

Delta Smelt feat. Katherine Sun

Hey to all you fish enthusiasts out there. Whether you're an avid angler or just curious about fish, we'd like to welcome you to Fish of the Week! your audio almanac of all the fish. It's Monday, January 24 2022. This year we're excited to take you on a week-by-week tour of fish across the country with guests from all walks of life. I'm Katrina Liebich with the US Fish and Wildlife Service in Alaska,

And I'm Guy Eroh here to remind y'all that truly whoever smelt the Delta Smelt, dealt it.

Indeed. We are going to delta smelt it on this episode. We're heading to California. We're going to be talking with special guests Katherine Sun, who's the Delta smelt experimental release and supplementation regulatory and Outreach Coordinator from our San Francisco Bay Delta Fish and Wildlife office. Welcome, Catherine.

Hey, yeah, thanks for having me. And hello to all of our fish friends out there.

So first things first, what do these fish smell like?

Yes, delta smelt have a pretty interesting smell. And they smell like cucumbers. So sometimes when you get close enough, you get that whiff, you feel like you're at a spa, and you're like, "oh, there might be a delta smelt in this net."

Awesome. So we like to give our listeners a sense of what a fish looks like before we get in our conversation. So if you were to have a delta smelt in your hands, you're smelling that cucumber smell, what do they actually look like?

Yeah, so smelt are pretty small fish. It's about three inches in length when it grows to adulthood. Think a little bit smaller than maybe a finger on your hand. And so it'll fit nicely in your palm. And they've got this nice little silvery blue sheen to them. And even in some places on their body, they almost look translucent. So they're a really neat looking little fish.

And I do want to clarify something real quick, because I was trying to do my due diligence. Do my research before coming on this show. And this is a fish that has been in the news a lot over the last decade, decade and a half. And there's a lot of people out there that call them a minnow, and that really irks me quite a bit. So I want to clarify that these are a smelt. They're an Osmerid and not a Leucisid. So just wanted to throw that out there while we're talking about it.

That's correct. Thanks, Guy. We need to stick up for them. These are not minnows, they definitely belong in the Osmerids.

So these Osmerids, these smelt, what is their life history kind of like? What kind of habitats do they need to survive? And then how do they go through? What's their lifecycle sort of like?

Yeah, so delta smelt, they're endemic to the San Francisco Bay Delta estuary, meaning that this is the only place in the whole world where this fish lives. And so typically, this fish has about a one-year

lifecycle, so the clock is really ticking on them from the moment that they hatch from the egg. They got to grow up, they got to make it to adulthood, and they got to survive to spawn so that they can contribute to the next year's population.

So Katherine, this fish obviously has a clue in its name about where it lives. Where exactly are we on the map?

The delta, when we're talking about the Delta, we're talking about the San Francisco Bay Delta estuary, and that's in California. So this is actually the largest estuary on the West Coast of the United States. So when we're talking estuary, we're talking about where freshwater flows out to meet the ocean. Here in California, we've got two large rivers, we've got the Sacramento River that flows down from the north. And we've got the San Joaquin River flowing down from the south, and they both join up. And they flow out into San Francisco Bay, hence, the Bay Delta estuary, as we call it around these parts.

Let's talk about this delta a little bit more, you know, so there's been some major changes over the past 150 years or so. And I guess I'd like to know, what did it used to look like? What does it look like now? What are some of those major changes both to the Delta itself and to the fish community?

Yeah, Katrina, that's a great question. So let's bring it back to the early 1800s. So we're at a point where what is now California, this is really before the major settlement and the urbanization of the area. So we've got these rivers that are naturally flowing out to the ocean, and the Delta was a really rich tidal wetland landscape. And what I mean by that is you've got this daily tidal flooding coming in from the ocean side. You've also got seasonal riverine flooding that's coming from the rivers. And then you've got these really intricate systems other than those two major river systems we talked about. We've got lots of freshwater tributaries that are coming down from the Sierra Nevada mountain range. So this constant ebb and flow of the water it brings a ton of nutrients both ways, from the land and from the sea. And when the water recedes, you're left with a really rich soil and really rich ecosystem to sustain both aquatic and terrestrial wildlife.

