sell, they'll say I'm willing to take \$10,000 for my license. And if it fits the criteria that the Department has established in looking at, then they will try to retire that license and it will not be reissued.

Lance Robinson [01:03:45] And over time, it's not a quick fix to the solution, but over time, the idea is that the fleet would gradually be reduced and it would be less impactful to those fishermen that are out there working every day. And it hasn't been as successful as some of the other fisheries. I think partly because of the, the open-endedness, if you will, of how it was structured and the industry was very concerned about being shut out of a fishery, even though we had examples of how it had worked in Texas with other fisheries and, and even other states.

Lance Robinson [01:04:19] But, but we've, we've heard from, from fishermen, I mean, they see the same problem that you alluded to with, with all these boats moving down the coast and, and working on a resource that, you know, it's just not, it doesn't have the abundance to support it.

Lance Robinson [01:04:36] One of the other things that that changed, that has certainly added some additional help in the Parks and Wildlife toolbox, if you will, was that the Parks and Wildlife Commission is primarily responsible for managing state resources through means and methods. So they can set seasons, bag limits, size, minimum sizes, and things like that. They also have the authority, on oysters, to close an area when it's determined that the area has been overworked.

Lance Robinson [01:05:09] The challenge was, is that when we were seeing all of this pressure being exerted on a particular reef or minor bay or a bay system, in order to get that effectively closed, we would have to go to the Commission to have that done. And the Commission would meet five times of the year. So by the time we got anything through the publishing process for the Texas Register and get it adopted, the season was already over. And

so it was really, you know, a day late and a dollar short to try to help quickly try to help protect those resources there.

Lance Robinson [01:05:43] Well, the Legislature recognized and saw that. And, and in, I think it was 2011, there was another bill that was passed that did a couple of things. It, it created a shell recovery and replacement program, and we can talk about that a little bit, in restoration. But it also granted the Parks and Wildlife Commission, and the executive director of the Department, the authority to quickly close an area when it was determined that was being overworked.

Lance Robinson [01:06:14] And so that management strategy is now very active in, in the programs there, and we have certain criteria that, that the Department looks at, or are out sampling for, and when the population drops, abundance drops below a certain level on a reef, or the percentage of, of undersized or market size oysters drops below a certain level, then the Department will step in and close that area off. And it can close it usually within a matter of few days. And so that has certainly helped.

Lance Robinson [01:06:47] But again, the challenge there is that because we have such an over-capitalized fishery, it just concentrates the boats in the areas that remain open, and then that accelerates their closure. So you get into this never-ending cycle of closing areas off and, and not being able to open it, sometimes for years, because they've been fished down so heavily by all the fishing pressure.

Lance Robinson [01:07:10] And so there have been a number of things that have happened to try to curb some of the pressure and the effort on this resource. When I started with the Department, the daily sack limit for oysters was 150 sacks a day. A sack in Texas is one hundred and ten pounds. By comparison, a sack in Alabama was about sixty pounds, or seventy pounds, something like that. And the daily sack limit in Alabama, more, most recently, is six packs a day. And, but over time that 150-sack daily limit has been reduced to now to where now it is 30 sacks a day. So, and that's over a course of about 15 years, it has dropped from a 150 down to 30 sacks a day.

Lance Robinson [01:08:03] There has also been some challenges with, what I oftentimes refer to it, and in talking with members of the industry, the dealers, the big players in the industry, they, they recognize that they've actually pointed it out as well to me, is that there is a, there's a different philosophy among the harvesters now that didn't exist back, or that they don't exist, doesn't exist now, but was more prevalent back in the '90s when I was there on the water in Galveston.

Lance Robinson [01:08:38] And for lack of a better term, they refer to it, I would refer to it, as kind of a stewardship philosophy or mentality. The fishery has changed in another dynamic, in that back when I started with the Department, it was prosecuted by local fishermen, by fishermen who lived in the communities that they lived. They were part of those local fishing villages. They grew up in the industry. I mean, their father typically was in the industry in some capacity, so they were all locals.

Lance Robinson [01:09:11] The fishery today is almost exclusively a migrant fishery. The bigger dealers in the state are bringing in migrant workers during the season for six months. The captains and the deckhands are from Mexico. And, and they're hard workers. They do a great job at, you know, what they're hired to do. The challenge, I think, becomes, and I think where the industry is seeing some of the effects of this, is that there's no guarantee that the

fishermen that's working for them this year, is going to be back next year. And, and so the incentive for fishermen and the harvesters to leave something in the water or leave the undersized in the water so they can grow to a marketable size and it's available for harvest in the next season is really probably lacking a bit.

Lance Robinson [01:10:04] And, and we've seen that borne out in some of the challenges that our law enforcement staff have realized. That there is a, there is a target. The legal size of oysters is three inches, but because oysters grow on top of each other and you'll have small oysters attached to legal-size oysters, they cull them. They try to knock off those under-sized oysters. But sometimes you just really, they just can't get them all, you know, knocked off. And so there has been a tolerance of 15 percent that was allowed for under-size in a cargo of oysters.

Lance Robinson [01:10:39] And what, what was being observed in more recent years is that tolerance was being totally ignored. When law enforcement would board a boat and they would check a sack and look at the size of the oysters in that sack, they were, in some cases, finding cargo, where 90 percent of the oysters on the boat were, were under-sized, and often times less than an inch in size.

