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Dr. Sandra Rideout-Hanzak [00:00:23] Hi there, welcome to A Talk on the Wild Side, your biweekly tour of all things wild in Texas. I'm your host, Dr. Sandra Rideout-Hanzak.

Rebecca Zerlin [00:00:32] And I am your co-host, not a doctor, rebecca Zerlin.

Dr. Sandra Rideout-Hanzak [00:00:36] In this episode, we're going to learn all about oysters and oyster reef restoration. I absolutely love oysters on the half shell. But Rebecca, even though she claims to be from Louisiana, has supposedly never tried them?

Rebecca Zerlin [00:00:51] Maybe it's my secret identity. I claim to be from there, but I'm working on it. I'm working on that. I'm...within the last couple of years started eating clams. So we're working our way up the oysters.

Dr. Sandra Rideout-Hanzak [00:01:04] OK, we're getting closer. (Laughter) When you do it, we're going to need some photo document.

Rebecca Zerlin [00:01:11] Yeah, sure. (Laughter) I'll be sure to take pictures and maybe a livestream because people really want to watch me eat! (Laughter) Yeah. Well, I think right now it's time to hear from Andrew Lowery, about what's wild and new with our segment on conservation issues and recent headlines. Andrew was wild and new right now?

Andrew Lowery [00:01:32] Howdy. Howdy. This episode's Wild in New Segment takes us all the way to Australia, mates! We all know that our pet cats love to roam if they're outside, but they are skilled little predators and this places native wildlife in harm's way. So in Knox City, which is a municipality within the larger city of Melbourne, the city council has enacted a 24 hour cat curfew. This cat curfew requires that all cat owners keep their pets on their property at all times, which may require them to even be inside at all times. Cats will not be allowed to roam freely, even outside their own home. The mayor, Lisa Cooper, issued a statement that cats are at a higher risk of illness and injury when they are allowed to roam, plus confining them to their owners. Property will protect wildlife as well.

Dr. Sandra Rideout-Hanzak [00:02:19] Hmm. So how do the people in town feel about this?

Andrew Lowery [00:02:23] Well, the rule was adopted after a trial period which required cats to be confined overnight. Then the city council collected feedback from more than 720 respondents. After that trial curfew, 86 percent were in favor of the new law, and almost half of them were cat owners. You can't make everybody happy, though. And some residents have taken issue with it, asking that the rule only be applied to newly registered kittens. This would allow cats that are alive today to continue to roam as they always have. But for now, at least, they are planning to apply the rule to all domestic cats. Cats that are roaming may be picked up, and their owners may be fined.

Dr. Sandra Rideout-Hanzak [00:03:01] Well, just the fact that they're required to register cats and kittens is pretty odd for, I mean, very different from what we're used to here in Texas, maybe all of Texas. I don't know of any place in Texas that requires you to register a cat or a kitten. I could be wrong...

Rebecca Zerlin [00:03:18] Yeah...I don't know... but I haven't I haven't explored a ton of Texas.

Dr. Sandra Rideout-Hanzak [00:03:23] Austin would probably be the closest if anybody did, because they're they're weird compared to the rest of us, but. Yeah, I don't know.

Rebecca Zerlin [00:03:30] Yeah. So is there any information about the impact of feral cats on wildlife in Australia?

Andrew Lowery [00:03:35] Actually, yes. According to a research paper from Australia's National Environmental Program that was published in June 2021, domestic cats are considered one of the most invasive species worldwide. I didn't know that. And in Australia, feral cats kill about two billion animals each year reptiles, birds, frogs, small mammals, etc. Australia has recorded 34 mammal extinctions in modern times, and cats contributed to almost all of them. By the way, an municapality in the same state, Victoria, also introduced a cat curfew this year, so this may be the start of a new trend in Australia, or at least in that state.

Dr. Sandra Rideout-Hanzak [00:04:12] OK, so they're not the first one then? That's interesting. I really hope that somebody is studying the effects of this change on wildlife. You know, does does it and do any of the small mammal populations increase or the reptile populations or even does it just change their behavior because they can relax a little more outside without feral cats being there? I think it would be really important to know if it created a positive change for wildlife.

Andrew Lowery [00:04:40] Yeah, no, definitely. Maybe even some data from veterinarians about cats. Would it be helpful to, you know, a change like this could create fewer injuries and even contagious illnesses for domestic cats.

Dr. Sandra Rideout-Hanzak [00:04:51] Yeah, absolutely. I mean, it's hard to get hit by a car if you're inside all the time.

Andrew Lowery [00:04:56] And both my cats are inside cats.

Dr. Sandra Rideout-Hanzak [00:04:57] Yes. Mine, too...Which...

Rebecca Zerlin [00:05:00] Mine goes for walks on a leash. So when we need to be outside. So that's that is an option for people who have cats that want to go outside, I mean, you have to get them used to the harness and the leash first.

Dr. Sandra Rideout-Hanzak [00:05:11] Absolutely. When when they're kittens too. It's a process (Laughter).

Rebecca Zerlin [00:05:14] Don't just put them in a harness and put them outside and expect them to be happy because, they probably wouldn't be. (Laughter).

Dr. Sandra Rideout-Hanzak [00:05:20] I love how they just flop down, and act like a rag doll if you try it, and they're not used to it. (Laughter).

Andrew Lowery [00:05:25] Yeah, you know, I do think, though, that one thing that should be said is, you know, people may look at this as extreme, but even here within the United States, there are certain states like Hawaii, for instance, that has because of the overwhelming population of cats and people's inability to control their reproduction, has been forced to, you know, humanely remove a large portion of the cats. And that can

happen in any of the states, people. That's something to keep in mind is, you know...take care of your pets and don't feed the wildlife! (Laughter).

