

Transcript for Kelp Farming: Promises, Pitfalls, and What We...

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SPEAKERS

Rebecca Martone, Vanessa Minke-Martin, Nichole Price, Jennifer Clark, Dune Lankard

V Vanessa Minke-Martin 01:35

Hi everyone, and welcome to Kelp Farming: Promises, Pitfalls, and What We Still Don't Know. My name is Vanessa Minke-Martin and I'm an editor at Hakai Magazine, based in Victoria, British Columbia. Today I'm speaking to you from the territories of the Songhees, Esquimalt, and WSANEC nations. And given the topic of this event, I just want to take a minute to recognize that Indigenous peoples have long histories of harvesting and cultivating seaweeds all along the coast of what's now known as North America. Kelp aquaculture is by no means a new concept. At Hakai Magazine, we exclusively cover stories about the world's oceans and coastlines. And in mid March, we published "Banking on the Seaweed Rush" a story by Nicola Jones, which has now become our third most read story of all time. Kelp farming is definitely having a moment, we decided to team up with our colleagues at the Ocean Decade Collaborative Center for the Northeast Pacific to delve into the state of the knowledge about how kelp farming affects ecosystems and communities.

V Vanessa Minke-Martin 02:40

Now, before we start the panel, I want to get a sense of who's here today. And so we've got two quick polls for you. The first question here is "What best describes your identity or role as it relates to kelp farming?" And we've got a few options here for you to choose from. And the second question is, "What is the most pressing interest for you, your nation, or your organization when it comes to kelp aquaculture?" So I'll just give all of you a minute to answer those.

V Vanessa Minke-Martin 03:20

And in the meantime, I'm going to go over a few quick housekeeping items. So today, we're going to start with a half hour panel, followed by 15 minutes for audience questions. Please put your questions in the chat, which you can access via the button at the bottom of the Zoom

window. And we'd been hoping to invite audience members to speak during the Q&A today. But with so many of you here, it's not feasible. So my colleague Serena and I are going to be monitoring the chat and pulling out your questions for our host to pose to the panelists. And lastly, if you're a student or you self identify as being early in your ocean career, regardless of age, industry or background, please stick around after the Q&A. The panelists have kindly agreed to stay for a separate 30 minute discussion with early career attendees. So that's going to happen in a separate Zoom meeting. And we'll drop the URL for that event in the chat at the very end. So just going back to the polls here, it's great to see that we have a lot of academics and researchers in the audience, also interested members of the public. And when it comes to the most pressing interests for you. There's a lot of people here who are interested in the effects on marine species and ecosystems and the benefits or potential benefits for carbon sequestration. So we've got a lot of expertise in the room today. And I want to encourage everyone to use the chat to share resources and really build on the discussion that's happening during the panel.

V Vanessa Minke-Martin 04:51

Finally, I'd like to introduce our moderator, Dr. Rebecca Martone. Rebecca is the executive director of the Tula Foundation's Ocean Decade Collaborative Center for the Northeast Pacific, and has been working to inform management of nearshore marine ecosystems, including kelp forests, for 20 years. Take it away, Rebecca.

R Rebecca Martone 05:12

Thank you so much, Vanessa. I'm so grateful and excited to be here with you all today. As Vanessa said, that, you the Ocean Decade Collaborative Center for the Northeast Pacific is the division of the Tula Foundation were an endorsed contribution to the United Nations decade of ocean science for sustainable development. Our aim is to support and facilitate collaborative co-designed and co-produced knowledge for solutions to the ocean challenges in the Northeast Pacific region, which spans from Alaska down to Baja, California and out to Hawaii. The dialogue we're hosting today supports the ocean decade challenges around blue foods and food security, as well as ocean climate solutions, ecosystem restoration and recovery. On behalf of the team here at the Decade Collaborative Center, I want to acknowledge the traditional ancestral and unseeded territories of all of the indigenous peoples that have called the Northeast Pacific Region home since time immemorial, from the coast to the deep water, and across boundaries and borders. The clarity center deeply values equity, justice and reconciliation with indigenous peoples and we strive for inclusion of diverse voices in the work we support. So with that, I'd like to welcome the following speakers to our expert panel. We're so thrilled to have you all here.

R Rebecca Martone 06:30

First of all, welcome Dr. Jennifer. Excuse me, Dr. Jennifer Clark. Jennifer is a psychologist and Chief Science Officer at Cascadia seaweed, which is the largest kelp cultivator in Canada. There she oversees research and development on seaweed cultivation and ecosystem services, as well as the production of kelp and seven ocean farms for agricultural purposes. So welcome, Jen. Next, I'd like to welcome Dune Lankard. Dune is an Eyak Athabaskan fisher, an activist, and

founding president of Native Conservancy, a nonprofit organization that empowers Alaska Native peoples to preserve endangered habitats, and cultural lifeways on their ancestral homelands through initiatives such as kelp farming. Welcome. And finally, I'd like to invite Dr. Nichole Price to join us. Welcome. Nichole is a marine ecologist at Bigelow Laboratory for Ocean Sciences in Maine in the United States, where she studies the ecophysiology of seaweeds, how they cycle carbon and nutrients in the ocean, and their potential role in mitigating coastal ocean acidification and climate change. So welcome, everyone. We're thrilled to have you. We're going to start the dialogue today with a few questions.

