

Growing Atlantic Salmon in Wisconsin

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Marie: You're listening to The Fish Dish, brought to you by Eat Wisconsin Fish, a campaign of the Wisconsin Sea Grant Program. Are you fish-curious? Or are you a fish expert who wants to learn even more about Wisconsin's fisheries and cooking fish? We'll give you the latest "dish" on fish.

Your hosts are . . .

Sharon: Sharon Moen

Marie: and Marie Zhuikov

Together: Two friends who have been working for Sea Grant seemingly forever and who know a thing or two about fish.

Marie: But that's "forever" in a good way.

Sharon: Sharon is a food-fish outreach coordinator.

Marie: and Marie is a science communicator.

Our show today takes us to Superior Fresh, an aquaponics business located on 800 acres of rolling woodland and prairie in Hixton, Wisconsin. They've been raising Atlantic salmon and growing salad greens in their indoor facilities since 2017. The business reports it's the largest of its kind in the world and produces 1.5 million pounds of salmon per year plus organic-certified salad greens.

For the fish-o-licious part of this Fish Dish podcast, we cook salmon!!

Sharon: We'll prepare a super-easy, super-delicious recipe from the Eat Wisconsin Fish website: crispy salmon with roasted squash and kale chips.

Before we get to cooking and before we take you through the doors of Superior Fresh, I think it would be good to acknowledge "The Salmon Situation." By this, I mean the dizzying number of choices you have when buying salmon: Pacific, Atlantic, wild-caught, farmed, fresh, frozen, canned or smoked.

Taste and price typically reflect the species, where the fish came from, what it ate and how it was processed. These qualities also factor into the good stuff that a serving of salmon delivers (such as protein, omega 3 fatty acids and vitamins) and the baggage it might carry (which would be contaminants, saturated fat and its environmental impact).

And, did you know that salmon is the most-consumed fish in the USA? Even more than tuna! This makes the U.S. the largest salmon market in the world.

I'm going to geek out for a minute, but first, I want you to know that both wild-caught and farmed salmon can be high-quality, sustainable, and delicious choices with similar nutritional profiles. One is not inherently better, and both are being managed to ensure a continuous supply of salmon for human consumption.

Now, here's what I think is fascinating: "Salmon" is a generic term for a group of fish species that originated in the North Atlantic Ocean (genus *Salmo*) and in the North Pacific Ocean (genus *Oncorhynchus*). Depending on whom you ask, "salmon" might include a few species of fish commonly known as "trout." Genetic studies indicate Pacific salmon are more closely related to steelhead (rainbow trout) than they are to Atlantic salmon. And, Atlantic salmon are more closely related to brown trout than they are to Pacific salmon.

Also know that all Atlantic salmon sold in U.S. grocery stores are raised on farms. The U.S. Atlantic salmon fishery closed in 1948 as the wild population dwindled to almost nothing due to overfishing, the damming of rivers and other habitat changes. Since Norwegian fish farmers started raising Atlantic salmon in cages in the 1960s, the aquaculture industry has grown to supply upward of 75% of the salmon consumed. Farms in Norway, Chile, Scotland and Canada produce the bulk of these fish in saltwater net-pen systems.

The Wisconsin-raised Atlantic salmon we're focusing on today are farmed indoors along with vegetables. Farming fish in indoor systems is gaining popularity around the world for environmental and food-security reasons.

Marie: So, you're saying that salmon in the Midwest used to come mainly from overseas...but now, thanks to Superior Fresh, it comes from Wisconsin?

Sharon: Well, let's say that some of the Atlantic salmon consumed in Wisconsin is produced in Wisconsin. There is no way this one facility could meet the entire state's appetite for salmon.

Marie: Well, still, Superior Fresh is a huge operation, and one we had the chance to tour on Halloween Day with a small group from Wisconsin Sea Grant. Besides Sharon and me, our group included Emma Hauser, aquaculture outreach and education specialist with Wisconsin Sea Grant and the UW-Stevens Point Northern Aquaculture Demonstration Facility (which is also called NADF); and Jenna Mertz, our fellow science communicator.