Dr. Sandra Rideout-Hanzak [00:05:58] Yeah, yeah, exactly! But and, I mean, let's be honest, we're we're putting down millions of them every day because they are just wandering around millions every day might be a bit of an exaggeration, but at least millions, probably every year, you know, across the country. I don't know.

Andrew Lowery [00:06:17] It could be an underexaggerration...If you see some of the population scale models on how many cats come out of one female cat...and it's just mind blowing.

Dr. Sandra Rideout-Hanzak [00:06:23] Yes. Well. OK, let's move on. Yes, back to Oyster's! Rebecca, how are you doing? Are you ready for a breakdown?

Rebecca Zerlin [00:06:34] Of course I'm always ready for a breakdown! (Laughter).

Dr. Sandra Rideout-Hanzak [00:06:37] OK, then take it away with Becca's breakdown.

Rebecca Zerlin [00:06:43] Oh, shucks! It's time for the breakdown! You might want to grab a snack for this episode because it'll probably make all you seafood enthusiasts out there a little hungry. And that's because we're discussing oysters and oyster reef restoration today. But before we begin, it's time for the usual background info that will make our interview a little clearer. Get it? Like how oysters make the water clear??? Now we'll get to them. Let's first start with the basics. Oysters are bivalve mollusks. That's just a fancy term for an invertebrate that has a flat and body inside a shell with two hinge parts. Also included in this category are clams, mussels and scallops. Oysters can be found in both salt and brackish water. Definition time! Brackish water, is water that falls right in between freshwater and saltwater. It's saltier than freshwater, but not quite as salty as seawater. Since we've already discussed snacking, let's talk about how oysters eat. It's not like the cartoons where an oyster opens its shell like a mouth and takes a big bite of something. They eat by a process called filter feeding, which is basically where an animal takes a large gulp water, which usually includes other small organisms, and filters out the good stuff by passing water over a specialized filtering structure. In the case of oysters, they open their two valves and little hair like structures on their gills called cilia, make wavelike movements to draw in water as they draw in the water, plankton, algae or other suspended particles are trapped in the mucus of the gill. From there, those particles are transported to the mouth where they are eaten. I too am a filter feeder...In fact, last night I filtered my pasta out of the boiling water, then ate it right then and there. And now I'm being told, while there was technically a filter involved, that is not filter feeding... Anyway! After digestion, oysters expel waste in the form of feces or pseudo feces. All right. Now, what the heck is pseudo feces? Let me tell you, all these breakdowns are making for a weird search history. Pseudo feces basically means false feces. These are materials that could'nt be used as food, such as grit that the oyster has to get rid of. So oysters filter out suspended particles just by straining the water for food. And this is how the water gets cleaner and clearer right before our eyes...Like magic! But as important as filtering is, it's not all oysters do. Oysters are also considered keystone species because they are ecosystem engineers. Now, they're not out in the ocean with their clipboards and hard hats, but just by existing, they're able to help provide habitat for other animals. But how do they do this? A baby oyster is called a trochophore, which is just a free swimming plankton larva of certain invertebrates. As the oyster continues to progress through the larval stages, it's also sequestering calcium carbonate from the water to create its hard shell. It

will also form a foot and eye as well. Eventually, it will look for a place to attach, such as a rock or a pier or even another oyster. And once it's attached to another surface, it'll remain there permanently. Kind of like me on the couch when I get home from school... And this is how oysters provide habitat for other marine species. The nooks and crannies between their shells provide places where sea anemones, barnacles and mussels may be found, as well as many species of fish. I think that covers the basics. So now you won't have to strain yourself listening to our interview! So grab a snack, and let's learn some pearls of wisdom from our guests today.

Dr. Sandra Rideout-Hanzak [00:10:24] So, today we're talking to Dr. Jennifer Pollack. She is the chair for Coastal Conservation and Restoration at the Harte Research Institute at Texas A&M University-Corpus Christi. Dr. Pollack, thank you so much for being here.

Dr. Jennifer Pollack [00:10:38] Thank you for having me!

Dr. Sandra Rideout-Hanzak [00:10:40] I'm so interested to talk to you about your oyster reef restoration, but first, just tell us a little bit about yourself and what you do at the Harte Research Institute.

Dr. Jennifer Pollack [00:10:51] Sure, yes. As you said, I'm the chair here focusing on coastal conservation and restoration, I'm also an associate professor of marine biology. So I have students that are coming through the various graduate programs related to marine science at Texas A&M-Corpus Christi. I'm a marine ecologist by training and most of my research focuses on habitat restoration. The reason I care about habitats is they're super important for a number of ecological benefits that are provided to things like the fish that we like to eat and the birds that we like to watch. And they also have a lot of economic importance as well. So most of the seafood that we depend on from our estuaries has really some relationship to habitats, whether they're small fin fish that spend their juvenile years in seagrass beds or oyster reefs, or whether they're something like oysters themselves that form both the habitat and support of commercial fishery.

Dr. Sandra Rideout-Hanzak [00:11:49] Mm hmm. OK, all those things are tied together.

Rebecca Zerlin [00:11:53] That's right!

Rebecca Zerlin [00:11:54] You said a lot of your work is on oyster reef restoration. Why do oyster reefs need restoration?