Lance Robinson [01:11:06] And I would get calls from time to time. I can remember getting calls from a dealer in South Carolina who called me one day and asked (it was during the season) and called and asked, "Had Texas changed the size limit on the oysters that that were being harvested?" I told them, "No, that that it was it was three inches, still three inches." And he said, he went on to share with me that he had just bought a cargo of oysters, a trailer load of oysters from Texas, and that he said pretty much everything in the cargo was two inches or so. I mean, all undersized. And he just thought that the state had changed that, that regulation and we hadn't.

Lance Robinson [01:11:48] And so what has happened since then, the commission has tightened up some of those requirements. They, they now have gone to a five percent tolerance, which is set by statute, which has helped. But probably another huge help was that the Legislature in 2017 made a number of significant changes in statute directly affecting the oyster industry. And part of it was to get at this problem of over-harvest and especially harvesting of under-sized oysters.

Lance Robinson [01:12:24] Prior to that legislation passing in 2017, if a boat was boarded by a game warden and a violation was found on board the boat, they typically operate with a captain and two deck hands, and the deck hands are responsible for putting the dredge out, pulling it in, culling, sorting and sacking up the oysters while the captain navigates to the, between the reefs and pulls the dredge while they're, while they're culling a cargo, a load. And so up until that time, if a violation was found, the captain got the ticket. The deck hands were not fined or were not ticketed.

Lance Robinson [01:13:00] And so the Legislature recognized that, at the end of the day, the deck hands are responsible for putting that cargo in the sack, and therefore they do have some direct responsibility for what's going in the sack. So they expanded the penalty structure, such that now, if a violation of under size is found on board a boat, that a ticket is issued to every member of the vessel. And on the second offense, it escalates to a jailable offense, which really escalated and increased the, the severity of those penalties.

Lance Robinson [01:13:36] And also the, the one of the, because of that limited-entry program that's in place that limits the vessels, what we were seeing, in some cases, the law enforcement was seeing, is that since the captain was only getting the ticket, if the captain and it becomes, it escalates upon a second offense when they would stop a boat, the captain would be a deckhand and they would say, "No, no, no, I'm not the captain. This other guy's the captain today" (because he didn't have any offenses). And so they, they were kind of working the system, if you will, so that the penalties weren't being escalated by shifting captains around or making a deckhand a captain if they were boarded by law enforcement.

Lance Robinson [01:14:17] So the, the, the bill in 2017, HB 51, it, it issued penalties to every person on the boat. But it also put a, a black mark, if you will, on the vessel itself. The, the vessel owner wasn't ticketed, but the vessel itself carried a violation. And if that vessel had a second violation, upon the second violation, that vessel is tied up at the dock for 30 days. So it takes the boat out of production as well. And so that gets at what we were hearing from the dealers who own the boats. "Why, I can't control the guys on the boat, I mean, they're there, you know, I can't control them. I tell them, Don't do it." Well, this got their attention and they very quickly started policing, you know, those violations much more closely.

Lance Robinson [01:15:13] And they also, that same bill, also extended or expanded, for the first time ever, a violation, undersized oyster violation, to the dealer, such that if a dealer was found in possession of a cargo of oysters below or above a certain percent that their business, their license to do business, could be suspended for 30 days, which, you know, which was a huge, is a huge deal for the, for the businesses because that basically puts them out of business for that 30 days. But, if nothing else, that got their attention. And there, there was a lot better compliance on the boat because those dealers were turning away cargo because they didn't want to get caught with it and run the risk of losing their licenses.

Lance Robinson [01:16:04] There's still a lot of work to do. Don't get me wrong. I mean, we see that every day and even being, you know, having to close these areas down, there's just too many boats in the fishery.

Lance Robinson [01:16:13] We, we had a Hurricane Harvey disaster, fishery disaster, grant that came through after that storm, in, I believe it was 2017 or so, that included a million dollars in that grant that was dedicated for retiring oyster boat licenses in the fishery. And so I don't know if they've been successful. They kind of implemented and started using that money after I retired. But, but they have, they, I know they've tried to retire some of these vessels, but it's going to have to, they're going to have to get the fleet reduced down. There's just too many boats working on too limited of a resource.

David Todd [01:16:58] That is so fascinating, and it seems like such a loss for anthropological story about carrots and sticks, and, you know, how do you penalize, incentivize and encourage people to do the right thing? I know that's, that's really fascinating. Thank you so much.

David Todd [01:17:16] So we've talked a lot about the fisheries and the pressure of the industry on the reefs. I was interested in looking at some of your background and noted that you had studied, along with your colleagues at Parks and Wildlife, the impacts to oyster reefs from seismic air guns and, you know, knowing how big a role oil and gas plays in Texas and on the coast, maybe you can tell us a little bit more about what you were looking for and what you found there.

Lance Robinson [01:17:51] Sure. Sure. I know that that was an interesting effort. We, as you alluded to, there's, you know, there's a lot of oil and gas infrastructure in Galveston Bay - hundreds, if not thousands, of miles of pipeline traverse that whole system. There's a number of wells in the, in the, in the system that are production wells. And so and they continue to play a role in the energy industry of Texas. And so when new state (submerged lands in Texas are controlled by the, are owned by the state, they're managed by the Texas General Land Office), and when the, when new state land tracts are going to be opened up for bidding for oil and gas leases, a lot of seismic companies, or oil and gas companies, will hire seismic crews to come out and do surveys across the tract to look at the energy reserves that may be buried below, below ground.

