Lake Superior Sushi

Music from Zenith City by Woodblind

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 runs the Eat Wisconsin Fish campaign

Marie: and Marie is a science communicator.

Sharon: I'm really excited about this episode of the Fish Dish because we have Dr. Ryan Lepak with us. Ryan is a research limnologist at the Environmental Protection Agency research laboratory in Duluth, Minnesota. Among other things, he studies mercury in aquatic environments. He's also an avid fisherman and he's teaching us how to make Lake Superior sushi today. If you get a moment check out the Wisconsin Sea Grant video posted online where Ryan and his wife Courtney show you how to have fun making sushi.

Marie: In the second, "Fish-o-Licious" part of the show, we even try to have a competition for the best sushi, with the emphasis on TRY.

Sharon: Welcome Ryan. Can you tell us what you do at the EPA?

Ryan: A lot of the work I do is associated with understanding the status of the Great Lakes and then trends – are the Great Lakes improving or are they getting worse – for a whole series of metrics. Sometimes we're talking about thermal things like temperature. Sometimes we're talking simply about water levels but then we get more complex – things like nutrients, contaminants, fish health, fish populations. Our role is to take all these pieces of information and say what's the status of the lake and what can we do to continually improve them and not lose condition at all.

Sharon: You know, when we talk about fish and eating Wisconsin fish, most of us are aware of the fish consumption advisories. I know you're an avid fisherman. Do you worry about the fish consumption advisories?

Ryan: Sometimes I do select where I'm going to fish because I'm looking to find cohorts of fish that are maybe cleaner for contaminants. An example of a very clean ecosystem are the Great Lakes.

Sharon: Right, so, I only know of a couple of cases of mercury poisoning. The last one I read about was a person who worked on a tuna boat and he ate tuna every day for about 18 months and got super sick. Do you know any stories about anyone getting mercury poisoning from eating fish?

Ryan: What you're talking about is mercury poisoning as an acute response. Something very brief, very obvious. Frankly, I've never seen that. We've heard these stories like you just mentioned and typically it's in those communities that are extremely reliant on fishes. What you're more susceptible to as a population is chronic level issues. Issues that are picking at you slowly. It's kind of not so different from smoking, right? You think about someone who smoked their whole life and it increases your risk of cancer. Think of mercury that way, too. If you continually consume fish, the cost could be something like a loss in IQ. And at that level I have seen that. Not so much in this region but more so when I work in regions like Africa and South America.

Marie: We had a Lake Superior conference a few years ago and as part of it, I got my hair tested for mercury. And it was higher. My mercury levels were higher than average.

Ryan: Okay.

Marie: It made me more cognizant that ooh, oh my gosh (laughs) I have mercury in me! It's not something you think about every day unless you get tested for it.

Ryan: Absolutely. And we all do. Mercury is basically everywhere. It's just a matter of managing risk, right? And realizing that not all mercury in fish is equal. Smaller fish generally have less than bigger fish. So for that chemical that makes things very easy. If we were to go out fishing and we were to catch a collection of bluegill and walleye and northern, and we were then going to feed our family, if we can, we would give the bluegill to the kiddos and then maybe give the bigger fish to the adults. And that's probably their preference anyway.

Sharon: The study I read last, you were doing work on Lake Michigan with our boss, Dr. Jim Hurley. Was that your Ph.D. work?

Ryan: Yeah, we started that in the master's work and then quickly advanced it for the Ph.D. work. That was fun because we realized a couple things early on. One, when we first started, that was when the news got really flashy for all these big beds of nasty, smelly algae washing up in Lake Michigan. That's called cladophora. It's not an invasive thing. It's just a naturally occurring thing that has changed from the past. And the reason it's changed is because the way nutrients cycle in Lake Michigan has changed, and that's the result of invasive mussels. Basically, they're able to capture all those nutrients and deliver them to the ground, which basically plants that nutrient seed for the cladophora to grow. The reason we studied it is, now you've got this intense recycling of nutrients, this intense recycling of contaminants, and we thought, does this matter to the mercury cycle? Lo and behold, we found it did! We found that there was more issues with mercury in the coastal region of Lake Michigan than the offshore region.

Our follow-up work then said, well, what are the lake trout doing? Traditionally, we all know that lake trout are these big offshore species that for all intents and purposes, they are the wolves of their ecosystems, they are the bosses. But it still matters, where can they find a meal, and how do they get food? These fish had to adapt when those mussels came in because the food that they eat, disappeared. So, they had to find new food. In doing so, they started to move inshore because there was this explosion of another invasive species, the round goby. Their new diet has been transitioning to that.

Sharon: Wow. So, creatures do adapt, especially the wolves. (Laughter) We like the wolves of the lake. That's good.