Dr. Jennifer Pollack [00:12:04] That's a that's a really good question, so oyster reefs are kind of an iconic coastal habitat here in South Texas, and actually around the Gulf of Mexico in the east coast of the United States. You know, when you go to a coastal area, you see oyster reefs, you eat fresh oysters. It's just something that we associate with these coastal places, these special places along the coast. The problem is that we know oyster reefs are extremely degraded. In fact, they've been called the most threatened marine habitat globally. This is due to a number of reasons, things such as unsustainable harvest, changes in salinity and the coastal environment, pollution, things like dredging and habitat destruction, have all really contributed to the loss of reef habitat. And there are estimates of 85 percent of native shellfish reefs are locked from around the world. In the Gulf of Mexico is in a little bit better shape. The estimates are more like 50 to 85 percent loss. So, we're considered to be kind of in moderate shape, even though that sounds pretty bad. The good news is, although we have still experienced a lot of reef loss across the Gulf of Mexico, we're still in a good enough place that we can restore reefs and expect to see

successful recruitment and replacement of those lost habitats and in a fairly short period of time. And this is because we have a lot of live natural oyster reefs that still exist because those oyster reefs are out there. They can provide the source larvae for these habitats that we that we build in areas where they've been lost and and need it the most.

Rebecca Zerlin [00:13:53] Yes, you mentioned quite a few reasons for decline. Is there anything in particular that might be causing decline here in the Gulf?

Dr. Jennifer Pollack [00:14:05] I think in the Gulf, it's probably a combination of factors. So we know that the amount of freshwater reaching our estuaries where the oysters live has really decreased over time due to upstream damming of rivers and upstream diversion of freshwater to, you know, municipal uses of agricultural uses, industrial uses, things like that. It just means there's less water that comes down the estuary. And so that comes down to the estuary, which means that in years when we have drought periods, the salinity can get a lot higher in those bay systems than they normally would if adequate amount of adequate amount of river water flowing to those bays because oysters are essentially cemented in place, as as as juveniles, and adults, when the salinity and the environmental conditions around those oysters changes, they can't get up and swim away like a fish or crawl away like a crab or something like that. So they really are affected and they they are dependent on the sort of delicate balance between fresh and saltwater. So that that change in salinity is one big one that I would point to. We know that salinity also influences oyster disease. So there's a disease in the Gulf of Mexico called that some people called dermo disease, it's called, but it's caused by a protozoan parasite, perkins's marinus. That, and I'll say it doesn't affect humans at all. You know, it really is just something that affects the oysters ability to thrive. But we know that that parasite is much more active in infecting oysters when the temperatures are warm and the salinity's are high. And so, you know, on the Texas coast, it's always pretty warm for most of the year. So then when you add that combination of higher salinity is because of less freshwater, it really is another stressor that causes the oysters to experience greater mortality. So those are two things related to salinity. And on the other side of things, I would say things like unsustainable harvest, storms that come through. For example, Hurricane Hurricane Ike in 2008, dumped a bunch of freshwater on the Houston Galveston area and caused a huge amount of sediment to runoff from the the land and that buried the oyster reefs. And because oysters are filter feeders, they have to be able to access the water. And if they're buried under a foot of mud they're not going to do that, be able to do that anymore. And so that killed a lot of oysters. So and then, of course, Hurricane Harvey dumped a lot of freshwater in the days and made the sun go the other direction where it was very, very fresh. So there really, I think what's happening in the Gulf of Mexico, you know, I just keep listing these these disturbances or these stressors. It's sort of like they get the one two punch, something happens to the oysters, they start to recover, and then the next thing kind of knocks them down before they can get all the way back up again. And I think that's just happening now more consistently and over a longer period of time that we're just seeing these declines.

Dr. Sandra Rideout-Hanzak [00:17:11] Yeah, so because of these swings that we're having lately with the climate, they're just getting hit over and over again, is that is that what you're getting at?

Dr. Jennifer Pollack [00:17:22] Yeah, they're just getting it over and over again and, you know, may not be enough time between those disturbances for the reef to get reestablished to the point where they're more resilient the next time around. So, you know, you may have unsustainable harvest that breaks down the the reefs, removed too many oysters from a reef, and then you may have young oysters that start to get established

again, but then you have a big drought period or something like that. So it's just kind of a constant set of disturbances that doesn't let things get reset again. Kind of like if you keep mowing your lawn, right? Like you keep mowing your lawn and nothing else grows after it. It's almost like you're mowing down the reef over and over again and not getting that nice biodiversity establishing itself.

Dr. Sandra Rideout-Hanzak [00:18:07] OK, that makes sense. So you mentioned salinity, what other water conditions are our oysters tied to? There are certain depths and things like that.

Dr. Jennifer Pollack [00:18:23] Yeah, that's a very good question. So that is not typically an issue in Texas and I would say in most of the Gulf of Mexico because the bays are typically pretty shallow. And so anywhere within the bay is usually an OK depth. If that makes sense. The oysters are not like seagrasses or something where they need to have sunlight that reaches them in order to live so they they could grow quite deep. I mean, we do see oysters in on the Atlantic coast that are growing quite deep, you know, maybe 20 feet down in estuaries. But the thing that does influence them in the water besides salinity would be dissolved oxygen for sure, because that oysters require oxygen, just like we do to breathe. And sometimes in very deep bays, you get stratification of the water column. So in the summertime, the upper layers of the water get much warmer because of the sunlight, because they're much shallower. Lots of people have experienced this when they're swimming right where you feel warm, but your feet are dangling down like a cold layer. So that upper layer, because it's warmer, it's less dense. So it floats it. That's like it's an individual kind of parcel of water, if you will, that's floating on top of the colder water. But that parcel water, because it's at the surface, typically has the most oxygen in it. So when you have stratification happen in deeper bays, we can kind of be trapped down in an area where there's low oxygen and that can be detrimental and cause oyster mortality. But because, like I said, in our bays in Texas, for example, it's so shallow, it's really well mixed. And you really don't see that stratification occur or it would be very rare to see it. The other thing that oysters are sensitive to is temperature. But typically it's sort of a you know, they live in south Texas so they can handle high temperatures, but they can't really handle the high salinity that can come from more evaporation because of the warmer weather.