Lance Robinson [01:18:57] And so they will go through a process of laying out what they call, "receiver lines", which are basically listening devices that are attached to a cable in long, long lines, miles and miles long. They put a grid of these things out on the, across the bay bottom. And then they'll come, I guess, diagonal or perpendicular to that and lay a line of shot lines out. And the shot lines are where the energy source is then detonated. And then that, that sound wave is transmitted down through the sediment, and it is refracted back to the surface based on whatever structure it hits. And the listening devices will pick up that signal and then they analyze it to determine what's there.

Lance Robinson [01:19:46] The, the sound energy source of choice that they use in Galveston is explosives. And they will drill a core down 50 or 60 feet and plant a charge down there. And then they would detonate that charge at a prescribed, you know, timing and record that, the energy level.

Lance Robinson [01:20:07] However, the seismic companies are prohibited from using explosives across oyster habitat. In fact, they have to avoid, they have a buffer of 500 feet around oyster habitat and that they cannot use these explosive devices. So, in lieu of that, they will resort to using air guns, or air cannons, if you will. It's just a compressed, it's a device that hangs over, they lower it over the side of the boat. It's an array, it has multiple heads on it, and they will discharge that all simultaneously. And the compression wave that's generated by the compressed air will serve as that energy source that will go down through the sediment, refract back and is picked up by the sensors.

Lance Robinson [01:20:56] And so back in the, I guess it was in the '90s, we had one of the private location holders, one of the leaseholders, in Trinity Bay, Upper Galveston Bay, that the oil and gas company wanted to run a survey line, a shot line across their, his, his private oyster bed. And he, he balked at it. He said, absolutely no way was he going to allow them to do it.

Lance Robinson [01:21:22] And so we got involved, Parks and Wildlife got involved, working with the, the oil and gas company, the seismic company, and with the oyster fisherman there. And we came up with a proposal that the, the oyster location holder was amenable to. And what we did was we went out to the area where they were going to be doing the work. We collected oysters off of his private bed and put them in cages. And then we put an array out, if you will, of oysters that were in cages. We measured the oysters. You know, I got a, you know, put them in the cages, we had a, we had a shot line or a transect where we were going to have the boat, the gunboat, move across and we set buoys out that were right over the top of these cages that had oysters in them. And we were going to have the boat run along that transect line and at every buoy, they were going to discharge, full-power, their air, their seismic air guns over that oyster, those caged oysters. And then adjacent to the cage, the shot line

extending out laterally, I think 25, 50 and 100 feet, I believe, we had additional cages with oysters in them as well, to see if there was an impact on them, right along the shotline, to see if that radiated out 25 feet away. How far was that, was there any impact that might, that might have occurred?

Lance Robinson [01:22:55] And so and we were not looking at a long-term mortality. This was really kind of looking at short-term mortality impacts. And so we, the day of the event, we had the boat come out. The, the location holder was out there on the water with us, you know, and observing. And, and they shot the, the, the gun boat off. And then we anchored a boat up on-site, and we stayed there for two days because we didn't want anybody messing with the oysters. We wanted to make sure they were secured and, and nobody was, you know, wanting to change things on them. So we stayed on site for two days and then started sampling the oysters periodically during that period of time, looking for any impacts to mortality, or looking at, opening up oysters and looking for any tissue damage or things like that within the oysters.

Lance Robinson [01:23:45] And what we found was that there was really no impact at all, that that those seismic guns really did not have an impact. And not surprising, we had done a lot of literature reviews of that technology. And, and although it can have some impact on some, some other invertebrates and certainly, you know, animals with air bladders and things like that, oysters, you know, they're kind of a, a loose matrix, if you will, of meat. And so there's really nothing rigid to kind of, you know, compress against them. And so, you know, we didn't see any impact. And, and at the end of the day, the, the leaseholder agreed to let the seismic company go ahead and shoot across the, his location. And I think it worked out for all involved, I think, as best as I think it could.

David Todd [01:24:36] I see. OK, well, thanks for explaining this. There are so many industries and people and communities, you know, operating in the bays. I know it must be a ticklish thing to manage them all.

David Todd [01:24:48] You know, going back a little bit, you were talking about the, the effects of these sort of acts of God. I think you told us how Hurricane Ike was such a big, sort of watershed for, for oysters along the Texas coast, and particularly Galveston Bay. I have heard that Hurricane Harvey was also a big factor, you know, a different kind of storm, different kinds of effects. But maybe you could talk a little bit about how Harvey's impact on the oysters up there?

Lance Robinson [01:25:24] Yeah, sure. Absolutely. Yeah. To kind of set the stage a little bit, to, kind of, you know, explain some of the impacts these storms have on these oyster reefs, you got to go back and look at how, what these oyster reefs look like now versus what they looked like, or would look like, if they weren't being fished.

Lance Robinson [01:25:44] We're fortunate, I think, in Texas, in the sense that in the, in Sabine Lake, which is up Texas-Louisiana border, that border water there, there hasn't been any commercial harvest of oysters in Sabine Lake since the early 1960s. So for all practical purposes, and we looked, and I think we couldn't find any evidence anywhere in the country of a, of a bay system that had not been exposed to commercial oyster harvest of any kind. And so Sabine Lake probably represents the only unfished, if you will, if you're going to talk about nothing has been fished on it since the early '60s, anywhere in the country. And so we've gone in there and we share that water with the state of Louisiana. And there have been a number of incidences where Louisiana and the commercial industry there want to open up the Louisiana

side of Sabine Lake to oyster harvest. They have not done so up to this point. And, and hopefully that won't happen because I think it's a unique, it's a unique habitat up there that we can learn a lot from by looking at.

