Ask A Biologist Vol 107 (Guest: James Sulikowski)

Shark Tales

There is something about sharks that bring out our inner fears. It is likely their teeth, or there black eyes that are shown in scary movies and nature films that sends chills down our back. But these animals have an important role in the health of our oceans. With over 500 species of sharks, and some of those do not have any teeth, there is a lot to be learned about them. Dr. Biology catches up with James Sulikowski, a biologist and shark expert. The two talk about what we know and don't know about these amazing animals.

Transcript

Dr. Biology:

This is Ask A Biologist a program about the living world, and I'm Dr. Biology. Today we get to do something that I usually don't get to do, mainly because home for us is in the desert. And because of that, exploring the marine ecosystem and marine life is not done at least close by. But for today's show, we have an expert on one of the animals that is, well, one of the most talked about and most terrifying, at least for humans, and sadly, one of the most misunderstood animals in the ocean.

Dr. Biology:

If you haven't figured out already, we're going to be talking about sharks. And when I say sharks, they're over 500 species of sharks. And one of the unfortunate parts of this story is that over 150 of these shark species are vulnerable or critically endangered. To get the inside story about these amazing animals, our guest today is James Sulikowski, a professor and associate director in the School of Mathematical and Natural Sciences at Arizona State University. He has spent much of his career studying sharks, their physiology, their behavior, and his work has been featured on Discovery Channel. He's been on NBC's Today show, National Geographic BBC, and that's just to name a few. So, sit back, relax. We will not be going into the water today, but we will be learning part of the story of sharks.

Dr. Biology:

Welcome to Ask A Biologist, James.

James:

Great to be here. Thank you so much for having me, Dr Biology.

Dr. Biology:

We could take the easy path, right? We've got things like Sharknado and all these other things out there and Jaws, heaven forbid. So, we could take that easy path. But we're not going to focus on those things. We're not going to deal with fear. Instead, I thought we could talk about the role of sharks, their role in the ecosystem and maybe learn more about things like their reproduction cycle and their reputation. Is it really deserved? Let's just jump into there. So maybe the first question? With your background is. Are sharks, good parents.

James:

Are sharks, good parents? Sharks are terrible parents. OK. Absolutely horrible parents. Sharks are not the parent that you want to have. That is for sure. Sharks give birth and they immediately leave the area. And that's. Because of a stick around they'll probably eat their babies. So, you don't want a shark as a mom or dad?

Dr. Biology:

And do sharks all reproduce the same? In other words, you know, we know how humans have babies, but we know others lay eggs and

James:

Right.

Dr. Biology:

And so, the question is, how do sharks reproduce?

James:

Well, let me tell you. - sharks reproduce because they have sex just like human beings. All sharks do. But what happens after that is much different depending on the species. And that's why sharks are so exciting and interesting to study.

Dr. Biology:

Right, so let's talk about it, so there's the typical one where two sharks' mate. And how much later might they give birth just like humans would give birth? You know, how many months is that later?

James:

Right. And that's the incredible and interesting part, because it can be. As quick as four to six months or it can be almost two years. So, it's a long time, and that's why. Every different species we have to study. And that's what makes my job exciting.

Dr. Biology:

So, two years? Which species is the one that would be going for two years?

James:

Well, there's this little shark called the spiny dogfish. They think they carry the pups for almost a year. Somewhere between 18 and 24 months. But that's not the interesting thing. They think that some sharks give birth every three years. So, they take two years off in between being pregnant. And there's other sharks, they're pregnant all the time. So that's what makes my job. Really interesting and. Cool is I get to. Go out there and play detective and kind of find out which species does what.

Dr. Biology:

When you're out hunting for sharks. How do you find them? I mean it, IT seems like because of the news, you might think you'd find them very easily, but I suspect they're a little more shy than we might think.

James:

Sharks are really hard to find, particularly the ones you're actually looking for. We were just on a trip in New England looking for pregnant porbeagle sharks. And we didn't find one. And lots of things can happen. Seasons change, storms move through. And I think we got caught in between those two.

James:

Last year. When we went, we went to the same spot. We caught ten sharks, ten female sharks this year, zero. So, it's frustrating for us because we never know where they're going to be. But that's. one of the things that we want to do in our research. Is try to figure out when and why they move. Where do they go? How long they spend in spots so that we can do a better job of predicting their locations.

