

Ocean Sunfish feat. Dr. Tierney Thys

Hey to all you fishing 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, September 26 2022. And 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.

I'm Guy Eroh. And this week, we got a fish that's the owner of many fabulous superlatives, I guess you could say is the Marty Stuart of the fish world, talking generally about the Molas, the Ocean Sunfishes.

I am very pleased to welcome our guest. She's a marine biologist, a science communicator and National Geographic Explorer. And she's very familiar with the ocean sunfish. And that is Dr. Tierney Thys. So welcome to the show.

Thank you for having me.

I'm actually in awe of this fish. And I've been looking forward to this conversation for a while. And to kick things off for folks listening who may or may not be familiar with its unique look, we were hoping you could just first describe what this fish looks like.

Well, it's very characteristic fish. There's nothing really that looks like it. It's like a big head with long fins stuck to it that can flap back and forth. And it doesn't have a tail so to speak. So it's like a big swimming head.

Really big, right? I mean, this is the biggest bony fish on Earth.

It's the heaviest bony fish in the world. Yes. So if you're looking at just by weight, you know, you can divide the fishes into the cartilaginous fishes, the Chondrichthyans and the Osteichthyans. There's two major groups and out of the Osteichthyans. The bony fish, it's the heaviest it gets to be over 6000 pounds.

That's huge. That's like rhinoceros size or bigger.

Yeah, yeah.

So I'm a big fan of the taxonomy. I think you might be able to recognize that. I am curious what the current state is because everyone sort of knows who's in the ocean sunfish kind of sphere of knowledge that you have the Mola mola and that's kind of the big species. Everyone knows about what other species are in that genus and are there other genre of Ocean Sunfishes?

Yeah, well, taxonomy of sunfish is a hot field right now. [laughs] So you've got three genera. You've got the Mola genera the Masturus and the Ranzania. And the Mola and the Masturus they're the ones who get really big. The Ranzania doesn't get so big. It only gets to be you know, less than two meters. But it's beautiful fish beautiful, very different from the other ones and more confined to the tropical areas.

Well, but you do find them in South Africa, but they have a more constrictive geographic range. That's Ranzania laevis, you have Masturus Masturus lanceolatus which is the Sharptail Mola. It's got a little bit

Ocean Sunfish feat. Dr. Tierney Thys

more of a nub on its posterior end. And you find those in Taiwan and they're a little bit more tropical than the molids. And so with the Mola you have Mola mola, which is the most common in the northern hemisphere. You have Mola alexandrini, which is more common in the southern hemisphere. And you have Mola tecta, which is more common in the southern hemisphere, but we are finding it in the northern hemisphere as well.

Yeah, and so like the juveniles so we're talking about the larger adults fish. What do the juveniles look like and what do they have in common with maybe some of the other related fish?

Ah, yes, juveniles are the cutest little baby pictures you've ever seen. The juveniles like little, little pin cushions with fins. They're they're completely adorable. And they give away their ancestry with their individual development. You know, the old saying, ontogeny recapitulates phylogeny. I guess that doesn't really roll off most people's tongues, but it's a way of saying that we trace our evolutionary history in our individual development. And so when you look at the sunfish babies, they have these long spines on them. And they look like little porcupines. They're related to Porcupine fish and puffer fish. And that's their basic body plan their basic blueprint kind of stiff bodied, maneuverable, but not super streamlined.

That's cool. Do they share any other traits with those, like puffer fish or file fish or any of the others?

Yes, a lot of a lot of traits. A lot of cranial fusion, so many bones in their head are fused to look more like a human skull. You know, fish have so many bones and they also have their whole spine is fused and very few vertebral centra. So they're not wagging their bodies. They're wagging their fins.

They don't look like a wagger. If you look at their body.

They're not a big wagger and they put a lot of effort into their paired fin locomotion so that's something they share with triggers and boxfish and porcupine fish, puffer fish you know all those durgons. All those funky funky looking fish. humuhumunukunukuāpua'a - They're in the same order.

That Hawaiian fish. Yeah!

