In Hot Water Episode 3 - Cranes, Oysters, and Crabs.mp3

Julie Kuchepatov [00:00:11] Three generations hit the road to explore key seafood producing regions across the U.S. and hear from people working at the intersections of fisheries, aquaculture, seafood, and conservation while grappling with the effects of the global climate crisis. We may represent three generations, but we have a lot in common, namely a love of seafood and a dedication to contribute to community driven generational effort in movement towards climate justice. The result of these travels? Welcome to In Hot Water, a seafood and climate podcast series. Join me, Julie Kuchepatov, Gen X, along with my travel companions

Crystal Sanders-Alvarado [00:00:45] Crystal Sanders-Alvarado, Xennial. And

Cameron Moore [00:00:47] Cameron Moore, Gen Z

Julie Kuchepatov [00:00:49] as we travel the country and chat with people who share the challenges facing their region and their personal stories. Along the way, we experience the moments that make us ask "what the heck?" as we try to understand why we are in hot water and what we can do about it. We start the series in the Lone Star State, Texas, particularly with a visit to the coastal bend along the Gulf of Mexico, one of the most important offshore petroleum production regions in the world, making it one sixth of the United States total production and a critically important source of seafood, supplying more than 40% of the U.S. domestic seafood production. We travel from Aransas Pass, the self-proclaimed shrimp capital of the world, to Corpus Christi, "the Birdiest City in America," and end up in Galveston, known in the 1800s as the "Playground of the South" and importantly, the birthplace of Juneteenth, where on June 19th, 1865, two and a half years after Abraham Lincoln issued the Emancipation Proclamation that legally freed 3.5 million enslaved people in Confederate States, the Juneteenth Order was issued, finally liberating the 250,000 enslaved Black people in Texas. In this episode, we'll hear from world class experts on oyster farming, blue crabs, and the endangered whooping cranes and their interconnected existence, fate, and future under the threat of the global climate emergency. Oysters are the perfect food. They are delicious. They filter water and are a climate friendly source of protein. Here's Jennifer Pollack from the Harte Research Institute at Texas A&M in Corpus Christi.

Jennifer Pollack [00:02:18] I mean, oysters do it all. You know, even when people argue about the way that wasters should be managed, everybody can agree on the fact that everyone wants more oysters in the water. They're filter feeders, so they filter out excess nutrients which prevent harmful algal blooms and keep the waters clean and clear, which can help other habitats like seagrasses that we really benefit from and that also support biodiversity. They create the structured habitat with lots of nooks and crannies for lots of organisms to live in. They protect shorelines, you know, they can make these sort of living breakwaters. Of course, if you like fresh seafood, they themselves are seafood. And as I mentioned earlier, they, we're learning a lot about the potential role to capture and store carbon. The complicated part, of course, is that they're the only habitat that we eat. So, I tell people it's sort of like if you, you know, took all of the habitat where the fish was, was swimming after you caught it. Like if you collected all the water and the fish or you took all the seagrass with the crabs that you were harvesting. So, when you when you harvest an oyster, you harvest its habitat, which is the reef. So, maintaining those benefits and getting the fresh seafood, but maintaining all the ecological promise that it provides has been challenging.

Julie Kuchepatov [00:03:28] And what are the challenges around that? I'm trying to wrap my mind around what you just said. So, when you harvest an oyster, you're harvesting its habitat.

Jennifer Pollack [00:03:36] When you harvest an oyster, you harvest its habitat. So, the simplest way to think about this is that an oyster reef is essentially the, the shells and the living, older generations of oysters that provide this scaffolding. And the younger generations of oysters are tiny little planktonic larvae, and they attach onto the backs of the older generations. So, when you harvest, you harvest with a dredge, which is like a rake, and you rake across that reef, which removes the shells and the older generations and the younger generation. So, it's removing the habitat while it removes the oysters.

Julie Kuchepatov [00:04:10] Tell us about your oyster recycling program.

Jennifer Pollack [00:04:12] Oyster shells are the natural material that reefs are built out of. And so, it's a really, it makes sense that if you can do something to put those shells back in the water, sort of where nature intended, that you do that. The oyster shell recycling program here is run out of the Harte Research Institute. I am running it right now in concert with Brad Lomax, who is the owner of Water Street Restaurants. We've recycled over 2 million pounds of oyster shells working with him. It's a very simple process. It's not like a battery or something. We have to take it apart. You go to a restaurant, you eat oysters. The shucker takes the top half of the oyster when he serves it to you and puts that into a special bin. And after you've eaten your plate of raw oysters, the busser takes the other shell, puts that in the bin. We come by and pick up those bins of shells. We put them outside in the sun to sunbleach for at least six months. And then you have this beautiful material building block of the reef that we then use science to understand where and when we should put them back in the water, but then we put them back in the places that really are in dire need of restoration and provide that, that building block for the younger generations to attach them for the cycle to keep going and for the reefs to be sustainable over the long term.

Julie Kuchepatov [00:05:28] So to be honest, I have never thought of oysters growing wild in the Gulf of Mexico, but they're there. Gail Sutton, the director of operations for Palacios Marine Agricultural Research, recounts her early days in wild oyster reef restoration.

