Jerusha Klemperer:

I am looking at a pile of rough and bumpy oysters that are sitting on a heap of ice. I've got a dish towel, an oyster knife, and a view of Northern California's Tomales Bay to my right. Everything smells briny. The sun is shining into my eyes. I slip the knife into the hinge of the oyster as I've been instructed and wiggle it side to side. When I'm able to pry open the shell, I slip my knife under the oyster itself, separating it from the bottom half of the shell. Then I slide the sea creature into my mouth and down my throat. "Every oyster is a tide pool in miniature," wrote author Rowan Jacobsen, a poem built of saltwater and phytoplankton that nods to whatever motes of meaning shaped it. It is the sea made solid, the bay made sentient. Why do oysters, gelatinous, slimy, hidden in a shell that's craggier and stranger than a scallop or a clam evoke such poetry?

What are they? Why are they mostly farmed and why unlike other farmed seafood are they considered such a benefit to their environment? In this episode, we head to the farm, the oyster farm, and talk to various experts to understand more about the beloved and very sustainable oyster. I'm Jerusha Klemperer and this is What You're Eating, a project of foodprint.org. We aim to help you understand how your food gets to your plate and to see the full impact of the food system on animals, planet, and people. We uncover the problems with the industrial food system and offer examples of more sustainable practices as well as practical advice for how you can help support a better system through the food that you buy and the system changes you push for.

Marlon McLaughlin:

I can tell you everything you wanted to know about oysters plus a little bit more... check out our nursery tank, check out our operation up here. Then we'll head back to the tables. We're going to teach you all how to shuck, if you don't know how already. We like to call it our Shuck University. Shuck U. Yeah. Now, I will ask that you hold those burning oyster questions for just a little bit. Otherwise, we got to hold off on all the oyster tangents, but I promise I will answer all of your questions in a little bit.

Rowan Jacobsen:

I think there's still a lot of people out there who don't realize that oysters are alive, at least right up to the moment they're being eaten and if well-shucked while they're being eaten. My name is Rowan Jacobsen and I'm a food writer, but I don't do restaurant reviews or that kind of food writing. I look more at where our food comes from and what makes it great or interesting or occasionally terrible. An oyster is a shellfish. It has the shell that it lives in, and anytime it's disturbed in any way if it thinks there's a predator around, it will clamp that shell shut just like a clam will or a mussel, and it can hang on for a heck of a long time with that, shell clamped shut and it's got seawater inside, so it's good for a while. An amazingly long while. You can pull an oyster out of the water, and if you keep it cold, it can go a month before expiring and you'll know when it expires because it is the one keeping its own shell shut.

When it dies the shell opens up. If you buy like mussels in the supermarket, they tell you throw out the ones that the shells are open. That's because they're dead. Of course, the mussels, you're going to cook, so then they're all going to be dead, but you want them to be freshly dead when you're eating them. So oysters, if the oyster's shell is shut, that oyster is still alive doing that in the hopes that its fortunes are going to miraculously turn around. So then when the oyster is shucked, when you shuck the oyster, you might kill it. Like most people, if they're not being too careful, they're going to stab the oyster at some point, and then the oyster's very freshly dead or at least dying.

But if you shuck it really carefully where you're just slicing the mussel off the top and bottom shell, and you take a look at that oyster really carefully, you can see it's got this little tiny heart that's nestled right up against the muscle and you can see it beating. That's the confirmation that that oyster is most definitely alive. That can freak people out a little bit or a lot. The good news is it's alive, but there's not a whole lot going on. Oysters don't really have a brain or anything like that, so they're very simple animals, so they're

probably not worrying about their fate so much. So you don't have to worry that the oyster's going through great turmoil in its last moments. But yeah, that is a live animal going in some of the time.

Jerusha Klemperer:

Yeah, I was going to say that I think when Nate and I were shucking Tomales Bay oysters next to the water there, mine were dead when they got in my mouth, but Nate's were maybe still alive.

Marlon McLaughlin:

I like to bring folks down here not only for the fantastic view but also because this area is representative of those areas where we're growing our oysters. It's the intertidal zone. It's that space between high tide and low tide, preferred habitat for bivalves. So bivalves, two shells hinged together, you've got oysters, clams, cockles.

Chris Gobler:

Well, oysters are mollusks. That's sort of the class that they're in. They're filter-feeding bivalves, right? So that says a lot in and of itself. Bivalves have got two valves or two shells and a hinge, and from there they can open up. The living organism is inside of that shell that shell's made of calcium carbonate, and they're filter feeders, so they get their food by filtering the water. In a wild setting, they actually live in what we call a communal way. So they actually form these big things called reefs, and actually, they grow on top of each other in that case, and that can happen actually over decades or even hundreds of years historically. And so if you find a really good oyster reef, for example, in Chesapeake Bay or further south, you can actually... People have done this where they drill down and they find out that the calcium carbonate that makes up your oyster shells, you can go down meters and you'll still find calcium carbonate.

I'm Chris Gobler. I'm a professor at Stony Brook University. I'm in the School of Marine and Atmospheric Sciences, and I've been studying coastal ecosystems since... well, as a graduate student since the early nineties. And so a lot of my research focuses on water quality, but beyond that, I also just look at coastal ecosystems holistically and really everything in them from the microbes on up to the fish and things in between. Yeah, do a fair bit of shellfish work. I'm the co-chair of the New York State Shellfish Restoration Council. I've done a lot of work both on restoration of shellfish and also to some extent shellfish aquaculture. Oysters are well known to be probably one of the most powerful filter feeders that there are. The number of people that throw around is that an adult oyster can filter like 50 gallons a day, and that has incredible environmental benefits.