Lance Robinson [01:26:54] But one of the things that really jumps to mind when we were doing side-scan sonar, mapping the reefs up in Sabine Lake, one of the things that jumped out at us immediately is the vertical profile of these reefs. These reefs extend eight to 10 feet off the bottom, up into the water column. That's not surprising. Oysters, when you think about how oysters grow, they settle, the juveniles settle on top, usually of existing oysters, and they just grow on top of those and they just keep growing vertically. In fact, oyster reefs in the Chesapeake, they have much deeper water there. It's not uncommon to have reefs in the Chesapeake that are 20 feet tall off the bottom.

Lance Robinson [01:27:31] So, so, for, for these shallow coastal bays that that we deal with in the Gulf Coast, having one that extends up eight feet off the bottom is unprecedented. And so that is, if left to their own accord, no fishing pressure, that's what you would expect to see these oyster reefs look like everywhere along the coast. They are going to have vertical, three dimensional profile on them. And they're going to stick up above the bay bottom a lot more.

Lance Robinson [01:27:58] In fact, you can look back historically before the mechanical dredges became involved with oyster harvest in Texas, and there was a lot of stories about landowners running cattle across Galveston Bay. And they would drive the cattle across the oyster reefs, except when they crossed the little section where the channel, the Ship Channel was, and then they would get back up on the reefs and they were up near the surface. I mean, the cattle could walk across these reefs. And so reefs have been that, have been that high profile in Texas in the past.

Lance Robinson [01:28:31] So but what has happened over the time with fishing is that they have been graded down, if you will, drug down. So they're, they're very, very low relief. I mean, you're talking inches above the surrounding sediment of mud bottoms.

Lance Robinson [01:28:45] And so when you get a of an event like a hurricane, especially one that has a storm surge like Ike, it doesn't take much for that sediment to kind of smother these shallow-profile reefs. And that's what we saw with Ike.

Lance Robinson [01:29:01] Hurricane Harvey was a little different in that it was more of a rain event. I mean, it was a hurricane, but there was a tremendous amount of fresh water that came into the watersheds. And oysters are resilient, but they can't live in freshwater indefinitely. They can certainly, will shut down. They will stop filtering. And so for a couple of days, they'll be OK and do fine. And if the salinity gets back up to a couple of parts per thousand, they will start pumping and filtering again and they'll do fine.

Lance Robinson [01:29:31] But with Harvey, we had prolonged freshwater - I mean zero salinity from the surface to the bottom - that went on for over a week. And, and so there was tremendous mortality of oysters that occurred as a result of that storm.

Lance Robinson [01:29:49] If you're going to look at a silver lining to that, they left a lot of cultch material in the water. Those oysters, those dead oysters that, that remain provide substrate upon which the next generation of oysters will attach and grow.

Lance Robinson [01:30:04] You lost that with, with Ike because they were totally taken out of availability because they were covered by sediment. And, you know, we looked at all types of options to try to expose that shell. But we ran against, ran up against. We had ideas. FEMA was throwing ideas out to help us out and, and some of them were even anchoring up vessels and prop washing some of the sediment off of these reefs. But that caused problems with water quality for TCEQ. So, so it was it was just a real challenge. The sediment overburden was just, you know, just huge. And we had sediment overburden up to over almost two feet of thickness in some areas, which clearly, those aren't coming back unless another storm removes that sediment off of it.

Lance Robinson [01:30:49] And so I mentioned before the surveys that we did which were to identify that low-hanging fruit so we could target those areas that had a very thin lens of sediment over it in. And in one case, we hired commercial oyster boats. We got a federal fisheries disaster grant and we hired commercial fishing boats to take the bags off of their dredges and had them go out and work some of these reefs, just dragging the dredge over it, letting the, just turning the oyster shell, the dead shell, bringing it back up to the surface. And as the subsequent surveys of, you know, of looking at the effect of that, that effort, you know, I think we ended up reclaiming about 1100 acres of oyster reef just from that one activity and, and the industry kind of felt some ownership, too, I think even though they were paid for it. They were also bringing back, you know, the resource that they were going to, you know, that their livelihood depends on.

Lance Robinson [01:31:45] So but, but yeah, they were two different storms, but they were both equally impactful to oysters. And, you know, that freshwater is one that just, you know, is was a big nemesis when it just sits there over those reefs for so long.

David Todd [01:32:00] Wow, it's such a dynamic system along the coast, there's always changes coming up.

David Todd [01:32:07] You know, one thing that sort of strikes me and it sounds like you are often involved at that sort of high level in the agency where you were trying to collect money, resources, you know, people's staff time to, to make these interventions. And, and, and it seems to me, as just an outsider, that what often made money available, ironically, is when you'd have a disaster.

Lance Robinson [01:32:31] Yes.

David Todd [01:32:31] You know, when there is, you know, Hurricane Harvey or Ike or, you know, maybe the Deepwater Horizon spill.

Lance Robinson [01:32:40] Right.

David Todd [01:32:40] And I was curious if you could talk a little bit about that - you know, how you make the the pitch when, when money is tight and you want to avoid that disaster. But it seems like the disaster is what it takes to sort of make people pay attention.

Lance Robinson [01:32:56] Yeah, sure. No, you're exactly right. I mean, it's unfortunate that it takes a disaster to try to get resources, you know, directed toward recovery of a, of a, of a resource like oysters and other species as well, depending on the, the event.