R

Rebecca Martone 07:49

So first, I'd like to highlight some of the key aspects of kelp cultivation. As many of you all know, that are on in the audience, there are three different groups of seaweed. There are red seaweeds, green seaweeds, and brown seaweeds that are named for the color of the pigments they use to photosynthesize. In some regions of the world primarily Asia there is a long history of seaweed farming, mostly red algae that are used for things like food as well as additives in various products such as cosmetics and ice cream, I think sunscreen other things. And now markets are beginning to expand and seaweed production is taking off around the globe, including Europe, Africa and North America, including here in our region in the Northeast Pacific. So in this conversation today, we're really focusing on kelps, which are a large group of group of large brown seaweeds, and Cascadia seaweed as the largest kelp cultivator in Canada is doing a lot of this work. So Jen, can you start us off by describing a typical Cascadia kelp operation?

J

Jennifer Clark 08:49

Yeah, sure. So thank you so much for having me here. Today I'm hailing from Sydney [British Columbia] and... in the traditional unseeded territories of the WSANEC people. So Cascadia seaweed has eight farms around Vancouver Island and around 24 hectares in total, with some of our biggest farms being about six hectares and our smallest farms being about one to two hectares. We primarily we make three different we make we cultivate three different types of seaweeds, *Alaria marginata*, *Saccharina latissima*, and *Macrocystis pyrifera*. And we we estimate anywhere between 100 to 200 tons of weight that this will provide. We are uses primarily for our seaweeds is in the agricultural sector. So we are making products for cow feed. So a feed supplement and also biostimulants. And a biostimulants is a little bit different to fertilizers in which they actually nourish the soil through providing a microbial [inaudible] of the microbial network in the soil. Cultivation can happens in a nursery and most farms will have a nursery or at least know someone who is growing seaweed in a nursery. It takes about six weeks to produce spools. And here's just an example of a very small spool of what our seed actually grows on. So the seed will attach on to these spools. They spend about six weeks in the nursery until they're big enough. And then we take them to the ocean farms. And we have production lines, just an example, which we put into the spools and unwrap the actual seed line around the production line. So that's typically how a seed seeded farms get seated from the nursery, all the way out to the ocean, they spend about four to six months depending where you are in the water to where they will grow until April in May, to big healthy looking seaweeds in which we harvest. So we are we're actually now in the middle of harvesting now. So it's very exciting time.

R

Rebecca Martone 11:10

Well, great, We're so thrilled that you're here joining us given your busy schedule. Maybe turning to Dune, Dune, Alaska Native communities have used kelp for food and cultural purposes that stretch over millennia. You've had the traditional relationships, but what roles do or could kelp farming play in local food security and cultural revitalization today, and again, if like, if you have other thoughts about your own kelp farms that you want to add to what Jen has just mentioned, to please, please include that as well.

D

Dune Lankard 11:40

Sure. Well, I'm excited to be here with you all today. I've been traveling quite busy here, which, you know, I thought going from commercial fishing to kelp farming, that things would slow down because I don't have to chase that food source around in the ocean. And I don't have to feed it or water it or give it fertilizer. And somehow I'd get paid to watch kelp grow. But that hasn't been the case at all. It's been go, go, go, nonstop. I've had 70 hour weeks for three and a half years now. But I enjoy it. In 2017, our Copper River fisheries kind of plummeted, you know, usually we'd harvest a million and a half to 2 million sockeyes annually from the Copper River Delta. And in 2017, we only had a harvest of 45,000. The following year 90,000 sockeye salmon. The following year, the ocean heated up to 76 degrees for three weeks down the 20 feet below the surface. And I sat down with my family and friends and said, "We're going to have to pivot and this is what climate change is like in going to be like." And so we have to figure out how to create blue/green jobs that are going to build economies that are based on restoration and regeneration. And that was tough to you know, leave something that I've been doing since I was five years old and reinvent myself as a kelp farmer. But, you know, I started reading about kelp and talking to a number of people. My sister Pamela found this article from the Cordova Times in 1908, where this reporter had seen these two Eyak gals get off of the the Bering River ship that had come in from the Bering River that's about 100 miles east of Cordova, where I live on the Gulf of Alaska. And he saw them skipping down the road and it looked like a brick of coal from the Bering River coal fields underneath their arm. And there was a big battle that was had happened and ensued for about 12 years over opening the Bering River coalfield to the Alaska Syndicate, so they can power their locomotives to go 150 miles up river and take the copper ore out of Kennecott and bring 'em down to Cordova, so he thought that these two native women had a brick of coal underneath their arm. And when he caught up to them, they actually had a brick of kelp and the Eyaks were famous for rendering the hooligan oil and using it for fires and cooking and butter and lights and we traded that 300 miles up the Copper River and 300 miles across the Copper River Delta. Well, this kelp cake: Imagine a layer of kelp, layer hooligan oil, layer of berries, more kelp, you know, just stack and then cold pressed, it was probably one of America's first energy bars. And so they would, when you would go on long trips, you would take one of those with you because it would keep you alive if you couldn't catch any other fish or any other animal. And so there's even stories of the early military expeditions to Alaska, in scientific expeditions where when the people didn't realize how to feed themselves, or were getting scurvy and dying, as their boats crashed and went dry on shore at low water, they saw this kelp, and they ate it, and they survived. And so it gave them the strength to rebound and figure out how to finish the report. So historically, indigenous peoples for 1000s of years have harvested and enjoyed kelp. There's a wonderful report that this Tlingit elder Dolly Garza wrote about Alaska kelp, which as soon as I read that, I knew that I was on the right track. And the last thing I'd like to say in this opening is that my first income from the sea was when I was 12 years old, and we're grappling using hooks

throwing it in the water and ripping the kelp out of the bottom and taking the herring row on kelp and selling it to the Japanese for \$4 a pound. So at 12 years old was my first \$4,000 made from camping out in Prince William Sound. And so now ironically, I find myself at 64 This summer, one of my last incomes from the sea will be from kelp.