Dr. Biology:

So, when you go out searching for sharks and then you capture them. Tell me a little bit about handling sharks, because I assume no matter how much we might say they're not dangerous. They still ALL have teeth. So how do you go about handling a shark?

James:

Well, Dr. Biology, let me tell you, you have too really be careful. Right? Not only for human safety, but for shark safety as well. And because of that, we have to follow very strict protocols. And we have to be trained. And we have to make sure that we're doing everything in our and the shark's best interests and it can get crazy. And when you talk about a shark that's. 14, 15, 16 feet long, you know, everything that you do has to be perfect. To make sure that nothing bad happens to anyone or anything that's involved in the research.

Dr. Biology:

So, are there any particular techniques you do with a shark to keep it a little more calm?

James:

Well, there's. one, and it works on certain species, and it's called tonic immobility. Imagine turn that. shark upside down and you rub its belly, and it goes to sleep. It calms right down. And that allows us to work with tiger sharks, which are huge. They can be up to 15 feet long. And so that calming down of that shark allows us to do everything we need to really understand their biology, their physiology, where they go if they're pregnant, and how we can learn more about protecting their locations and their habitats.

There's a fear of sharks by humans, and, you know, it's not one that I'm going to say everyone should overcome, but sharks have a role in the ecosystem. And so, will just do a mind exercise. What would happen if we had no sharks?

James:

Well, if we had no sharks, the ocean is going to be a terrible place. We'd have an ecosystem that's out of balance. You can think of an ecosystem for really simplistic terms is that you have an apex predator. You have a mesopredator. Right? Which kind of the middle dog, right? And then you have some of these lower trophic levels fish that eat coral or algae. And then you have things that are smaller and smaller. And if you take away the apex predator what happens is the mesopredator eats everything. And then your coral reef or your kelp farm, or whatever it might be, gets out of balance. And then what you have is an ecosystem that doesn't function properly and doesn't produce enough oxygen, it doesn't feed enough of its inhabitants, and it produces an environment that we wouldn't enjoy as human beings.

Dr. Biology:

Right. And when you say apex, you really mean the top dog.

James:

Top dog. Right? And interestingly, in some environments, sharks are not the top dog, right? Orcas are definitely the top dog. When you look at predatory animals in the ocean. At least coastal, where many shark species are what we interact with. In most other areas, though, sharks are the top dog. Which is, you know, one of the reasons we study them.

Dr. Biology:

So, let's talk a little bit about some of the things that sharks have that are somewhat unique. One of them is their eyesight. You know, a lot of people talk about sharks. Do they have good eyesight? You know, the idea is, how did they find their prey? Let's talk a little bit about their eyesight.

James:

Eyesight is great. They have very crisp, clear, great eyesight. A lot of them are visual predators, and they're looking for their prey. They're searching with their eyes for things to eat. Their eyes are set up differently. Their lenses are round, and they move the lens back and forth to focus, which is great.

James:

They have this really cool adaptation, tapetum lucidum. And it's basically a set of mirrors on the back of their eyes that reflect light. So, moonlight, low light levels, they're able to reflect that light back so they can see in the dark. A lot like cats. And so, when you see movies with cats, with these weird looking eyes at night that's that tapetum lucidum. And that allows them to see these low light levels.

Dr. Biology:

Cool night vision.

James:

Yeah, definitely. Cool night vision.

Dr. Biology:

Another thing about sharks. They have a special organ that allows them to sense things that I don't know or any other animals able to do this. You know, the type where they can actually sense them almost like an ESP, right?

James:

Right. Well, sharks have a lot of really cool senses. OK? And there's two in particular. One is this lateral line, which I call the force because it allows them to sense objects that are around them as they swim by. And it's really a pressure sensor alongside THE they're about their bodies. And as they move across an area and there's a school of fish, the water pressure, as those fish move, causes this lateral line to jiggle, and move and this shark sense is that. And they can tell where that school of fish is or where that rock is. If it's pitch black, if it's dark, if the murky water, they're really able to sort of sense their environment.

James:

But they have another one that's super cool, too. And that's the Ampullae of Lorenzini, and that's the ability to detect electro reception. Think of this. They can detect electricity that's being given off by their prey items that might be hidden in the sand. Might be trying to hide from them. So those animals think they're hidden, they can't be seen, but their hearts are beating, or their muscles are contracting, and that's giving off an electrical potentials, producing electricity. And the shark can detect that. And they can actually find him, it's really cool.