Lance Robinson [01:33:13] But, you know, we, oyster restoration is not cheap. I can tell you we, you know, I mean, these fishery disaster grants would, would have millions of dollars in them. I think, I think, Ike, we ended up with about \$7 million overall and it covered not only oysters, but it covered the shrimping industry and the crab fishery. And I mean, it was commercial fishing that was impacted. That's what the fishery disaster grant program is about. And, but it did have funding in there for oyster restoration, and we tried to reclaim some of it. But, but, you know, it's not uncommon for those, those projects to run \$20,000 an acre, or more, to restore that. And when you're contracting it out, trying to get them, you know, bidding those projects out, the money only goes so far.

Lance Robinson [01:34:03] And, and so I think, that was, with Hurricane Ike, I think specifically, that that point was brought home, I think. And I have to commend the Texas Legislature on their, on their foresight in thinking about this and looking at it, because as a result of some of the challenges that the oyster resources were having and the industry was certainly involved in and, and speaking to legislators, their legislators as well because they recognize the, the problems that they were seeing.

Lance Robinson [01:34:38] But but for the first time ever, that I that I know of, and certainly in the Gulf states, I mean, I know other Gulf states were just, we'd have meetings with our peers in other Gulf states, our partners in other states. They would always ask, "How in the world did you guys, you know, get shell recovery dollars dedicated for oysters, for shell recovery?" And that's the Legislature who did that. And initially they started out, and again, the industry bore the brunt of that. I mean, they are the ones that are reaping the benefit from utilizing a public trust resource like oysters.

Lance Robinson [01:35:17] And so the Legislature created a program. It was the Oyster Shell Recovery and Replacement Program, which initially started with a 20 cents per sack fee that was dedicated to returning oyster cultch back to overworked oyster reefs or reclaiming reefs. And what makes that so significant is that initially, when it first started out it, it was, the cost was being borne by the fishermen themselves. Usually these fees, when they come in, they, they will typically target the dealer. But this was, this was one that was a little different. It targeted the actual fishermen, the first harvester, with a tag that they would have to affix to their, a 20-cent tag, they would have to buy ahead of time and they would affix it to the sack. And it would have to be tagged with this, with this tag on it. And that money then went into a fund that could only be used for putting cultch back out into the water or some acceptable cultch.

Lance Robinson [01:36:23] One thing we have to remember, too, is that oysters that are destined for the half-shell market and a lot of oysters from Texas go to, go to the, go to Maryland and New York and the East Coast. And so when you ship half-shell product or shell stock out, the shell is gone. I got a chuckle one time at a, at a meeting with some of our oyster people in the Gulf states. And during the meeting, during the course of the conversation, the biologist from Mississippi spoke up and he said, "You know, I want to, I want to thank the, the state of Texas for the 50,000 cubic yards of oyster shell that, that came into Mississippi." And in case of Mississippi, they reclaim a lot of that shell that comes in and they use it for cultch-planting over there. But, but oysters that were harvested in Texas, put in a sack, trucked over to Mississippi, ultimately used by dealers there. And the state of Mississippi reclaimed that shell and put it in Mississippi water. So, but that was just kind of, you know, kind of spoke volumes about, "OK, this product is gone and you never get it back."

Lance Robinson [01:37:33] So, so the fee that was established, 20 cents per sack, was clear in allowing for the use of suitable, acceptable cultch. So it could be, and certainly the most desirable is oyster shell. But limestone and river rock and clean washed concrete also will work as good cultch materials for catching oysters.

Lance Robinson [01:37:55] That program was expanded back in 20... See that one started in about 20, actually, that one started in about 2011. So in 2017, with House Bill 51, House Bill 51 was a, was a huge bill dealing specifically with oysters. There were a lot of stuff in that bill that was beneficial to the oyster fishery and I don't think we've seen the benefit yet. Yes, we realized the benefits of the actions that were taken in that bill.

Lance Robinson [01:38:34] But one of the things that I think was a game changer, I think going forward, was that the bill expanded the shell recovery program to where now dealers, the individuals who are buying off of the boats, and stuff, they are now required to return, themselves, 30 percent by volume of a suitable cultch, Department-approved cultch material, to a designated, to the designated reef that the Department has established and obtain the necessary permits for. But the dealers are taking that product out, which is, which is getting actually more substrate into the water because they have the boats and the equipment and they are able to do that much, much more easily than, than we could by contracting with big barges and tows and things like that. So, so I think that one is going to be a huge game changer in there.

Lance Robinson [01:39:36] And there's already a lot of effort going into putting oyster reefs up and down the coast, putting this material onto reefs. And that certainly has a kind of those, those in my backyard kind of benefits to it, those, those dealers that are down in Seadrift, or Rockport / Fulton and those areas, they want to see cultch material go back into their bay system. And that's what this program does. It puts it back out into those particular bay systems.

Lance Robinson [01:40:05] It doesn't go, you know, like the 20 cents per sack, oftentimes, the combined effort, you know, to get a, you know, the bigger bang for the buck, you know, we wouldn't even do a project unless we had a half a million dollars in the, in the account to do it. So we would oftentimes cobble projects together and those projects tended to be in the Galveston area.

Lance Robinson [01:40:29] So, so, so this effort is getting necessary cost material into waters in other bay systems of the state.