Rebecca Zerlin [00:20:27] What about cold weather? Like we had that really bad cold snap this year. And I know turtles, which are obviously a little different, just a little bit. (Laughter) They both have shells. That's the same thing, right?

Dr. Jennifer Pollack [00:20:41] Just a little bit. (Laughter)

Rebecca Zerlin [00:20:41] They they couldn't can't do well with when it gets cold. How about oysters? How do they handle that really cold weather?

Dr. Jennifer Pollack [00:20:50] You know, we thought we would see. More of an effect on the oysters than we did. So just anecdotally, from from our being out and about, we didn't see a lot of we really didn't see very much oyster mortality at all. Talking to colleagues at Texas Parks and Wildlife Department, they weren't saying anything either or anything notable. And then, a colleague of mine, Dr. Joe Fox, who has a pilot aquaculture farm up the coast and Copano Bay, they had some oysters in cages that were higher up in the water column. So you'd think they would experience even shallower water than the oysters that are on the bottom or colder water than those that are on the bottom. They didn't experience any mortalities either. So surprisingly, the oysters down here seem to do fine with that, with that freeze. I will say I would have expected maybe to see some mortality

just because they're more acclimated to warmer temperatures. But the oyster, the eastern oyster Crassostrea virginica the species that live here in the Gulf of Mexico, all the way, it lives all the way up the East Coast and you find them in Maine so they can experience and survive colder weather. I just thought maybe there would be some more susceptibility because these guys have never you know, the oysters that live here have never experienced weather like that probably in many, many years. But, yeah, they they handled it.

Dr. Sandra Rideout-Hanzak [00:22:16] Well, that's good. You and you mentioned the kind of oyster that we have along the Texas coast, do we just have the one kind of oyster? And, you know, most importantly, is it the tasty kind? And it is Texas, a good place for growing oysters?

Dr. Jennifer Pollack [00:22:37] So, yes, we have the eastern oyster. The the scientific name is Crassostrea virginica. It's the same oyster that grows throughout the Gulf and up the East Coast. It's native to this area. There are some other oysters that live around here, but they're much, much less abundant, much more rare that you would find them. And there are some oysters that even live off an offshore oil platforms that you can find as well. But really, when people are talking about oysters, they're talking about the eastern oyster. It's the one that forms the basis of the fishery, which is, you know, the most the largest commercial fishery, saltwater fishery in Texas. It's you know, Texas provides probably the second most oysters to the whole world, only behind Louisiana. So it's incredibly lucrative in terms of the jobs, the economic benefits and the ecosystem benefits that are provided. So, you know, we know that oysters do a lot of great things just by keeping them in place, even if we don't harvest them. So we have this amazing fishery. But we also know that oysters are filtering and cleaning the bay waters. We know that the reefs can provide protection against storm surge and wave action that's coming across the bays and help protect sensitive environments that are adjacent to them, like salt marshes. And we know we're starting to learn a lot more about the role of oysters in carbon sequestration. So you may have heard of this term blue carbon, which is the ability of marine ecosystems to capture and store atmospheric carbon or atmospheric CO2. Oysters have a role to play in this as well. They also create this really bio diverse, rich habitat that supports an assemblage of organisms that you won't find anywhere else in the bays. So this oyster has really been of interest to a lot of people, whether it's for growing it...You asked if this is a good place to grow oysters, it absolutely is. Whether it's harvesting in the wild oysters or whether it's just preserving and conserving them for their ecological benefit.

Dr. Sandra Rideout-Hanzak [00:24:50] OK. That's really interesting about the carbon sequestration, I always just think of plants when I think of carbon sequestration, is it the actually the oysters themselves or is it the plants that come in around the oysters that are sequestering the carbon?

Dr. Jennifer Pollack [00:25:08] That's a great question, so, well, yes and yes, so that's the first part of it related to Oyster's. You know, you think about like you said, plants are growing, right? And they take up CO2 and store it. So oysters do a similar thing in in their suspension feeding activity. So, again, like I said, they're filter feeders and they feed upon phytoplankton, which are essentially little tiny plants, little microalgae that are floating around in the bay. And so the oysters feed on those, remove those from the water column, and then they transfer those, that carbon that's been collected in those phytoplankton to the sediment around them. They do this either through species or through something we call pseudo feces, which is that the oysters just can process incredible amounts of of suspended material from the water and move it to the sediment. They just do a great job of

cleaning the water. And through this process, they've moved that carbon to the sediments where then more sediment will settle on top of it and then that carbon gets buried away from circulation with the atmosphere. And that's essentially what plants do as well. I mean, plants hold the carbon in their their trunk and their leaves or their stems, but that turns over pretty quickly. The carbon that stored the most is going to be the carbon that's stored like in the roots and in the sediments below those plants. So oysters are doing the same thing by burying that carbon in the sediments around and below the reef.

Dr. Sandra Rideout-Hanzak [00:26:42] That's really interesting! Yeah, I had no idea!

Dr. Jennifer Pollack [00:26:45] Yeah, it's really interesting. We have a lot to learn about this. And then I guess I will say that you're asking about the plants growing around, you know, oysters because they're clean and clear up the bay waters so effectively. A lot of times folks have shown that seagrasses just come in. These really rich seagrass beds will come in after oysters are restored to an area, for example. And we've seen this in St. Charles Bay. It just allows better light penetration. And so then you have oysters that are able to sequester carbon and provide all these benefits and you have the seagrasses right alongside of it which have been facilitated. And then they're providing a bunch of associated benefits as well.