R

Rebecca Martone 16:54

That's really so fascinating. Dune, thank you so much for sharing that. And I will definitely return to you and dig into that some more. But maybe just building on what you were talking about with the Copper River salmon and the threat of climate change, which is clearly something that is continuing to be an impact in our in our region and around the world. You know, we hear a lot about how seaweed aquaculture can aid in climate mitigation and carbon sequestration as a potential solution in addition to the benefits it supplies in terms of food, and stimulating local economies and potentially, you know, other markets. And we can talk some more about that. But I want to ask maybe Nichole, given your perspective and your expertise. What does research say about how help farms might counteract climate change? And then, you know, what are some of the biggest knowledge gaps that we're still trying to fill in that space?

N

Nichole Price 17:45

Yeah, thank you for the question. And thank you for inviting me today. So I'm, I'm zooming in from East Boothbay, Maine, which is located about an hour north of Portland. And that's where Bigelow Laboratory for Ocean Sciences is located on Wabanaki territory, so I'd like to recognize them as well. And we've been doing some research on kelp aquaculture at Bigelow, since about 2014. Now, and the research started in terms of climate mitigation, looking at the ability for farmed kelp to take up or absorb carbon dioxide and locally remediate or mitigate the effects of ocean acidification around the area where the farm is being grown, particularly with the hope that the possibility of CO culturing kelp, along with other shellfish species would relieve those shellfish species from the stress caused by ocean acidification in terms of calcifying and growing those shells and we've had some exciting results looking at farming kelp and mussels together. But pretty quickly, that turned into questions about what's happening to that CO₂ that the kelp is absorbing, where does it go? And what does that mean for global warming and potentially mitigating at a larger global scale the problem of climate change. And so not too long ago, we teamed up with a group called Oceans 2050, which is led by Carlos Duarte to do some research on a global scale, looking at 22 farms across the world, and taking sediment cores from beneath those farms to understand what the deposition rate of detritus or flaked off bits of seaweed might be to the sediments below the farms, with the hope, or the supposition, that once that seaweed falls down to the sediment becomes incorporated in the sediment it might be trapped there and thus permanently removed from the global carbon cycle or at least removed for long enough periods that you could count it as carbon sequestration. So we've been measuring up to take rates now, we're measuring deposition rates, and hope to get some evidence of longevity of or permanence of that deposition. Um, and I'll put the link in the chat after I'm done discussing that we have a preprint article that's available now online. And it's been submitted for a peer review process that shows that there is evidence of potential carbon deposition and sequestration then underneath certain kelp farms. But as is with anything, the certainty of whether or not that carbon is getting sequestered, definitely depends on lots of factors like the size and the age of the farm, how much kelp is being grown there, whether or not the sort of exposure or circulation patterns around that farm end up removing the fixed

CO2 in tissues and placing it elsewhere or storing it right there. So we are just really scratching the surface of being able to understand what sorts of carbon sequestration processes can happen just from a natural kelp farm growing cycle, then there are additional questions to be asked about whether or not one would want to sync the entire crop of seaweed purposefully when trying to target the deposition of the entire farm as a carbon sink process. I personally like to think a little bit more critically about the kelp product, and how it might have lots of value to the farmer in various markets that also can contribute to climate mitigation. For instance, as Jen mentioned earlier, feeding the seaweed to livestock, particularly ruminants, like cows for dairy or beef systems, and suppress the methane burps of the enteric methane that's generated from those animals just as a normal part of their digestion process. There's also ways to think about the kelp as a biofuel, or again, as Jen mentioned, the biostimulants can also act to sort of spur on the carbon sequestration potential of the soils in those ag systems as well. And then there's a lot of interesting research that starting looking at bio plastics made from kelps. And building materials made from capsules also have a longevity to them, that could contribute to carbon sequestration. So in the end, what is really needed a major gap is some very robust lifecycle assessments that compare the various pathways for the help product and how it's best used to help address climate change scenarios. So I'll leave it there for now. But I hope we get more questions.

R

Rebecca Martone 22:39

Yeah, thanks so much for that Nichol. really thorough, and I think it's important, and I appreciate that you, you know sharing that there's still a lot of work to do in that space. Both, you know, for the the idea of kelp as a sink, or how you actually create a circular economy that could still help with carbon sequestration. But again, there's these huge gaps. Maybe shifting a little bit into how kelp, you know, while it may have these questions around carbon sequestration, there's also you know, discussion about how kelp provides other ecosystem services, you know, such as absorbing excess nutrients from seawater, acting as fish habitat, but also they can have negative ecosystem effects. And so this idea that there are definitely impacts in everything that humans do, but understanding that, such as reducing phytoplankton growth by shading the water column, potentially, especially at these larger scales, potentially entangling whales in floating lines. You know, again, this idea that there going to be different types of impacts of different types of farms in different places, such as offshore nearshore. So, maybe turning to Jen in your, you know, arena, what do we know about how seaweed aquaculture affects the local ecosystem and what still remains to be resolved or identified. And again, I would also encourage both Dune and Nicole, please feel free also to jump in or you know, if you have a comment, give me a nod after Jennifer responds, thanks.