Gail Sutton [00:05:42] Part of my master's degree was actually, I started an oyster shell recycling program with local wholesalers and restauranteurs, but it seems like a real easy peasy thing but how do you quantify that? What difference does it make to recycle oyster shell? It's a given. It's super easy. I mean, you see actors standing there in blue jeans going, yes, these were made from plastic bottles, and you can buy them. And you're like, I don't get it, you know, or you recycle a car or a battery. And it's really a very complicated system. And sometimes you do more harm to the environment than good when you recycle something. So, oyster shells are super easy, you know, you let them dry out. You wait for six months by law. You throw it back in the water and it can't hurt anything. It's a purely, you know, calcium carbonate. It's a perfect product. It doesn't hurt anything, quite honestly. It doesn't really hurt for it to go to the dump either. So that was my quandary is, if you're going to haul the shell around and you're making a carbon footprint, what's better? So, what I thought was going to be a simple thing to say, yes, it's wonderful to recycle shell and of course you should do it. It was going to be like a very short thesis. Because it was going to be, of course you should do it. Everybody loves it. But I had to really dig and then had to come up with a basis for my quantifiable benefits and non-quantifiable benefits. So,

what I ended up doing was using a formula that they use for public housing, because it's the same theory. It is a wonderful thing to get people off the streets and in a home, but they'll never be able to pay the rent that it takes to support the housing. So, what are those non-quantifiable benefits. So, I had to come up with those and I did. I did my formulas because in the landfill an oyster shell actually can help with liming. And they have to lime landfills, help it compost. And they're shaped really well. They're kind of cupped. They, you know, can help make little air pockets for the composting, blah, blah, blah. But what you find is the sheer volume of a landfill versus the amount of oysters or clams or anything that we eat that has a shell like that, there isn't enough to really make a hill of beans. And so I had to do all the calculations, though, taking our local landfill and estimating how many oyster shells could have possibly gone to it. What's the hill of beans that it would make? And it didn't really make a dent, really quite honestly. So then hauling it, you know, storing it, hauling it out, putting it out for a reef. And then we built our, I built a reef. Then looking at the biota around the reef that was attracted because of the oysters, and I found within one month, it was attracting fish and crabs and all that. So, oyster reefs are a 3D structure, and they don't move around. They, you know, they're a reef. And so, they're what we call generational builders. You know, auntie on top of junior, on top of grandma on top. They all they they're attracted to their own shell. That's just nature. And so, by putting the shell back out there when the oysters are spawning, they are attracted to go to the shell. And we've, we've shown that in our studies and it's, it's well documented. So, taking the shell out there, putting it, we started with a reef that had been knocked down by dredging, harvesting. But also, with the advent of jet skis becoming really popular in the 70s, 80s, 90s, smaller boats, people started topping off reefs. And the problem was it knocked them down so far in the water column, they couldn't get back up to the level where their food supply was. And so, we lost a lot of critical reefs. Throughout the world oysters are down probably 85%, yet you just don't hear about them being on an endangered list or anything like that. You know, they're out of sight, out of mind. In the Gulf of Mexico, it's about 50%. So, we're really kind of what people would consider in good shape, but it's really not acceptable. It's in this area in the Corpus Christi Bay area, in Nueces Bay, we call it kind of call it the Coastal Bend estuary system here. There were three major construction companies in the 30s, 20s, 30s, 40s that dredged, and they didn't want the meat, they just wanted the shell for construction. They used it for shellcrete. And one time we had a road all the way from Brownsville to Dallas that was 100% oyster shell. That's a long way. It's probably, what, a ten, 12-hour drive back then. It's a lot. So, and then people use them for gardening, for roofs, for, you know, they use them as a binder in concrete. So, it just decimated our area, and it just never came back. So, Corpus Christi Bay is basically a polluted bay because, you know, the oysters are our little water treatment plants under water, and they filter maybe a gallon of water per oyster. So, 50 gallons of water per oyster a day. So, it's a lot of water being filtered. And we don't have that.

Julie Kuchepatov [00:11:14] Do oysters sequester carbon?

Jennifer Pollack [00:11:16] This concept of blue carbon, right. So that that really encompasses any kind of coastal and marine habitat, vegetated habitat, that's the blue, the marine part that are capturing and storing carbon. So, the way that it works for kelp or seagrass, or saltmarsh or mangrove is that these are all plants that are photosynthesizing algae, right? And they, they are taking up CO2 from the atmosphere through photosynthesis. And when they take up that CO2 from the atmosphere, they're storing it in their tissue. They're, they're creating, you know, the trunk of a tree or into the roots, but they're also storing it in the soil around it or in the sediments for in the marine environment. So, oysters are not plants. They're not trees are not algae, but they eat an enormous amount of plant material. So, they eat phytoplankton, which are tiny plants that are floating

around in the marine environment. And, you know, there's estimates that one adult oyster can filter 50 gallons of water a day. And that's an enormous amount of plant material that they've consumed and assimilated. And when they eat that plant material, they are transferring it to the sediments. And then the sediments get buried over with other sediments because, you know, gravity drops everything to the bottom of the bay. And that carbon can get locked up around an oyster reef and in the nooks and crannies of an oyster reef, similar to the way that it's stored in the soil of a forest, or in the base of a saltmarsh or under a seagrass bed.

Julie Kuchepatov [00:12:40] That's great.

Jennifer Pollack [00:12:41] The challenging part of figuring this out for oysters, I will say though, is people often think, as I did when I first got into this is, well, the carbon is stored in the shells of oyster reefs, right? You sort of think like it's a calcium carbonate shell. There's calcium or there's carbon in the shell of oysters. So, isn't that the way that they're capturing carbon? But when you get into the chemical processes, actually when they build their shell, they're actually respiring CO2, just like us, because oysters are animals also. And so, they are actually creating, releasing CO2 in the process of building their shell. So, the shell is not capturing the carbon, it's what goes into the sediments around the reef. And that's what we're trying to understand is, are there places where oyster reefs capture more carbon? Is it better to be near, near a seagrass bed or near a saltmarsh, or is it better to be out in open water? And is it better to be deeper or shallower? So, there's a lot of questions. If you restore a reef, does it capture carbon right away?

Julie Kuchepatov [00:13:42] So we don't know the answer to any of this that you're saying.

Jennifer Pollack [00:13:44] We don't know the answer to any of this.

Julie Kuchepatov [00:13:45] Interesting.