Many of the interns NADF hosts go on to work at Superior Fresh—a fact evidenced by all the friendly faces Hauser recognized during our tour.

After pulling plastic coverings over our shoes ...

Plastic sounds

...we followed Kyle Woolever, director of operations and a UW-Stevens Point graduate, as he showed us around the facility, which recently experienced a 60,000-square-foot expansion.

Kyle Woolever: In front of you is where we grow the fish from egg all the way up to about a kilo or just under, okay? So, everything's in metric here, too, but it takes about 14 months or so, and then we transfer them next door. I'm going to show you that, to our expansion. That's where we went from 160,000 pounds of head-on gutted salmon and steelhead. To now, we're one and half million on the year and we are full production right now. In fact, we're a little over production at the moment. Doing just under 3,000 fish a week and roughly 25,000 pounds of salmon. We have a half-million fish on-site.

Marie: The fish are sold in Wisconsin grocery store chains such as Festival Foods and Tryggs, and also in a few independent grocery stores and co-ops. And so, besides the salmon that Superior Fresh sells, they do other things, too. Refresh my memory on what some of the other products they have are.

Sharon: Sure, there's other food products. They send their salmon to be smoked over there at Rushing Waters. I believe you can get a salmon fish dip made there at Rushing Waters, which is a trout farm. And then I know some of our establishments along the South Shore of Lake Superior sell the smoked salmon from Superior Fresh.

Marie: Oh, okay. Where is Rushing Waters?

Sharon: That's in Palmyra, so that's near Milwaukee.

Marie: Oh, okay. Interesting! Yeah, and another thing that impressed me besides, you know, the diversity of the products that Superior Fresh has, was how clean the facility was. I mean, they have these huge tanks of fish and we'll talk more about that later, and it didn't like smell super fishy when you first walk in there, which . . . I had five whole tanks of fish at one point in my ah, tropical fish career and they can get kinda fishy smelling.

Sharon: The tanks were huge but so were the biofilters. Did you see those rows of biofilters?

Marie: Yeah.

Sharon: And they're used to remove the waste products from the tanks. So evidently, they're doing their job because I agree, you probably wouldn't find any farm cleaner. They do a great job of maintaining a healthy environment for the fish and I think Kyle's going to tell us more about that.

Marie: Uh hmm. The fish and the workers, too, I think.

Sharon: Yeah.

Marie: So those biofilters were like huge silos. Each biofilter contains tons of finely graded sand sourced from a Wisconsin quarry. As we mentioned, all those fish require a constant flow of clean water. Gesturing toward the big tanks, Woolever described the water footprint of the facility.

Kyle: Two small wells are raising all of what you're going to see on 50 GPM of water.

Sharon: I'm just going to explain that GPM means gallons per minute. For comparison, residential wells pump between five and 10 gallons per minute. So, really not that much.

Marie: So, 50 gallons per minute really isn't that much.

Sharon. Right. How does Superior Fresh raise salmon using relatively little water? The answer is their Recirculating Aquaculture System, which includes high-tech equipment and monitoring to effectively clean and recycle the water throughout the facility. This water is also used in the greenhouse, where leafy greens further remove the nutrients that they need to grow. The water then returns to the fish, and the cycle restarts.

Superior Fresh captures all water that spills or is flushed from the production system and then uses it to irrigate over 50 acres of native grasses and alfalfa, while operating with zero wastewater discharge. The grasses and alfalfa are cut and baled several times annually and are used by local farmers for cattle. The business also uses other regenerative farming practices, such as creating a soil amendment from digested fish manure, which can be injected into the fields before planting.

Marie: When we toured the facility, the first place that we went had these huge round tanks of fish and they were, I don't know, like fifty feet across or something?

Sharon: I'd say about that, uh huh.