So we know that at least in shallower ecosystems where the volume of water isn't enormous when you have a large enough number of those organisms, they can actually keep the water quality in check and actually help to keep it clean because they're... Instead of the algae growing out of control, they're putting a check on them. And in some ways, you can think of them almost as not too far off from the filter on a fish tank. They can keep the water clean and clear. An interesting thing about oysters also, they actually can be selective in what they eat. And so they do this really fascinating thing where they're, on the one hand, you could think of them like, oh yeah, they're just sucking through a straw. They have this thing called... They're just sucking the water in.

But then when they bring the particles in onto their gill, they actually have a mechanism to sort out the different particles, and they can amazingly sense like, oh yeah, that's a good and juicy piece of food, that goes towards the digestive tract, and that's a piece of silt. And so it makes it such that in certain such scenarios, an oyster can be clean and clear where another bivalve, like a blue mussel for example, they don't really do that kind of sorting. So they can actually get contaminated in a scenario where an oyster, because of the sorting ability, is keeping itself clean.

Marlon McLaughlin:

Out of Tomales Bay, we harvested about three million oysters last year that only meets about half of our demand for our restaurants, restaurants we wholesale to. So we bring product in from these other farms. When we sell them babies, maybe we get a little deal up, give them a little deal upfront if they agree to sell us back some finished product. So I've had people ask, "All right, do you then call it a Hog Island oyster if you bring it in from some other farm?" Absolutely not. We want to highlight and celebrate the diversity created by oysters growing in different environments. You go to our San Francisco restaurant might have five or 10 different oysters on the raw bar menu going to tell you who grew it, where it was grown. Now, that circular process gives us a real opportunity to see that effect on the oyster from that environment.

So here we have a Sweetwater Pacific oyster grown here in Tomales Bay. This one's from Hama Hama Oyster Company up in Washington. So they've got different phytoplankton, different rainfall, temperature, runoff. All those enviro factors are different. So it's going to come back looking and tasting different. I mean, these could potentially be sibling oysters from our hatchery in Humboldt Bay. So wine people say terroir, right? Oyster people say merroir. It's that flavor of the ecosystem.

Rowan Jacobsen:

So my very first book back in 2007 was called The Geography of Oysters. I've always been fascinated by terroir, the taste of place. It's a concept from the wine world that the characteristics of a place will affect the flavor of the wine. It used to be something you really only heard about with wine, but at some point, people began realizing that it really applies to almost any agricultural product. The landscape is going to make a difference, but with some foods, it really matters. I grew up eating oysters but didn't think about it much. But then by the two thousands, I had noticed that oysters were one of the only foods other than wine where they were always named for the place they came from traditionally, going back hundreds of years, people would say, "I want an Apalachicola oyster," or "I want a Blue Point or a Wellfleet."

These were all the names of the bays, and that was true in France they did that too, and I thought, that's interesting. People were associating the flavor with the place with oysters from way back, and there was no information available about it. So I went and did the research and wrote the book really as a guidebook. I sort of put it together as just like a wine guide but for oysters. So it was really the guidebook that I wanted to have and didn't exist, and it ended up being a hit and sort of helping to spur this oyster renaissance that happened in the U.S. Terroir is the taste of place with land. The root is terrain, terra firma. It's about the dirt and the way that dirt affects a food. So when people like me started talking about how oysters are strongly affected by their environment, we use the term terroir, but some people felt like, well, that doesn't make sense because there's no dirt with oysters.

They're in the water. So of course the French word for sea is mer, la mer. So merroir was coined. There's a lot of people in the oyster industry who claim that they coined the word merroir... I'm not one of them, even though sometimes it gets ascribed to me, but it definitely wasn't me. But yeah. So basically it's just about the flavor of the sea that comes through in the oyster. And if you think about what an oyster is, it becomes obvious why that is the perfect seafood for reflecting the flavor of its place. Lots of seafoods do it to a certain extent, but with oysters, their place is really everything, and it's because they're a filter feeder. All they are is this shell that opens up and they have these gills and they pump sea water across their gills all day long and filter out the plankton, the microscopic algae, single-celled plants in the water that are their food, and probably a little bit of other super, super tiny animals too.

That's what they eat. So just like if you feed a pig acorns, you get sort of acorn-flavored prosciutto. With an oyster, whatever that mix of plankton is that it's eating is going to affect its flavor, but not just that, also the salinity of the water is going to affect them because that's the liquid inside their bodies. So you can really tell. Well, the example I like to use is the Chesapeake Bay. So the Chesapeake Bay is this long flooded river valley open to the ocean right down at the bottom around Virginia Beach like Hampton

roads, and that's the only place that exchanges water with the super salty ocean. So as you go up through Virginia and up to the Maryland end where there's all these rivers pouring fresh water into the system, the salinity goes down and down and down until by the time you get up to Baltimore, it's like five parts per thousand salt versus 32 parts per thousand in the ocean, and if you eat the oysters from north to south, they will get saltier and saltier all the way. That's one very obvious example of terroir in action.

Jerusha Klemperer:

I asked Chris Gobler about the role that oysters can play as water rehabilitators.