Jennifer Pollack [00:13:46] There's only this is kind of almost for me professionally, almost akin to what you're saying of, you know, starting a new oyster aquaculture industry. This is a real area of discovery right now. There have only been about a dozen papers, maybe less, that have been written about oysters and carbon sequestration. But as the whole world, but the U.S. In particular right now, is talking about ways to reduce our carbon footprint and it seems like we're not going to change our habits in terms of driving cars and turning on the lights and cooking and things like that. We're more and more looking for what ways can we be mitigating for that footprint, and if we can be, if I can try to get better investment in, again, restoring coastal habitats, restoring oyster reefs, but also being able to provide this benefit back to whoever's making this investment by saying there's carbon credits associated with this, then that provides another mechanism that sort of a win-win.

Julie Kuchepatov [00:14:43] I've been hearing the term "living shoreline" a lot in these conversations. What is that and what does it mean for wild oysters?

Gail Sutton [00:14:51] I've come to find out. It means a lot of things to a lot of people. And to me, it means that you purposefully put out concrete or structures to get things to grow on it, because it really kind of cements it to me. Now, I'm sure there are people out there that are much higher education than me could give you a better explanation, but to me, the whole design of it is to attract the animals and by it being a living shoreline is more apt to

be structurally sound because you know they can, an engineer can build all sorts of stuff but there's something about Mother Nature and putting oysters or oysters start growing on something and it's unmovable. I mean, it's just amazing. I have a quick story about we were doing living shoreline work at Goose Island State Park here, and they have a terrible erosion problem in the Big Tree Unit and there are thousand-year-old oak trees in there. And what was happening is there was, at least in some areas, a meter of land lost a year. And it was really getting bad. So, Dr. Jennifer Pollack and I wrote a grant, and we were we had a kind of a three-phase thing going on. We were going to do some little bit offshore speed bumps to slow down the wave action, then bagged oyster shell to build a kind of a mini reef in front of that, then do some shoreline work to bolster the shoreline. And we started off further out offshore and we just did these rows of solid oyster shell. We put down 1 million pounds of oyster shell, but we did it in these rows of 30ft by 12, about a foot by, you know, another foot tall. And we just made these speed bumps with little cuts in them so water could get in and out, not trapping. Well, we put down the strip kind of late in the year. You try to get it around this time that oysters are spawning, so you don't get a bunch of other things growing on there, and they outcompete the oysters. So, we did this in, I guess August, which is late for us. Very late. And three weeks later, Hurricane Harvey hit, and we went, oh, no, all this loose shell, because it was just lying out there in these speed bumps. Well, we go out there about three weeks later and Mother Nature always comes back with a vengeance. I've heard that Mother Nature is much more resilient than humans and it's true. I bet the spawning was ten times what it normally was. Those speed bumps were covered in oysters. Covered in oysters. Massive, massive spawning event afterwards. From where? There's no reef around there. So, see, it is amazing how these things happen. So, then we had been already working on our little oyster bags, you know, putting that down. They're doing great. You know it, and it really worked too, it's protecting the shoreline but it's also building reef. So, it's a two for one.

Julie Kuchepatov [00:18:21] But wild oyster and reef restoration is tricky business. It's not about just throwing stuff in the water and seeing if it works.

Gail Sutton [00:18:28] So one of the things in my prior job at the Harte Research Institute was finding that baseline on oysters. What is the baseline? What is the health of these animals in these reefs? And now you can go and decide, or you, but you're going to have to be very thoughtful about restoration, because I see a lot of people just throwing stuff in the water and pat themselves on the back walking off. And it's like, now, wait a minute. Are you going to monitor that? Are you going to look at it? Did that work? So that's some of the work I want to do now is look at methods of restoration. You know, maybe you don't put an oyster on everything. You know, everybody's in this saying throw the oysters out, they're great. Yes, they are wonderful. But they don't belong everywhere. And you don't find them everywhere for a reason. They know where they need to be. And we're very lucky in Texas waters, we have a lot of good natural production. We're just substrate starved because we've taken these reefs out. They've got nowhere to go. And yes, an oyster will plant itself on a boot, on a rock, on a pier. But you don't see reefs in those locations. They really need a whole reef to be a truly productive reef. You know, just they need the whole system, not just a boot or a pier. They need the whole reef system to be really productive. Not all places are designed for oysters, so don't put them in a situation that you know they're going to have a difficult time. So, you're seeing all these people wanting to do living shorelines, and that's the way to go. And that's how we're going to help with storms and sea level rise, blah, blah, blah. In some cases, it's appropriate. In some cases, it isn't because the animals maybe are going to be out of the water too much. You do have intertidal oysters, but they can't suffer through exposure for sustained periods. So, I'm not saying you can maybe look for traits in that too but for now, like I said, there is really good

natural production in Texas. We're very lucky. And if you put it out there, will they come? I say in some cases find out. And if they do populate it, great. I had a gentleman show me the other day these concrete rings that he's been working with near shorelines. For some reason, these oysters really like it. And they're just like growing on the inside of these rings. He said, can you tell me why? And I said, no, I absolutely cannot, but I'd love to try them somewhere else because you don't know why the animal picks what it picks. You know, there's something about it. And maybe it's just that area too, that they're just, are really happy there and it was a happy occurrence. But is it can you replicate it? I don't know. That's the thing to find out. They mean to do well but just going out and planting seagrasses and planting seagrasses and planting seagrasses, you really need to be very focused. And where's the bang for your buck and impact? Restoration is a very expensive proposition. Right now, we're kind of shut down in restoration. The supplies are so expensive. You're talking about three, four times what they were when we wrote our grant. And now we're like, what do you do? So, to me, what I'd like to do right now is to test a lot of things that people have come out with. You got reef balls, you've got the triangles, you've got this little ring thing this guy showed me, and we have two marinas that we lease, and we're going to use those for our nursery but in the marina, it's kind of interesting because you got lifts for boats. So, Gail would like to use those lifts to build a hoist in and drop down into a curtain area, like a reef ball or a triangle thing or whatever these engineers have concocted. What do the oysters like best and drop it down into an area, put our larvae in there, let them swim around and plant their foot where they like it, and let's see what they like, because everybody makes a lot of assumptions. But I want to get a bumper sticker made that says, Think Like an Oyster because they need to. What does the animal want when you're building these things? What, you know, they throw all this stuff in the water, and they think, oh, they'll just land anywhere. Well, they probably will but if you're going to spend this kind of money, what works best and what do they really want? I've seen some really interesting contraptions and I, I don't get some of them, you know, but I'm not an oyster, so I got to think like an oyster and try it and see what it might like.

