

# The Blue Revolution\_ Aquaculture in Florida and Beyond

📅 Mon, Mar 25, 2024 12:38PM ⌚ 32:51

## SUMMARY KEYWORDS

aquaculture, farming, noaa, shellfish, systems, siting, understand, ocean, coastal waters, environment, thinking, products, offshore, seafood, science, ken, florida, land, coastal ocean, water

## SPEAKERS

Ken Riley, Phillip Stokes, Ricky Telg

---



Ricky Telg 00:04

This is Science by the Slice, a podcast from the University of Florida's Institute of Food and Agricultural Sciences Center for Public Issues Education. In this podcast, experts discuss the science of issues affecting our daily lives, reveal the motivations behind the decisions people make, and ultimately provide insight to solutions for our lives.



Phillip Stokes 00:35

Welcome to Science by the Slice, I'm Phillip Stokes, Education Coordinator at the PIE Center. Not long ago, my seven-year-old daughter posed a question to me. She asked, "How many people are there in the world?" Like many would, I went to my phone for the answer, which is approximately 8 billion people. And this number is growing fairly rapidly. By 2050, the global population is expected to be closing in on 10 billion people. And maybe it's a good thing that my daughter is asking this question, because it will be her generation and subsequent ones that will continue to address the ever pressing concern of how the Earth's resources will support the population. And much of the scientific literature around this topic is about food resources. Can the world produce enough food to feed this growing population while accounting for food preferences among different nations, nutritional requirements, affordability, and environmental sustainability. And with a growing demand for food, aquaculture is a growing industry in the US and many other parts of the world to meet these needs. Aquaculture, the topic of this episode, is the breeding, raising, and harvesting of fish, shellfish and aquatic plants. Basically, it's farming in water. Recently at the PIE Center, in collaboration with the Florida Department of Agriculture and Consumer Services Division of Aquaculture and the National Oceanic and Atmospheric Administration, or NOAA, National Centers for Coastal Ocean Science, we curated a toolkit to educate diverse audiences about aquaculture operations in Florida. This toolkit underscores the potential benefits of responsible offshore practices, offering valuable insights to stakeholders. You can access the toolkit through the link provided in the show notes. So today, we're joined by one of the experts from the project, Dr. Ken Riley, scientist and Science Advisor for NOAA Fisheries Office of Aquaculture. Ken and I discuss the

aquaculture industry and delve into the expansion of offshore aquaculture, the technology driving production decisions, and the measures taken to address environmental concerns. Keep listening to gain a deeper understanding of aquaculture's role in meeting global food demands. Well, Dr. Ken Riley, thank you so much for being a guest on the PIE Center's podcast, Science by the Slice. It's so great to have you here. And first, I just wanted to give you a chance to introduce yourself. Tell us a little bit about yourself, your background, and the organization that you represent.

K

Ken Riley 03:21

Hi, good afternoon. I'm so excited to be here. I'm a scientist and Science Advisor for NOAA Fisheries Office of Aquaculture. Our home office is in Silver Spring, Maryland and it's right there outside of Washington D.C. And I lead a team of scientists and science coordinators that work across the agency to help support strategic planning for all the science that we do to advance aquaculture development. Every day, we're working on the front lines to advance industry development to help produce science advice, products, and information that can be used to help in regulation and management of aquaculture. I've been with NOAA for a little over 10 years, and I have a rather unconventional path to my current position at NOAA. In that I've worked in industry, I worked in academia, and I've worked with nonprofit organizations. I'm classically trained in aquaculture and fisheries, meaning that I've worked in a variety of different university settings. Many of those were land grant or sea grant based institutions. I have a doctorate in interdisciplinary science and fisheries, a master's in aquaculture and fisheries, and a bachelor's in marine biology and science education. And I've worked around the globe in aquaculture development on food and restoration topics. And I'll just say that I spent a large part of my career actually working along the coast of Florida, with so many different species including clams and oysters, shrimp, freshwater and marine finfish.