So this fish, which we've described doesn't really look much like a fish it's kind of like if you play Mario Kart sorta looks like Banzai bill, the fly and bullet that goes around. And you know, they're like three, four feet across, can't really swim well just splash kind of splash round towards the surface, although I hear there's some vertical migrations that go on.

Well, I have to differ with your opinion. They're actually very efficient swimmers.

ok!

And there was one that was just satellite tagged, and it was tagged in Taiwan and ended up all the way down in New Caledonia. They travel up to 30 kilometers a day, they can launch their bodies out of the ocean, up to three to four body lengths.

Wow!

Ocean Sunfish feat. Dr. Tierney Thys

They're capable speed six meters a second burst speeds, so they are no slacker when it comes to locomotory prowess. They may look like they're just some ne'er-do-well, lying around, you know, sucking down jellies at the surface. But they are hiding quite an active agenda, they can dive to 1000 meters, up to 40 times a day. They have incredible thermal tolerance, two degrees Celsius to, you know, 18 or 20 degrees Celsius in one dive.

I'd really like to learn more I think about like the swimming mechanics of this fish. I mean, just Yeah. How does it all work? And yeah, I guess another thing that we've talked about on the show is fin placement. We've talked about all the fins, you know, depending on which species we're talking about, but how exactly are they arranged? And how is it different than some of the other fish?

Yeah, well, this fish has no axial muscles. So when you like look at a fish steak in the grocery store, you see those concentric circles. Molas is not have any axial muscle running down the length of their body, most of their muscle is dedicated to their paired fins. So they have their little pectoral fins on their sides. But those are more for sort of maneuvering and stability. And then they have these long dorsal and anal fins and the muscles that power the dorsal fin attach to the top of the head. And the anal fin, just heads straight down to the anal fin. The posterior part is called the clevis, which means rudder in Latin, and it's made of the dorsal and anal fin rays that have migrated to the back of the body. It doesn't have a tail. Gotcha. And then it has some very small muscles that can move that more like a rudder, when they're really wanting to crank, they will flap that, but it's not a true tail. So the way they move is primarily with their dorsal and their anal fins that they can change the camber of those, and they can flap them in synchrony. Or they can flap them asynchronously. And when they flap them asynchronously, that's when they're going on long distance. They actually have quite a bit of red muscle next to their backbone, but so they asynchronously sort of flop their way around. A lot of yaw. but they generate vertical lift. It's the only fish that swims through vertical lift generation, like a turtle on its side. And then they also have this skin that's acting a little bit as a buoyancy device. It's a really interesting form of locomotion, with a stiff body, a stiff vertebral centra, and then these flapping fins where they can change the camber of them.

Guy mentioned them kind of at the surface, I think a lot of times people see pictures of them kind of near the surface kind of spread eagle there. What are they doing there? And I guess, yeah, you've mentioned some of their other behavior where they're moving quite a bit and eating but I guess what are they doing at the surface when folks see them there?

Yeah, so they have this name of sunfish. Some say that comes from they sort of glow like the sun. Others feel that that name has come from the fact that you do often encounter them, at least Mola Mola, at the surface, we found that they do warm their bodies up. They're like a big solar panel. So the deeper they dive in, the colder they get, the more time they spend up at the surface warming up so that they can engage in those dives and keep their body temperature above ambient, to allow them to keep going up and down. So by coming up to the surface that can serve multiplicity of purposes: they can warm their bodies up for future dives, they can also expose their skin to UV light and bake off parasites. They're rather infamous for having a ton of parasites.

Ocean Sunfish feat. Dr. Tierney Thys

They're like a parasites' dreamboat, probably with how big they are.

They're like little smorgasbord of parasites depending on what part of the world you're looking at. Even their parasites have parasites on him, and so the UV light can bake off the Ectoparasites. Also, anyone who spends any time in the ocean, they know that floating objects attract other little things underneath them. Flotsam tends to attract all sorts of little critters. And those little critters are often larval fish that can eat parasites off the underside of the Mola. So it can do that. And also by being at the surface, they can expose themselves to seabirds like the California seagulls will come and eat the Ectoparasites off the sunfish. But a variety of different seabirds can alight next to the floating sunfish and pick up some of those ectoparasites.