Dr. Sandra Rideout-Hanzak [00:27:22] That's great. So you get that synergistic effect of everything working together.

Dr. Jennifer Pollack [00:27:27] That's right.

Rebecca Zerlin [00:27:30] You mentioned that Texas ranks number two in terms of oysters, only after my home state of Louisiana shout-out! (Laughter) What's the actual economic value of oysters in Texas? Do you have an estimate on that?

Dr. Jennifer Pollack [00:27:46] It's in the millions of dollars. I mean, it's an incredible economic generator for the state. We know that oyster reefs provide millions of dollars, probably on a per acre basis, in terms of ecosystem services. So a lot of these services, we haven't even valued them yet. We're just starting to recognize what contributions these this habitat is making of these organisms with habitat making. Like I said, with carbon sequestration, we don't have like a good one-to-one comparison, say, with Forest, for example. We actually have some research that's starting up over the next year to try to get at that, to try to understand under the conditions that we have in Texas, meaning like these shallow, warm bays with variable salinity, you know, some restored reefs, some natural reefs, we're trying to start to tease apart what characteristics influence the value, the ecosystem service value of carbon capture and storage by oysters. In Texas, for example, we have done some work looking at ecosystems, the ecosystem service of nitrogen regulation. So, again, like I said, oysters are suspension feeders and they are removing phytoplankton, but also access nutrients from the water column. And so there's a value to that. You know, communities would be the other option would be to do something like changing land use practices or putting in tertiary treatment onto a wastewater treatment plant to remove excess nutrient. And so we have done a we've used the replacement cost method in the past or we said, OK, it's going to cost X amount of dollars. If you wanted to add a tertiary treatment option to your wastewater treatment plant. Instead of that, oysters are removing a certain amount of nitrogen naturally from the water. What is the value of that nitrogen removal so that you wouldn't have to put in an amendment to wastewater treatment plant or wouldn't have to do some other action? And that's hundreds of thousands of dollars per year. And we've done that just right up the coast here for the

Copano Aransas Estuary. And it's a real substantial amount of money to say leaving the oysters in place provides these values that are in addition to kind of the traditional value or the only value that a lot of times are assigned to oysters is commercial harvest. So be able to be able to put the most other values up there to say even when oysters aren't harvested, they provide quite a lot of economic benefit to Texas, helps to, you know, think about preserving habitats in the face of, you know, coastal development in the future.

Dr. Sandra Rideout-Hanzak [00:30:31] Sure. What about specific fish, I mean, you mentioned phytoplankton and and seagrasses, what about fish or other animals? Are does everybody, you know, like the oyster reef or are there specific species that are really tied to them?

Dr. Jennifer Pollack [00:30:50] Yeah, there are different species that are tied to the reefs for sure. I mean, the fish that used the reef that I would call reef resident fish are typically like the little prey organisms that your sport fish would come to visit the reef to feed on, which is why you see a lot of recreational anglers fishing over Oyster Reef is because there's a lot of prey on that raising that's bringing the sport fish to that place. But we do see things like blue crab, for example, which has a commercial value associated with reefs, with these stone crabs. And we see using the reef for feeding, we see things like red drum, black drum, sheepshead, trout. We've seen spade fish out there. You hear a lot of fish that maybe people wouldn't want to catch, like oyster toad fish. You can hear them croaking out on the reef. You can hear croakers drumming out on the reef. So it's amazing the diversity that supported by the reef for the things that live there, but also that the fish that are swimming by and are going to stop there to forage.

Dr. Sandra Rideout-Hanzak [00:31:59] So you mentioned changes in salinity being a big deal for oyster reefs, the the city of Corpus Christi and the port of Corpus Christi recently started the permitting process for some desalination plants and it up up to four different sites, I think. Do you have concerns about that for the oyster reefs? Are there expected changes that, you know that might happen to the water because of these desal. plants?

Dr. Jennifer Pollack [00:32:33] I don't know the answer to that question, I mean, I have I'm aware of this I don't I haven't looked at the data. I don't have any access to the data or if they've done any modeling. You know, it would all depend on if I think where the intakes and the outflow would be and what effects that would have on water quality and salinity. I mean, you hit the nail on the head. It sort of depends what...what the area of influence would be and then where that's located relative to oysters. You know, oysters...Typically, you know are spawning in the estuary and those larvae are retained in the estuary, so it's not like some of the largest fish that would bond offshore and then the larvae would have to be entrained and make their way into the estuary. So, that wouldn't necessarily be an effective they have to move in and out of the inlet, but if there's, say, a plume of extremely salty water that makes its way into the estuary with our reef, then we know, you know, we could predict pretty well what would happen to those oysters because of their sensitivity to salinity. So I realize I'm hedging my for my answer here. But but I don't possibly I don't know, without looking at the what's out there.

Dr. Sandra Rideout-Hanzak [00:33:57] You're fine, I'm a fire ecologist, and you're giving the answer the fire ecologist always have to give, which is super frustrating to people. (Laughter)

Dr. Jennifer Pollack [00:34:04] And so, yeah, I mean, I hate to say, like I say, I need more data, but, you...

Dr. Sandra Rideout-Hanzak [00:34:10] No, the answer is very much, it depends. It depends on where they are going to draw the water from and where they're going to put the the waste. Yeah, hopefully. Hopefully they will work closely with you and other researchers at the Harte Institute to make sure that. That they do the best they can to not effect the oyster reefs and other sensitive areas.