P

Phillip Stokes 04:51

That's great. Yeah. And, you know, Ken, I think you've worked a lot in the Gulf of Mexico, right and then up and down the Atlantic coast. So you have a good variety of kind of the different waters and the different types of I don't know seafood and aquaculture that, that exists out there. I will say this. So when I think about seafood, you know, something comes to mind for me. And when I think about aquaculture, something else comes to mind. Right. And so they're related, of course, but there is a little bit of a difference there. If you could just kind of provide our listeners a little bit of an overview of what aquaculture is. So we know we have a baseline of what we're talking about.

K

Ken Riley 05:40

So aquaculture is generally the culture of aquatic organisms, meaning, we think about the way that we can farm things and water. It generally includes breeding, rearing, and harvesting of fish, shellfish, algae, and many, many different types of organisms. And it may include freshwater and saltwater. Usually, it's for food. Sometimes we're doing things to restore populations, or stocks of shellfish or, or finfish, or maybe even like corals. In many places, we're now thinking about aquaculture for the other products that it can be derived, such as pharmaceuticals, and other industry or products that can come from some of those culture

products. And then lastly, in Florida specific, particularly, there's a big industry around ornamental aquaculture, so growing plants and animals for aquaria. And for just pure enjoyment.

P

Phillip Stokes 06:36

What's involved in setting up aquaculture in some of these different areas?

K

Ken Riley 06:40

Sure, why don't I start at home with a place like Cedar Key Florida, and talk about how clam farming in the 90s really found its home and Cedar Key. And the fact that those clams are farmed on land, and bred in hatcheries. And then they're stocked out into this healthy coastal waters where they're then allowed to culture and grow for a period of time. And then after about a year, they're then harvested and brought to market. Well, that's one example of like shellfish farming. Increasingly now, where that story started in the 90s, with clam farming, we're now doing oysters all around the coast of Florida. And then as we walk around the country, what we see is that same story unfolding in coastal communities around the country. So when people think about clam farms, they are thinking about clams and oysters and other shellfish species in this coastal waters. But then increasingly, we're thinking about those same waters being home for new seaweed farms and algae farms. And we're seeing that, you know, emerging out of Europe and Asia and then coming here to the United States and kind of taking hold. And then we move on land, we're thinking about coastal pond systems that can be used for raising species like red drum or striped bass, or other species, those are still marine, and at NOAA we do think a lot about marine or saltwater species. And then there's this whole new era that's taken hold all over the globe, attracting hundreds and hundreds of millions of dollars or billions of dollars. And that's land based recirculating aquaculture systems, or systems where we have close containment. We literally are recycling and filtering all the water, and reusing all that water in tank-based systems to raise finfish and shrimp and other species.

P

Phillip Stokes 08:30

So clearly, there's a reason why this is, right now, a thriving industry and why, you know, it has moved to a land based system. So what are some of the reasons behind that? And what does aquaculture really offer to, to humans and our food source?

K

Ken Riley 08:49

Sure. So as we explore land based systems, one of the things that's apparent is that real estate can be rather expensive, and can be a constraining factor. So when we build land based systems, it's really about understanding what are all the inputs that are required, and in that, sometimes it's the cost of land. It's the cost of energy. It's the application and availability of freshwater or the use of water, and the discharge of that water. That can be some constraints. So I don't want to lead folks to think that land-based systems are the only great opportunity out there and the fact that it is part of the reason why we've been exploring offshore aquaculture in the Gulf of Mexico and some other select places around the nation. But land-based systems are

a central tenant or a central part to the offshore story too, because we have to have those land-based systems for breeding programs, for systems to reproduce, and produce the fingerlings or the seed stock that would be used to stock you know, grow out facilities, whether they're in land-based systems and pond-based systems or potentially in the next frontier are the new, that new space that we're exploring out in the open ocean.