Julie Kuchepatov [00:23:12] So what's the solution?

Gail Sutton [00:23:14] My thinking was, after doing all this work, you know, one of the conclusions I had come to in my paper was, so what do you do about it? Well, my thought, which probably is not an original thought, but my thinking is it's like a three-legged stool. You need to take care of the wild animals. You need to give an alternative and then you have to have some way to enact that. And to me, we need good rules and laws on when have you gone too far in harvesting and when do you shut it down? And how do you control that? And also, if you're going to pull the oysters out, what are you going to do with that shell? It is an asset of the state, let's say. It's an asset of the communities. If it leaves the state, is there a price to pay for that? And what are you going to do with the money if you charge it like a bag fee, which we do. Where does it go? How does it get utilized? So, policy I think is very important. Another thing is taking care of the wild. The wild is, you're overharvesting, shut it down before it gets there. You know, these people need to make a livelihood, so I get that. You want people to survive, but you need to take care of it to where they don't go so far, they're out of business anyway. And then the third part is what's a good alternative? To me, aquaculture is a wonderful alternative, especially with oysters, because oysters, unlike let's say, shrimp, oysters do not put out an effluent. Whatever water you pull in to feed them, it will be much cleaner when you put it out. So how wonderful is that? Also, after you eat the oyster that you've grown in a cage, you do have the byproduct of the shell that didn't cost you anything because it didn't come out of the wild. So, you can recycle that shell. And even if you didn't put it in the water, oyster shell is still used. It's ground up for chicken grit. And, Asian countries, they eat a lot of bivalves.

And it became such a problem actually, in let's say Korea, was one country, they decide to do valorization. And that's where you give a false value to something like when we used to recycle Coke bottles and stuff. They'd pay you a nickel or dime to bring it back. Well, they started doing that in Korea because you'd be driving down the road, there'd be heaps and heaps of shell everywhere, and it became a real health hazard, right? Because of the tissue that was still left on the shell, so, and not to mention stinky and all that. So, they decided to tell people, okay, if you just bring your shell, we will pay you X amount to not leave it on the side of the road and stuff. And so now they have all the shell. What are we going to do with all is shell? Well, they start grinding it up and radiating it and using it as a binder for medications, for makeup. Let me tell you, they've thought of all sorts of ways because it's just calcium, you know, carbonate. It's not going to hurt anything.

Julie Kuchepatov [00:26:12] Texas was the last coastal state to legalize oyster mariculture.

Gail Sutton [00:26:17] Back in 2009. I got on this mantra because I was working on my master's degree of, you know, this is the solution. You know, we've gotta. If we give people an alternative, they won't want the wild caught. They're gonna want this pretty, consistent look, you know, flavorful blah, blah, blah. So, I go up to our regulators and, you know, talk to them about it and basically got tossed out on my keister several times. Crazy talk. Never, never, ever in the state of Texas, ever. And I was just floored by it. But like, how could you not want this? What could it hurt? Honestly, at the end of the day, what could it hurt if Gail wants to just set up a cage and grow some oyster. It can't hurt anything. I mean, shrimp, yes, I get it. So, I think a lot of the negativity was due to the shrimping industry because they were dumping a lot of effluents down the rivers, use antibiotics a lot of times the shrimp and stuff like that.

Julie Kuchepatov [00:27:14] This is farmed shrimp.

Gail Sutton [00:27:15] Yes. Farmed. The mariculture really caught on in the 80s and 90s here because of the shrimping problem. Here are shrimpers were overharvesting. And I mean they were down to just like one shrimp left type thing. And so, they actually started really controlling it. But then they started the buyback program, which was very helpful to buy back bay boats because they were coming into the bays harvesting before. They're an annual crop. So, if you're taking mom and dad out of the equation, then nobody's going to be there next year. So, it was becoming a real problem. And they started the buyback program. And that lowered the number of licenses in the state. Helped a lot. We'd like to do the same thing with oysters. That was part of that policy thing. That's another policy we hoped was going to be passed in this recent legislature, but it was not. We're really pushing for that because to me, let's say you have 500 and some licenses, if you can get half of them out of there, it might be more sustainable, quite honestly. That’s, that’s the key is you've got to work on multifaceted solution. It's just not grow 'em all. That's not a solution. Somebody's still going to go harvest. So, you've got to work in different directions and hope that you can make it again where it's a sustainable practice.

Julie Kuchepatov [00:28:36] The challenges that the wild oysters face are very similar, I would imagine, to what the farmed oysters are going to face.

Jennifer Pollack [00:28:44] It's true in some ways, for sure, like storms and not enough water coming down to the bays.

Julie Kuchepatov [00:28:51] Acidification or.

