



## **Shark Tails: Monsters of Myth and Legend with Dr. David Shiffman**

### **Nerdin' About Podcast Transcript, Season 1 Episode 5**

#### **Michael**

Hey everyone welcome to Nerdin' About. I'm Space Michael and with me as always, is probably the biggest Buffy the Vampire Slayer in this part of the world. That's Kaylee Byers. How's it going, Kaylee?

#### **Kaylee**

Oh really great thanks, I'm so flattered. I'm definitely not a Buffy, I would be fortunate to be a Willow and a true inspiration to my heart. I don't know if I'd quite be a Buffy. Who would you be? Have you even gotten past like the first two to three episodes?

#### **Michael**

Well, I mean, I was a little taken aback when Angel was revealed to be a vampire, and which of course is like the first few episodes. So I'm way behind, but I will catch up, I promise.

#### **Kaylee**

Well, we'll have to remedy that. So today we are joined by Dr. David Shiffman, and you actually may know Dr. Shiffman from his social media persona as "WhySharksMatter". As you might guess, from that handle David's a marine biologist who studies sharks, but David also studies the intersection of science and environmental policy. So today we're going to be talking about sharks and conservation and policy. So hi David, how you doing?

#### **David**

I'm doing okay, Kaylee, thanks for having me.

#### **Kaylee**

Oh, we are so excited for you to be here. Do you remember when you first started getting interested in sharks and where that interest came from?

#### **David**

Well my parents say I've been obsessed with sharks as long as anyone in my family can remember. I grew up in Pittsburgh pretty far from the ocean, but even so, I've known that this is what I wanted to do, basically, my whole life. My parents have always been very supportive, though. I think they always thought I would grow out of this eventually, and I never did. There's no specific moment. It's just sort of always been there.

#### **Kaylee**

What is it about sharks that you find so compelling?

#### **David**

I think that sharks are a fascinating group of animals. Every time I see one, I still get excited, as excited as I did the first time I did when I was a kid seeing them at the shark tank at the Pittsburgh zoo. I've seen thousands of sharks now at this point, since I've started keeping track



I've seen 54 species. Every time I'm excited to see them, but they're powerful, they're monsters of myth and legend, and they're culturally significant animals. I've learned years into being obsessed with sharks, that they're also very important to a healthy functioning coastal ecosystem, and that many species are in trouble. So that's when I shifted from "sharks are cool" to marine conservation biology, focusing on this intersection of science and policy trying to protect threatened species.

**Kaylee**

So you mentioned having seen 54 species. I'm curious, do you know how many species there are, and then how many of them are actually threatened?

**David**

So there are, according to the latest edition of Sharks of the World, which is coming out soon, but I've gotten the official press release materials. There are 551 recognized species of sharks, but there are more discovered all the time. In fact a new species of shark or shark relative has been discovered on average every two weeks for the past decade or so. There are a lot. According to the latest public statistics, the New Earth statistics aren't out yet, but they're worse than this, I can't say more than that yet, but 24% of all known species of sharks and their relatives are considered threatened with extinction by the IUCN Red List, which is an international group of scientific experts. So one out of every four are vulnerable, endangered or critically endangered and I can't remember the last time one got what's called down listed, which is it's now considered to be in better shape than it was the last time we did it. All the time they get up listed which is worse.

**Michael**

When it comes to conservation with some of these sharks that are slowly going extinct. What are some of the main issues? Is it all just hunting?

**David**

Unsustainable overfishing of sharks is the issue, there is nothing that's even a close number two. It's humans killing too many of them for meat, for fins, accidentally as bycatch - which means they're trying to catch something else and they accidentally catch sharks that are near them. There's nothing that's a close number two. Climate change is a threat to a lot of ocean species, but not a major threat to sharks. Plastic pollution is a major threat to many ocean species, but not really a big threat to sharks. Unsustainable overfishing is by far the top one, and the solutions have to do with creating zones of the ocean where fishing is restricted or not allowed either with certain gears or certain times of year, or at all, or making fishing quotas that are smaller, some species need to be protected from fishing entirely. Sometimes it's something as simple as gear restrictions we have to do. So the solutions can be a bit technical and dry, but in general, humans are killing too many of them. We need to be killing fewer, and there's a bunch of ways to do that.