Chris Gobler:

So I mean it's really that revolves around that filter feeding and the idea that there are certain water bodies where historically, as we discussed before, there had been a lot of bivalves, oysters, and other species, but they've been over-harvested, and lost. That can have a severe ecosystem consequence because you go from a situation where, just as an example, it's estimated that in Great South Bay in New York in the 1970s, there were so many clams that they actually filtered the entire Great South Bay every three days. It was almost impossible to say, have algal blooms that would break out, that would make the water turbid or be harmful. But then conversely, that population was over-harvested and lost in the early 1980s, and then the ecosystem without that filter on it started having harmful algal blooms, something called brown tides, and the brown tides were harmful to the clams and the clams couldn't...

So it's sort of this negative spiral that went on and on and on. So what we've been doing in the past decade-plus has been to try to restore these shellfish populations. This has been an effort that people have been doing for many decades. So like oysters, as I mentioned, you find them down in the Gulf of Mexico so they can handle the warm water, they can handle the lower salinity, they can even handle some of these harmful algae pretty well. So those are areas where we've been trying to restore oysters and specifically trying to build oyster reefs. So yes, have them filter feed, but also making sure they're in a location so that when they do spawn, that their offspring will have maximal success as well. In some ways, you can almost think about it as like it's a little hard to put the right term together, but investing in the future.

So yeah, we can get them to filter now, but gee, if I can get this one oyster reef to produce a hundred million offspring in one year, then that will pay dividends down the road. So we're trying to choose locations such that when they do spawn the larvae end up in the spot that they're going to thrive and have the right habitat to attach to like, oh yeah, there's a lot of shell that they can attach to there. So the whole system can sort of rebuild on its own. If you can combine the awesome reproductive power of shellfish with their awesome filtration power, that's where you can really transform an ecosystem.

Marlon McLaughlin:

Now let's look at the life cycle of an oyster in the wild. So we start with mom and dad oyster, right? Most oyster species are broadcast spawners, so triggered by warming water temperatures, mid to late summer, going to release their sperm and egg into the water. Somebody give me a guess as to how many eggs a female oyster is going to release when they spawn.

Speaker 7:

Hundred thousand.

Marlon McLaughlin:

Pretty close. Couple more zeros, 10 million, right? I mean, think about it. It's a numbers game. If you're going to release that sperm and egg into the open water, better be a ton of them in order for them to connect.

Chris Gobler:

I won't get too far into the biology, but one important point, oysters are what are known as broadcast spawners. So when they have a baby the right time of year, they throw their gametes into the water, which will swim around, form a larvae, and then that larvae swims around for almost two weeks. At that point, it's sort of at the whim of currents and tides. After the two weeks, it actually then uses something called chemotaxis. So chemical sensing or sensing direction based on the chemistry, it seeks out shells, so it seeks out other oysters, calcium carbonate to settle, and that's how you end up getting a reef because all the babies are saying, "Oh, where's a good place to settle? Oh, look, there's a whole bunch of oysters here. This is where I'll settle." And the interesting thing is once they do that, they can't even move. They literally cement onto the reef, and that's where they live the rest of their lives.

Jerusha Klemperer:

Wild oysters need those reefs made out of shells to settle and spawn and repopulate. In his book, The Big Oyster, author Mark Kurlansky describes how oysters were once plentiful in the waters around New York City, enjoyed by the Lenape and then by the Dutch settlers. As the city grew, oysters were over-harvested, depleting that critical reef. Add to that the raw sewage of the new growing population being dumped into the waters and the New York City oyster was doomed.

Chris Gobler:

The last stat I saw, at least for New York, is that something on the order of like 90% of the oysters that are eaten were aquacultured. The sad legacy of the oyster in New York and actually for much of the world and the United States is that, yeah, a lot of over-harvesting, which is obviously unsustainable and the population has just collapsed. For that reason, people instead are growing them on farms and the techniques have been perfected, and again, you can therefore have control of, I'm going to put out a million seed because I know that I'll be able to move a million oysters this year just as an example. Each farm is different, of course. In an ideal scenario, again, the oyster farmer can choose their location.

Jerusha Klemperer:

So most of the 2.5 billion oysters we eat each year are farmed, which means they're grown in bags or trays or racks in the waters off of Washington state, California, Maine, Massachusetts, Louisiana, and beyond.

Marlon McLaughlin:

Each variety grows at a different rate. Our Pacific oysters take about 12 to 14 months to reach market size for the raw bar. The Atlantics, Kumamoto, European Flats might take two to three years to reach that market size. Native Olympia oyster is super slow growing, might take eight to 10 years to reach that same size. So we harvest them smaller, younger, maybe three years old right? Now let's do a little math to give you some perspective on what we have growing out there. At any given time, it might be up to about 10 million oysters. Most of it grown in our rack and bag system, so it's a constant cycle of harvesting, replanting, and we're planting ahead one, two, even three years. So our farm crew does a great job. I think those guys are really the unsung heroes of the oyster world, right? Don't necessarily think about them when you're at the raw bar, slurping them down, they work super hard. They know the oysters, they know the bay better than anybody.

Jerusha Klemperer:

There are several different ways to farm oysters. Hog Island has their own way of doing things, and they call their oysters Hog Island oysters.