Jennifer Pollack [00:28:51] Acidification. Yeah, those things certainly are going to affect farmed oysters. In some ways. The farmed oysters have a little bit easier because they harvest so quickly. So, they can maybe harvest twice during a 12-month period, whereas the wild reefs, you know, they're just depending on the generations and generations and generations of the reef doing well. So, you know, nothing is left really in between harvests on an oyster farm except the equipment, like the baskets that are out in the water and then they're going to put new seed oysters back into those baskets. So, there's a little bit of an ability, a little bit of a safety net, I guess I would say for the farmers. They're not as much at risk. However, there are some things that need to be worked out, like what if a big storm is coming in? What are the farmers do with their equipment? With the oysters? Where do they go? I think that the plan right now, or the way that it works, is that they would drop. All the farmed oysters are at the surface in floating cages or in baskets. I think they would just drop them to the bay bottom, let the storm come through, and hopefully it's those cages and things are protected.

Julie Kuchepatov [00:29:49] And they can put them back.

Jennifer Pollack [00:29:50] And then they just pull that line back up. Okay. Yeah. So, there are ways to deal with it. But certainly, what if the salinity of the bay becomes fresh and stays that way for six months. What does that do to an oyster farm? So, there are things, I think, in Texas that haven't been worked out yet, like is there a place, like a safety spot where farmers can bring their oysters in that situation? I don't think that exists, for example.

Gail Sutton [00:30:12] So that's an interesting thing about oysters is by growing them in a cage, unlike fish and other animals that you grow in cages, they'll actually keep reproducing in a cage. So, what we're looking to do is also research what happens when you have the animals in the cage to the local environment. They're going to be cleaning the water because they're filter feeders, but also if they're still spawning while they're in the cages, they're going to be adding to the local environment. So, you're not, not only are you growing animals in a cage, not taking from the wild, but you might be adding to the wild. So, we're going to find all this out through our research.

Jennifer Pollack [00:30:51] Oyster farming is to almost support a different industry. It's a little bit of a nuance, but when you go to a restaurant and you get oysters on the half shell and you're presented this beautiful plate of oysters that are sort of all the same size, and they really don't look all gnarly and gross, and they're pretty, you know, cupped and beautiful, that's what oyster farming will support. It's sort of that more niche, higher end market, whereas the wild caught oysters will certainly still be sacks of oysters that you buy and you, you eat in your backyard with your family or that are pre shucked and you buy like a quart of already shucked oysters. So, it will take some pressure for sure off of the wild oyster reefs, but it won't replace, I don't think, wild harvest.

Julie Kuchepatov [00:31:36] What's the state of oyster farming in Texas right now?

Gail Sutton [00:31:39] We're at a mission critical stage, though. We need to get seed oysters to the farmers. Hatcheries don't make money. So, most of the states you see, the hatcheries are state hatcheries. State of Texas doesn't want to do a hatchery. They're focused on the fish. I say that I'm not speaking for the state, but my interpretation is they're not interested in it. So, we're building one. We've gotten our permits finally for it. We're running a small mobile oyster hatchery that was built for us by the Oyster Holding

Company. It's a East Coast oyster hatchery. And the gentleman, Mike Congrove, built the first two for two universities as a coastal resiliency project. They could put the broodstock in the hatchery. It's literally in an 18-Wheeler trailer, and it has everything you need in it. It's got an algae culture room. It's got an autoclave. It's, got, you know, it's got a broodstock room. It's got everything you need. So, you throw your oysters in there with your generator and you go, baby, go. That's to preserve your business, right? But we thought, hey, we don't have our hatchery yet. Wouldn't this be a wonderful world if you built us one so we can work out of it? And they're like, really? They did it. We bought it. It's working. We're knee high in oysters right now, but we're seeing a need for the industry to have seed oysters to grow in the cages, because who else can afford to build a hatchery? And there are some basic hatcheries you can do. Oysters are pretty simple animals. However, again, it's not the part that makes the money, it's the grow out that makes the money. So right now, in Texas, we're shipping our broodstock out of state. Other Gulf states have been wonderful enough to grow, you know, hatch them out for us. We get them tested at VIMs, Virginia Institute, Marine Science. They certify that they're disease free so they can come back into the state, and they grow them out. But that's going to be sunseted it at some point. We can't keep doing that. We got to grow our own oyster. So we're trying to help by getting our production online so our farmers have seed oysters to grow up. So right now, they're about the size of a pinky nail and we're, we're trying. But it's been a little slow because we've never done this before. You know, we had to import people in and tell us how to do this. Nobody's done it in the state.

Jennifer Pollack [00:34:09] I think it's going to take us a decade to understand. Like what does Texas oyster shellfish farming, really, what is it going to look like? Everybody's sort of going the same direction right now, trying the same things because nobody's done it here before. And it's a lot easier, I think, to try the same things and talk to the other two people who are doing it to figure out what's working. In Texas right now, we have three, I believe we have three farms that currently have oysters in the water. One of them is woman-owned and woman-operated. So, for everybody who's not counting on Texas, you know, that's pretty great. One of the three right now.

Julie Kuchepatov [00:34:48] Another animal that is an integral part of the landscape of the Gulf of Mexico and also experiencing the effects of a changing climate are cranes, specifically the critically endangered whooping crane.

Liz Smith [00:34:59] I'm Liz Smith and I work for the International Crane Foundation, and I retired last year from the director of North America Programs and as Texas program director. And one of the most fascinating aspects of cranes is they're very long lived, and they take care of their young for an entire year. They're five feet tall, so they stare you right in the eye, and they're beautifully snow white. They're very expressive. They have a red patch on the top of their head that gets, when they get excited or mad, it gets even deeper red and goes down the back of its neck. Very easy to tell when they're upset, and they do not like us. They immediately go into alert mode and just stare you down and you feel it. It's like we love them, but they don't love you.

Julie Kuchepatov [00:35:51] Tell us a bit about the history of the decline of cranes and specifically the whooping crane.