J

Jennifer Clark 24:06

Yeah. So you know, that kelp can do all these fantastic things, carbon capture and nutrient uptake as a part of their kind of basic metabolic activities. You know, they're photosynthesizing. They are uptaking and storing carbon, and then they're also up taking nutrients. And I know that's like the, you know, this, everybody wants kelp to be this, this silver bullet that's going to feed and feed the world and, you know, solve climate change, but there's definitely things that count agriculture can do. Part of that being as Nichole said, you know, being a part of the carbon cycle, we still don't know a lot. We still need to learn a little bit more about that, that permanent carbon sequestration. But nutrient uptake for sure, like, although like, we probably

can't uptake everything that we want to take out, out of the oceans, it can definitely help kind of reduce some of those, those nutrients perhaps in runoff or from point sources. You would need quite a lot of kelp to do that. And I don't think, I'm not sure if the kelp agriculture sector right now is in that position to produce that much kelp to reduce that nutrients. But you know, it does provide a temporary habitat for some of our migrating fish. We actually have a researcher Dr. Colin Bates, who is doing work as a part of the British Columbian Salmon Restoration Innovation Foundation and he is looking at kelp farms as being a potential place for refuge for migrating salmon and their forage, the forage fish that may inhabit it. And you know, he's put these kelp cams out and has taken measurements and scuba like surveys and we are seeing usage, use of the kelp farms for temporary habitat, whether that's for food or for shelter, just a place to kind of hide from predators. And you know, this is a temporary habitat for sure, at least while the kelp is in. But even with the kelp out some of those lines that are kept in this file, they they sometimes they provide just a little bit of shelter and food for for passing passing fish. So those those those data are really, really informative to really see whether kelp farms can provide at least a temporary shelter for for fisheries and other forage fish. The wild kelp diet biodiversity so we know that wild kelp stands provide, you know, a 3D structure they've got stipes and holdfasts that create this this ecosystem that potentially kelp farms can't mimic. But they can potentially provide that temporary relief from from going from forest to forest. And you know, the effects of the wild kelp genetics, we actually are very conservative on producing our seed for farms. So every year we take we take individuals from the farm, around 50 kilometers from around the farm, our parent material is sourced and we mix many individuals to create, you know 900, more than 900, genotypes that potentially can intermix with whatever is already there at the time. We do take all of our kelp out of the water before they become reproductive. But if they do become reproductive, they're kind of already mixing in with the genes that are already there. We are also collecting conservatively. So we only take the reproductive part of the of the seaweed, of the kelp. And in fact, last year, one of our divers was able to to get seed again from the same individual that was cut. So we know we are being conservative. And so then, of course with any kind of farm with any kind of, there are some risks and we are in north in the Pacific Northwest kind of navigating those risks at the same time. But I know from Cascadia, we are taking a very conservative approach to it. Things like light shading, our, our counts are in the water from October to April in the middle of winter. So a lot of our a lot of the seaweeds that are kind of already growing are in that dark period as well. And any kind of invasive species, we don't actually move any of our seaweeds at all. So there's no risk from moving one population or one farm to another place because it but never happens in in this in this industry. So we're definitely navigating these risks as they come. And actually for the phytoplankton bloom, I read a great article about how kelps can actually help with reducing harmful algal blooms because they're reducing the nutrients available for those harmful algal blooms. So this there's definitely some some positives and negatives for kelp farms. And I think there's a really great story to be told about how we can provide food and products that are helpful for agriculture, do something about climate change, and provide those ecosystem services and as well as the economic opportunity, providing jobs for many people up and down the coast.

R

Rebecca Martone 29:44

Thanks, Jen. I saw that Dune had maybe wanted to make a comment and then Nichole and then we'll turn to another question. Dune?



Dune 30:50

D Dune Lankard 29:50

Yeah. When I think about you know, the restoration and healing that has to happen for the ocean I can look back to the Exxon Valdez oil spill where in Prince William Sound prior to the spill, we had 200,000 tons of Pacific herring returning to the sound annually. Then, the herring fishery literally crashed. And we have had maybe two fisheries over the last 33 years, because the number plummeted down to about 4000 ton returning, and the herring were actually bleeding underneath their scales and not reproducing. And the last two years, we've had 20,000 tonne, returning but spawning on the Copper River Delta and not in Prince William Sound. And so what we're hoping is that the herring will spawn on our count farms, because the Native peoples are interested primarily in healing the ocean and restoration first, feeding their people a traditional food source second, and being part of regenerative economy last, but, you know, there was a big kelp farm that was put together and, and set out in Southeast Alaska. And when the herring came back, they decided to spawn on that kelp farm, and the owner was pretty upset. And we are all cheering and happy. Because I've always believed that the herring are smarter than us humans. And if they'll spawn in cleaner, cooler waters off shore, that they won't be getting this disease from this oil that is still coming off of the beaches. Because there's a lot of areas in Prince William Sound that are still dead zones 33 years later. So we wanted the Exxon Valdez Oil Spill Trustee Council in their last act of restoration for the spill zone, to help us get kelp and mariculture farms in the water to do the best we can to heal and feed our people at the same time.