Rowan Jacobsen:

Traditionally, for centuries, an oyster would just be named for the body of water it came from. On the West Coast, you had Olympia oysters, which were coming from near Olympia, Washington. You had Totten Inlets, which were coming from you guessed at Totten Inlet, and the East Coast, Wellfleet, Apalachicola, Blue Point are the ones I mentioned before. Those are three of the most famous. You might hear of a Chesapeake oyster, but often it would be more specific like James River. It was just the name of the place, and there might be many people harvesting oysters out of those bays. They weren't named for the person who was harvesting it. It was just the name of the place, which made sense. But that's when most oysters were wild harvested when we still had large populations of wild oysters so you could get away with that. Now we have very few wild oysters.

They were pretty much all over-harvested in the 1700s and 1800s. What replaced that was oyster farming. So then you have the individuals, the small companies or just one-person operations who had a lease to that they were allowed to grow oysters in one spot on the water, so they would grow their own oysters, and then they wanted to sort of differentiate themselves and have a brand name, maybe their neighbor who was also in the same bay in Wellfleet wasn't doing as good a job with their oysters, so they didn't want to get watered down with that subpar oysters. So then they've come up with a brand name. So that's what you see today. Oysters, instead of just being named for the place, they'll have a brand name, and if it's a good restaurant, they'll list the place underneath because your in-the-know oyster eater wants to know what the place is as well.

Basically, then oyster farmers discovered this is more recently in the past 20 years, what everybody else in marketing has discovered, which is that people remember the brand name. And so if it's a really goofy or sexy brand name, people are going to often go for that one because most people don't know the deeper knowledge, so they don't know to look for the place so much. So then suddenly you were getting the Lady Chatterley oyster and the Naked Cowboy oyster and a bunch of names that didn't tell you that much about the oyster. But as people have gotten knowledgeable, the other thing that you will sometimes see listed on a raw bar menu besides the place is the cultivation technique because, and this again, wine's the perfect metaphor. It's not just the place that makes the wine it's also the type of grape and the way it's produced, the way it's grown, and the way it's fermented.

So with oysters, the way you cultivate them can make a big difference in the final product. Some people grow the oysters on the bottom of the bay, just sort of naturally with the way they would be. So they're connected to the mud on the bottom, and they kind of get a deeper richer flavor from that. That's like the baritone of oysters. Other oysters are grown in floating trays on the top of the water, which is advantageous for various reasons, but they have a lighter flavor there. They don't get whatever those bass notes are that they get from the mud. So they're more like, I guess the tenor, not really the falsetto. And then there's another other cultivation technique called tumbling, which has become quite the rage now where the oysters are kept in motion all the time.

Marlon McLaughlin:

So we talked a little bit about our rack and bag system. So it's static, it's not moving. It's just sitting there. We're also using another system now called our tipping bag system, single bag with a buoy on it attached to a cable. It would be in deeper water. That's a sample, right? With that buoy on it with the high tide, it's going to be up here. Low tide, it's going to be down here. Now take a look at this little guy, pay particular attention to that leading edge of growth there and how fragile that is.

So that motion with the tide is just enough for those oysters to be banging into each other, breaking off that very fragile leading edge of growth. It's going to slow the growth down. The oysters are going to end up with a deeper cup, smooth shell, hopefully a bigger muscle because they're kind of opening and closing more. Exercising that adductor muscle gives us what's called a tumbled oyster. So when you see

an oyster with a deep shell, deep cup, smooth shell might be paying a little more money for it too. It's like the ultra of premium oyster, right?

Rowan Jacobsen:

They're in baskets that move around, rock with the waves. Sometimes they're in bags that actually flip with the tides, and all that motion physically changes the oyster because whenever they get tumbled, they think there's a predator out there, so they close up their shells. So these tumbled oysters, instead of just being able to crack their shells open all day long and filter water, they're constantly opening and closing their shells so they get a little workout. So it's like Pilates for oysters, and that builds up their muscle, and the muscle is the sweeter, firmer part in the oyster. So these little ripped oysters are a little bit sweeter and firmer than their wild brethren. And they also, as a result of that tumbling action, they lose the little growing edge, outer edge of their shell that little thin outer edge oysters want to grow long to get to the good food source. They're competing with each other.

So they lose that really fragile edge and end up having to deepen their cups without getting long. So not only do you get a firmer, sweeter oyster, you also get this beautiful little perfect, smooth polished rock shape to the oyster with a deep cup. It makes it something that most people prefer. So tumbled oysters have really sort of taken over and it's more labor-intensive, so they tend to be a little bit more expensive, but they're definitely the big development in oysters in the past few years. So on a good raw bar list, you'll see the species of oyster, which matters, the place which matters, and the cultivation technique.

Marlon McLaughlin:

The other benefit to this is that when they're closed up tight with that low tide, they're exercising their adductor muscle, that's what's keeping that shell closed tight. Adductor muscle is the sweetest part of the oyster. So if you can get them out there pumping iron a little bit, get that muscle a little bigger, going to get a sweeter oyster. I actually think that farming is a little bit of a misnomer. It's really more like oyster ranching, right? We're really just leasing access to that phytoplankton for those oysters to graze upon. We're not adding any food or fertilizer. We just want them out there happily grazing. Our main inputs are gasoline for our boats, for our trucks, electricity for our restaurants, for our operations here we're now offsetting with solar power, so very sustainable.