Liz Smith [00:35:57] So they probably were never very numerous because they're extremely wetland dependent. And there's been a lot of wetland loss everywhere and the United States is no different. There's only two species of cranes on the North American continent. The other 13 species in the family are on the other side of the world, and none

in South America. So, when they declined from overhunting, overharvesting, and also loss of habitat in the 1800s, the last nest in the United States was in 1894. I just visited that site two days ago in Iowa, and fortunately it's still there. They're restoring all their wetlands there, but after that, they just continued to decline to a low of 15 in the 1940s. So just 15. So that's kind of a genetic bottleneck. There's all kinds of things that are a challenge. And they also are very long lived. They could live in the wild, you know, 20 to 30 years and sometimes more. And they only have two eggs each year. Usually only one hatches maybe every other year and makes it to fledgling. And usually that bird only makes it to maturity, probably, you know, 1 in 5. So, when you take a species like that and you knock it way down, it's very difficult for it to build back up. But over the years, with a lot of conservation action, set aside of land, reducing the hunting, the illegal hunting and everything like that, there are about 550 birds today in this population.

Julie Kuchepatov [00:37:36] Oh no. From those 15 that were left remaining right in the 40s. Right. That's amazing.

Liz Smith [00:37:42] Yeah.

Julie Kuchepatov [00:37:43] So they winter here and then they migrate north?

Liz Smith [00:37:47] Yes. They go from here twice a year. They migrate. They migrate 2,500 miles across the Central Flyway, only 150 miles wide and 2,500 miles long. And they go to Wood Buffalo National Park, which is in the Northern Territories in Alberta, and that is over a million acres of fairly pristine habitat. And there's a lot of issues with mining around the area now. And also, these fires, we're seeing some impacts from all of the smoke that could potentially affect their breeding.

Julie Kuchepatov [00:38:26] In the last episode of this podcast series, we talked about wind energy development and the challenges around this. I gather wind turbines on land are a challenge for migrating cranes?

Liz Smith [00:38:36] They migrate in families and the subadult will migrate in flocks. But the families, you know, leave and they come down every night, so they land every night. So that means navigating all of that airspace to come down through a six-week journey for some of them, a two-week journey on the way north because they're anxious to get back to the, you know, the breeding grounds and claim their territories. But that is a difference of a bird that's migrating nonstop and staying above the space. Just even talking about the wind farms and their location, that's something that there's a lot of active research going on in the flyway concerning that. And the, you know, again, a consortium of federal biologists are working on how do cranes respond to those wind farms and their placement. And certainly, we try to encourage that they're not put directly in the flyway. But that's very difficult to do. And oftentimes we hear about the construction and it's too late for all the planning. So, what they have found out is that the cranes actually are very, very sensitive to currents, air currents, and so they are appear to be avoiding the wind farms by flying around them. And that's good, but if they continue to fly around more and more, you know, and we have so many that it actually impedes their progress down and they've got to go further away. They too get out of that wind that is so beneficial for the wind farms and they have to work harder to migrate. So, the other thing about, you know, wind energy, which it's a, you know, we want this alternative energy, and we want to see it become a viable over time as technology improves but it's the distribution lines coming away from those wind farms that are also detrimental to flying animals. Cranes fly pretty high. And so those distribution lines crossing the flyway and crossing where they are extends past where the

wind farm is. And so that is a really big concern. And how do you mark every distribution line? Well, should it be done.? If it is who's paying for that? And so as we say, there's lots of other birds and mammals such as bats that are affected by that. So, it's challenging. So far, you know, we don't have any data on how many cranes have died because of this, because it is usually on private lands and the companies self-patrol. And so, there's some really good ones out there that are, you know, employ people to do those patrols and etc. The problem is, is when a crane hits a power line, it that's it, you know, it's not going to survive. But we don't know how much the impact that is. In the wintering grounds. It is concerning that they have been permitted to be at the very last leg of their journey coming into Aransas and all. So, we feel like one of the things we can do right now is encourage marking up those lines, because right now there are very few lines that are marked in the wintering grounds and surrounding.

Julie Kuchepatov [00:42:07] So the birds can't see them.

Liz Smith [00:42:09] Right. It's usually the trailing bird, the third bird, which is usually the juvenile that does not realize that the lead adult is raising up and that's, you know, when that hits, it's usually the second bird or the third bird that that hits the lines.

Julie Kuchepatov [00:42:26] With ten of the world's 15 crane species facing extinction, our future promises to be one of continued growth and innovation to meet the growing challenges. So, what are the challenges and what are the innovations that will meet them? So, in trying to support these cranes that are facing extinction.

Liz Smith [00:42:44] So if we just look at the wintering grounds where they spend almost half the year, they generally are in coastal marshes along the, the bays and estuaries, and they require a lot of habitat, upwards of, you know, almost 250 acres to 500 acres. And that's all shoreline habitat, the same habitat that we like. And so, development, of course, is, is a competing use of that land. The refuges and the set, that are set aside for wildlife have certainly been a good stronghold for them. But now as they increase in numbers, they're outside the refuge. The great thing about Texas is we have a lot of lands and private holdings. Over 80% of the coast is in private land, and most of these are heritage ranches and farms of people that came here 200 and something years ago and established some very, very large ranches, you know, some upwards of 500,000 acres. And so, there's still some that are over 200,000. And the family has a land ethic that's taught to them. And so, the habitat is in really pretty good shape on the ranches. Farmlands, of course, are converted. And so that is unavailable to them from, from the prairies that were there. But the neat thing about, you know, the work that we do is that we don't go in and talk to landowners and say, this is what you need to have whooping cranes. The landowners say, we have whooping cranes because this is what we do. And so, it is a very, very great balance of, of how things are managed. And if that habitat is good for what they need, it's usually pretty good for whooping cranes. So, it's not so much putting lands in conservation, permanent conservation, it's more working with landowners that have a conservation ethic. And so, it's very rewarding and it's an honor to walk through that, you know, drive through that gate, and go onto those lands and, and then monitor these birds. The thing is, is that so many people want to live on the coast, and everybody wants to be right on the water, and that you just have to get ahead of it before the plans are put into place. So, our saving grace right now are those shorelines that are in those ranches, and those ranches being able to sustain themselves economically, that they can continue to keep that shoreline intact. They are super aware of their surroundings, and they not only can you hear their call a mile away, but they can hear anyone, you know, us, predators, etc. and so they don't like to be around habitation, etc. we are starting to see some cranes

starting to come into rural areas because they're exploring. And so that's where a lot of our outreach is. So that from one, for hunters to know that they're protected and that they can't shoot them. And then two, for people to just stay back and not habituate cranes to people. We want them to stay wild.