Dr. Jennifer Pollack [00:34:34] Right, and I would I would hope I mean, my altruistic sense would be that there would be. Almost a requirement of that, I would seem to be a patient in that about a requirement of that through the permitting process. Right. It's sort of like what what is the way that you can do the least harm or, you know. Would demonstrate no harm.

Dr. Sandra Rideout-Hanzak [00:34:56] Absolutely! Surely there's surely there's going to be environmental protection studies and and all of that good stuff done, so...Fingers crossed!

Dr. Jennifer Pollack [00:35:06] Right!

Dr. Sandra Rideout-Hanzak [00:35:09] So for those of us who aren't currently building desal. plants, but we're just average Texans, what can we do? I mean, we've established the fact that Texans love oysters. So what can average Texans do to help protect oyster reefs in the Gulf and ensure that our oysters are healthy?

Dr. Jennifer Pollack [00:35:28] Well, you know, that's a great question. You know, I've been asked this question before, even to folks like who don't live at the coast, like what can I do to help oysters or organisms that live at the coast? And so it can be as simple as, you know, conserving water like I was talking about before, because oysters depend on such a delicate balance between fresh and salt water. It really does matter how much water is coming down the rivers to the bay. So just water conservation, simple things like that are really important. You know, for folks who do live on the coast, that can be extended to things like how you manage your yard, you know, deep fertilizer grass right down to the bay, or, you know, when those of us who live in coastal areas are so much more direct connection to what we do at our own homes than in our own neighborhoods that we live and the coastal environment. So just kind of being sensitive, using, you know, natural environmental practices are always going to help oysters and things that live in the bay. You know, I love to eat oysters. If you're going to eat oysters, try to find a place that is recycling their oyster shells. So we have an oyster shell recycling program here in the coastal bend where we work with restaurants and seafood wholesalers and actually seafood festivals as well. We go all the way up as far as often to recycle shells from festivals. And the whole point behind that is because the oyster, the way the oyster reef is formed is that you have the the larvae that basically the youngest generations of oysters are don't have a shell yet. They're little tiny plankton. They're trying to find a place to attach and they depend upon the shells of older generations to attach. And that's how you form a reef. It's the older generations on the inside. And it's kind of capped by a veneer of younger living oysters. And so we recycle oyster shells because when you harvest oysters, you harvest their habitat. If they're typically harvested in the Gulf using a dredge, which is like a big rake that you pull across the oyster reef, and you collect the oysters and their shells. And those shells are the fundamental building blocks needed to continue reef sustainability. So if you participate in a program that has oyster shell recycling, those shells then are returned to the places that need the most, put back out into the bay their natural environment. A lot of places are just going to send the shells to the landfill, which is

it's it's a really big loss to the marine environment where they need to be. They don't they don't do anything bad being in a landfill. But it's sort of a loss of a really key habitat builder.

Dr. Sandra Rideout-Hanzak [00:38:09] They're not doing anything good there either.

Dr. Jennifer Pollack [00:38:11] That's right. That's right.

Dr. Sandra Rideout-Hanzak [00:38:13] So, yeah, I know you some of your research has been on creating new reefs by by burying shells. You know, there are there are like, there are things that citizens can participate in, like beach cleanups and stuff like that. Can citizens participate in any of that sort of thing in any sort of reef rebuilding activities?

Dr. Jennifer Pollack [00:38:37] Yes. Thank you for bringing that up, actually. We do have a volunteer community oyster reef restoration events. As you can imagine, they've been on hold for the past year because of covid. But we did just start to do a couple of small events this spring in April, and then we kind of been washed out on our other ones this spring because of the weather. But what we do is we have small groups come out on piers. We're interested in habitat restoration or just interested to do something to help the bays that are in their backyard or the bays when they come to vacation. And yeah, people do a lot of beach cleanups, but oftentimes people don't have a way to get really in the water and connect with the habitats that are there. So folks come usually for a few hours to Goos Island state park, which is where we normally have run these events in partnership with the state park. And we take those recycled oyster shells and we bag them in special biodegradable mesh bags that help hold the shells together so they don't rinse away when we place them in the water. And then we sort of go and build a reef and the water bag by bag, almost like you sort of build a wall or kind of tile a floor. We just put the bags in it in an area that we've selected using some of our previous research. That is an adequate area for oysters to to recruit and settle and attach and grow and survive. And by the end of that day, you know, we've gone from a big pile of recycled oyster shells to a small section of restored reef. And, you know, we've had everybody from really young kids to elder hostlers, retired folks who are just winter Texans coming down. And so. We we really love those events, you know, we don't restore as large of an area as we would as if we took the oyster shells and stuck them on a barge and put them out there. But I think the value is almost arguably greater when we do these community events because of the knowledge and the awareness and sort of the environmental stewardship that you can see growing because of those, because the participation in those activities.

Dr. Sandra Rideout-Hanzak [00:40:52] Where can people find information about that? Some website or, you know, so that they could be involved and, you know, in them in the future?

Dr. Jennifer Pollack [00:41:03] Yes, so they can go to the Harte Research Institute website with Harte is H-A-R-T-E Research Institute, we always have there's a link in there. Like I said, typically our community restoration events happen in the springtime. We do that because that's when oysters are naturally spawning and the larval of oysters are recruiting and looking for a place to attach. So we're trying to put that material out there at the best time, or we get the most bang for our buck for oysters. So typically, like March, April, May is when those events are hosted. So you can also go to the Harte Research Institute Facebook page where they push out a lot of event information as well.

Dr. Sandra Rideout-Hanzak [00:41:46] OK, that sounds great.

Rebecca Zerlin [00:41:48] I have a I have a weird question. OK, so I know clams. They're all laughing at me now. (Laughter)

Dr. Sandra Rideout-Hanzak [00:41:58] So like being secretive about.

