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 all the fish. It's Monday Sharktober 24th 2022. And this year, we're excited to take you on a week by week tour 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 and this week we're getting Halloween started a little bit early by talking about the goblin shark.

And I'm very pleased to introduce our guests we've got Vicky Vásquez, also known as Vicky Sharkey. Vicky is a marine biologist and educator who specializes in sharks, specifically deep sea sharks like the really cool Goblin Shark. So welcome, Vicky.

Thanks for having me. I'm so excited to talk about weird sharks, especially during Sharktober Yes, it's real. Sharktober is real. It is not just something I came up with in my mind. It originally got its name because of great white sharks Carcharodon carcharias. It is because the old like wives' tale or I should say surfers tale is that October is called "tax season." So the unfortunate time when attacks on humans is the highest it is actually October so I love to usurp the idea of Sharktober to really highlight other species because we have things like the goblin shark, it's just fun to have an excuse for things that are spooky. And why not things from the deep sea. There's so many sharks that live there.

So cool. All those deep sea fishes are pretty amazing.

I get super excited, as you can tell.

Okay to set the stage here, I was thinking today, we could all close our eyes unless you're driving and listening. Imagine dropping down into the sea. It's dark, it's cold. Vicky, we'd love if you could help us imagine what a goblin shark would look like as it swims by.

First, if you could pretend you have a lateral line, it wouldn't matter. Because Goblin Sharks swim so slowly. When I was in Tokyo, Japan researching them, I was actually very stressed out that we were dealing with a dead or dying goblin shark. Because as many of us who hang out in coastal waters, imagine how much you are dealing with waves and all of that strong action water. But when you're in deep sea, think about being in space. That's a much better idea. And so that goblin shark is perfectly equipped for floating by perfectly. It knows exactly where it's going. It is moving in such a way that it's barely disturbing the water. And so when I was in the boat, seeing this thing getting sloshed around in our temporary holding tank, I was thinking like "it's not doing well." And when we released it, it did perfectly fine, taking its time back down to the deep sea. And so that is what impressed me so much about these sharks. They are really made for their environment, these huge predators. And when I say huge, I mean huge. I want you to think about a great white shark because that is their relative, their close relative. Think about a great white shark that is made for the deep sea and that's what you get with a goblin shark. But instead think about a jelly, soft body, that's pink with blue fins. And you don't even know that it's coming. And it comes by super slow so you don't think there's much to worry about.

Except that when it's really close the jaws shoot out of its mouth, super super fast, faster than you're like realizing. And that's how it gets yah.

That's awesome.

Is that why they call it a goblin shark? Cause it's gobbling up the food?

That and the face is very disturbing to look at. Most pictures that you will see of the goblin shark are usually with the jaws already jutted out. And so that is I think how it got its name. If you see the rare photo of the jaws inside of its mouth, which is how it's usually swimming about its life. It almost looks instead like it's wearing a weird hat. And that is its snout. It's really a long projected snout.

Yeah, I was looking through photos. And I did notice the jaws and like really funky. They were jutting out like that. But yeah, it's pretty amazing. I'm hoping Vicky, you can just kind of describe the mechanics behind how their jaws work.

Oh, yeah, sure!

What's going on here?

What you're seeing is the thing that all sharks are known for is which their jaws aren't really attached to the rest of their skull, which gives them that ability to really jut out their jaws. And in the case of the Goblin Sharks, they have the ability to shoot it out faster than any other animal in the entire world. I want you to think about that little muscle in your upper lip. I don't know what it's called, but it's the one that's between your two front teeth. For the goblin shark, that muscle is like a huge, giant joint, it's a really thick muscle. And the only point of it, is to keep the jaws from ripping completely out of the face. So when you see videos of the goblin shark, eating, it is actually a very slowed down video, because this happens so fast that the naked eye can't really process it. So yeah, so you can only really see it slowed down. When I saw it in real life, it almost reminds me of a magic trick, you know where like, it happens so quickly that it looks almost more like something disappeared.

When you're looking at this fish extending his jaws, we know that there's a lot of freshwater fish that we've talked about on the show that also extend their jaws, they do more of a vacuum feeding. Is that what this fish is doing? Or is it strictly just getting the extra distance in order to pierce and grab the prey?

The ladder. It is getting that extra distance so it can grab and pierce the prey.

Okay, you mentioned that it's a close relative of the Great White shark. You imagine those kind of triangular, serrated teeth, this thing's just all snaggletooth looking. What is the reason for having these different tooth structures?

That is a great question. And that has everything to do with the environment. So when it comes to a goblin shark, not only is it eating a soft bodied animal, like a fish, but it's also eating soft bodied animals

in the deep sea. So these animals are living at a very deep pressure, it really just needs teeth that are equipped to, to catch. So that's why it's so much more snaggled toothed because it doesn't have to worry as much as a white shark does about the prey item being able to rip away from it. The goal of a goblin shark is to be able to just trap and catch the animal.

That's cool. Do we know what they're eating? Like? What kind of prey items do these guys like?