So now we're gonna fast forward about 50 years, we're gonna enter the Gold Rush era. So it's about the mid 1800s. And the interest in what is now California, it's exploding. It's like an Adele concert. And if you're not trying to find your fortune mining for gold, you're probably starting a farm on the rich soils of the delta. So really, in order to sustain this agricultural boom, to encourage settlement to encourage people to come west, we and by that, I mean kind of the government's at the time, this is about the time that California also became a state. So eventually, the federal government also got involved. But today, we have over 1000 miles of levee systems that are built around this delta to keep the water from flooding up these fields so that you can actually have a chance to grow and produce and export those crops. So in doing so, we've really forever altered the landscape of what the delta used to be. And we've altered the flow of the water within the Delta ecosystem. So we've got the Delta smelt here, and it's evolved over hundreds and hundreds and hundreds of years to thrive in this historical habitat with the ebb and flow of this brackish water environment. And within the last 150 years, we've managed to completely reengineer it for our urban, our municipal and our agricultural needs. So it's not really what smelt have evolved for. And it's a big reason why they're struggling today.

So I read a statistic that kind of blew me away that of the 29 native species that occur in this estuary in this delta, that only, I think that's the only 12 of them currently exists still live there. Is that accurate?

I think so. I'm not super up to date on the rest of the fish community statistics. But certainly, we've got a lot of invasive species that are capitalizing on the channelization of these delta river ways. We've turned it into from the ebb and flow of our historic tidal wetland, we've turned it into these channels that we're strictly controlling the flow of the water, we want it to move one direction, and we want that fast. So what this creates is really just sort of this warm kind of shallow water environment where you've got invasive species that move in, and they, they are able to thrive in this environment in ways that native species, native California fishes cannot.

It's interesting, because we see that all over the US where a water you know, a water body or a delta or river, they've been kind of controlled and changed. And you see that just change over time. And sometimes it happens very slowly, and people don't really notice it. And sometimes it happens very quickly. But yeah, it seems like this is a common thing that we see across the US.

So far, in this conversation, we've kind of beat around the bush about the state of the Delta smelt we've kind of taken for granted. I feel like us in the in the fisheries community, the Delta smelt is almost a poster child of a species that's on the brink. But people who are listening, they might not know that, can you give us a little bit of more modern history of what the population size of the Delta smelt is look like? And especially in the last 15 years, what's happened to it?

Yeah, so just a bit of the history. So the Delta smelt was listed in 1993. And that was under both the federal and the California Endangered Species acts. And so the population has really declined dramatically in recent years. And that's along with some of this historic record breaking drought that we're seeing on the west coast here. And we're seeing extreme weather, we're seeing climate change. And all this is not good for the Delta smelt. Some of the estimates that we have for the wild population at this time, we're talking in the hundreds. So we've had a fish community surveys that have gone back through the 60s and 70s. And this fish used to be pretty plentiful. You could pull up a net and expect to see a good handful of them. We've got scientists at the University of California Davis, and they noticed they saw Delta smelt was relatively plentiful in a common sight in the 60s and 70s. And then they saw in the 80s, and 90s. Well, they're not seeing them as often they're starting to drop in the numbers. They're not seeing as many in their trials. So the university has really become a major player and a contributor in Delta smelt research. And so much of what we know today about the biology and behavior come stems from a lot of the research that they've done at UC Davis.

Katherine, you've got a real interesting title, can you give us a quick snapshot of what you do? And yeah, if there's any other additional partners who you work with, to help the Delta smelt kind of hold on to their final stronghold here, I guess I mean, there's hundreds is not very many fish. So I'm just kind of curious what you guys are doing to help them?

Sure. Yeah, I think my title can be quite a mouthful, and it seems to get longer every time I look at it. But to break it down, I'm really one of two coordinators, we've got a science coordinator as well. And we're trying to draw this roadmap for how to return Delta smelt to the wild. And so as the regulatory

outreach coordinator, I handle some of the big peas in the business we've got permitting to make sure that we're in environmental compliance with the state and federal wildlife protection laws, and everything that comes in between that. And we've got partnerships as well. So we've got a lot of really amazing partnerships in the Delta, we've got a lot of really amazing organizations that are dedicated to the cause, the California Department of Fish and Wildlife, the California Department of Water Resources, we've got the US Bureau of Reclamation, they handle a lot of the water supply federal issues in the West, we've got the US Geological Survey, and of course, UC Davis, they're interested in the science, they're interested in seeing how can we help this native fish and bring it back from the brink?

What compelled you to join this position to really dedicate your career thus far to trying to help a species such as the Delta smelt? What drew you to that?