Lance Robinson [01:40:38] And then during that same year, 2017, the Parks and Wildlife Commission, I mean, just yeoman's work, and because they recognized some of the challenges that the Department was realizing with that, that, that, that fleet of fishermen that are coming in, that, that, that are only here for that one season. Some of the practices, they were moving into very, very shallow waters and, and they would beach the boats and get out of the boat and harvest and, you know, in shin-deep water by hand because the deeper reefs were overworked and there was just no resource there. And so they had moved into areas that we hadn't seen commercial oyster harvest in my tenure with the Department, some of these areas had not been fished.

Lance Robinson [01:41:26] And so when this started happening and the concerns of sportsmen also got involved very actively - sporting groups and recreational anglers - and the Commission closed six minor bays along the Texas coast to all oyster harvest, commercial

oyster harvest. And then equally important, they closed all shoreline oyster reefs, shorelines within 300 feet of the water's edge, out 300 feet. All oyster harvest in those shallow waters are now closed. There is no - even recreational harvest is prohibited.

Lance Robinson [01:42:05] Part of that was due to research that was done by Texas A&M - Corpus Christi, who found that those shallow water reefs were incredibly valuable for other important recreational and commercial species like blue crabs. I mean, they were more of those oyster reefs, shallow oyster reefs - we oftentimes hear the value of marshes, for the ecosystem and economic value that marshes and estuaries bring. Oyster reefs in those shallow areas far exceed the value of those marshes, and so the Commission recognizing that, close those areas off to protect that resource from further destruction or harvest.

David Todd [01:42:49] That's, that's really interesting. Just that we talked earlier about hurricanes and how dynamic the coast is that way, but it sounds like there's really so much evolving both regulation on one side, but also the, the kind of research that, you know, the state's universities are doing, you're starting to understand more about the value of these, these reefs.

David Todd [01:43:12] So one of the questions I wanted to ask, I think we've covered a lot, but I'm curious, I think you talked earlier about how Galveston Bay is so, has traditionally been really productive because it had the sort of freshwater and nutrient flows coming from the Trinity and the San Jacinto. But, you know, over the last 50, 60 years, some of those river systems that have been dammed. And then, of course, we've also had these droughts, like during 2010, 2011.

David Todd [01:43:44] I was wondering, you know, have you seen an impact from those changes in the river systems in the state and the droughts that we've been hit by?

Lance Robinson [01:43:55] Certainly the droughts - we've seen impacts, direct impacts that occur. And I think you can extrapolate the impact of the droughts to other issues that ultimately result in reduced freshwater inflows into coastal bays and estuaries. And as I mentioned earlier, oysters are very resilient and they will live. And, you know, the typically ocean of ocean water, the Gulf of Mexico is about thirty five parts per thousand salt. The bays and estuaries very typically in that nine or mid-teen area. And obviously, freshwater is zero. And but oysters, although they can survive for a short period of time in zero salinity, they can thrive and do well in high salinities. Even in hypersaline systems like we see in the Lagunas, we will have oysters down there. In fact, we have a, a kind of a unique situation that we're observing, watching, about oyster genetics in Texas. And we seem to have a different population of oysters that are in that saltier water, and we can certainly talk about that if time presents.

Lance Robinson [01:44:59] But getting back to your question about inflows and freshwater and droughts, oysters can survive in those high salinities. And they will do fine in those environments. The challenge becomes, though, in that predators and disease thrive in higher salinity waters as well. And so when we see drought conditions occur very quickly, we see disease manifest and pop, and outbreaks occur. Dermo, it's a, it's a cryptosporidium, or really parasite, but they call it dermo disease. But it will kill the oyster before it ever reaches, you know, three inches. And in some cases, even the younger, you know, two-, one-inch, we've seen some mortality from even younger oysters. And so when you get these high salinity events occur, derma, will, excuse me, dermal prevalence will increase and we'll see a corresponding mortality.

Lance Robinson [01:46:01] [Excuse me for just a second].

David Todd [01:46:02] [Yeah, of course.]

Lance Robinson [01:46:06] [I'll take a drink.].

Lance Robinson [01:46:08] So, so yeah, we would see a, a corresponding impact from mortality from those events. Predators also thrive in, in the higher salinities. And the major predator for oysters are a snail called the oyster drill, and also blue crabs. Some crabs, or stone crabs, will crush the shell. And so they are more prevalent and prefer higher salinity waters.

Lance Robinson [01:46:37] And so when we get these drought conditions, we start picking up in our sampling, that routine sampling that we can, that we have been doing for many, for decades, we can go back and look at drought events and look at the corresponding data that's collected during those timeframes, and we can track the increase of oyster drills in our sampling in areas that that we typically don't see them.

Lance Robinson [01:47:03] And a kind of an interesting phenomena we observed in Galveston during one of the droughts while I was there is that we started to seeing oyster drills showing up in our oyster dredge samples way up in the upper reaches of Galveston Bay - areas that typically rarely get above, you know, eight or nine parts per thousand. It's right near the mouth of the river, the San Jacinto or the Trinity River. And so we started seeing oyster drills showing up up there and, and some of the, the leaseholders, location holders, were also describing increases, massive increases in drill populations on some of their upper bay tracks.

Lance Robinson [01:47:44] And what we ended up finding out is that that these drills are actually using the Houston Ship Channel as a conduit because the salinity is higher the deeper you go. So down in the deep waters of the Ship Channel, the salinity is much higher, so they'll use that channel as a conduit and move up and down that Channel and when conditions warrant, salinities go way up in the upper parts of the bay like you see in a drought, they come out of the Ship Channel and then they'll start predating on oyster reefs up in that area.