Dr. Biology:

Incredibly cool. And the one where the pressure sensing, I can imagine some sports athletes wanting that skill like, you know, like a quarterback, right? Wouldn't you like to know?

James:

Yeah. You know, they. Always behind you. Yeah, yeah, absolutely. You know where they were, how far they were. You know how fast they were moving. So those are the sensors that they can detect with this lateral line. It's absolutely amazing.

Dr. Biology:

Wow. So, another, not necessarily myth, but something that is maybe misunderstood, is that people often think that sharks must swim all the time or they will die. And that's not true for all sharks.

James:

It's not true for all sharks. That is correct. Dr Biology. And let me tell you, it's only a handful of sharks that really. Require to be moving all the time. Particularly the really fast-moving ones. Things like white sharks, mako sharks, porbeagle sharks.

James:

This family Lamnidae, they have to use ram ventilation. They swim their mouths open. Basically, to get enough oxygen. Water to go over their gills so they can breathe. Other species hammerheads, blacktip sharks. They need to be constantly moving as well, but they don't require as much oxygen because of their lifestyle. They're a little slower moving. It's like an athlete sprinting, right? It needs a lot of oxygen, oxygen, oxygen. You can think of a Lamnidae or mako. A shark is one that's way sprinting. Whereas a hammerhead or black tab is sort of a jogger, right? But if they get stressed out. And they need more oxygen, they can swim faster with their mouths open. That's why some species are so vulnerable to fishing. So, when they get on that hook, they can't swim and they circle and they can't get enough oxygen and they end up suffocating.

Dr. Biology:

Yeah, actually, what's the number of sharks that are lost to fishing each year? It's an amazing number. DO you know that one by chance?

James:

So, the exact numbers large. For sure. And that's called bycatch. When you catch something that you don't want, and a lot of sharks fall to that. And one of the ways to manage better is to reduce that and figure out ways and how to, you know not have sharks bite the hook or don't set the hooks as long or make the hook, we call these things gangions, it's line that is attached to the hook. You make that longer so they can swim around. So, we can do those. Sorts of things.

James:

The major issue really, though, is the illegal, unreported trade. And that's where you're talking about millions of sharks that are illegally caught and killed every year. That's where the issue is.

Dr. Biology:

Right for their shark fin, I think is one of the things it's a problem there.

James:

Shark fins is the major problem, and the problem is economics. You have a shark meat that's worth. $0.20 a pound. And you have a shark fin that's worth $100 a pound. And so, the more bodies that you keep on board, the less fins. And so, you toss the body overboard, you get more fins, and that's where the issue is. And so, working to reduce or eliminate that trade is really important.

Dr. Biology:

So, we have shark fins, that's a challenge. We also have the ivory trade.

James:

They're almost identical in a sense. Where you're only taking a high value part of the animal Illegally. Here in the United States there's a legal shark fishery. And it's well-managed and it's based on great science. And if you have that in place, then you can monitor how many sharks are taken out and you can make sure that you have enough left to reproduce and fill back in

that kind of gap. And we've done a really good job here in America of governing that. It's other countries in the world that we're trying to work with to reduce that illegal fishing.

Dr. Biology:

We are talking about over 500 species of sharks. And the vision is a mouth with rows and rows of really, really, really sharp teeth. But there is in particular at least one shark that doesn't, and it's actually the largest fish in the ocean, right?

James:

Right.

Dr. Biology:

So, let's talk a little bit about the big fish, right? Right.

James:

You know, the whale shark is a super cool species. It's huge. It is the largest fish. No teeth whatsoever. And it's eating tiny little things in the ocean. It loves fish eggs, loves fish eggs, right, loves caviar. You know it will eat a little. Some of the. Little fish that are eating, you know, that caviar. But it's actually truly amazing when you think about. That. The largest fish in the ocean, the whale shark, is absolutely harmless to human beings. There's another one to the basking shark. Which is the second, I would say, largest. You know, only about. 35 feet. You know, not that big. Right? Again, only a plankton eater. And it's. Just really cool to see that diversity.

Dr. Biology:

Right? Just to make sure we don't get confused. There are fish and there are mammals. Mammals such as whales and dolphins and orcas. And so that's why we can say the largest fish, because someone's going to say, hey, wait a minute, there's giant whales.