Yeah, well, I myself was a UC Davis student. And this is really, as you mentioned, it's kind of the poster child of some of the really big plates in California with endangered species, and to be able to have gone to school at this university, where they're really doing a lot of the cutting edge research on Delta smelt. And then the partnerships that they have going on with a lot of these wildlife protection agencies, there were just a lot of connections there. And it just really drew me in to feeling connected with the land that you know, we're around here in California.

When it comes to a fish that's on the brink, there's usually a few different strategies that you can take to kind of bring them back. One of them is habitat restoration. We're talking a pretty complicated habitat issue it sounds like. The other technique is stocking or supplementation. Can you talk a little bit about what you guys are doing with stocking these fish back into the wild? And just kind of the thought process that went into that strategy versus maybe some more of the habitat restoration?

Sure, yeah. So as I mentioned, you know, we're trying to look for some of these new and innovative ways to encourage the conservation of the species. And so we're lucky because we've got a really important facility for delta smelt conservation, and that the UC Davis, Fish Conservation and culture laboratory. So researchers here, they've been raising captive bred Delta smelt since the 90s. And they've spent all this time they're fortifying our captive gene pool. So they're using genetic management to make sure that in captivity, our population has a gene pool that's both diverse, and it's going to give us a really robust population, especially as wild smelts are becoming a rare sight. So using these captive-bred fish, we have a lot of opportunities to conduct research. We've got researchers from a lot of different entities, agencies and universities. So they're able to build on that research that's occurred since then using these captive fish. And it's led us to the point where we are today, we're trying to figure out how can we get captive raised Delta smelt back into the wild environment in both a safe and effective manner.

So I reckon you're not like dropping them out of planes like they do on to some of those lakes?

Not quite. So we're working with all these partners to figure out what are going to be the best methods for reintroduction of smell into the wild. So this year is really our first try at releasing smell into the wild. There's a lot we don't know. And there's a lot we just have to try out. It's never been done before for the

species. And some interesting background is that delta smelt they're relatively weak swimmers and they tend to rely on the current to get to places so you can imagine how they evolved in this tidal estuary to just kind of roll with the currents to get to where they're trying to go. So as weak swimmers, it's interesting that you bring that up on how we're trying to return them to the wild. So one of my favorite tidbits about what we're trying to do is in our transport processes, as we're refining these methods, we've had to go with the use of rounded containers to transport these fish. And the reason is because delta smelt had been known to get stuck in corners, they get stressed out, and they die. So very relatable Delta smelt. But also, it's just, you know, we have to go about this in a really careful manner, because we're talking to a really fragile species that's extremely prone to stress, especially the transport stress, and some of the new sort of release strategies that we're trying out for them.

How many did you release this year?

So far, we've got about 25,000 fish into the delta. And that's yeah, that's huge. That's more than you know, it's totally successful. And we accomplish that in to release events, we're hoping to have more, we still got some fish to release. But we're trying to work out the logistics there. And the way we've done it, we've taken the approach of two different release methods. So you've got a hard release and a soft release. And I'll explain those, the hard release is really just a direct from the transport container into the river. So that's going to be sort of the easiest, but also potentially the most stressful way to do it, because you just go, you drive them down, out to the Delta and, plop, they're in the water, and they just gotta deal. So that's potentially a very stress inducing way for very fragile fish. And then we've got the soft release, which is an acclimation based approach. So UC Davis has built these really large cages that are designed to sit in the water and provide a safe space for these smelt to hang out to get used to the new environment that they're put in. And then after a day or two, we'll drop the cages and we'll have the fish be released into the river.

How do you guys plan to evaluate the long term success of this? Because you're talking about the about one year lifecycle? How do you know if the fish that you're maybe seeing the year in and year out are going to be these fish that you're putting in?

Yeah, that's a great question. I think we're really just at the tip of the iceberg. On all the questions that we have in this first year, we're almost figuring out what are the questions that we're trying to ask, we have ideas on what we can do with Mark recapture. And we just have to make sure that we're kind of working our way up to studies like that, this year, we're really focused on how do we get them out there safely? And did we do it in a way that was efficient and safe, even for our people to do? So we're really exploring a lot of these logistical methods, but we certainly have plans to figure out. Alright, how far did they go? How long did they live? And we're seeing some of these preliminary results already, we're able to tell that they're ours because they've got things clips or tags on them really tiny, but this is really good information. So every time we pick one up, that's a data goldmine. We know what genetic family they're produced from, we know how far they went, we might be able to tell what they ate their body condition and health status, and potentially even up to the spawning season, we might be able to tell if they were able to successfully spawn.