P

Phillip Stokes 10:05

You know, I think when when I go to my local seafood market, I don't know if, if people typically do this, but I usually like to ask, you know, hey, where's this? Where's this seafood coming from? And a lot of times, the answer is, oh, hey, this salmon, it was farmed down in Chile, it was farmed in, you know, parts of Scotland or, you know, the shrimp, same kind of thing. So is this, I mean, I think just to kind of round out the discussion of aquaculture, is this what what we're talking about as well, in this whole conversation?

K

Ken Riley 10:42

It is some of what we're talking about in the fact that you're, you're leading into another particular topic of how much seafood we import. And you're quickly recognizing, in all our seafood markets, there's a portion of the product that we're seeing that is imported, in some places, it's really a lot of that, that market space in terms of the imported product. And in others, we're still celebrating kind of like this local food system. But we get a lot of imported seafood from South America, from Norway, from Europe and from Asia as well. And it encompasses different spaces. Now, we are, you know, when we are thinking about, you know, what our domestic aquaculture product looks like, we're probably talking about, you know, usually, we're talking about the culture of local species, native species, things that are already part of our diet and are complementary to the commercial fishing that occurs in our coastal waters.

P

Phillip Stokes 11:41

Yeah, and I think that is kind of an interesting point, talking about some of the seafood here domestically, we've been consuming for years, right? Because it goes back to the indigenous groups that have been here that have relied on the ocean, that have relied on different, the Guld, and different systems for their food source, a very nutritious food source, right. And so there, there are a lot of cultural implications. And there are some economic implications, right, if we can do some of this, and really, you know, focus on the local food system, I would think there's a benefit from that, right. And so is aquaculture an example of a way that we can preserve some of our heritage while also offering something to the economy?

K

Ken Riley 12:26

It certainly is. And it's part of how I got into the study of aquaculture. And it's part of my my history as well. But let me just share in the fact that people for generations, and as you said, for 1000s of years, have always celebrated being tied to the sea. We have deep cultural implications for coastal communities at those linkages with coastal ocean, and our estuaries

and, and the ocean itself. And so what I want to share is that aquaculture is part of our history. And it's part of our story. And it spans back 1000s of years in the fact that we've long been gardening clams. And in places like Hawaii, we have fish ponds, systems that are early aquaculture practices, and they're in, in some cases, in some of the shellfish farming communities, they're not much different today. And so we do have that capability to understand that we have this long history, that aquaculture has always been there alongside of commercial fishing. It's been a part of our story of gathering seafood and then bringing that to the table or to the market. But aquaculture also offers many technological advances today, that we can use modern technologies to produce more seafood. And we can do that in a way that is also sustainable.

P

Phillip Stokes 13:50

Yeah. And you mentioned before, exploring the possibilities of offshore aquaculture, right, that's one of the newer frontiers, right? I guess I would say, you know, what are some of those new technologies and applications that NOAA and other organizations are really looking to explore to enhance our seafood production and for food and for, you know, other other services as well?

K

Ken Riley 14:15

Sure. So the first thing that we need to think about is that real estate piece. And so whether it's on land, or whether it's in the coastal ocean, I'm developing tools to essentially evaluate what is the best available location or site is really important. It's important on land because it's about pickings, you know, access and resources and an infrastructure that's going to be supported on that land. It's equally or maybe even more important in the coastal ocean, because we're doing this in a three dimensional environment, where you know, the ocean has depth and it has environmental, variance or change over time and understanding, you know, what are the environmental conditions of our coastal oceans that would support aquaculture growth. And so fully understanding and having essentially a good sense of data and information systems on how our ocean behaves, what is the climate of the ocean, understanding where to situate and site farms is really, really important. And as NOAA, as a leading agency on ocean observation, weather observation, it kind of puts us in the front seat there with spatial planning and siting analysis. And then from there, logically goes to engineering and design of systems that can withstand those ocean systems and and the storm systems and hurricanes that comes through there. And we're making strategic investment in engineering and design and help supporting the community of engineers that are working on those kinds of systems. And then thinking through the species, and identifying what are the candidate species to farm in those environments, whether it's finfish, shellfish, or seaweeds. And then going all the way through how do you harvest and bring those products to market? How do you bring them to market alongside wild caught products? And then how do you make sure that you achieve market values and prices that have a significant return on investment? So that business plan is sustainable.