Rowan Jacobsen:

So aquaculture has a bad name for a lot of people, and that is all because of finfish aquaculture. We know that farmed salmon is problematic from an environmental standpoint, and the reason basically is because you've got these big pens off the coast and you're dumping tons and tons of feed into the water to feed this unnatural concentration of fish. You're nutrifying the water and that causes unhealthy algae blooms, and then dead zones and all kinds of problems. Some of the feed goes into the fish, some of the feed comes out of the fish, but it's just... It's a lot of stuff going in the water. The beauty of shellfish farming is that it reverses that equation because you don't have to feed your animals, whether it's mussels or clams, or oysters they're all filter feeders. So they are all filtering the nutrients out of the water.

They're filtering the plankton and algae out of the water, so they're literally cleaning the water around themselves as they grow. That's what attracts so many people and so many people who have an environmental conscious to oyster farming. It's funny how many marine PhDs you see go into oyster farming once they look at it and they're like, "Ooh, this is different." And oysters don't move around. So they are not being unnaturally pinned like fish are when they're being farmed. So they're getting to lead their natural lives. Actually, it's like a better version of their natural lives, because they're generally protected from the starfish that like to eat them, and they're making the water a little healthier in the process. That's why not just oysters, but any kind of shellfish is usually at the top of the green lists of sustainable seafood.

Marlon McLaughlin:

Now, under optimal conditions, the oysters can form massive oyster reefs. It's that generational piling on, sticking to each other. So the oysters are considered a keystone species. They can provide food, structure, and habitat to hundreds of other plant and animal species, and that keystone designation like the keystone in a stone archway at the top, holding it all together, right? Remove that you're in trouble. Same thing with the oysters. If you have enough out there, suddenly remove them. It's going to have a profound effect on that entire ecosystem.

Jerusha Klemperer:

Hog Island is a growing company. They harvest over five million oysters and clams per a year. They run five restaurants. They even now have a hatchery to spawn their own seed. So I asked one of the heads of Hog Island, Terry Sawyer, how they make sure not to get too big, not to replicate the problems of finfish aquaculture.

Terry Sawyer:

I don't know if there's a way to describe the right size, to be honest with you, but what I can say from my experience is that sure, we have grown and are still here after 40 years and hopefully at least another 40 years. But what I would say drives the growth would be a slow growth, trying to really manage the diversification vertically and horizontally. So you have a very key phrase that we're all having to think about these days, which is resiliency because you have market forces, you have natural conditions that are always changing, and Lord knows, look what we've done to ourselves and with climate change on having to maintain that. If you put too many in one place, you got to think about the conditions that are required for them to make a living. So you need the food, you need the oxygen, you need the flows.

You need the flows to handle not only the bringing the oxygen in the water out but to take away any of the waste products, any of the ammonias. This is a living organism, and no, you think about it when you have plants in your gardening, you crowd them, they don't do as well. Same thing with an organism, same thing. You put too many animals on the lot when you're growing pigs or cows or whatever it is, you're going to impact that area in a negative way that will actually come back and affect the quality of that product. Same thing with the oysters, same thing with clams, same thing with mussels. So if you are actually just piling it in there, next thing you know, you've got mortalities, you've got disease factors, stunted growth, et cetera, et cetera.

Chris Gobler:

There's this term we haven't brought up yet, but it links together the filter-feeding part with the aquaculture part, and that's called regenerative aquaculture or restorative aquaculture. Yeah, fish farms are a dirty practice and you've got to import food, and then you've got the waste from the fish, and the fish can spread disease amongst themselves, and they're definitely polluting the water, and that can lead to water quality impairment and other sorts of problems, whereas it's almost the exact opposite with an oyster farm where an oyster farm, they're actually there to make the water quality better and you don't need to feed them anything. They're just feeding on what's in the water. So these are almost the exact opposite approaches. They're two ends of the spectrum when it comes to aquaculture, one that's harmful to the environment. And the other that's beneficial, and I'll just add in just coming back to what we talked about a little bit earlier, about the reproductive capacity of the oysters.

So not only is the oyster farm regenerative because it's filtering the water but then each oyster farm is actually has a restoration aspect to it as well, because every year in summer, oysters spawn and spawning is most successful when the oysters, again, I mentioned it before, they're broadcast spawners. If you have them packed in close, you have really successful fertilization. And so each oyster farm, therefore each

year is spawning probably hundreds of millions of baby oysters. They don't all make it. That's just the way they're designed, but then those oysters can go out and repopulate the environment as well.

Jerusha Klemperer:

Are there any red flags in oyster aquaculture?

Chris Gobler:

To my knowledge, not from a consumer point of view. The two things that I think about is one, managing ecosystem expectations. I always call this the halo effect. You're going to see an effect within the farm, and I actually often refer that with the seaweeds also. Like, oh yeah, the seaweeds are changing things locally for the oysters. But look, you're not going to change the course of global climate change with some seaweeds on an oyster farm. And so similarly, I think in many cases, these oyster farms are not the sole solution for addressing water quality. So if you've got a lot of nutrient pollution, either from sewage or from fertilizer, that's got to be addressed. You're not going to overcome this problem through oyster farms alone.

I haven't seen this come up in any New York oyster farms to date, but I think if you ever got to the point where they were very large scale and there for a very long time and you didn't have the proper water circulation, it's possible that, and I think this has been documented for places like in Asia where these farms can go on for hectares and hectares, the sediment underneath these areas can be transformed from... They just can become more and more muddy. That can create its own environmental problem.