That's interesting you bring up seabirds. I know some of my former work with whales that some of these right whales have issues with overpopulations of like seagulls actually not just eating parasites, but pecking at the flesh of the whales themselves. So I'm curious that this kind of lifestyle that the sunfish has, does it leave it open to predators? I mean, surely getting big is going to keep you from getting eaten by lots of stuff. But sort of float in there. Do the birds ever present a problem or sea lions or anything else?

Oh, yeah, the birds are not the best masseuse. They're not the hygienist you would opt for.

I wouldn't want one.

Yeah, they're not very gentle. And if given the opportunity, they will poke the Mola's eyes out in a second in a heartbeat. So the molars have this muscle where they can pull their eyes deep into their sockets and protect their eyes. And the seagulls are I mean they're not gentle. No, they're in it just to get that tasty morsel and if they take a bit of the poor sunfish's skin with it doesn't matter that mind

yeah. What else? I mean yeah, they kind of sitting next to other bigger predators a guy mentioned sea lions with like sharks or anything else?

Yeah, so we know quite a bit of different predators for the for the sunfish. Sea lions, certainly here in Monterey Bay are a big predator for them. They play ultimate frisbee with them. They rip off the dorsal and anal fins, fashion them into these little round disks and toss in between each other. And it's hard, their skin is like no other fish. It's very thick. It's like fresh coconut meat. And it's like a big hide, very difficult to get through. And so the sea lions, they can get into the hide, they'll eat the sunfish, but if they get tired with it, then they'll just kind of toss it around like a Frisbee. We do know that sharks eat them because some of the sunfish we've seen look like they have shark bites in them. But also, we know that they have larval shark tapeworm parasites. So for that tapeworm to complete its lifecycle, it has to start with sharks so we know that most likely sharks eat sunfish. And we also know that orca eat them. There's a number of accounts of orca eating sunfish using it as a tool to teach their youngsters how to fish and dolphins will grab them and play with them. And I imagined they would eat them if they could get into the viscera.

Are they a target for fisherman at all in terms of consumption or bycatch or anything like that?

Ocean Sunfish feat. Dr. Tierney Thys

Bycatch is a big problem with sunfish especially in the drift gillnet fisheries. So big areas of bycatch have been in the Mediterranean traditionally. Traditionally, California had one of the largest problems with bycatch with sunfish but that was due to the drift gillnet fisheries that are now coming to a close. South Africa, high seas, we do see sunfish getting caught in bycatch. They are eaten not so palatable for Western tastes. But they're eaten in Taiwan, Japan, Philippines. Yeah, Taiwan they have a dish called Dragon intestines where they eat the gut of the Mola. The molas have these tubular long white tubular guts, and they look like they look like a dragon intestine. If you know what a dragon intestine looks like or can come up with that in your imagination. Then in the Mediterranean, they have been eaten but they are listed as "not to be caught" because they're in the Tetraodontiform group which is known for having tetrodotoxin a potent neurotoxin that can kill you if you. Like Fugu is one species within the Tetraodontiforms that could kill you. Mola don't have that actual toxin. But out of an abundance of caution, the European Commission has forbidden the sale of any Tetraodontiform.

If you're diving with one of these, is there anything you should keep in mind in terms of their behavior or how you should approach or anything like that?

Yeah, and I'm so glad you asked that. Because there are some areas where there's so many divers in the water, it's really become a problem. You see this in many places like with whale sharks, with orca. You know, too many divers harassing the animals, these islands off of Bali, are a big hotspot for diving with mobile Alexandrina. And you get just way too many divers in the water, and they're just pawing at the fish and flashing their lights. And the reason they come to those particular areas is to get cleaned of their parasites. If they're getting harassed, then they can't get clean to their parasites. And that leads to secondary infections. And it can lead to their death. There's voluntary codes of conduct to when you get in the water, keep your distance, don't flash them, don't touch them. Don't swim fast at them, let them do their natural sunfish thing. And watch the cleaner fish interact with them, but let them be cleaned, let them have their peace. Because if you don't, then they're just going to leave. And they and you won't find that dive spot there anymore.