P

Phillip Stokes 16:28

You know, it's really interesting hearing you share this, Ken, because it really does parallel what you think about with traditional land-based agriculture, right? When you're you're picking plots

of land, you're looking at the the soil and the climate of that particular area. And what can be grown there, you know, what are the different candidates that can be grown in that area? I mean, and I know aquaculture is essentially, it's farming in water, but I mean, there's a lot of transferable and relatable components there. Would you say that's true?

K

Ken Riley 17:04

I completely agree. You know, as I shared, prior to NOAA, I did a lot of teaching. And so one of my favorite classes to teach was to take students out of the classroom, and let's go walk along the salt marsh, and look at like, the different environments within a salt marsh environment that have different energy regimes. We pick up handfuls of dirt and talk about the consistency of the soils, and are those soils the right soils for farming oysters, or for farming clams. We'd look at the wave climate and the energy across that site. We'd do that in the coastal environment, we would go out in the ocean and let students have their first experiences sometimes on boats and vessels and understand, you know, what is it like to ride on a boat to go to work every day for five miles. And that you might have to do that, you know, year around in the hot summer. And you might have to think about transporting and keeping ice on the boat to keep your product, you know, safe and quality product to get it to market. Or you might have to think about in light of like, working under those harsh conditions sometimes to be able to, to work on the farm. And it is not, while technology can help us with some efficiencies, it's still farming. And we should always think of aquaculture as a sector or part of the agricultural industry.

P

Phillip Stokes 18:24

So when we're looking at the big picture, and we're thinking about selecting the different areas for for aquaculture production, right, and all of those different variables that we have to consider, there are impacts and maybe I would think sometimes impacts that we have to mitigate for, but then also maybe some like positive impacts, right? Like, you know, shellfish might be there to kind of filter out some of the the algae and clean up some of the water. And in some areas, maybe the fish are providing some of those waste products. And so I would think there are, you know, different things to consider, you know, kind of the byproducts and the products of doing farming in an aquatic environment like that.

K

Ken Riley 19:17

Sure. And I'd say that as we think about agriculture, agriculture has impacts, right? For sure. And it's it's good to put in the context of the fact that we are growing food, food production often has and sometimes has those negative impacts, but we can also have those beneficial impacts. And the easiest case to make, the story is with like, shellfish farming in the fact that you're able to find waters that are healthy and high quality and have sufficient water quality to farm our food. And then that means that we're farming that food in a way that we're also going to be able to recreate and continue to fish and use that water body. In many places, we're seeing eutrophication or areas that have a lot of nutrients that are running off the land from point source, nonpoint source pollution. And in those cases, those shellfish farms can help improve the water quality, they can improve the water quality to the to the fact that perhaps that even things like sea grasses and things can then recover and become to flourish and those

kinds of systems. And then sometimes, aquaculture and even shellfish farming can have impacts on the environment. And it, and sometimes those impacts can be characterized as short term impacts where the environment is incredibly resilient, such as when we go in and we harvest shellfish, sometimes I start harvest activities do have temporary impacts, but then the environment itself is able to quickly recover. And again, for that whole water body, you're able to maintain those great farming parameters and essentially the shellfish farmers are becoming sentinels for the environment, they're protecting the water quality, they want to make sure that they're always able to farm and harvest their oysters out of that water. I used the example with shellfish. But we should also talk about the fact that if we are talking about offshore and fish farms and those types of operations that we too have to consider about those impacts. And as a nation, we have some of the strictest regulations around the globe in terms of how we protect our environment. At NOAA, we have mandates to protect fish habitat to protect water quality, to protect sensitive and protected resources like whales and dolphins and sea turtles. And so we take all those considerations in siting farms offshore, we take those considerations into engineering those farms and making sure those farms are compatible with the environments where they're located. And then in considering the discharge from those farms, we also take into consideration and we model and do scenario planning and predict how the environment is going to respond to those nutrients and in those additions into the environment. And many cases, we're looking for the optimal environment where essentially the environment has incredible resilience and ability to recover and be able to absorb those nutrients in the system.