Jerusha Klemperer:

What about climate change? How is it impacting Hog Island and oysters more generally? How are warming waters affecting oyster health?

Chris Gobler:

The signs of climate change are everywhere, right? Full stop. And in marine environments, it's not just the temperature, but particularly the bivalves we also worry a lot about ocean acidification. So this is the process where CO□ from the atmosphere, the same CO□ that's going into the atmosphere and causing the global warming is also coming to equilibrium with the surface oceans. And when that CO□ goes into the ocean, some chemistry, the pH goes down and it affects other parts of the chemistry that makes it harder for shellfish to make their shells. Yeah, temperature's a big one and can be super stressful for a lot of marine life and lethal, if you've got the wrong... If an organism is already at their temperature limits. With oysters, that's thankfully a good part of the East Coast at least.

And again, I can speak with authority on the East Coast of the U.S., they can handle those hot temperatures, but acidification is a whole other realm where it's going to slow their growth. And those little larvae that I said that are first spawned by the oysters are very sensitive to acidification. And so if they're spawned into an acidified environment, they may not make it because they've got to de novo, make this new shell and extract the calcium and the carbonate from the environment, and that when you've got acidification is very, very difficult.

Terry Sawyer:

When we went through a period of time about... Oh my gosh, I guess it's about 12 years ago when we started seeing some of the signals that were going on with ocean acidification. We weren't able to get the seed and run systems the way we ran them.

Jerusha Klemperer:

Hog Island was having trouble getting consistent oyster larvae from the big hatcheries. It turned out that various diseases were attacking the seed and they weren't able to protect themselves because they were stressed and working overtime to build their shells. Something that was becoming difficult because of varying pH levels in the water. So Hog Island owners, John and Terry decided to grow their own seed in Humboldt Bay further north, a place they deemed as having good biosecurity. Now they supply their own farm while selling any excess to other oyster farms on the West Coast, essentially decentralizing the seed source.

Marlon McLaughlin:

So now we'll look at our hatchery life cycle. So our hatchery in Humboldt Bay, part of it is an indoor lab setting. We've got tanks of bay water inside where we have full control of temperature, salinity, the amount and variety of phytoplankton we're feeding the oysters and we can select which oysters we want to breed.

Terry Sawyer:

We actually started, I mean talk about a scramble because this is a futures game. Now you're talking about something that takes two, three, four years to get to market, and you can't plant that harvest window's effective for that long. It's very unsettling to have that happen and you have your orders in and they can't meet your orders. So what we did is we made that decision to do that labor and cost-intensive thing, which is to take it and do our own. It's an unusual way to do business. Yes, you'd specialize in one or the other, but the bigger farms had the capacity to actually to do both.

Well, we weren't that big, but we decided to do both, and it was a huge investment in faith. It was an insurance program because what we were facing, one of these uncertainties that were going on with the ocean acidification, so we chose an area that had a really good health history for oysters, and so that's biosecurity. And so Humboldt Bay has that biosecurity currently. So we have a whole other operation that basically enables us to grow, have the brood stock, have control of the brood stock, so make decisions on genetics that might make them more resistant to disease or maybe the ocean condition changes and it allows us to actually control that.

Jerusha Klemperer:

Hog Island monitors the pH levels at the hatchery, buffering the water as it comes in to ensure it's at an ideal pH that keeps the oysters from getting stressed. This solution is working for now, but we have to assume as CO2 levels in our atmosphere rise that this is a moving target. And then there's the matter of rising water temperatures and disease. In the summer of 2023, three people in New York and Connecticut died and an additional person was hospitalized after being infected by a bacteria called Vibrio. Public health officials aren't positive how each of these people contracted the disease, but at least one of them reported having eaten raw oysters.

Chris Gobler:

Interesting about Vibrio is that I've been telling people recently get specific, Vibrio is the genus, but there's actually many, many species of Vibrio, right? There's cholera, there's parahaemolyticus, there's vulnificus, and they all are more or less abundant and have different effects and such. But yeah, some of these Vibrios are definitely following temperature. And so there was actually a fascinating paper that came out, just came out earlier this year, and the people in this study documented this was specifically on something called Vibrio vulnificus, kindly known as the flesh-eating bacteria. And so the paper showed that from the mid, or I think late 20th century through until recently, that the incidences of this have progressively moved up the East Coast. So it was like formerly a Gulf Coast phenomenon, and I think in

the last year or so, they had something show up. I can't remember if it was New Jersey or Delaware or Maryland, something like that.

And then they had a model in there and they said, "Well, here are two climate change scenarios." These bacteria like warm water, they also slightly brackish water, so slightly lower salinity. And so the migration north has been because of warming waters. Then in the paper, they also had, they took two climate change scenarios, the ultra-aggressive mitigation and the do nothing, and then said, "Okay, then this here's what could happen with Vibrio in the coming decades." And I think it was under their almost do nothing or very little mitigation that then you'd finally see it up on say, Eastern Long Island and into New England. Now, that paper was published, I believe in the spring and well, this summer, Vibrio vulnificus showed up in Connecticut and in Long Island. This is the funny thing about climate change, I often say is that in my experience in learning about climate change over the last 30 years, not only does almost everything come true, it often happens faster than predicted.