R Rebecca Martone 32:16

That's really interesting. And you know, an unintended consequence, perhaps good for the herring and harder for the farmer to figure out how to address but that's a really, you know, I think critically important consideration, Dune. Thank you. Nichole, did you have a comment?

N Nichole Price 32:31

Yeah, just a couple of short ones. And in response to some of the questions, there's so many good questions in the chat. I really appreciate it. One comment is there some really interesting research happening at UNH [University of New Hampshire] on breakaway lines for seaweed farms to address the concerns or issues about possible marine entanglement, marine mammal entanglement issues, or any marine wildlife entanglement issues. There's another really good question about, do we know what the impacts are for dumping large amounts of seaweed on the seafloor? And the truth is no, we have, we have no idea. So there's definitely a major research gap there. And that's a concern about using seaweed in large amounts for carbon sequestration, the unintended consequences of sinking large amounts of seaweed. There are small experiments that are starting to happen at Bigelow, and I'm aware of some happening elsewhere in the world to try to fill those knowledge gaps. And I hope to keep people informed as we go along. And then there was a really good question about the safety of seaweed, it's getting grown in the ocean. It is a very good sponge for carbon dioxide, but also lots of other naturally occurring heavy metals in the ocean environment. And I just wanted to make everyone aware of an ongoing program by the National Institute of Science and Technology to standardized testing protocols for seaweed tissues for some of the safety concerns, because it's not only potentially a problem, depending on where the seaweeds grown. But there's an additional problem that labs aren't currently reporting the exact same numbers for the exact

same sample. And that makes it really difficult to follow how safe the seaweed is to consume. So those results should be coming out in the next year. So that was funded by the World Wildlife Fund and NIST.

R

Rebecca Martone 34:27

So that's in the United States, but it's so it's national guidelines for the US. But that's useful information for other countries that are looking to have standards as well or is it a global?

N

Nichole Price 34:36

It was global in scale for invitations for labs that wanted to participate in the event.

R

Rebecca Martone 34:42

Great, okay, thanks. Well, I'm... Great that you were able to answer some questions from the audience too. We'll be turning to audience questions soon. But before we do that, I want to go back to Dune. And Dune, we have talked about these benefits that help provides, as you said, some of these things that the the communities are interested in is certainly ocean health, but also, you know, traditional food harvesting, and, and then ultimately, potentially economic value and jobs. And so I wonder, what do you think? Or how do you feel about communities, as they're going through this process, what do they need to know to make informed decisions about, you know, whether or not to dive in? Are there some considerations for, you know, Indigenous sovereignty in this space? Ensuring social justice? And if you have some thoughts about, you know, what do you feel that Indigenous community should know about as they get, you know, start thinking about how to dive into the kelp farming industry?

D

Dune Lankard 35:42

Yeah, that's a good question. And kind of how I start out with different tribes that we work with across the state is, I go into like a little meditation, I say, "Okay, now imagine you're sitting in front of your bay window, and you're feeling really good about life. It's early in the morning, and you're drinking your sovereign cup of coffee, and feeling good about things. And all of a sudden a boat comes rolling in the bay and starts deploying anchors, lines and buoys, and it's not you. And that permit is good for 10 years. And it can be renewed for another 10 after 10. Now how you feel?" And, you know, they immediately go, "Oh my God, you know, we need to be permitting." And unlike fishing that starts in May and ends in end of September, kelping starts in end of September and ends in May. So in order to do this kelp farming and monitoring, you're going to have to be out in the coldest, darkest stormiest as parts of the year. So you're going to want to permit close to home, you're not going to want to have to travel four or five miles, or excuse me, four or five hours, across the sound to attend to your farm. So what we're witnessing is an actual modern day land claims on the ocean. And it's about ocean rights. It's about water rights. And it's about self determination and sovereignty. So I feel that Indigenous peoples should organize. And we started a Kelp Now listening tour, so we could hear the fears and concerns of Indigenous peoples across the state. And they... it was resounding, they were concerned about mariculture coming to a shoreline near them soon. You know, I also think that

if we're going to have any chance of having sustainability in this new ocean industry, we actually have to get involved with the Coastal Seaweed Farm Act, you know that we need to look at the laws, look at the legislation, look at the policies, and a lot of them are wrong. A lot of them need attention and you know, some work. So we're going to start a native kelp cooperative. So we can figure out how to offset the overhead expenses and get into processing and do a number of things. Because you you have all these detriments and barriers to entry. And I call it the big five which is marketing, processing, dehydration, transportation to market, and renewables. And so we along with the kelp cooperative, we want to start a native kelp Alliance, a 501c4 to address those laws and policies. And then we are also looking at a kelpnation.org. You know, like, you know, how do we unite and duplicate the successes rather than the many mistakes that we'll make in this industry? Because anything that we can do to figure out how to de-risk this major investment that's unproven. We're, we're really going to have to, you know, sharpen our pencil and sit down and figure this out, because some of the biggest things that we're facing right now is, is funding to help get this started into began. Social Impact money as well as foundation and private donor money is what's going to help get this off the ground. Permitting is a huge expense. Figuring out where you're going to source your seed. The processing is one of the biggest detriments to get into market. And you know what, I just feel like, you know, we're all wise enough and smart enough that if we collectively put our minds together, we can figure out answers and solutions that we can help each other because I'm not worried about the big processors, the canneries, or the big kelp corporations, or even the fishermen for that matter. They're gonna get their share, but I can tell you right now, the Indigenous peoples are not. So that's why I'm helping organize them to the best of my ability to give them the opportunity to be a part of this quickly, rapidly growing industry.