Julie Kuchepatov [00:45:54] So cranes are sometimes killed by hunters?

Liz Smith [00:45:57] Most of our shootings are not hunters. Fortunately, we have a really great, along with our agencies, a hunter awareness that we do every year prior to the cranes and the hunting starting. We, we hand out information. We get with lodges and guides just to let them know they're out there. And so that hasn't been as much of a problem, although it does happen. And usually, they just didn't know what they were shooting at. Bad light. Didn't know the rules, etc. It's more people that shoot anything.

Julie Kuchepatov [00:46:30] Gotcha.

Liz Smith [00:46:31] And this is a big bird. And so, it's quite a, you know, a quarry. And so those are the ones that we actually work with the court system to talk with the judges, the federal judges, with the district attorney, give them information about the importance of these birds all the way from its intrinsic value to the value that it has a right to be here too, to how much it cost to replace a crane. And so that if this person is truly not remorseful, then they're punished.

Julie Kuchepatov [00:47:04] How much does it cost to replace a crane?

Liz Smith [00:47:07] It's about $100,000 to raise a crane. We actually have two reintroduced flocks right now. And so, the International Crane Foundation actually raises most cranes right now, although there are some different conservation centers that are zoos that have ramped up their ability to raise more cranes. But that's a lot. And it's something that, you know, it takes a long time. And so and those two populations are not self-sustaining yet. So, it's very important that this population remains stable and growing.

Julie Kuchepatov [00:47:42] I read that people at the research centers dress up as cranes to rear the young. How does this work?

Liz Smith [00:47:47] Do you realize that they that they're very alert and they're watching every move? You know, they, the person in the costume can't talk. You know, even coughing, you got to suppress that. It's one of those things that you're walking around mostly blind in that costume, and, you know, you fall down. You can't say anything except for seeing a little crane looking down going what happened? No. So.

Julie Kuchepatov [00:48:13] Yeah. And do they feed them?

Liz Smith [00:48:14] Yes. They teach them how to look for food and how to handle food. You know, it's a, it's just amazing. And now what we do also is parent rearing because we do have enough cranes in our captive conservation flocks then and they're good parents that they can actually incubate the egg and in some cases raise it up to a certain age.

Julie Kuchepatov [00:48:38] Why do cranes raise their young for a whole year?

Liz Smith [00:48:41] It's a probably a lot to do with its size and the migration.

Julie Kuchepatov [00:48:45] Right?

Liz Smith [00:48:46] The length of migration. Having to know a whole year cycle of where they're born, how they migrate down, how they find totally different food here, you know, up in Wood Buffalo. They're eating dragonfly nymphs and frogs and stickleback fish and anything. I mean, anything that moves, it's open season for these birds. And then they come down here and they're, you know, they're searching for blue crabs, saltmarsh snakes, clams, all kinds of things they will consume. But mainly it's like looking for those really nutrient rich foods, you know, like blue crabs.

Julie Kuchepatov [00:49:22] This brings us to the importance of another key seafood from the Gulf of Mexico, which is also experiencing a lot of challenges in a changing climate. The blue crab. Their scientific name, Callinectes sapidus, means "savory, beautiful swimmer." Blue crab provide an indispensable food source for many estuarine inhabitants by converting decaying matter and other organic material into edible biomass. They are also a critical food source for many recreational finfish species, such as sheepshead, black drum, and red drum. Economically, the blue crab is the most important crab species in Texas and is the third most valuable fishery behind oyster and shrimp and has been part of the fishing culture since at least the 1800s. I continue with Liz. So, I'm really curious about how just talking about the blue crabs and understanding like the, I guess, is it symbiosis or the relationship that the blue crabs and the cranes have? Of course, it's as a food source. Of course, all these things that are happening around the climate change are also affecting blue crabs and freshwater availability. So, let's talk a little bit about that because I think it's super interesting.

Liz Smith [00:50:30] Okay. Even when the early biologists started studying whooping cranes on the wintering grounds, back when the refuge was created in 1937, they noticed that they ate a lot of blue crabs. And so, in all the studies, it shows that a large proportion of their food, when they're working the marshes would be blue crabs. They eat just about anything. But blue crabs should be numerous. They are, you know, a part of the system. They're easy. They respond really quickly to excellent conditions. They reproduce very quickly in large numbers. So blue crabs anywhere should be very predominant in an estuary. So why aren't they? The decline of blue crab populations is region-wide throughout their range. And so that means something much larger, larger than just here is happening. But it may be the same things happening all over. The mixing of freshwater and saltwater in these bays is dependent on both Gulf access and also freshwater from the rivers. So everywhere we're using a lot of water from rivers. It's just that down here we have much more of an influence from drought conditions and the fact that our rivers are not as big and have a watershed that doesn't get as much rainfall. So, when we start limiting that, we take a natural cycle that is drought and wet and we exacerbate that, we call that anthropogenic influence. And so, we can be in drought longer than we would normally be, because when we're in a drought, we still use the water. And when we're not in a drought, we're still using the water. So, the fact that the last, you know, wild population was on Blackjack Peninsula, that's in San Antonio Bay, that is fed freshwater by the San Antonio and Guadalupe rivers, means that what happens in the Guadalupe Basin is very important. This is important everywhere but for this context it is extremely important. And so, the other thing is, is that the basin is also located in the hill country, is one of the fastest growing places in the United States. And so, more and more water is needed. The downside of that is, is that we don't have a large population on the coast. And so, in apportioning water and thinking about water, most of the time when it's made by humans are making decisions, it's where the most humans are. So, we've been working very hard to be part of efforts to stakeholder groups and expert science teams, you know, trying to