Lance Robinson [01:48:20] So, so that's what we see in a drought condition. I think, I think one of the big challenges, you know, that we look at from a long-term perspective is freshwater inflow. I mean, as, as the state continues to grow and more people move to the state, water is going to be a bigger and more desperate need - fresh water. And so, so that's probably going to have an impact on bays and estuaries. They're probably going to get saltier. And so along with that comes some of these other things that, you know, we're just going to have to try to work to manage around. I just don't I just don't see there any, any, any way to turn the clock back on, on that.

David Todd [01:49:03] Yeah. Yeah. Growing state.

David Todd [01:49:07] Well, I had one last question that I guess sort of keys to both the beginning of your career when you were looking at mariculture, when you were at Auburn back in the late '80s and early '90s. But then lo and behold, I guess in 2015 through 2020, it came up on your radar again. You were working on mariculture, but this time in Texas.

Lance Robinson [01:49:33] Right.

David Todd [01:49:33] And I was curious if you could tell us a little bit about the beginnings of this new industry here and how that came about and what, what sort of role you think it might play in, you know, recovering oyster populations?

Lance Robinson [01:49:48] Yeah, no. I mean, I think it's, you know, I think it was inevitable that, that mariculture or aquaculture, oyster aquaculture, would be, would be coming to Texas. It's just, you know, I think our goal with the Department was to ensure that it was done as properly and correctly as, as we possibly could make it. Texas, I mean, there's, we look at history and you look at what's happened in other states. I mean, I'm very adamant that, you know, we can learn from other people, and hopefully not make some of the same mistakes or accidents that may occur that maybe we can prevent. And certainly that bears fruit with as it deals with oysters.

Lance Robinson [01:50:26] And one of the things that I think one of the reasons why Texas probably was kind of last to the, to the, to the, to the table with oyster mariculture, at least on for Eastern oysters, was that Texas has always been very cautious and very adamant about protecting the state's natural resources against exotic and invasive species. I mean, there is a long history of protecting with vegetation and other, other resources there, and, and that holds true with oysters as well.

Lance Robinson [01:51:02] And in fact, you know, we have had several cases, bills filed in the Legislature, to allow or that, that would allow people to ship Pacific oysters into the State of Texas, in the shell. And so, and that, that is right now prohibited. You can bring Pacific oysters, which is an oyster species that grows along the west coast of the U.S. and the Pacific Northwest. You can bring them into Texas, but they have to be shucked. They have to be removed from the shell. And part of the rationale for that is, is that there are a number of restaurants along the coast. And as we've already spoken about, oysters are colonial and they will, juveniles will, attach to adults. And the, and if you look at some of these coast restaurants that sit on the water, nice idyllic views and all that stuff. But, but you will also see in the water as they eat oysters, they just pitch the shell into the water.

Lance Robinson [01:52:06] And so the concern has been that if you're dealing with an exotic species, certainly Pacific oyster, you could inadvertently introduce the species, or a pathogen that that species carries, into Texas waters. And there's an example that this, where this has occurred in the Chesapeake Bay. MSX, which is a pathogen of oysters, was introduced in the '50s through Pacific oysters that were brought into the Chesapeake Bay, and that disease has devastated the Chesapeake Bay oyster fishery. And to this date, thus far, MSX has not been found in oysters along the Gulf Coast. And, and I think part of that is, you know, trying to be a little bit proactive and kind of protecting the state's resources and so forth.

Lance Robinson [01:52:58] So one of the things that, that I think that's one of the reasons why the state has, has been a little bit late getting to the table, perhaps. But I think the program is, is, it's got some checks and balances built into it, I think, that will benefit the industry. Right now, one of the challenges that, that, that the industry, and certainly the Department, faces is that in oyster mariculture, they don't, they want a sterile oyster. They want an oyster that's putting all of its energy into growth. A wild oyster will take about two years to reach three inches in size. A triploid, or an oyster with three chromosomes, will, can do that same growth in about a year. So they can grow these things much, much faster. The challenge becomes that ploidy, or triploids in oysters, or tetraploids, is not permanent. And so

they can revert back to their diploid status and become fertile. And in some cases, we have mosaics in the populations that where these triploids can actually spawn.

Lance Robinson [01:54:08] And so the challenge becomes that getting a brood stock or getting a stock for mariculture in Texas, the industry wants triploid oysters. The only place you can find a, a line of triploid is produced by a tetraploid line coming out of Virginia. And so it's a, it's a Virginia genetics that are being utilized and crossed, I think, with the Louisiana oyster to get a triploid. And so there certainly is risk associated with allowing that that genetic hybrid, if you will, to be placed into Texas waters.

Lance Robinson [01:54:47] And but the Commission, you know, has, as we've talked with experts, we've talked with geneticists, and with others along the East Coast, and recognizing that there is a risk, we believe that it can be managed and there is certainly a goal within that program or a requirement within the Texas program that a genetic Texas line of, of tetraploids - you have to use Texas-derived triploids, I think by 2028 or six, six or eight, there was, was a date. I think it's maybe 26. There was a date certain that the industry is going to have to shift to a Texas line of triploid oysters. And I think they'll get there. I think there's a lot of research being done at A&M - Corpus Christi and they're working on that effort right now as we speak. Some in the industry, some of the growers are also interested in kind of helping to develop that that line.

Lance Robinson [01:55:48] But, but how we got there, I mean, I think it was I think the, the, certainly the industry, there was a there was, I think the Hurricane Harvey and some of these other hurricanes, you know, impacted coastal fishing communities and infrastructure. And, and certainly legislators and others were looking for ways to enhance or develop coastal communities and business opportunities. And this was one that, that kind of piqued a number of individuals' interest, and so went through the legislative process to develop the program. And it, it is in place.