R

Rebecca Martone 40:13

That's really great. Dune, thank you. I really appreciate your emphasis there and maybe just turning to Jen and Cascadia's approach to things just because, you know, I think this is a huge challenge that communities are going to face, this rapid expansion of an industry that they may not get benefits from, but would feel the impacts from. So how do we actually, as you say, Dune, create solutions in the space and get on it quickly, because it's coming, whether... You know, kelp is having a moment, as Vanessa said.

J

Jennifer Clark 40:45

Yeah, absolutely. So Cascadia actually works with all of our indigenous people... as a part as of Cas- ... we partnership with many indigenous people, many First Nations, we actually partner with seven. And there are... Many of the nations that we do partner with, actually approach us. So at least in the BC coast, that's what we have, I'm not sure what it's like in Alaska, but there's definitely interest for, for having kelp aquaculture in some of these areas. And as partners, we work together, making sure that they're, you know, involved with many of the processes that happens with acquiring a tenure or a part of the lands... or a part of the ocean, sorry. So the the licenses are actually owned by the First Nations, and we actually leased the area from them. And we employ and use boats as much as possible from our First Nation partners. So we are involved that we are... Partnerships are highly involved in Cascadia seaweed. So I really hope that that's kind of like the what we're going with forward, including coasts and First Nations in all aspects of kelp farming.

R

Rebecca Martone 42:06

Well, I'm just seeing the time we maybe want to take a question from the audience, and then we can circle back on this. Oh, Nicole, did you have a comment? I'm sorry.

N

Nichole Price 42:14

Yeah, just a quick comment. I really wanted to echo Dune's, and congratulate Dune's objective of uniting groups to come forward and organize around these concerns. I would caution, something that's been happening on the East Coast and in Maine, in particular, in the state, we have at least three groups that are trying to represent the seaweed industry. In Maine, we have the Maine seaweed Council, we have a Seaweed Fisheries Advisory Council, and we also have a Maine Aquaculture Association. And as these groups bubble up, it's difficult to constantly seek alignment with with goals across them. So that's a challenge that the Northeast has faced. But it's an opportunity to learn from what's working over here and what isn't. And then I would say that the co-op model that you're proposing is one that is really gaining traction on this coast, there are at least four co-ops models that are working in the Northeast that are becoming lucrative in some way or another for the members of those co-ops.

R

Rebecca Martone 43:25

Thanks, Nichole. And yeah, it's really helpful to have your perspective, given that Maine has probably had the longest running, you know, kelp aquaculture in North America, it might be interesting to hear some more thoughts from you on that, but maybe, first we'll start with a question around... One, there's one that's, maybe to you, Jen: There seem to be guides for sustainable development of kelp farming coming from the US and Europe. But are there any in Canada? Or can we look to these international guidelines? And do we need to be pushing for more of these from a Canadian perspective?

J

Jennifer Clark 44:01

Yeah, absolutely. So there right now there there isn't very many regulations for kelp aquaculture, and in fact, we are, I believe, we're still under the shellfish aquaculture regulations. And, and so we are being very cautious, as we kind of continue with producing kelp without [inaudible], you know, a lot of regulations in BC and we have actually taken from Alaska, for instance, being conservative and only taking parent stock from 50 kilometers around our farms. So we're trying to navigate how to be sustainable and very environmentally conscious about how we can grow kelp in the ocean. And yeah, and without regulations in BC. So yeah, we're, we're, we're taking a cautious approach for sure.

R

Rebecca Martone 44:59

Yeah, maybe going back to what Dean had said about, you know, this importance of being involved in legislation for community and too... Dune, I don't know, if you have a thought or a perspective on that.

D

Dune Lankard 45:09

Yeah, it's, um you know, I can only go back in my history and, like, what happened with limited entry in 1973. Okay, they turned our finfish, our salmon, into a commodity. And all of a sudden, there was limited entry, a number of permits that were for sale. In Alaska, you can only fill each bay with 30% mariculture. And so, real soon here, it's going to go towards limited entry. And so your \$10,000 to \$15,000 permit that, you know, by the time you figure out how to do your landscape analysis, write your business plan, write your application, figure out how you're going to get workman's comp, your insurance, and form your LLC, you're gonna be \$10,000 to \$15,000 invested and that's without even getting your farm gear, right, your anchor, lines, and buoys. Well, if it goes unlimited entry, depending on what we get per pound, you know, I'm pushing for a buck a pound for as hard to work as this is... where... and that's just for raw, wet, kelp just pulled out of the sea, where if the value of that permit could go up to \$300,000 to \$400,000 each. And so what I'm hoping is that the indigenous peoples are going to organize and figure out how to get CDQs for mariculture rather than individual owned farms. And what I mean by CTQ is his Community Development Quotas that are owned by the tribe. So when you're building this regenerative industry, that if a farmer wants to step down, another one can step up, and you don't lose that restorative or regenerative economy that is only one of the 1,000 blue/green jobs that actually needs to be funded and then implemented if we're going to survive as a human race. So I feel like, you know, as much as we can gather and in historical, you know, history that that has shown how to do things wrong, because we, we have the ability, we have this opportunity right now to do to do something good for the ocean. But Alaska needs a plan. America needs a plan. The world needs a plan. And I don't see that happening quick enough. And that's why I was really happy to see our Congresswoman Mary Peltola jump on with Jared Huffman and, and Ed Markey, to roll out the Coastal Seaweed Act. And so it's at least a starting point on how we can get some sort of plan in place that's going to work for the environment, for the ocean, for all the critters that depend on wild kelp forests. And then us humans, you know. I feel that we can balance this if we just put our minds to work and figure out how to do it.