They're going to eat whatever they can find in the deep sea. So they're going to be very opportunistic. They're going to be eating a lot of squid, which again, is a very soft bodied animal. So a lot of invertebrates and fish.

How do you go about finding one of these sharks to study?

It's incredibly difficult. And the only thing that we can count on is trying to study the young ones, specifically in Tokyo Bay, trying to study the large ones is next to impossible. The last time a large one was found was off of a gillnet trawl in the Gulf of Mexico. And that was I've got to say like 2016 maybe? And so that was just obviously not what those fishermen were looking for. It was just happenstance. And there has not been an adult's goblin shark found since then. Oh, wow. to target an adult goblin shark, which would be amazing. It as you can imagine, is next to impossible. So we went to Tokyo Bay having no clue if we were going to catch babies, or we were going to catch adults. Now how did we go there to try to catch them? That was to be perfectly blunt, the most depressing part of the work because we had to rely on the kindness of fishermen. Meaning that we were essentially a very common job that many marine biologists take out of college, which is a fishery observer. As somebody who works a lot in deep sea sharks. I always work with dead sharks, but I have worked We've been in the part of the fishery observer where I am seeing them being caught live. And that's what we were doing. And we knew from talking to the fishermen and other people that the Goblin Sharks were very hardy species. And so even though they were being caught in the nets, they're being caught very healthy and alive. And so worth being candidates for tagging, we went with holding tanks that had ice and blankets, so we could very quickly mimic deep sea conditions for them. They appear to have done well. But it is not ideal of a way to move forward with things but because there was so little known about them, where to go for it language barriers. It was actually the best way for us to actually even try to find this species because it was an incredibly preliminary work because nobody had ever done it before.

So what are the fishermen targeting? And I understand these guys can go down extremely deep, so I guess yeah, what depth they being caught up.

This was the shallow range for them. And we were probably at about like 900 meters and they were going for snow crabs.

Okay.

Japanese spider crabs, which if you go to your local seafood would be snow crab legs.

Did anybody boop the shark on the nose once you caught to tag.

Noooo! Now I can never sleep peacefully again.

Let's talk about that honker on him a little bit.

I need to hear about the honker.

have not had many sharks on this show that we featured. We haven't had any on his guests either. Can you talk a little bit about the ampullae of Lorenzini? Both why sharks have them in general? And then what particular help they have on the goblin shark on its long nose there?

Yeah. So the ampullae of Lorenzini are electro receptors. And sharks can use these for a number of reasons. The main one is just to sense electrical pulses. People are always obsessed with, "oh, sharks can smell a drop of blood and an Olympic sized swimming pool." And I'm like, "yeah, they can sense your heart beating in the water. Oogity boogity." I'm not going to do anything, you're going to be fun. But that is one of the ways that they are detecting prey. So when you see a shirt, zigzag swimming, that is one of the reasons why they're doing that behavior because they are trying to sense electrical pulses as a mechanism to you know, what's better to say, like a metal detector, they're using those ampullae Lorenzini just like a metal detector primarily for detecting prey. And then you get something super weird looking like a hammerhead. And it really drives home the purpose of the ampullae of Lorenzini because not only are they using it to detect prey, like sting rays that are burrowed in the sand, and you can't even see them. But they have also been found to use the Earth's electric magnetic polarization and travel with it. So they can actually congregate and seamounts and they are doing this based on the earth, electro magnetism. I kind of made up a word I think.

Yeah, it's just this magnetic field

Electric magnetic field. There we go. That's much better. It's something that we know that a lot of other animals in the world use. And then here we see that there's another animal using it in a completely different way with their electro receptors. So it's really cool. Not all sharks can do that. Now, in the case of the goblin shark, the reason that they have that extremely long snout is because their ampullae of Lorenzini are really dense on that snout.

And these ampullae, they're just they're like just little pores all along the nose, right?

Yep. Little pores. And that's going to be really helpful in the deep sea, because food is going to be really sparse and hard to come by.

Super cool. Are these guys considered a living fossil? I see that term a lot online and if so, could you maybe just describe why sharks like this are called that or fish I guess in general?

Yeah, a lot of the deep sea sharks in particular get called living fossils, because of the fact that they are some of the first sharks to have evolved. And their evolution has been pretty stagnant since then, compared to something like sharks that are around the like Indonesia area like the coral triangle where

there's this like burst of adaptation, something like a frilled shark, or a goblin shark, they are called these prehistoric sharks because they have been the same since the time of dinosaurs. It's working for him. Whereas something like a walking cat shark, also called epaulette sharks have evolved much more recently. So that's where that's coming from just because of the fact that they have been the same for you know, millions of years.

You like taxonomy, Vicky?

Oh, yeah, I am technically deep sea chondrichthian taxonomist.

All right. All right.

Guy likes taxonomy.

Are sharks fish?

Yeah.

Are we fish?

No.

Okay. You want to elaborate? I love having this debate.

Oh, okay. I see where you're coming from.

Yeah, like cladistics perspective.