P

Phillip Stokes 22:28

Yeah, you know, it, it really does seem like, and I know you presented previously in a webinar that we hosted as well. And thinking back to that as well, all of the decisions that are being made, you know, at least in the U.S. domestically, when we're thinking about aquaculture, there's a lot that goes into them. You know, there's a lot of science and a lot of preparation that goes into that that most people aren't going to see, you know, unless you're kind of behind the scenes really working on that. And I think that is really important to share, you know, the science of, like you said, modeling out, you know, what are some of those best locations and really accounting for all of that. So Ken, if you could just walk me through maybe what that process could look like from identifying a location and thinking about some of the kind of implications that would take place with an aquaculture production.

K

Ken Riley 23:27

Sure. So let's talk about, just really quickly, the different forms of aquaculture. Sure. So inherently land-based systems are going to be those decisions, deciding is going to be you know, largely local decisions, local municipalities and local ordinances to govern business development that's in a county or coastal county in a state around the country. And in developing those farming operations, those folks may work with folks at a land grant or sea grant institution, and oftentimes, that's extension. And so they are there to extension personnel or sales, essentially there with boots on the ground such that they can help people understand how to build an aquaculture operation on land. They do that very similarly, in coastal waters. So these are like nearshore coastal waters, estuaries bays, where we might build a shellfish farm for clams or oysters, particularly in the Gulf Coast region. Maybe it was seaweed too, because seaweed is an important growing sector of aquaculture, and those land grant, and so your institutions have academic researchers, and they have folks that work in extension and are

constantly there and available to help folks with some of those decisions about siting and planning for aquaculture in these state waters, and they also will work along other state offices to help them understand the rules and regulations for aquaculture development, as we move further offshore with the potential for offshore farming, that's beyond state borders and in federal waters and in the open waters of the ocean, such as the Gulf of Mexico. And in Florida, that's about nine miles off the coast of Florida. The conversation changes a little bit in the fact that those proponents that want to develop those businesses will also rely on the sea grant, land grant institutional support. But they'll turn and they'll have to have support from federal agencies. Because those permits for that may be required will be from the Army Corps of Engineers and the Environmental Protection Agency. And that's a little bit of a more complex process. And at NOAA, we have regional aquaculture coordinators that work to help folks navigate that situation to understand what are the rules, and regulations and policies that are there to help with siting those farms and permitting those farms. And then in NOAA we have scientists and science programs that can help provide science advice or science information that goes everywhere else that applies across the board, from spatial planning, and siting to identify that real estate or those ocean neighborhoods where we're going to build the farms, all the way through understanding what is the engineering? How do we approach aquatic animal health? How do we work on the market and harvest and market side of things. And then lastly, across the entire spectrum of NOAA, and the universities and other nonprofit organizations, we all work in the space of education and planning for what the workforce development might look like. And that's really, really important to understand who's going to be the next generation of folks to go to work on those farms.

P

Phillip Stokes 26:54

Yeah, and I mean, that's a great explanation. And I would think that with what is required in this industry, you know, business owners and operators would need all of that support. I mean, there's probably a good amount of risk and certain occasions. And so, you know, deciding to go into business, into this type of fisheries operation with aquaculture. Yeah, it would be pretty important to get that support from federal and state and local governments and regulators.