Katherine, a lot of times people connect with fish through fishing. So I'm just wondering if there's any insights you have about kind of how this fish was historically important from that standpoint. And if there's any ways that the public can connect with this fish, today with what you guys are doing.

So thinking about these native California fishes that have been here, for long before any of us got here, I think we just have to consider that for a second and consider what an integral part of the ecosystem that they are, and how interconnected this whole ecosystem is, I think we should be concerned about these native species. And just to know that when one is in trouble, it's not a far cry to think that the rest of the ecosystem may also be in trouble. And we see that with some of our other fisheries in the California Delta system, like we've got a couple of different runs of salmon that are listed also under the Endangered Species Act. So I think it's a really big indicator that the health of the ecosystem may not be, where it once was, and where as a service. Our mission is really to protect these resources for the American people.

I really do like how you frame that as the loss of the Delta smelt isn't necessarily that you're pulling a piece out of the ecosystem, and everything's gonna fall because of that. But really just, it's kind of like it's an emblem of this system, and then it might be the first to fall, and the same pressures that are pushing on the Delta smelt are going to be the same pressures that push on all the other species that are out there. And, as you mentioned, you know, the Sacramento San Joaquin River system, it's not just the smelt, it's this whole system, it's kind of, it's not known as a system that's doing really well. We have something special here that's different. You can't find it anywhere else in the world. And do we want to lose that to replace it with another bass and catfish fishery, something that we can find a million times over and other parts of the country. And that's what really drives me why I think it's important to try to conserve the species because it's something special, something that's different, something that you can't really recreate. You got to make a stand somewhere. And I guess this is a good hill as any to die on.

Diversity is really a beautiful thing. And that's something to be valued in fish and in people. And I think about our Endangered Species Act, and it was really something that came from our society to help protect that diversity of wildlife, of fish, of places. So I think this is a really interesting discussion about this really unique place in California, that is really a preeminent kind of, you know, representation of that state and its uniqueness. So I think this is a really neat discussion of why it's important to protect a fish like the Delta smelt that isn't super charismatic. It's not very big, you can't fish for it anymore. But it is unique fish that's very specific to a very special place.

Catherine, are there any thoughts or ideas you'd like to leave our listeners with about the Delta smelt and their Delta home?

Yeah, I think we've talked a lot about the history. And as a native Californian, you know, I can't deny all the great things and the great experiences and opportunities that I've had in California. And, you know, part of where I think we just have to think about our choices moving forward. And just finding that balance. California is a tough spot. And with regards to like endangered species consultations, we are far and away number one, because we're number one in development. We're number one in projects, and green, solar, and a lot of those things, we're such a populous state, we're almost the size of maybe

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our own country. And we've just got to make sure that we're sort of balancing the resources. So if we want to provide for future generations to have the same opportunities and resources and access to the beautiful, natural environment and habitats that we have today, we've got some work to do to continue to foster that balance to make sure that we're sort of coexisting and we're living and within our part, to conserve what we've got in terms of the native habitat.

Is there any reason to be hopeful looking into the future for delta smelt?

You know, I, from my work with the experimental release technical team, it's provided me with a lot of perspective and to see folks who have worked in this system for much longer than I have just come to this project with the energy and the enthusiasm that they have. And just to see these fish go in the water. And just to know that that's, it's a huge milestone in conservation for a fish that's been the center of research and environmental concerns for decades now. And just to see that energy still there, I think that gives me a lot of optimism for what we can accomplish with our program. I think we have a lot of the support and the partnerships that we need to build a strong program moving forward. And I think people should look out for really great things from this program.

You're doing great work.

Thank you, Katherine. It's been really neat talking to you. And yeah, thanks for joining us on the show today.

Great. Thanks so much for having me.

We hope everybody gets out there and enjoys all the fish, including, you know, really get to know that delta smelt and some of those really special endemic fish around the US that are tied to a unique place.

Thanks for listening to Fish of the Week! My name is Katrina Liebich. And my cohost is Guy Eroh. Our production partner for the series is Citizen Racecar. Produced and story edited by Charlotte Moore-Lambert. Production management by Gabriela Monteguin. Postproduction by Alex Brower. Fish of the Week is a production of the US Fish and Wildlife Service, Alaska Region Office of External Affairs. We honor thank and celebrate the whole community: individual tribes, states, our sister agencies, fish enthusiasts, scientists and others who have elevated our understanding and love as people and professionals of all the fish.