James:

Well, and that's a great point, Dr. Biology. Because a fish, right? When you think of a tuna or salmon. Right, is a fish. And when you say shark, people say it's not a fish. Well, it Is because they have a lot of things in common. They breathe through gills. Right. That's a really important thing. And that's what separates a fish or shark from a whale or another marine mammal. But the main difference when you look at sharks versus salmon or tuna, right, is that a salmon and tuna and those fish have a bony skeleton, and a shark has a cartilaginous skeleton. Stingrays have a cartilaginous skeleton, skates another relative have a cartilaginous skeleton.

James:

And so, what you have here is sort of a separation through evolution of two distinct ways of sort of dealing with life. Other than that, you know, there's nuances in their biology, but they all live in the water.

Dr. Biology:

Right? So, no bones.

James:

No bones.

Dr. Biology:

They've got cartilage and cartilage. If you wiggle the very tip of your nose. There's some cartilage there. Some other places you can fill a little bit, sometimes in around the ears and stuff like that. But it's interesting because they make use of cartilage instead of bone. And as you said, this is part of evolution. Why, what's the advantage for them to have cartilage instead of bone?

James:

So that's a great question and one of the advantages is that it makes them lighter, okay. Makes them lighter in water and so there's an energetic component to that. And so, if you look at it through evolution, the boney fishes have adapted ways to deal with a bony skeleton. The sharks have adapted ways to deal with a cartilaginous skeleton. And so, the way that they've sort of adapt and evolved is different. But they live in the same water environment. They just do it a little bit differently than one another.

James:

The cool thing about sharks that I find super interesting is they have the ability to regenerate their teeth. So, they are constantly losing their teeth. Constantly. A shark will lose both an upper and lower row of teeth at least once a month. They constantly are falling out, and it gives them a fresh sharp set all the time. And that's what makes them such great predators. People like their teeth can't be cartilage they're so strong and stiff. Well, they are, they've just fortified them with components such as calcium that make up bone, right, that make them a little bit harder and stronger. But they fall out. Their teeth constantly are being lost. Some sharks will lose thousands of teeth a year. All elasmobranchs or the sharks, skates, and rays do. Which makes it super unique and interesting that they're always ready. For that next prey item.

Dr. Biology:

I was reading about the sandbar shark and you when you talk about replacing teeth, they can go through 35,000 teeth in a lifetime.

James:

Yeah, easily 35,000. I mean, they're an incredible shark and their teeth are on a conveyor belt. And I think that's the most incredible thing about all of us. Think about

James:

5,6,7 rows of teeth constantly being made. Moving forward, like a conveyor belt and then the sharpest one just hanging out there. And if they lose it, no problem. Another one's going to pop up in its place.

James:

And so, when you think about how sharp these teeth are. The best way that I can describe it. Is imagine a warm, hot butter knife going through a stick of cold butter. That's how easy and

sharp these teeth just sort of work through their prey items.

Dr. Biology:

You talk about this conveyor belt, this constant replenishment of the teeth. For humans, in particular, one of the things we don't think about is the skin you're wearing today was not the skin you were wearing last year.

James:

Right.

Dr. Biology:

Even replacing that quite a bit. So, it's very interesting when you look at the parts of the body that are under stresses that need to be replaced. Nature's found really some amazing ways of constant replacing things. So that's a good example of it.

Dr. Biology:

We've talked about some pretty cool things about sharks, but I haven't asked you, what do you think is the most unexpected thing that you've had or learned about a shark that just took you off guard or just really surprised you. You?

James:

Wow, that's a great question, because. Every time we think we know and we've defined an answer. To one of our questions, it opens ten more. And one of the really important and interesting things that we do is we study shark reproduction. Right. We want to know where sharks give birth, how long they carry babies, what important spots they are, how often they give birth. And we're finding some really interesting things that sharks are very plastic. And what that means that they can sort of change their biology in a sense to fit their environmental needs. And we'll find a shark species on one coast of Florida, we'll say the East Coast and Atlantic Ocean has a different reproductive biology than that same species of shark on the West Coast. And it's mind boggling to us because one of the things that we want to do is take that information and use it to effectively manage and conserve the species.

James:

So, if we know that the shark reproduces every year. And she gives birth to 20 pups every year. Then we can kind of gauge about how many moms we need in the ocean to keep that population stable. But if that same species gives birth to 20 sharks every other year or every three years that means we need to manage her and her population a little bit differently. And in the past, we thought that, you know, a black tip shark, was a black tip shark, was a black tip shark, and we're finding that that's not the case.