K

Ken Riley 27:26

I completely agree. The other thing I'd like to add is, at NOAA, and a particularly proud reason that I work for NOAA, is that farmers across the country turn to know every day for our weather products. Most people know, when it comes to forecasting weather with satellite information or other ocean and environmental sensors from across the country and around the globe. NOAA puts out daily weather forecasts. And so we kind of work in that same space that our row crops and our other livestock farms are working and looking at those weather forecasts, we're thinking about too, how we at NOAA can not only help on the regulatory and the permian side, but how can we provide that ocean intelligence, that weather, that information, that predictable forecasts to help people understand what it's like to work in our coastal waters, as well as in those that are further offshore.

P

Phillip Stokes 28:20

You know, Ken I, I do want to give you a chance to kind of wrap up and say anything else that might be on your mind. But you know, one thing I was thinking about, as we were talking is sort

of the you mentioned recreation. And in even like, you didn't use this term, but even I would say ecotourism. Right. And so I can remember some years back, I visited the area of Port St. Joe, it's not too far from Apalachicola, and I remember being out in the bay, and just being on a paddleboard, and going over, this was before Hurricane Michael, by the way, and going over the bay, and it was very shallow. And in that area, there was a lot of clamming, you could do some clamming in that area, just recreationally. But the water was so crystal clear. It was like you were, it was like you're at a touch tank at an aquarium. It was, you could see, you know, it's maybe only about four or five feet deep at times. But you could see the bottom you could see all of the different organisms. And it was just such an incredible ecosystem down there. And, you know, I just think it's really great that in this industry, we can we can live with, work with, and recreate in this environment and in this space. So I don't know if there's there's not really a question there. But I do want to open it up. I think there's just a lot of social components. We get something from it, but also it's just a great place to be as well.

K

Ken Riley 29:51

I'll just say that. Aquaculture tourism is a growing part and a fast growing part of ecotourism and food tourism as a whole. In my home state in North Carolina, we have an oyster trail, and the concept of going on a vacation and you're integrating stops on your vacation with your family to go out to visit an oyster farm or to go out and see an oyster restoration site, or to go eat oysters, you know, they've just been harvested at the dockside. Those are all important part of growing part of tourism. And it's also an important part of how we communicate about aquaculture. And it's an inherently organic way that we can teach people how to be connected with their food, how to truly understand aquaculture, and it's coming to every community around America where we have aquaculture. And in Florida, that's just about every community in Florida because almost every county in Florida has some kind of aquaculture happening in their backyard.

P

Phillip Stokes 30:56

Yeah, and that's wonderful. And I do think it's a great way to connect people to their food and create that appreciation and really build that knowledge. Is there anything else Ken that you wanted to share? Before we close out today?

K

Ken Riley 31:09

I just say that we're, we're always listening. And so having podcasts and platforms like this. Hearing, you know, our stakeholders and our communities voice their concerns, developing communication products to help people fully realize the opportunity that we have here on understanding, you know, what is our sustainable seafood solution for the future, what that might look like, and a seafood solution that incorporates wild caught fish and shellfish and products alongside of foreign products. It's an important part of how we get to food security in the country. So I appreciate you having us here today and look forward to continuing to work with you.

P

Phillin Stokes 31:52



Trump Scores 51%

Well, Dr. Ken Riley, it was a pleasure. And thank you for being on the PIE Center's podcast Science by the Slice and thanks so much.



Ricky Telg 32:01

Science by the slice is produced by the UF/IFAS. Center for Public Issues Education in Agriculture and Natural Resources. Thanks for listening to today's episode. Subscribe to Science by the Slice on your favorite podcast app and give us a rating or review as well. Have a question or comment? Send us an email to [piecenter@ifas.ufl.edu](mailto:piecenter@ifas.ufl.edu) That's piecenter all one word at IFAS I-F-A-S dot U-F-L dot E-D-U. We'd love to hear from you. If you enjoyed today's episode, consider sharing with a friend or colleague. Until next time, thanks for listening to Science by the Slice.