R

Rebecca Martone 48:21

That's great. Optimism is wonderful. I think the other thing, if you have CDQ examples for mariculture, I don't know if there are any, but if anybody does have any, if you could drop those into the chat. Or, I know there's small-scale fisheries cooperatives in Mexico that also exists (not around kelp farms), but there are examples in the world. So Dune, if you have some, can you share them?

D

Dune Lankard 48:43

Like we have CDQs for the bottom of the ocean in the northwestern part of the state. So all the communities north of the Aleutian chain, have community development quotas for the bottom fish. And what, originally when Stevens created that program, Senator Stevens, he thought that he'd throw the Natives a bone and bring \$20 million a year in income to the communities that needed it. Well, it's about \$200 million a year in revenues, that's helping all of these villages flourish. And, you know, build community cold storage, community food centers, you know, that are actually helping feed their people. But, you know, I feel like, you know, we need to go one step further, you know, we need to figure out how to do Community Development Quotas for

the surface of the ocean, because of this land claims mentality that is happening in the industry. And what we're talking about, in some of these villages they're experiencing 85 percent unemployment, so I feel like this blue/green ocean farming economy has the opportunity to relocalize lost jobs that have been taken by the seafood industry over the last 150 years. So my hope is that Indigenous peoples will figure out how to rise up and work together to get something meaningful in place that actually is going to work for their goals of healing the ocean, feeding their people, and building a regenerative economy.

R

Rebecca Martone 50:25

Thanks so much for that. I'm gonna shift gears, even though we could have, I think, many, many hours' discussion in this place and learn a lot from you, Dune, for sure. Maybe I'll turn to this idea of questions around selective breeding of kelps for heat tolerance, there's been quite a few in the audience. So maybe for Jen or Nichole, maybe Nichole, how can GMO kelps help the industry and ecosystem? What are the potential consequences to that? Or maybe is there science that even is starting to look into that?

N

Nichole Price 50:54

There's a very critical distinction, and you just mixed up two terms that need...

R

Rebecca Martone 50:58

I did. Okay. That's... great.

N

Nichole Price 51:00

So selective breeding is taking, as Jen was describing, the natural population, and just crossing them to see what you end up with, and maybe challenge them with a certain growing condition and only take those that have survived. For instance, this is going to probably be become quite critical for thermal or temperature tolerance. It's actively happening... somebody else asked what we can learn from Asian countries. I mean, this is a very big research program in South Korea, and a very successful research program to breed selectively breed more thermally tolerant individuals over there. It's not something that's acceptable to Maine policymakers as of yet, and I don't know where it stands in Canada, to be honest. But there are two ways to make this a conservative approach. One is to, as Jen described, is to use very localized population so that you're not introducing any new genetic material to that population. And two, to either harvest the seaweed before it becomes reproductive, or generate, through selective breeding, non-fertile individuals, so that they aren't going to reproduce and put genetic material back into the population. I hope that evidence-based research can drive decisions around whether or not those can be acceptable, because I do see... at least, we have another researcher at Bigelow who's looking at populations in Southern Maine, native kelp populations, and they are moving forwards, as has been reported on the coast of Australia and elsewhere in the world, sort of running away from those rising temperatures. The other piece that you spoke about: GMO, that's genetically modified organisms. So that's actually getting in there and messing with the genome experimentally and introducing novel pieces of DNA. I don't see an appetite for that

yet in ocean aquaculture. Although we should point out that it happens all the time in shellfish aquaculture and in oyster aquaculture, for instance. And it happens quite a lot in land based ag systems. But I don't see an appetite for it yet in kelp aquaculture.

R Rebecca Martone 53:13

Thanks. And yeah, thanks for clarifying that, and keeping us straight. That's really good. That's why we're so happy to have you here. Dune, did you have a comment on that? Or can I switch to another question?

D Dune Lankard 53:25

Go ahead.

R Rebecca Martone 53:26

Okay. I think maybe this idea of well, maybe I'll start maybe, well... This might be our last question. So maybe I'll just open it up for all three of you. Like, how do you? How would you like to see the industry evolve in North America over the next five years? And maybe I'll start with Jen, and then go to Nichole, and then we'll end with Dune. Is that okay? So I really appreciate that. And I, we didn't get a chance to answer all the questions from the audience. So we appreciate everybody being able to be participating, and we'll try to do that in the chat later. And I think Vanessa will address that, too. So maybe, Jen, go ahead with you, and then we'll shift to Nichole.