Marie: Yeah, and Kyle showed us an empty one. It was quite deep, like twenty feet, maybe?

Sharon: Uh huh, yeah.

Marie: The tanks have maybe a window here and there so they can check on the fish and things, but it's good that they don't have a lot of glass like an aquarium does because sometimes freshwater fish don't do well in glass environments because they don't realize that the glass isn't just more water. (Laughs)

Sharon: Right and so Atlantic salmon are saltwater fish that run up rivers to procreate. And then they lay their eggs and the fry stay – and this would be in the natural environment – the fry would stay in the stream for a wee bit and then . . .

Marie: A wee bit! You and your wee bit. (Laughs)

Sharon: A wee bit and then they would run back into the ocean and that's where they would go through their smolting where they would become saltwater fish again, which is going from like a non-salty environment to a salty environment really takes some physiological changes that they must go through. So, when they're in these tanks at Superior Fresh, they're in fresh water their whole lives. They are landlocked salmon. They're in fresh water their whole lives.

Marie: So even natural salmon can adapt to fresh water.

Sharon: Correct. That's why they've been so good at being part of the Great Lakes ecosystem now and the food web. They've been planted in the Great Lakes and salmon fishing on Lake Michigan is particularly exciting for people.

Marie: Uh hmm. But wasn't Kyle saying something about – when they go through that smolting time period where normally they'd be switching to salt water, they're kinda vulnerable, aren't they?

Sharon: Right and so they have to be treated gently during that time, so they have special tanks for their smolting and it's another reason not to have windows because they spook easily, too. So, they just try to keep them calm and treat them with kid gloves.

Marie: Uh huh, you gotta baby the salmon.

Sharon: That's right! (Laughs)

Marie: And then I thought it was also fascinating how they moved the fish between tanks. You know when the fish grow to a certain size, they'll move them to a different tank or when they're getting ready to take them to market. So, they suck 'em up, right?

Sharon: (Laughs) It was like a big vacuum cleaner.

Marie: Yeah, and they go through these metal chutes and plop out into the other tank.

Background sound of fish thudding through the chutes.

Sharon: Yeah, it was pretty slick, very efficient and it didn't seem to harm the fish at all.

Marie: Uh huh, and we got to watch them sorting the fish, too. They sucked up some fish for us that they were going to get ready to put into a tank to go to market and so, the workers were making sure the fish were big enough...

Sharon: Right.

Marie: ...to be sold and the ones that weren't big enough, I guess they went back into the original tank or something.

Sharon: They get returned, yeah.

Marie: Uh huh, to grow some more. And it was also interesting how they feed the fish. I don't know if you've ever seen like automatic fish feeders, but the feed just plops out in one location into the fish tank and whatever fish are closest to the feeder can get the food first. But at Superior Fresh, they shoot the feed (laughs), they shotgun it (laughs again) across the tank so that fish, like a really greedy fish, can't just like...

Sharon: Park itself...

Marie: Park itself in front of the feeder and steal all the food. I thought that was a really cool idea, too.

Sharon: Absolutely. I think one of the fun parts about visiting fish farms is you can just see the innovation that they have to use to keep their fish healthy and happy and bring them to market. Different farms use different methods for that. So, that's been a really interesting part of my job is to visit farms like Superior Fresh.

Marie: After touring the aquaculture facility, Kyle led us to the greenhouse, where the thrum of churning water faded to the quiet of plants photosynthesizing. It's here where the nutrient-rich fish water fuels the growth of Superior Fresh's organic salad greens.

Upon entering the greenhouse, rows upon rows of white rafts filled with a variety of plants in different growing stages floated in long tanks of water. Sam Heward, greenhouse manager, explained how plants make a linear journey from one side of "the pond" to the other. Baby greens spend about three weeks on the water before harvest.

Sam Heward: It's a system called a deep-water culture. There's a lot of different hydroponic, aquaponic systems, but we grow in about a foot of water. The roots just grow down into the water.

Kyle: Okay Sam, let's go to head lettuce.