Rebecca Zerlin [00:42:00] It's a weird question. So I've seen videos of clams and they have that tongue foot thing that they stick their foot out and they can move around. Can oysters do that? Do they have a tongue? Foot?

Dr. Jennifer Pollack [00:42:15] They do not know and they also, you know, when oysters come out of the water column, when they're moved from larva to attaching onto the shells of the older generations of oysters they have cemented on there. So. At that point, when they come out of the water column as the final stage of the lava, they're called a pediveliger and that's probably the only time where they have what you're talking about. So they have something there called pediveligers because they actually develop a little sweat. And so when they come out of the water and look for a place to attach, they can use that little foot to kind of feel around to make sure that they've found a suitable substrate its a foot, thats right. But after that, no foot, no more.

Rebecca Zerlin [00:43:04] Interesting...So I can't teach them to dance. (Laughter)

Dr. Jennifer Pollack [00:43:06] No, you can't (Laughter)

Dr. Sandra Rideout-Hanzak [00:43:10] Can't teach them to dance. Oh my goodness! (Laughter)

Rebecca Zerlin [00:43:12] That's cool! I didn't know that about oysters. I don't I've never actually, I'm, um. I grew up in the Gulf, but I've never actually eaten oysters, so I don't really know anything about them. I know I'm getting shocked. I know I eat clams and that's like they have to be seasoned in a lot of stuff.

Dr. Jennifer Pollack [00:43:29] Oh, my gosh! So that's like an inaugural thing for all students in my lab, they have to have an oyster.

Dr. Sandra Rideout-Hanzak [00:43:37] Have you never eaten an oyster on the half shell? Oh, my gosh. Oh, gosh. You're kidding. You are missing out. Yes.

Dr. Jennifer Pollack [00:43:46] Well, come to Corpus and go to Water Street Seafood where they will recycle the shells for you and have some oysters. Yeah. You even have oysters many ways they're.

Dr. Sandra Rideout-Hanzak [00:43:59] Absolutely. And that was you know, that's why my my experience is that Waterstreet or why I asked what kind of oysters we have around here, because they're like instead of just, you know, hey, we'll take some oysters on the half shell. They're like, OK, do you want the big and blue ones or do you want the small ones that are more...

Dr. Jennifer Pollack [00:44:15] Oh yeah. Yeah. Actually that's a good point. It's it's it's a marketing thing, you know. So that's a lot of what they're talking about for Texas too. I mean, those are all if they're coming from the East Coast or the Gulf, they're all eastern oysters, but they'll call them like blue points or murder points or, you know, they have they're named for that area where they're where they were farmed. And the reason for that

is because they can take on, you know, flavor. Sure. Based on the conditions where they were grown.

Dr. Sandra Rideout-Hanzak [00:44:46] OK. Yeah, well, that is that's interesting. So it's all the same oyster, but they have slightly different flavors and sizes and shapes and whatever because they grew in a different place.

Dr. Jennifer Pollack [00:44:57] Yes, exactly, and, you know, depending on what Waterstreet has it and if they're getting oysters safe from Washington state, that would be a different species. That's probably the Olympia oyster. But again, it's typically when you're eating at a restaurant, it's like that name, that sort of marketing, the flavor that you can expect so that if you go eat anywhere and you get, you know, murder oysters, you know what to expect.

Dr. Sandra Rideout-Hanzak [00:45:22] Good to know! well, this is this podcast project is so much fun because I learned so much. I just like learning, you know, I feel like a freshman in college again, which is kinda cool!

Dr. Jennifer Pollack [00:45:32] I'll tell you something else that if you just because you guys seem interested in that, I'll tell you another cool thing about that flavoring, because I have a close colleague in France and, you know, in France, they're very passionate about their food, you know, and they're very you know, they're very much interested and invested in the food that they eat. So the oysters, they're they would pretty much never just harvest the oysters from the bay like that would be when they asked me how we eat oysters in Texas. And so we just harvest them and eat them. They were like, Ahhh! (Laughter) They they take them and put them in these ponds that are called Claires, which are all along the coast. They're manmade ponds that are more fresh. And so the oysters get a bit of a sweeter flavor instead of a salty flavor. And then depending on what density, they put the oysters in the ponds so they can put like a ton of oysters in the pond or really just a few oysters in the pond, they will take on more of the flavor of the plankton that live in that pond. So if they're at low densities, they're going to taste get like more of a nutty flavor, they call it, whereas if they're at a higher density, they might have a sweeter flavor with a little bit nuttiness. And then that's marketed to it's like a green ribbon or a blue ribbon. And then they the ones that are held at the lowest, lowest densities in those ponds, the most phytoplankton, when you sc1 the gill and the gut that you can see are just like bright emerald green. And that's like another specific grade of oyster. And so everybody there knows exactly what type they like. They're like, oh, I like this size of this type of oyster. It's really interesting. So they take it to another level.

Dr. Sandra Rideout-Hanzak [00:47:15] That is cool! So I actually wondered about that, but I thought that is a silly question, Sandra...there out in the ocean, you can't do anything about it. I was going to ask you if anybody does anything to, like, manipulate the flavor. So but we don't do that in the States. We just get them out of the Gulf.

Dr. Jennifer Pollack [00:47:30] Not that I know of, I think it's pretty much like bay-to-table sort of thing in the Gulf. But, you know, you also if you like oysters, you probably noticed, you know, different oysters coming from the different areas taste different as well. You know, you can get saltier oysters from some places and less salty or like my colleague said, sweet, sweeter oysters from some places, even just within the bay. So, people can target what they like.