So sharks are cartilaginous fish. And when you look at evolution, and adaptations are and where things have gone. I would argue that when you classify things, humans may have evolved and have common ancestors that eventually reached down towards fish. But the whole point of classifying and adaptation and the way that we built taxonomy is to say that we are no longer anything like a fish, and therefore, no, we are not fish, we're in a completely different category and the categories, the Mammalia. And that's because of all the unique adaptations that we have. If we were anything like a fish, we would definitely not be drowning so much in water.

I think Guy's a fish. I'd like to shift this conversation a little bit and hear from you how you got interested in studying deep sea sharks and sharks in general.

So my world growing up was just a lot of fishing. And as a result of that, I was on the water a lot in one very specific way. But the sharks that I always saw were blue sharks. And it wasn't until I got into college, that I went on a trip to Guadalupe Island for tuna. I was fascinated by the behavior that I was observing. There were very intelligent animals, I was surrounded by crystal clear blue water. And yet, the white sharks were coming by one at a time. They clearly were having some sort of hierarchy

decision, but not within any visual distance that I was seeing. In addition to that, they were using as little effort as possible to steal our fish. They weren't doing the dramatic flair that I was seeing on TV jumping out of the water showing all your teeth. And the coolest part the part that got me I don't think everybody has like the one moment that got them and I do. I was about to catch the jackpot fish. Everyone puts in a little bit money, which is called the jackpot, which the fisherman that has caught the largest fish of the trip now gets all of that money. Being the only girl on the boat. I was really excited to win that I was like "Oh, I'm gonna show you guys" and it's really hard to catch tuna for those who haven't done it you're talking about using all of your force for like an hour powerful. And so I was about to call color which lets all the guys all the deckhands know that the fish is really close because for so long you're fighting it and you can't even see it. So when you call color it means that you can finally see the fish right when I say that one of the deckhands yells shark. And I was like we were would you even just shark and as I'm reeling it in, thinking, I'm just finally going to be done. The sharks coming by and a deckhand grabs my pole, which is like death, because if somebody else grabs your pole, you're not going to win. So I'm thinking like, what are you doing? And he drops my line, which I'm also thinking like, don't don't do that. I have to like reel it all in again. But what he was trying to do was a last ditch effort to save my fish from the shark that was very slowly coming by. So this is what I saw happen, as he did that gave me the pole back. And I'm like, trying to reel it back in. PacMan very slowly coming to get one of those little white spheres

Pacman stresses me out. Big time.

Yeah. Yeah, that's how I felt. So now I'm reeling it in, it's very heavy. Finally bring it to the surface, get it on to the boat. And I'm looking at it. And my face looks very disappointed because I'm just looking at a tuna head. But that's not what I'm actually feeling at the moment. It is pure fascination. Because the head is still breathing. What I was realizing was that great white shark, put no effort into eating most of that tuna got exactly what it wanted, which was all the meat didn't eat the bony head. The neural receptors in this fish were still firing its head did not realize it was dead in the time that I had pulled it up. And so from there, I was obsessed with great white sharks. When I started to go to graduate school, the professor that I talked to Dr. David Ebert, because I'm all hyped from this experience. And I'm like, "it's gotta be great white sharks, listen to my story!" And he's like, "okay, that's, yay for you." He's like, "but really, why does it have to be great white sharks, their populations are rebounding. They don't need that much protection. Everybody's studying them right now. And everybody's tagging them. So what are you going to do?" And I was like, "I don't know." And he's like, "there's these deep sea sharks that need a lot more attention. People barely know they exist. And we're still discovering new species." And I was like, "wait, what? You're still discovering them, like we're not done. There's more to be found?" And then that conversation was equally powerful to me. I realized that I could take that same passion that I had, from my experience with the white sharks, and I wanted to try to translate it to these other species that were being completely ignored.

You discovered one, right?

Yes, I did.

All right. Tell us about that.

That is the ninja lantern shark. It is a ridiculous name. Because my cousins came up with it. And their ages range from eight to 12 at the time. But my professors also kind of low key obsessed with JAWS. So the scientific name is *Etmopterus benchleyi* named after Peter Benchley, who is the writer and creator of JAWS. I have a dark confession. I need to tell you. I cannot move forward without mentioning that a recent paper came out claiming that this is a junior synonym. I don't even want to tell you. But I am not done. I will counter write. I don't know what I'll do. But you know that science? It's fine, I guess. But common names live on. So it can still be the ninja lanterns shark so ha.

Yeah, job, kids. Are there any other final messages you'd like to give to the public about these lesser known sharks or sharks in general?

Keep falling in love with them and bug all your friends that they exist. And for anyone that's interested in graduate school, study the deep sea sharks. The end.

Thank you so much for joining us. This was a fascinating conversation. And yeah, I really appreciate you coming on.

Thanks for having me.

Okay, so get out there and enjoy all the fish especially the lost sharks and those lesser known species.

Yeah.

Thanks for listening the 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 in story edited by Tasha AF Limley. Production Management by Gabriella 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 as people and professionals of all the fish.