Sound of plastic-covered shoes walking on a cement floor.

Sam: It's dinosaur kale.

Marie: Dinosaur kale. (Laughs)

Sam: Yeah, you can smell it. So, we grow kale, romaine, red leaf lettuce, green leaf lettuce, and we sell it as living butterhead, and then chop head lettuce, a full head. Any way you want it. It's pretty much sold out.

Marie: It's a system called deep-water culture. Sam explained that the plants get all the nutrients they need from the fish water, except for a few.

Sam: We add iron. We add a couple other micronutrients, but other than that, it's just good. It's everything they need. So, during the day, this metal thing is full of water. It's kind of like a river. We're moving about two thousand of these rafts a day for baby greens, so it's a lot. Harvesting two thousand, planting two thousand new ones.

Sharon: The greenhouse is warm and bright. It's the perfect place to be in winter. And it's a really interesting sight to see from the road as you're driving past Superior Fresh because of the purple lights at night. They just glow. They create this eerie, almost alien glow that a lot of people comment on.

Marie: Yeah, I've heard about that. (Laughs) I would like to see that sometime. We were there in the daytime, so, you know, it wasn't quite as impressive. (Laughs)

Sharon: Right, well, next time we're driving to Madison, we can keep a look-out for it.

Marie: Yeah and it's fitting for Halloween. You should go past there on Halloween night. (Laughs)

Sharon: That's right. So, by the end of the tour, it was clear that Superior Fresh is working so that Atlantic salmon don't have to be airfreighted across oceans from Chile or northern Europe—they can come from your local community—and greens don't have to be grown thousands of miles away in sun-soaked states. In other words, they're successfully forging another way to eat Wisconsin fish . . . with a side salad.

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Marie: Now it's time for the Fish-o-Licious part of our podcast, where we discuss fish recipes which, by the way, you can find on the Eat Wisconsin Fish website (which is eatwisconsinfish.org). Today we're cooking..... crispy-salmon-with-roasted-squash-and-kale-chips

Sharon: And I can smell the squash and kale chips in the oven right now.

Marie: We prepped the squash and kale chips ahead of time and it was really easy. It's just put a little olive oil and salt and . . .

Sharon: A little bit of lemon on the kale that Marie had to massage in. If you read the recipe . . .

Marie: Yes.

Sharon: You have to massage your kale.

Marie: Massage your kale. I've never done that before, but I think the kale liked it!

(Laughter)

Marie: It's to soften it up a little bit, so . . . next we'll be cooking the salmon and so, you'll get to hear us do that!

Sharon: Let's go downstairs to the kitchen!

Marie: Woo hoo!

Marie: We're prepping the salmon, and it doesn't say it in the recipe, but I think we're going to add it to it, because you need to cook both sides of the salmon. Sharon is actually cutting the skin off the salmon.

Sharon: I am. So, I'm filleting these chunks of salmon that we got... So I'm filleting the skin off and trying to get some of the extra fat. After we filleted the skin off, Marie salted it with sea salt, and then we are preparing some sesame seed oil, and a bit of butter, and it's just starting to bubble and once it gets hot enough, we need to have our oils and butter hot enough so it'll sizzle the fish and not make the fish too greasy. Give it another couple seconds here and then we'll start putting the fish in.

Marie: And we salted both sides of the of the salmon.

Sharon: Yes. Now I'm putting the fish into the oil.

Sizzling sounds

Sharon: One of the things about Superior Fresh is they don't use hormones or chemicals added to the feed. So, when you're buying, say, fish grown in net pens, there's often some pharmaceuticals that are added. But at Superior Fresh they don't need to add those extra pesticides. Which I think is great.

Marie: And our squash has come out of the oven. That looks great. The kale -- I think we put it in there a little too long. (Laughs) It's like super crispy, but it tastes good.

Sharon: So, we have to sneak a couple, couple of samples to make sure it's worth talking about. I've never done that with kale before. It's actually really good.