This is something to be aware of. There's really very, very little data. And so it's a kind of scenario where nobody should be jumping to any conclusions without... There's like three data points. Unfortunately, three people died and two cases that was skin exposure, and in one case it was shellfish consumption. But I haven't gotten definitive answer on... I think the answer is that shellfish may not have or weren't from New York. And so the question is, well, where were they from? Again, shellfish are tagged and it's very rare. You know, as part of that interstate commission, they know exactly every single shellfish that's eaten is associated with that.

It's a whole sort of, it's not quite blockchain, it should be, but there's a whole record. But anyway, it's a concern and again, not enough data to say anything super definitive right now. Again, those bacteria love hot water and they also love slightly brackish water. And so to me, no surprise, just knowing the way the summer played out in New York, it looks like this thing showed up right after we had a major heat wave. So super hot temperatures, water getting close to 90, and with that, these tropical cells of rainfall that we've been getting where all of a sudden the skies open up and there's like four inches of rain and the ground is saturated, and when that happens, that can depress the salinity probably into the zone that these guys like.

Jerusha Klemperer:

It's still the case that you can protect yourself by eating oysters in cooler months.

Rowan Jacobsen:

Oysters generally take anywhere from one to four years to reach maturity depending on which species and depending on what you define as maturity. This is one of my pet peeves in the recent industry is that people's idea of what an oyster should look like on your plate has really been changing as sort of more fair-weather oyster eaters come into the mix. Oysters are super popular. You can find oyster bars everywhere. More and more of the people who are trying oysters are kind of new to it and aren't necessarily the core oyster obsessives from the past, and they like smaller oysters. They don't want to put a big old honking oyster in their mouth. So oysters are getting smaller. It used to be when it was a wild harvest, the oysters had to be three inches. Just like with other wild fish or lobster, whatever, you had to let them reach a certain size.

You couldn't just harvest the babies. They had to change all those rules, not for wild, but for farm, because all the consumers are saying, we want the babies, and oyster growers are like fantastic because it only takes a third as long to grow a little tiny oyster as it does a big oyster. So both the farmers and the consumers finally were in agreement that they want smaller oysters, which the only people who lose are those of us who liked bigger oysters and they're becoming harder and harder to find, but it's fine otherwise it's a win-win. So now the little two-inch oysters, you can get those from tiny infinitesimal seed in a year, often. Two years, and you've definitely got your oysters ready for market.

Marlon McLaughlin:

Each variety grows at a different rate. Our Pacific oysters take about 12 to 14 months to reach market size for the raw bar, the Atlantics, Kumamotos, European Flats might take two to three years to reach that market size. Native Olympia oyster is super slow growing, might take eight to 10 years to reach that same size. So we harvest them smaller, younger, maybe three years-

Rowan Jacobsen:

Oysters also do have a real seasonality to them, and that's kind of because of their lifestyle, especially the oysters living in northern waters because northern waters get very cold and when they do, the oysters can't really feed that well. It just gets too cold for their metabolism. Also, there's just not that much to eat in northern waters. In winter, there's not that much sunlight, so there's not that much algae growing. It's too cold. Anyway, so oysters basically shut down. They go into hibernation in the winter, especially in the Northeast. What that means is just like a little bear or whatever, they have to fatten themselves up in preparation for hibernation. So this time of year they're feeding like crazy as the water temperature is dropping, trying to get enough stuff in their body that they can then survive on that through the winter while they're shut down, which means that this is the time of year when they are at their most delicious, like their full food, they're plump, they're sweet.

They also kind of sweeten themselves with amino acids that help them not freeze. They create these compounds that are kind of like antifreeze compounds that are naturally sweet. So a winter oyster is a really good oyster, and I think that's partly why traditionally in France and the US basically Thanksgiving through Christmas is your classic oyster season. The oysters are really at their peak, and then they'll live off those resources and they'll be pretty skinny by the time spring comes along.

Then the algae starts to grow, the water gets a little warmer, they start feeding again, and then they kind of get good again. But they also like to reproduce when the water's the warmest because they're going to eject sperm and eggs into the water itself, and then the sperm and eggs just meet up in the water. That works best if the water is as warm as possible. So they wait till summer, build up their sperm and eggs, and then shoot those into the water in June or July or something. So in summer, their bodies have changed. Instead of those sugary compounds, they've got gametes. So they're going to taste a lot gamier in summer, and not everybody likes that.

Jerusha Klemperer:

So it sounds like there are taste reasons for aiming to eat them in winter, for example, but what about the kind of food safety lore around you'll get sick if you eat oysters that are not from a month that ends in E-R, whatever it is. Is that garbage or is that real?

Rowan Jacobsen:

So the classic rule for eating oysters is that you're only supposed to do it in months that have an R in them, which means September through April, like May, June, July, August, don't eat the oysters. And that was always for a couple of different reasons. One, it was to let the oysters reproduce. Like I said, that's when they want to reproduce, so let them do their thing before you eat them so that they'll make more. But the other reason was for food safety because everything is more active when the water's warmer in summer, the food that the oysters want to eat, but also all these other types of bacteria that can cause illness.

This really mattered back in the days before refrigeration, when people would haul oysters out of the water, put them in wooden barrels, and leave them like baking on a hot dock for you don't want to know how long, and especially when you got farther down south into the Gulf of Mexico, New Orleans when it was really hot and steamy and you probably had some real issues with foodborne illness, and there's

bacteria in the Gulf that can kill you that an oyster will pick up, and it's actually been moving up the East Coast. Somebody just died somewhere, I forget.