Dr. Biology:

And also, when you talk about it, because you were talking about East Coast, West Coast, what's the range for some of these sharks? It's not like us, you know, typically I live in the desert. And yes, I might venture out a little bit, but I don't really move around every year from one location to another. What are we talking about with sharks?

James:

Yeah, the great question again, and it's very species specific. Some can range great distances. White sharks can range great distances. Basking sharks' range great distances. Whale sharks can range great distances. We're talking thousands of miles. No problem. But for most species, they're looking for either really a good food source or a really good environmental conditions or a temperature or salinity for them. And often times they kind of go hand in hand. So, like a whale shark is looking to spend its time in tropical water. So, it migrates long distances in tropical waters finding food. Or as a white shark tends to stay in more temperate, or cooler waters. And so, when one habitat, say in New England, gets too cold then it'll start to migrate.

James:

It's a snowbird down to Florida, where the temperatures are a little bit warmer at certain times of the year. So, you can think of them being white sharks being in the north during the summer and the south during the winter, like Snowbirds, right? Like us. And you have others that don't really move too much because they have the environment that they want right there. The food sources right there. The temperatures don't really change. So again, a shark is not a shark, it's not a shark. And I think that's what a lot of people think is like. Wow, they're all eating machines. They all want to, you know, take human beings out and they all kind of do the same things day and night. And that's completely not true.

Dr. Biology:

I also read somewhere that humans don't really taste that great to a shark.

James:

Our, I guess, signal to them on their taste buds. In there, all their other sensory receptors isn't a good fit. So, it's one of those things where their actual prey item tastes really good. It's like that piece of pizza. When you're starving, you know what I mean. Whereas we kind of taste like that three-day old ham sandwich that's been sitting out. You know, we could probably eat it, but we don't want to, right? We'd rather find something else.

Dr. Biology:

That's always comforting in that sense. James, my scientists don't get to leave. Ask A Biologist without answering three questions.

James:

OK.

Dr. Biology:

OK. The first question is do you remember, was there an aha moment in your life when you said, I want to be a scientist?

James:

Yes, there absolutely was an AHA moment. And it was about five years old. And we grew up in Texas and we were on the Gulf. Coast. And I remember seeing a shark washed up on the

beach and I was fascinated with it. And there's pictures of me, you know, just standing over it. This five-year-old. And since then, I've always been interested in water, fish, the ocean. And that was my moment. I've always been inquisitive since then. Even when I'd go fishing, you know, I was interested in the habitat. Where will I find them and how can I learn more about those species that were in that area? Actually, I didn't start being a shark biologist. I studied their relatives. Stingrays and skates, and we were developing techniques to do work non-invasively. We didn't have to kill sharks to learn about the reproduction. And so, there were some needs in different shark species, and I just sort of gravitated to that group and here we are.

Dr. Biology:

You use a really great word. Noninvasive.

James:

Noninvasive.

Dr. Biology:

Yes, right, and noninvasive, basically, you know, the idea is we're not going to cut something open, we're not going to harm them to learn. I just can't imagine doing it out in the ocean. How do you do that?

James:

Right? It's Been a challenge for sure. And when we talk about why we need noninvasive techniques, I mean, look, the old way in which we studied shark biology was to catch one. To bring it on the boat and then to sacrifice it. We had to basically kill it to look inside to see if she was pregnant. Were they mature? But it's really hard to put a satellite tag on that shark to track it. And satellite tags are great because they're like cell phones. We can use that satellite tag to track that shark's movement in real time. It's really amazing. But if she's dead, you can't do it.

James:

So, what we've done is we've taken medical grade technology like an ultrasound. Like a human goes to the doctor to see how their babies are doing right. Oh my gosh, I have twins. It's amazing. We can use that technology now. We can bring it out in the field, and we can look inside a shark to see if she's pregnant. It's great. It's portable. It's mobile. It's waterproof. And now we can count babies. We know how big they are inside mom. We get an idea of how far along she's at in her pregnancy. And then we put a Satellite tag on her and then we can track her movements. We can see where she goes, what areas and habitats are important to her.

James:

And so, the linking of these technologies are things that no one has been doing in the past. And so, one of the things that's nice about being here at Arizona State is that it's number one for innovation. So, if anyone can do it, we can, right? And so along with that what we're really trying to develop to is this special tag. It's called the birth tag. And this is a tag that goes inside mom. And you can imagine this thing looks like an egg gets inserted non-invasively. We don't have to do any surgery. It sits in there. And she carries it around. And when she it's time for her to give birth. We're kind of following her and the satellite tag that she's wearing.