That's good to know.

I got a bit of a loaded question here for you. And we'll see what you do with it. This fish is relatively new on the evolutionary scene. And as you mentioned, it's kind of a strange choice of behaviors and morphologies for an open ocean fish. Do you think evolution ever catches up with this fish and kind of wipes out this body plan? Or do you think it just continues evolving? And you know, another 100 million years down the line we still got ocean sunfish? Oh, no,

I think these fish have many, many characteristics to suit them well, for longevity in this fast-changing world, most definitely. Because, for one, they have massive range. So if you want to persist on this planet, location, location, location. The more places you exist, the more likely you are to persist. So you find them from north of the Arctic Circle to below Cape Town, South Africa. So they can live a lot of places. They have great thermal range, as I said, so in today's fast warming ocean, they can tolerate that some of our preliminary data shows that they can tolerate hypoxic conditions for short period of time, they produce a ton of young. That's a good strategy in a fast changing ocean. They grow fast. So that's

Ocean Sunfish feat. Dr. Tierney Thys

also a good strategy. And the niche that is really interesting that they're filling, they change their diet when they get about a meter in length. They have baby teeth, and they eat all manner of different things when they're youngsters, everything from squid to hake and benthic tunacates and then when they get over a meter or so they start to prey primarily on jellies which seemed to be increasing in certain areas. So that's well suited for the future. So gelatinous zooplankton, moon jellies, Chrysaora, nettles, siphonophores. That's a really important diet. In some areas where we've pulled out all the food fish, the low energy life forms, like jellies have moved in and taken up residence. And now they're not welcome. They're like in the Mediterranean. They're not good for tourism. In Japan, we have these giant Nomura's jellies. Namibia, they have problems with jellies. So we need to keep all our jelly eaters intact. The Molas are an important component of, of that whole gelatinous zooplankton ecosystem. And they're just so darn endearing that I think people are enchanted by them. And they're always the star of the show when they're on exhibit. Yeah, they have that going for them, too. They're the underdog. I think people want to save them when they strand.

And I guess just a follow up question. It kind of relates to you know, how people maybe will see these in the wild, but how are you actually capturing them to put tags in? And how do you go about finding one in the ocean to study?

Yeah, it all depends on where we're working. In California, if we have we have the luxury of having spotter planes that can spot them from the air and vector us to right to underneath them. And then we have a big, like, just a big net that we can capture him at the surface, bring them close to the boat and make a small incision where we put the dart in and then the tag hangs off. In other countries, we have to sort of, you know, find them at the surface and sidle up to them and grab them, cover their eyes so they don't get too spooked. And then tag them that way. Some countries they don't, like Indonesia, they don't come to the surface as frequently so we modify spear guns and sneak up on them when they're getting cleaned to put in tags at depth. And then in Asian countries where they're caught in set nets like in Taiwan, or in Japan, they're caught in the nets. And so we work with the fisherman, and we pay the fisherman for the, for the fish, tag it and then have to motor it way far away from the net, so it won't just get recaught right after we put that expensive tag on.

I'm curious. So obviously, you know a lot and care a lot about this fish. How did you get interested in ocean sunfish from the beginning? And can you even think back to that first time you saw one of these or learned about them?

Well, how could you not be interested? I mean, that just so peculiar. I sort of heard about them peripherally. And then when I got to grad school, my advisor had a little picture of a sunfish on his door. And I looked at that fish. And I said, That's the silliest design for a fish I've ever seen. I mean, why go out into the open ocean and leave your tail behind? It doesn't make any sense.

Yeah.

And he mentioned that there was an opportunity to perhaps study the sunfish at the Monterey Bay Aquarium. So I did, the more you find out the better questions you get, and the more interesting they

Ocean Sunfish feat. Dr. Tierney Thys

become. I didn't have any intention of studying them for the rest of my life. But they're just so interesting.