J Jennifer Clark 54:06

Yeah, sure. So I hope to see you know, I think kelp aquaculture can provide a lot of solutions, to providing a food system, and a nature-based solution, provide jobs, also help the food industry as well by providing better alternatives, like a biostimulant or methane-reducing products to cows, as we continue in the future. You know, I'd like to see the kelp agriculture industry being sustainable, that we can also just rely on, you know, shifting our mentality away from land-based foods and look more into the ocean for some of these for these solutions. I think when we were thinking about farming, kelp agriculture provides probably the least amount of risk in terms of not taking any more food, or taking any more land, not using fresh waters and not using any chemicals or fertilizers in that mix. So I think we have a great future in BC and I just really want to see it flourish and provide some other solutions that we know kelp can do.

R Rebecca Martone 55:22

Thanks, Jen. Nichole, I'll turn it over to you.

N Nichole Price 55:26

Yeah, I just hope that there's enough time to educate the broader public about carbon markets, and how there are some that have a lot of oversight, a lot of measurement, reporting, and verification procedures to to validate whether or not the sequestration process is happening. And as we learn more about kelp farming, and its potential for sequestration, that there are methodologies developed specifically for kelp farmers, from from any sort of type of farm: small farms or big co-ops, to be able to access those carbon credits, but that we don't go too far into the greenwashing sort of territory, where there are opportunities to claim carbon offsets and carbon value without any oversight. And I just hope that people can educate themselves as to the difference between those two processes, and target those that follow an evidence-based approach for sequestration. That's where I, where I hope we go with carbon sequestration and kelp farming.

R

Rebecca Martone 56:36

Thanks, Nicole. And finally to you, Dune. Do you have a few thoughts about that?

D

Dune Lankard 56:40

Yeah. You know, I think about my buddy, Dr. Elizabeth Hoover, who wrote this article entitled, "How Can You Call Yourself Sovereign If You Can't Feed Yourself?" And to me, as a fisherman, I fed millions of people every single year. And that's always been first and foremost on my family and me as the fisherman to feed people and make sure that, you know, we can feed our community, especially in these times of climate change. But to me, you know, we have to learn how to grow things from the land and the sea, if we're going to figure this out, how we're going to survive. And it looks right now, it appears, that kelp is the hemp of the sea, that it has all these different magical properties, it can do all these things, from the fertilizer to the compost to the pharmaceuticals and nutraceuticals, cosmetics, the animal feed, I mean, the list goes on, right. But to me, a lot of food, kelp farmers, ocean farmers are interested and concerned about that return on investment. I think there's a different kind of ROI that we need to look at, which is the ripples of impact that this industry has on the ocean and the people and the critters. You know, to me, it's about the ocean, it's about healing, it's about restoration. It's about mitigation. It's about conservation. It's about survival, as a human race. And so, you know, if people want to call me and talk about carbon credits, or carbon offsets, I want to talk about insets, you know, pay me to sequester carbon. I'm not interested in the trading, and a lot of Indigenous peoples aren't either. And so, the bottom line is kelp can help. And in the meantime, you know, we just have to do the best we can to be good stewards and guardians of the ocean, like we have for 1,000s of years. And sometimes that means that we just have to slow down and go back in time and change our relationship with the ocean, and change our relationship with our food source and figure out how we're going to do this because we're running out of time, people.

R

Rebecca Martone 59:06

[inaudible]

D

Dune Lankard 59:07

I think we should have a workshop and all of us back together again and have more time to work through some of these things. Because I've been looking at some of these chats. And it's wonderful. I think these are some of the best questions I've seen in a while in in comments from folks. So thank you for inviting me.

R

Rebecca Martone 59:26

I love this idea. And definitely let's let's talk about that. We should totally have that next space. So thank you all. Thanks for ending that, Dune, with that next step. I first just really want to thank you all the speakers as well as the audience for your time and your energy and helping to support the discussion that we've had today. I think it's been really insightful and just really rich and informative. We are as the Collaborative Center going to shamelessly promote our next dialogue in this series, which will be around environmental DNA for stewardship and monitoring. But I really liked this idea, Dune, of next steps in this space. There's so much more to talk about and much opportunity for collaborative work to inform solutions in this burgeoning field. So thank you. And I will pass it over to Vanessa to close us out.

V

Vanessa Minke-Martin 1:00:16

Thanks for moderating the conversation today, Rebecca. That was fantastic. I also want to thank the panelists and all of you who are participating in the chat. I think this discussion was really rich and informative. Someone described it as "drinking from a firehose", and I think that's a pretty apt description. So watch your inboxes after this event. We'll be sending an email in the coming days with a link to the recording on YouTube, a survey about how the event went, and as many other resources as we can glean on kelp and kelp farming so that everyone can take advantage of all the info that was zipping around. I also want to remind all the early career ocean professionals and students, so anyone who identifies as being just launching into their future working in ocean industries, join the panelists in the session immediately following this one. I've put the link to that Zoom event in the chat. I'll just pop it in there one more time. And that will begin immediately as this event ends. Again, thanks to everyone for joining us today. It was it was a really inspiring and exciting discussion. Take care.

D

Dune Lankard 1:01:26

All right. Bye, everyone. Let's connect soon.

R

Rebecca Martone 1:01:31

Thank you.