Marie: Yep. The kitchen smells really good!

Sharon: Wild salmon are typically leaner than farm raised. Yeah, because they're highly migratory. And they burn calories and reduce their fat content by swimming around in the open ocean and then up rivers to spawn.

Their diet is also typically lower in fat. Which results in a fishier flavor. So, when you eat a Pacific salmon, say a wild-caught Pacific salmon, you'll notice a difference in the flavor profile. And also, farmed salmon, they're typically a little paler, and the lines of fat are bigger. So, the ones we're cooking today, you can really see their fat lines. But that's okay, because that is omega 3 fatty acids, a little richer in that.

Marie: Good fat.

Sharon: Yeah, farmed salmon have a higher fat diet, which is what gives them their higher levels of omega 3 fatty acids, and that melt-in-your-mouth texture that many chefs prefer. So, when you order fish at a restaurant, often it'll be salmon, and often it'll be farmed Atlantic salmon because it's a little bit moister and flavorful.

Marie: And omega 3s, why are those good for us?

Sharon: Oh, they're really good for our ability to think, our cognition.

Marie: Brain food, huh?

Sharon: Yes, it's good for people. Omega 3s have been shown to reduce inflammation, help lower your blood cholesterol levels, and decrease the risk of cardiovascular disease, heart attacks, strokes, and so forth. There are also benefits for hair and skin, bone health, and mental health. And generally, it helps with aging, the aging process, or diminish the effects of the aging process.

Marie: We don't want to get old and saggy from eating salmon.

Sharon: It's the opposite of that. And so farmed and wild salmon have very similar nutritional profiles. So really there's not a better option. Both are great for you. And when raised or caught responsibly, they're good for the planet, too. So, salmon aquaculture, the farming of salmon, has come a long way since the 60s. Some of the benefits are that they relieve the fishing pressure on wild stocks, and they support local economies and jobs, like they are in Hixton.

Marie: Oh, and these salmon look like they're about ready to need turning, huh?

Sharon: Yes, except for the big fat one here.

Marie: The big fat one. You can kind of look at the sides of the salmon. And when they start turning opaque, about halfway up, let's flip it over. OOOOh, that's nice and brown. Pretty.

Sharon: Yeah.

Marie: While the salmon is cooking, I whisked 2 tablespoons of soy sauce. I can't eat soy sauce because I'm a no-wheat kind of person. So, I'm trying liquid aminos for the first time. And, we'll see how that goes. So, you whisk that with a teaspoon of toasted sesame oil, and then once the fish is plated, you pour some of that on top of the fish and garnish it with toasted pumpkin seeds. So, this just sounds like way too healthy. Hehehehe.

Sharon: It's good for ya.

Marie: After it was done, we tasted the fish and veggies.

Sharon: Oh, it's so tangy and flavorful. The sesame oil really comes through.

Marie: Yeah, the first thing when you bite into the fish, is you taste the sauce. The fish is great, but that sauce is amazing.

Sharon: It's a warm and rich tasting. I think the pumpkin seeds adds a nice crunch to the top.

Marie: Yeah, it's a really nice fall/winter dish.

Sharon: And it's pretty, too, even though we overdid the kale maybe a little bit, so the kale's a little bit dark. It's a great color combination.

Marie: It's a win! I'm gonna cook this again.

Sharon: Me too.

Sharon: I like that Superior Fresh grows kale also. So, you could actually make this meal with Superior Fresh kale, Superior Fresh fish. And I think the butternut squash you'd have to either grow yourself or find a local farmer to buy a squash from.

Marie: Or the grocery store.

Sharon: Or the grocery store. I'm just trying to make it all local.

Marie: Oh, okay.

Sharon: But you really could say, like, this is a Wisconsin meal.

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Marie: That's it for this episode of The Fish Dish. Thanks goes to Kyle Woolever and Sam Heward, and to Jenna Mertz with Sea Grant for her behind-the-scenes work on this script. Thank you for listening!