Rebecca Zerlin [00:47:57] You're saying the markets open for that in the U.S. (Laughter)

Dr. Jennifer Pollack [00:48:01] The market is open! I'm saying that if you're looking for another job. That's a possibility!

Rebecca Zerlin [00:48:06] Yes. Yes, I am. I'm a grad student...I'm always looking for another job. (Laughter)

Dr. Jennifer Pollack [00:48:11] There you go! But that's what the oyster farmers who are starting who are getting started in Texas are thinking about, too, right now is like at a very basic level. Where do I want to put my aquaculture farm? Obviously, I want it to be in a place where oysters will grow and survive. But they're also thinking about things like flavor.

Rebecca Zerlin [00:48:28] So you just changed my life. (Laughter) I Quit! (Laughter)

Dr. Jennifer Pollack [00:48:34] Wow, it's only... I've done a lot today! (Laughter)

Rebecca Zerlin [00:48:41] So we're going to we're going to change it up for this last question for you. This will be a more fun question. Not that these weren't fun, but a little bit more goofy, I guess. And we're should when working with when working out in the natural environment, things can sometimes go awry. So we're asking all of our guests to share a biology blunder with our listeners. Do you have any funny or fun biology blunders you'd be willing to share?

Dr. Jennifer Pollack [00:49:10] Yes, I have a lot of biology blunders, of course, when you work in the field. I mean, some of the biology blunders are not very fun. Like the boat didn't start, or we left something back at the dock and were, you know... we're forty five minutes away on the boat, or we drove six hours and we forgot something back at the lab, we have a lot of those, but we had some funny ones. I say one of our one of the funny ones that comes right to mind is, you know, when you're in the field and you're working, you're in a rush because you're just you have so much to accomplish. You're trying to take advantage of sunlight, of a good weather day, of having a team of people who can be out in the field. And so there's just a lot that normally has to happen when all those things come together. So one day we're out in the field and we had finished sampling at an oyster reef. And typically you're trying to rinse all the buckets and everything before you get moving again to go to your next site. And one of my students at the time was trying to rinse out all those buckets after the boat had started going full speed. And so in the process of trying, if you can imagine trying to rinse a bucket off the side of a boat while the boat is moving at quite a high speed, that ended up with the bucket and the student very quickly floating next to the boat as we were driving away. So that was kind of funny and unexpected. And we were all sort of like, why? What would make you think that that was a good idea? But we've also had I'll tell you another story that was sort of relayed to me, but one of us, one of my field sites was a really beautiful area near some salt marsh. And we're having a conversation about how that you can see lots of alligators at a lot of the coastal sites. And I was sort of bragging and say, oh, well, this site that I'm doing all this work, I've never seen any alligators. It's totally safe. Like I lucked out. This is the best site. And a colleague of mine, a colleague of mine proceeded to tell me that she doesn't fish at that site anymore because she was fishing literally exactly where an area was that I was working and multiple times had seen alligators come in to come into the area, sort of spot her and then disappear under the water. And she would have to back up onto the marsh, out of the water, and they would come up right where she was standing. So I always sort of felt like I was going to start running on top of the water every time something bumped my legs when I was working at that. (Laughter)

Dr. Sandra Rideout-Hanzak [00:51:37] Yeah, oh my gosh! (Laughter)

Dr. Jennifer Pollack [00:51:38] You never know what's under the water!

Dr. Sandra Rideout-Hanzak [00:51:41] That's true. That's true. We've talked about that before, the uncomfortable bump in the water when you can't see what's going on. That's that's never any fun. Well, do you have anything else you'd like to share with us today?

Dr. Jennifer Pollack [00:51:58] No, I mean, this has been great, I feel like I talked a lot and, you know, unless there's something you feel like I...I Missed, that you were thinking I would talk about or something to elaborate on, actually, that's pretty good.

Dr. Sandra Rideout-Hanzak [00:52:14] Oh, my goodness. Well, thank you so much for talking to us today. I learned so much, and I think our listeners will learn a lot, too.

Dr. Jennifer Pollack [00:52:22] Thank you! Yeah. I'm just thanks for reaching out to me for the opportunity as well. I mean, I love to talk about what I do. So it's fun for me as well.

Rebecca Zerlin [00:52:38] So I'm going to change my career now, (Laughter) and I'm going to give up my dream of having a flea circus and insect petting zoo to become an oyster farmer.

Dr. Sandra Rideout-Hanzak [00:52:49] OK, this from the person who has never eaten an oyster yet. Yet. OK. All right. We'll have to fix that, but... (Laughter)

Rebecca Zerlin [00:52:58] What are you doing for lunch? You're buying? (Laughter)

Dr. Sandra Rideout-Hanzak [00:53:03] Not today, but, yeah, we'll do it. OK, we'll do that. We'll go eat oysters. We're going to make Rebecca eat an oyster.

Rebecca Zerlin [00:53:10] We'll try the different ones. And it'll be like a wine tasting, but it'll be oysters, right?

Dr. Sandra Rideout-Hanzak [00:53:15] You got to know what you're investing in. When you start up your oyster farm. Yes. OK, well, I think I think we should wrap it up for now. I think we've done all we can do...with this (Laughter)

Rebecca Zerlin [00:53:30] Yeah. Let's go and remember, don't feed the wildlife.

Dr. Sandra Rideout-Hanzak [00:53:35] I'll talk. On the wild side is a production of the Caesar Kleberg Wildlife Research Institute of Texas A&M University-Kingsville. Funding for this project is provided by the Harvey Weil Sportsmen and Conservationists Award, by the Rotary Club of Corpus Christi. Editing was completed by the talented Gabby Olivas, Andrew Lowery and Tre' Kendall. We thank the Team Distance Learning Lab for all their help and cooperation.