Marie: Ryan, so you were in Madison when you did that research, what brought you up here to Duluth and the EPA?

Ryan: Yeah, great question. During our work in Madison, it because really apparent to the folks at EPA that the work we were doing was making answers that they wanted to hear. Something that provided an explanation for why our observations in fish didn't match our practices in the environment, right? We were reducing mercury in the U.S. and in Canada and the fish aren't just precipitously falling with those reductions. So, they said, "We want to continue work on this."

What they said was, "Why don't we start with Superior." And I moved up here because, of course, it's right on the lake. It's beautiful. And, "Why don't we do a reconstruction of Lake Superior because without those invasive mussels, the story should be much clearer. So, this should be a really easy thing to do." So, we began that adventure and quickly realized another reason why biology messes up our expectations.

Marie: It's not easy. (Laughter)

Ryan: Biology -- to quote one of my famous advisors -- it makes things fuzzy. Right? What happened was we rebuilt this mercury trend story. We basically measured fish from 1978 to present day, expecting see a continuing decline in concentrations, and what we actually saw looked more like someone took a shotgun on the plot. We were scratching our heads at first until we realized, hey, what about the biology?

Lake Superior doesn't have these invasive mussels to the same extent that Lake Michigan, Lake Huron, etc., do. But what it does have that these other lakes don't have is co-existing cohorts -- separate populations of lake trout – each that do their own thing. Commonly, when you're out fishing, you're catching almost exclusively lean lake trout. Those lake trout are basically the same version that are in all the other lakes. But here there's also 3 other types and maybe even more that do very different things. There's these red fins kind of out by Isle Royale. There's the humpers on the east side. Most importantly, there's siscowets. Siscowet, I think it's Ojibwe, means it fries itself because these fish are so fatty. Their lifestyles are very different. These are deepwater fish that almost never see sunlight, they chase a very different prey base. When we were catching those fish on accident and incorporating them into the lean lake trout database, we found that they made a radically different story. That was actually the explanatory variable for that. That kinda leads us into what's happening now. We're taking very special care to understand how biology's impacting contaminants broadly. Not just mercury, but all contaminants are affected by a fish's habits. These are individuals moving through time and space that have their own preferences. Now what we do is try and figure out what that fish's preference is to then better understand what the contaminant story might be. That's moving us into a new foray of contaminants. We can talk about all the alphabet soups that we can imagine, right? We can talk about the old ones from the past: PCBs, PAHs, or we can talk about the new ones, forthcoming. Some of these weird neonicotinoids or most famously, now, the PFASs.

Sharon: Right.

Ryan: Those are these unique classes of chemicals that are equally ubiquitous, kind of like mercury.

Marie: So, does mercury accumulate in the fat of creatures, fish? You know, I'm wondering if the siscowet messed up your study because they are so fatty.

Ryan: Yeah, I'm glad you asked that. This is probably one of the largest misconceptions I've encountered. Mercury does not have a preference for fat. But you're right, that the siscowet does have more mercury. But it has nothing to do with that. Mercury actually prefers to be in the proteins and the muscle tissue. So, when you catch a big fatty fish and you cut off the belly, thinking that you've saved yourself from that mercury, you really haven't. You've saved yourself from many other things but not mercury. (Laughter)

The reason mercury is high in those siscowet isn't because they're necessarily exposed to more mercury, it's because those fish are older, they live in cold waters. They grow slower but they intake about the same amount of mercury as their lean lake coastal counterparts. So you think of it, if both fishes are intaking one unit of mercury the same rate, but one grows half as fast, it leads you to the false impression that the one that's growing slower is exposed to more mercury when it's exactly not that. They're exposed to the same.

Sharon: Interesting.

Marie: The Wisconsin DNR, they've started testing fish for this forever chemical, PFAS. I know that there's been a consumption advisory put on rainbow smelt because of PFAS. What can you comment on about that and PFAS levels in different types of fish?

Ryan: You know, that's a real head-scratcher. To understand PFAS in fish you have to start at the beginning. PFAS doesn't act like chemicals we've encountered in the past. That's what makes them so valuable in commerce, right? That's why rain falls off your jacket. That's why your eggs don't stick to your pan. Because of their unique propensity to do these things. Unlike mercury, which we just talked about, where small mouths means less and bigger mouths means more, that's called magnification. You're obtaining the chemical from what you eat. PFAS seem to work a little bit different. They seem to work directly as an interaction between the fish and the water they reside in. Not all of them do this, but mostly that's the story. For whatever reason, lake trout are lower and smelt are higher. That's actually a subject of research for this summer for us. What we suspect is it's related to a fish's habits. It's right back to biology. We've got these big lake trout that exist in the deep part of the water. PFASs are surfactants, which means kind of like oil on water, they like to sit on top. Well smelt, they're kind of in the middle of the water column and often eat a lot of little things and reside, at least in proximity, closer to that scum layer of PFASs…

Marie: The scum layer. (Laughs)

Ryan: You can't literally see them but I'm trying to paint a visual for you guys.