Jerusha Klemperer:

Vibrio, Connecticut

Rowan Jacobsen:

Yeah, up in Connecticut, that's right. So it's still an issue. It's much less so than it used to be because oysters by law have to be kept frigging cold from the time they come out of the water. You have to chill them down to 40 degrees fast and they have to stay in that 40-degree cold chain all the way until they're served, and that really reduces the risk of anything bad happening. So it's not a big risk anymore, especially if you're in a reputable place. I don't know what's happening in the back of a lot of sketchy oyster bars in the world, so it's definitely still a risk. My recommendations people are always go somewhere where you trust that they're on top of their game back in the walk-ins, which a lot of restaurants are not, and you're definitely rolling the dice more in summer. In winter, you're totally safe pretty much anywhere. So summer it's a higher risk. It's still not a very big risk, but it does seem to be getting bigger.

Jerusha Klemperer:

For the consumer, either buying at a restaurant or a bar or increasingly there are some great options for buying oysters online from reputable companies.

Rowan Jacobsen:

One of the things I always tell people about oysters is you can get them at a restaurant and that's fun, but they're quite expensive at a restaurant and you can order them in a home really easily. They ship well, and as long as you know how to shuck an oyster, then you can save yourself a whole lot of money by just sending them right to your house and then the party's at your house. So it's a great way to make a splash. So I highly recommend online ordering of oysters because they have to be shipped next day to keep them cold. You'll save some money if you order from someone who's relatively close to you. There are very good oyster farms who are very skilled at sending oysters across the country, so they'll get them to you, but it's going to cost a lot more.

But if you want to explore what the other coastal oysters or like, you can do that too, because they are quite different. I have a website called Oyster Guide, and I'd list some producers that I know are really on top of their game then that I trust will get the oysters there in really good shape. If you do order your own oysters so that you have to shuck them, it's actually a much more complete experience than going to a restaurant and having somebody hand them to you. It's really true with all foods, but with oysters, I mean there's sort of like a sacrificial, ceremonial aspect to it. It's like the smallest animal sacrifice in the world, so you feel like the stakes are always raised a little bit with oysters. If you are actually doing the shucking, then you're really getting the complete experience, and this is going to sound like a funny thing from a food writer, but sometimes I think flavor is overrated or over-focused on with food.

There's usually a whole gestalt to the enjoyment of food. There's the look of it, there's the environment, there's all this other stuff that's going around it. That's all a core part of the experience that often gets dropped when you're just describing it with words or something. I always tell people appreciate the shells, like those shells are so amazing and they're such a key part of the animal, and they have such a good smell to them. The shells often have the best part of the smell, so look at the shell, admire the shell, think about how the oyster made it, and then you shuck the oyster, you eat the oyster, and then you can put the shell back down. I always put my shells back down, upside down on the plate so that by the time you've eaten your dozen oysters, you have these 12 awesome shells left on the plate, and it kind of completes the

experience, especially since the oysters are basically creating rock. So that connects you to that environment, that rocky environment that they came out of all the more.

Jerusha Klemperer:

Part of the mystery of oysters includes the question of whether or not they can feel pain, and as a result, whether or not a vegan or vegetarian could feel comfortable eating one.

Rowan Jacobsen:

I have known vegans who will make an exception for oysters, and it's an interesting thing to think about. They're definitely animals, but if the point of being a vegan is not causing pain and suffering, then it seems like you're in the clear with oysters because there's pretty much... Like most scientists say there's no pain and suffering going on with an oyster. In terms of, I sort of think of the complexity of the organism with these issues, and there's no question that some of the plants we eat have a whole lot more going on than an oyster does. They can kind of do more. So I feel like there's definitely plants out there that have more mojo than an oyster, so I would hesitate more to eliminate the plant than I would the oyster rather than making it just a very technical plant or animal thing. I certainly don't have the answer to that one, but it is an interesting topic that's coming up for sure.

Jerusha Klemperer:

Oysters don't have a central nervous system. They don't have a brain, so it's likely they can't feel pain in the way that sentient creatures do. So for some vegans, that's enough to clear them for eating, but for others, unknowns remain about what exactly they can and cannot experience, and so they err on the side of caution or compassion.

Rowan Jacobsen:

I've had so many oysters for so many years now that I forget that it's a weird experience for new people. I sometimes have to remind myself or I'll give an oyster to a newbie and then I'll remember like, oh, yeah, right. The first one's kind of weird. Obviously, oysters are kind of soft and they're kind of slimy. We're talking eating raw oysters now, which is really the core experience with oysters. Cooked oysters are fine, but they're a lot more like other foods, but a raw oyster. There's nothing else in our diet that's quite like that.

Marlon McLaughlin:

More questions? You guys want to go shuck some oysters?

Speaker 8:

Sure.

Marlon McLaughlin:

Yeah, let's go for it. If anybody needs restroom or wants to grab a beverage from the bar on the way, now's a good time.

Jerusha Klemperer:

What You're Eating is produced by Nathan Dalton and foodprint.org, which is a project of the GRACE Communications Foundation. Special thanks to Chris Gobler, Rowan Jacobsen and Terry Sawyer, and Marlon McLaughlin of Hog Island Oyster Company. You can find us at Www.foodprint.org where we have this podcast as well as articles, reports, a food label guide, and more.