Lance Robinson [01:56:25] It's fairly rigorous in getting it, because in Texas, it's another thing that I think may, reason why Texas was a little bit late to the table is that the management of natural resources in Texas is much more complicated, if you will, or convoluted, if you will, than it is in other states. And a lot of other states. You go to one entity and you pretty much do everything through that one agency. In Texas, that's not the case. And in fact, to do oyster mariculture, you got to work with Parks and Wildlife, because we're the ones dealing with the natural resources and things like that. Because you're going to be using submerged bottoms, the General Land Office has a role to play and they are going to have to lease submerged lands and approve those locations, you know, for those operations. The, because these are commercial operations, and some of the practices that are utilized in these grow-out operations in these farms can have an impact on water quality, TCEQ is involved and there may be permits associated with TCEQ in getting involved.

Lance Robinson [01:57:40] Because it's in coastal waters of the U.S., the Corps of Engineers has a permit that they have to get involved and have to acquire. The state health department, they are involved as well because now they're going to have to ramp up their efforts because up to this point, their monitoring programs were designed for open waters, and now they have to check all of these oyster mariculture farms, because one of the big challenges is that you can get birds roosting on infrastructure, pilings and things like that. And as they defecate into the water, the fecal coliform bacteria over your crop goes way up. And so you may be restricted from harvesting. The health department's involved and it's going to have to be involved with permitting and authorizing.

Lance Robinson [01:58:27] So in Texas, we've worked it out. Everybody is, you know, who's supposed to have a role to play there because of statutory requirements are there. But I think that's, was probably the biggest challenge was getting all of these other entities kind of around talking together and kind of figuring, OK, how does this affect your program or what, what's the obstacle that's going to, you know, make this a no-go, you know, for you and stuff. So, so we were able to work through a lot of that.

Lance Robinson [01:58:57] For the growers, I mean, it's a, it's a bureaucratic challenge to go through to get all the necessary permits and, and things in place to do that. But if they persevere and I think there are, I think I read that since retirement there is at least one or two individuals who are actually in production right now. So down in the Corpus area. So, so it's doable. But it is certainly, you know, a bit of a daunting task to get through the permitting requirements. And I think there's some hope in the future that as everybody becomes more comfortable with the program and with the facets associated with it, that that the permitting process can be more streamlined. There are a number of examples where that has occurred in other states and, and we've certainly, we reached out to every coastal state in the U.S. that had a oyster or clam mariculture operations. Some of the maritime provinces of Canada - talked with them. And some growers in Europe - we talked to some in the European Union that were growing oysters and stuff, just to kind of figure out what works for you. If you had to do it again, what would you do differently?

Lance Robinson [02:00:06] Hopefully, again, trying to, to learn from these folks that have paved the way for Texas. And hopefully, you know, as we go forward, that will be better and more productive for the Texas fishery, and it'll be a very, very successful venture. Certainly, Texas oysters are highly sought and desired. I mean, you go on the East Coast and and there, they bring, command a high value for the half-shell product on the East Coast.

Lance Robinson [02:00:32] And the oyster mariculture is really a niche fishery. I think it's, I think there's a number of people that believe that oyster mariculture will take some of that up wild harvest pressure off of the resource. It may have some limited effect there, but these are, these are labor-intensive operations. These oysters are destined for that high dollar half-shell. You know, dollar to \$2 a piece oyster, boutique kind of operations.

Lance Robinson [02:00:59] And, and the shucking product, the product oysters that are shucked for, you know, brooding and frying and restaurants and things like that, that, that depends on volume. And so I think that wild harvest will still be there because the economics just don't work out in a mariculture operation, at least at this point, to get volume at a cost that could supply a shucked product.

David Todd [02:01:27] This is so interesting and intricate. And it's intriguing that it just keeps on evolving, so sometimes I guess it's good to be not on the bleeding edge, maybe a little bit further behind. Maybe not the first to the table.

Lance Robinson [02:01:47] That's right.

David Todd [02:01:47] But still pulling up to the table.

David Todd [02:01:51] So you've told us so much. I don't want to overuse your, your day. I guess I would just ask you one more question, and that is if there's anything that you might

like to add, just a sort of open, open question there. We skipped something that you wanted to add or contribute?

Lance Robinson [02:02:12] I can't think of anything. I mean, it's pretty, pretty thorough. I know there's a lot of information to unpack, and I certainly don't want to overwhelm listeners as well. I mean, as you point out, it is, it's a, it's a dynamic and intricate fishery, and it's a unique organism, it has a lot of value to the State of Texas. And I think that I'm optimistic that even with the challenges that the, that the industry and the agency and the resources are realizing right now, I think I'm optimistic that, that, you know, there's going to be, you know, the corner has been turned, I think, and I think it will begin to come back in much of its heyday, which I think will benefit water quality and, and, you know, the habitat, coastal estuarine habitat along the coast.

David Todd [02:03:06] Yeah, well, through a lot of hard work and thought on your part and many your partners at the agency. So thank you so much for what you've done over the years and then just for your time today telling us about it.

Lance Robinson [02:03:21] Oh, you're very welcome. I enjoyed it.

David Todd [02:03:23] Well, thanks very much. I hope our paths cross some time, but until they do, thanks so much.

Lance Robinson [02:03:29] You're very welcome. Thank you.

David Todd [02:03:31] You take care. Bye bye.