James:

She gives birth. These babies come out. The tag comes out, the tag floats to the surface, transmits the location, and we know exactly where that pupping, or birthing took place. You're like who cares? But because of climate change, habitats are changing. Right. And so, an area that might be really good for sharks to give birth in at one time now has shifted and it could have shifted to an area where there's lots of people. So, you can imagine a beach that's really popular all of a sudden now is a nursery ground where mama sharks are coming to give birth. And so it's a way for us to interact with humans to make them more safe and aware. But it also gives us a chance to really make the area an environment safe for mom and her babies.

Dr. Biology:

Is the tag already being used?

James:

We are using it. We're developing it right now. We've put it in Tiger Sharks, Sandbar Sharks, Silky Sharks. We're getting ready to put it in a bull shark. With our Mexican colleagues, and the. Ultimate goal is to get it in a white shark this next year. So that's what we're after.

Dr. Biology:

With the tags, the birthing tag, what's the unexpected outcome?

James:

I think the unexpected outcome, really for us - what's unique is we really don't know where any of these areas are. Baby sharks are mobile, and those things can move. Like a white shark when it's born it's about, you know, somewhere between four, four and a half feet long. It's big and they can go hundreds of miles in a day. No problem. So, knowing where these locations are have been our holy Grail. Really determining what areas, we need to protect. What areas are important and how do we mix it all together? When you talk about humans, we're a coastal species. We love being in the water, right? We love being in pools. We love being wet. Even though we come out as prunes. We still love it. But taking advantage of those environmental conditions can impose on the animals that really are in there. And that's where we need to figure out how do we make us all work together and live together in more harmony?

Dr. Biology:

So, you are fascinated with sharks, got you the AHA moment, but when you got into science, you really just didn't go into sharks, but somehow you found your way back there.

James:

Found the way. Back full circle. It's incredible, huh?

Dr. Biology:

It is. And now I'm going to be mean because I'm going to take it all the way.

James:

Oh, no!

Dr. Biology:

This is the next question. So. I'm going to take all your science away from you, and I'm going to take teaching away because I do not know a scientist that doesn't love to teach.

James:

Right, mm-hmm.

Dr. Biology:

This is your chance to be anything you want or do anything you want. Is there any fantasy world? What would you be or do if you could be anything?

James:

Lead singer for a rock band. No doubt about it. Absolutely. Yes, that would be my next job. That would be my job, that I would do.

Dr. Biology:

Do you sing now?

James:

No, I'm terrible. I'm absolutely horrible.

Dr. Biology:

Well, that's the nice thing about fantasy. I give you a great voice. OK, so now the last question. We know your aha moment. And then I took it away from you. But now it's your chance to get some future scientist interested or give them basically that bit of advice for someone who wants to become a scientist. What would you say to them?

James:

Start early. Follow what you're interested in and don't let anything derail you from that. I mean, I remember honestly being ten, eleven, twelve years old and having a take home dissection kit where I was like dissecting grasshoppers, right? And if that's what's interesting to you, do it. You'll find your path by just doing what you love. And what is your passion and look for help along the way because there's people like myself that will support you and engage you to continue with that. We love talking to high schools. We love talking to middle schools to sort of emphasize that STEM is great. Diversity is great. And I think anyone can be a marine scientist.

Dr. Biology:

Well, James, I want to thank you for being on Ask A Biologist. It's been really fun learning about sharks.

James:

Dr. Biology: Thank you for having me. I loved it and happy to come back anytime.

Dr. Biology:

You've been listening to Ask A Biologist. My guest is James Sulikowski, professor and associate director in the School of Mathematical and Natural Sciences at Arizona State University. Now, if you enjoyed this show and want to learn more about sharks and see some really cool pictures, the Sulikowski lab has some great images on its website, and we will include a link to it in the podcast notes and in the show's transcript. The Ask A Biologist podcast is produced on the campus of Arizona State University and is recorded in the Grassroots Studio housed in the School of Life Sciences, which is an academic unit of The College of Liberal Arts and Sciences.

Dr. Biology:

And remember, even though our program is not broadcast live, you can still send us your questions about biology using our companion website. The address is askabiologist.asu.edu, or you can just Google the words Ask A Biologist.

Dr. Biology:

I'm Dr Biology as always, I hope you're staying safe and healthy.