develop, you know, good standards for how much water is released. This is ongoing. It's always going to be going. We're never going to see the results that we need. So, we just have to continue to work on it together. And we do. So, for the case of blue crabs, the trends in the fisheries show that there really isn't a huge decline in the numbers of crabs in the bays during a drought. It's just that they move away from the shallower areas because the shallower areas are higher salinity because of evaporation. So it isn't that you see this precipitous drop. You see just that there are, they aren't available to the cranes. And we see that right away. They come, they come down, they start looking for crabs. And if there that's a good year. They're just eating them, you know, nonstop for 4 or 5 hours. When they're not, they're searching, searching and then finally they go, I need to go look for something else. Yeah. So, the blue crab itself is so nutritious because it, sure it's protein, but it also has some lot of fats. And so that immediately goes to storage. They're very, very, very good at eating a blue crab. They're very methodical. They don't hurry. They just, you know, once they grab it, they start just flipping it and they get the claws off first, and then they eat the claw, and then they find the other claw, and then they look around and they find the crab, and the crab is thinking, hope it doesn't see me. Well, you know, it's not going to happen.

Julie Kuchepatov [00:55:00] Because the crab is still alive without its claws.

Liz Smith [00:55:02] Yeah. Then they take the legs off and eat them, and then they, if it's a really big crab, they take it to the edge and they just lay it in the grass where it has a hard time, you know, moving even if it has legs. And then they just jab it with their stout bill and break it up into pieces that they can eat. And it's extremely special to see a parent do all of this and then feed the juvenile who is as big as they are at that point, before they even leave to Canada and feed them that blue crab until about February, late February, they start not feeding it, and that juvenile is nonstop peeping all winter long. It's just beep, beep, beep.

Julie Kuchepatov [00:55:47] Because it's hungry or because it's just once.

Liz Smith [00:55:49] It's feed me.

Julie Kuchepatov [00:55:50] Feed me.

Liz Smith [00:55:51] You're supposed to feed me. So, by the end of the, the winter, the juvenile's bill is strong enough to break up a crab, and you do see them having to fend for themselves a little bit. By the next year they come back, and they are learning.

Julie Kuchepatov [00:56:06] They're learning.

Liz Smith [00:56:07] So it's it's, it's kind of like we know they need that nutrition that a blue crab gives them. We know that there's should be a lot of them. And we know that they're, they're, they have tactics to eat it. So blue crab is very important. You know, the whole question of the decline is not good. And that we want to see this, these cranes expand into other base systems. So, it's not just the Guadalupe. It's, you know, all the bay systems along the coast that are experiencing this same decline.

Julie Kuchepatov [00:56:40] How do crabs reproduce?

Liz Smith [00:56:42] The female, once she mates with a male. That's, she only does that once. And then she holds that sperm in her body until the right time, and she uses it

throughout her life, so she doesn't have to find a male again, and so, so she goes to the Gulf Pass and at the very right time, outgoing tide, she releases her eggs, and they immediately hatch, and they go out into the Gulf. So, there's a Gulf component to this. And so, as they, they're out there, they go through nine different stages. They come back as just a little miniature crab, and they come on in on an incoming tide. And then that's how the bays are refurbished. So, the thing is, is that there's a current out there. And so, it's possible that the crabs don't come back to the same pass because they've been there floating up and down the coast. So, everything that happens in all the bay systems is dependent on the health of that system. So that's one factor of it. But we have such high salinity as you move further south, there's thoughts that they might not even be going to the Gulf because it's saline enough here. So, if that was the case, we might have more crabs, but it's also a higher salinity and there's different stages that they can tolerate. So, they as adults they like lower salinity, 10 to 25 parts per thousand is like the window. So, when it's not that when it's higher than that then they're not available.

Julie Kuchepatov [00:58:17] How is management responding to the decline in blue crabs?

Liz Smith [00:58:21] Along with the regional declines of blue crabs, there have been fewer and fewer licenses that are permitted, and that's also been driven by the amount of crabs in the system. And so, you know, it's really a, you know, more of a family driven commercial enterprise. There may be just a few families in each bay, part. And so, and there's a season, there's a size limit. And so that's, that's all, you know, very carefully regulated. The other thing that can happen that is being addressed is that if those traps get lost, or they're abandoned for some reason, or if a storm comes in and they're, they're moved, then they continue to ghost fish and can continue to capture crabs and other organisms and they die. So, every year for ten days in February, the fishery is closed and they are required to remove all of their traps and then any traps that are found in that ten day period are collected and they're not returned. They're destroyed.

Julie Kuchepatov [00:59:33] In the next episode of the special edition of In Hot Water, a seafood and climate podcast featuring the Coastal Bend of Texas, we'll hear from academics, farmers, fishers, and activists about the root causes of inequality in the seafood sector in the region and their connection to climate change. We'll understand why we shouldn't discount Texas, or the youth, who are set up to inherit a planet that is in hot water.

Crystal Sanders-Alvarado [00:59:56] Thank you for joining us for In Hot Water, a climate and seafood podcast by Seaworthy and Sage. Let us know what you think by leaving us a review on your favorite podcast platforms. And don't forget to share with your seafaring friends. In Hot Water is a production of Seaworthy and Seafood and Gender Equality, or SAGE. Soundtrack generously provided by Mia Pixley. Audio production, editing, and sound design by Crystal Sanders-Alvarado and the team at Seaworthy. This season of In Hot Water is generously funded by the Walton Family Foundation.