Sharon: Right, right.

Ryan: So, you can imagine a scenario then if the only way you get it is by swimming in that water and if that water is a very thin layer on the top of Lake Superior, the closer you are in proximity to that, the more likely you are to take it up. That's just a hypothesis and we're going to test it this summer. Hopefully, if we come back to this next year we can talk about, hey, here's why the smelt are higher and here's how we can improve that scenario.

Sharon: I'm just going to take a moment here and say that I love science and what it can teach us about our world and the scientific method of asking a question and then methodically finding the answer. Thanks for all the work that you guys are doing over there at the lab so we can feel confident about eating our fish. And speaking of eating fish, you and your wife Courtney enjoy cooking together and friendly competitions. That's kind of how we got here today is because we were so intrigued by your couples' competition for sushi rolls that we wanted to try it in our fish-o-liscious section of our show.

Marie: Yes, so we're going to head on from the studio, which is up in the second floor of my house, down to the kitchen and we'll cook us up some sushi.

Sharon: All right!

Ryan: Sounds great.

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Marie: Ryan, there seems to be some misconceptions out there about sushi. What exactly is sushi?

Ryan: I grew up probably like a lot of people. I thought sushi, gross! I grew up in central Wisconsin. Sushi, gross! Raw fish and rice? Definitely not for me! But actually, sushi can be very dynamic. It's kind of like pizza. You've got your meat lovers, you've got your chicken alfredo and those are very different types of pizza. Sushi, you can have raw fish sushis, you can have cooked fish sushis, you can have cooked shrimp sushis, you can have steak sushis, you can have veggie sushis. Sushi just means a vinegared rice roll. Often when I encounter people who are like sushi, gross! I challenge the to think about it. Because if you don't think rice is gross and you don't think vinegar is too gross then you might actually like sushi. You just haven't found the right kind for you yet. Even today when we make sushi we're going to make it like a little contest or kind of like making a pizza. I like really spicy stuff. I don't think you like spicy quite as much as I do.

Marie: No, I'm not a spicy person.

Ryan: So, we made two different kinds and we can test each other's and just get creative with it. Like I said, it's kind of like that pizza night with your family with your kids kind of like making a pepperoni pizza with something goofy on it and the parents, they want a really mushroomy pizza. It's kind of the same thing, except we're going to make some sushi.

Marie: So today, we have some green peppers, some red peppers – Sharon's cutting them up – apple slices, red cabbage, mango, lime, mushrooms. What's that white? Onions, avocados . . .

Sharon: It's so colorful!

Marie: Yes! And some ginger, and then sprouts. Then for the meat we have some smoked whitefish and some walleye that is cooked, not raw. We're not doing the raw thing here.

Sharon: One thing I'm sad we don't have here is the cisco roe that's in season right about now. Cisco were running from November to December. It's over now but there's all this roe that we could eat here but we export most of it because we haven't developed a taste for egg roe in Wisconsin so much. I'd like to promote that this next year. We should start eating more of our fish roe here in the United States. Do you eat it Ryan?

Ryan: I've cured my own brown trout roe and it's really good. It's got a little snap to it. I would say kind of citrusy. It has zero fish flavor. Zero oil fish flavor. It's really simple to cure. It's just harder to pick from the web that it exists within that's called the skein. You pull the eggs out of there, it's the hardest part. But after that, curing it is super easy.

Sharon: So, you don't waste any parts of the fish that you catch.

Ryan: We do a lot of creative things. Basically, the innards are the only part that we don't use. Often if we get into a good mix of fish, we'll use the carcasses and make stock. Fish stock is supreme for chowders, for miso soup.

Sharon: That's great. I love the idea of eating the whole fish. Just not wasting . . . I think that's part of ethical living also, you figure out how to use stuff.

Ryan: Yeah, absolutely and it's culturally identifying with a lot of people who live here. There's a lot of Swedes and individuals from that whole area of Europe, at least by heritage, and traditionally they do a lot of unique things. They're eating lower fish. Whitefish livers, I think that concept comes from there. You're talking about exporting eggs. When we were in Sweden three years ago, I had Lake Superior caviar for the first time in my life.

Marie: In Sweden?

Ryan: Yep. We didn't realize it at the time, but the Swedes love the herring from the November bites. On the North Shore they catch a lot of that and if you try and buy it, it's impossible to find. And if you do find it you pay like, I don't know, 30, 40, 50 dollars a pound. It's extremely expensive. It's like the gold of the lake.