So Guy asked you about what first piqued your interest in these fish. And now that you've spent a lot of time with them over the course of your career so far, what questions do you still have about them?

Yeah, there's so many questions still to be answered. Like how long did they live? How fast do they grow? When did they reach sexual maturity? How long are their generation spans? Those are very important in terms of conservation. We have, you know, chunks of data deficiency that we need to fill. We're also looking to see if we can identify individuals based on their individual markings or patterns like you would the whale flukes.

Yep. Do we know how many Mola molas exist? Like how many like what the population is?

But no, that's another big question. We don't know overall population numbers.

From a citizen science standpoint, are there ways people can help? You mentioned maybe photography and patterns? And I know the ocean is a kind of hard place to study just based on how expensive it can be. I guess, how can people help with the research piece?

Yeah, well check out [ocean.sunfish.org](http://ocean.sunfish.org) where we have a lot of our data there, you know, we have the paperback of our book came out. So anyone who's really wants to take a deep dive into the sunfish can check out the one and only academic book on ocean sunfish. And then I naturalist is such a great platform for uploading your images of sunfish. And if you're going to take a picture, try to get the whole side of them both the right and the left side. Because we're always looking at those pictures and identifying individuals and looking for patterns and looking for new species. That's a really useful platform for keeping track of ocean sunfish.

Back in 2015 when I was an ichthyology student there is a video that kind of went viral on the internet out of Boston Harbor involving an ocean sunfish. And I'm curious how many people sent that to you?

Oh, a lot of people. And actually, I thought it was funny. I mean, it was very expletive ridden. So I couldn't really show my kids, because every other word was a swear word. And the Boston accent was just hysterical. But you could tell the fellow was just enamored with.

Oh, yeah. "It's a turtle. It's a baby wheel!" Yeah, he didn't know what it was.

He didn't know what it was. And for me, I just loved that because it underscored that the ocean is still filled with mystery. It can just engender such enthusiasm and such just unbridled awe and exuberance. And I loved that you could feel that excitement when he was looking at it. And that's in stark contrast to another viral thing that went on Facebook was someone poking fun at the sunfish and saying it was such a worthless fish and just a completely mean spirited rant. That got a lot of hits. Ridicule for a fish that has no voice. I mean, what kind of bully behavior is that? Why would this person do this except to just sort of get attention for themselves? Why bully a voiceless fish like that? And not see the beauty in it. Facebook and social media can bring out wonderful things in humanity and horrible things in humanity.

Ocean Sunfish feat. Dr. Tierney Thys

For people who aren't going to be offshore out on the ocean looking for those fish but who still want to see it, does the Monterey Bay Aquarium currently have any on display?

They do. There's one on display right now. So come, come visit. Japan also usually has them on display. In various European countries. I think there's one in Lisbon right now that's on display.

So I saw one once when I was in Barcelona that they had one. I don't know if they still do.

Yeah, yeah. Some of them adapt well to captivity and others don't at all. They have different personalities. Each sunfish is its own individual.

Super cool. This has been a very interesting conversation about this fish and it's great having you on.

Thanks, Tierny.

Yeah. Well, thank you. Thank you for the opportunity. I love what you guys are doing. We owe the fish a debt of gratitude. None of us would be here were it not for those fleshy finned fish that took the wherewithal to come on to land and, you know...and then came humans.

Some taxonomists or even say that we still are fish.

Well, I think we are, we're just bipedal desiccating fish but fish nonetheless.

Awesome. Well, we hope everyone gets out there and enjoys all the fish especially the ocean sunfish.

I hope so too.

Thanks for this has been great talking to you. And yeah, we're excited just to celebrate salmon and we hope everyone gets out there and enjoys all the fish thanks for listening to fish of the week. My name is Katrina Liebich and my co host is Guy Eroh. Our production partner for the series is Citizen Racecar. Produced and story edited by Tasha A.F. Lemley. Production management by Gabriela Montequin. Post production 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 enthusiast, scientists and others who have elevated our understanding and love is people and professionals of all the fish.