Sharon: Yep, Great Lakes gold!

Marie: Then we have some sauces. We have tiger sauce, we have sririacha. I made some eel sauce, which doesn't actually have eel in it. It has tamari and sugar and dry sherry. That provides a little sweetness and saltiness.

First, Sharon tries her hand at making sushi. Ryan instructs her on how to handle the dried seaweed sheets used to wrap the sushi. Then, it's my turn.

Ryan: The smooth side. You want the smooth side down. It's a lot stronger.

Sharon: Okay.

Ryan: There's a long side and a fat side. I do it this way, the fatter of the two sides. Every time you roll it it gets thicker, right?

Sharon: Oh, right.

Ryan: It's already enough.

Ryan: …. Usually what I do, I'm putting, I don't know, maybe a little over a quarter cup to start of rice. You're kind of aiming to get a nice layer of about one to two grains thick.

Sharon: It seems like it's so complicated, but once you break it down, it's like street food over in Asia.

Ryan: Yeah. That's a great point. Or if you've ever been to like Mexico City, and you see all the taco stands. There's no magic behind those. Sometimes simplicity… you let the ingredients take care of it for you.

Sharon: Right, right.

Marie: When I look at sushi in the grocery store, longingly, but then I read the ingredients and it's got so many preservatives in it …

Ryan: That's a good point.

Marie: … that I don't buy it. But I never thought about making it myself.

Sharon: I know. I never have either until Ryan brought this fun game up of like whose sushi roll is the best.

Ryan: Right. The other thing that's really helpful sometimes is just to leave a strip at the back end uncovered because you can use that then to seal it. You know, just get it a little wet and get it to seal. I'm just going to do something crazy right away and then you can reel me in.

(Laughter)

Sharon: He's going for the sriracha!

Ryan: Yeah, so we've got smoked whitefish. I like to put a fair bit of fish in so that you get that flavor. What I think pairs well with smokey, we're going to do the apples right away. We're going to do apples, onions, and I think jalapeno.

Sharon: Do you like the apples because you grew up on an apple farm?

Ryan: Yeah, I'm biased. (Laughter) It probably adds only like a small fraction of flavor, but it's like apples. You gotta support that, right?

Sharon: Yeah.

Ryan: We make all sorts of weird apple dishes, actually.

Sharon: You can call it a Wisconsin sushi roll. (Laughter) There!

Ryan: It looks like it's sealed, actually better than mine.

Sharon: It's my first sushi roll ever!

Marie: Good job! I'm doing walleye and apples and lime and mushrooms and maybe avocado. That would be different, or would that be too big?

Ryan: No, you're good. Avocado is forgiving too. It fills spaces.

Marie: It's smushy, yeah.

Ryan: The fish does that too. So those are two helpful… perfect.

Marie: So, then I just roll it?

Ryan: Yeah. You get that cap over the top and kind of tuck it in a little bit and it will be just fine.

Marie: Now, for the eating part. Who will win this friendly sushi competition?

Sharon: So, there's a little bit of wasabi going on. What do you think, Marie?

Marie: This is the smoked fish, apple, and avocado one. I think maybe I made this one? I like that.

Sharon: MMMmmm mmm. I'm getting a big burst of wasabi right now.

(Laughter)

Ryan: Clearing out the sinuses.

Sharon: I just had one of the smoked fish varieties. Yum! With some mango in it.

Ryan: That wasabi is strong.

Marie: Oooh, I got one of the ginger pieces!

Sharon: Nice. I just had a really yummy one. Let's see if I can identify it.

Marie: It's probably mine.

Sharon: It kind of has sriracha in it. It has color and the walleye.

Ryan: Okay, because you can tell if there's smoked fish in there, for sure.

Sharon: So, prior to eating this one, one of the smoked fish ones, it was like, oh! The smoked fish came out. And they're all so different.

Ryan: It's super easy, yeah, and even if one of them turns out bad, whatever, it's still palatable. You just get creative. Why not? It's a low-risk, potentially high-reward scenario.

Sharon: Right, exactly. I think the hardest part is remembering who made what. (Laughter)

Marie: I'm having seconds.

Ryan: Yes, please do. You first.

Laughter

Sharon: I really appreciate you taking time out of your day to ..

Ryan: Absolutely. This is part of my workday. I'm jealous that you guys do this more often than I do.

Sharon: Laughs.

Marie: We made the delicious mistake of intermixing our shushi rolls so we couldn't tell who made what. But it seems we were all winners with our sushi combinations.

For more information and Ryan's sushi recipe and video, visit Eat Wisconsin Fish on the web at eatwisconsinfish.org, plus Twitter and Facebook. Thanks to Ryan Lepak for sharing his expertise about mercury and sushi with us. And thank you for listening!