**Michael**

I believe you're one of the top shark Twitter people out there. What are some of the public misconceptions? What are a lot of the questions that you're getting asked from the public when it comes to shark conservation?



**David**

So I do an "Ask me Anything" session on Twitter every week, I've done one every week for an hour for the last five or six years. During this quarantine time, I've been doing them over video chat, alternating between Facebook and Twitter, but I usually just do them on Twitter. So I've answered thousands of people's questions about this, and also just sort of monitor public perceptions. It used to be that the big misconception that people had about sharks is that sharks are bloodthirsty killers, and if you dip your toe in the bathtub a shark's going to eat your whole family. That's really just not the case. There's never been a fatal shark bite in Canadian waters but there are, let me tell you, a lot of sharks in Canada. The things that kill more people than sharks in a typical year are flowerpots falling on people's heads from above when you walk down the street, and I've been watching some of my neighbors during this quarantine, poorly set up herb gardens in their balcony. So that number is about to go up. Vending machines kill way more people than sharks. More people are killed, falling off cliffs while not paying attention and taking selfies, than are killed by sharks. So this is a really overblown fear in many cases by irresponsible media coverage. One of my favorite analyses of this was done by my friend Christopher Neff. He looked at coverage of "shark attacks" as reported in Australian media, and when you hear shark attack, you think Jaws, you think there's a malicious monster stalking the coast and killing and eating people because it's bad. In 38% of reported shark attacks in Australia, the shark did not physically touch the human at all. It swam near them and startled them and it was reported as a shark attack.

**Kaylee**

Maybe they swam by and flipped them off or something like that. A little aggressive behaviour.

**David**

So that used to be the big myth and now the pendulum has swung too far in the other direction, and we have these "influencers" who are saying that actually sharks are cute and adorable, innocent puppy dogs, and they just need hugs and kisses, and they literally try to hug and kiss wild predators that can bite dolphins in half, and try to ride them and try to flip them over to get a picture of them falling, because when you flip a shark over they fall asleep. It is the bane of my existence. There is a happy medium between "sharks are bloodthirsty killers" and "sharks are adorable puppy dogs", and that's how we treat other wildlife.

**Michael**

Now, David, you mentioned Jaws and I can imagine this movie, being one of the biggest movies about sharks, probably had a huge influence on you being interested in sharks. So as a whole, do you think if we just talk about that movie in particular, has that movie benefited shark conservation? Or has it been bad?

**David**

Certainly in the 80s and 90s, Jaws was demonstrably bad for sharks. Incidentally, this is the 45th anniversary of Jaws, so it's been out a long time and Jaws truly changed the world in a lot of ways not just for sharks - it was the first summer blockbuster. There's actually something in the public policy literature called "The Jaws Effect", which is when there's some sort of disaster, which can be a shark but doesn't have to be, local elected officials want to be seen as doing



something, even if what they're doing doesn't help or makes the problem worse, because they don't want to be seen as the mayor from Jaws who kept the beaches open when the sharks were there. So this absolutely terrified people about sharks. People didn't really think about sharks very much before Jaws. My parents, they're very bright people, but they both independently told me and they didn't know each other yet when Jaws came out, but they were afraid to go swimming in the pools in their community for that whole summer when the movie was released. When I tell you to picture a shark, you picture Jaws. There's only one other movie that's had that kind of impact on how we visualize something, and that's Jurassic Park. So yeah, Jaws absolutely terrified a generation, and inspired people to proactively go out and kill sharks, but it also was the first time a marine biologist was the star of a movie. Richard Dreyfus' character inspired a generation of the people slightly ahead of me in their careers, so Jaws really is mixed bag. I wrote about this for Gizmodo for the 40th anniversary. That was a lot of fun.

### **Michael**

Well, I guess what my question would be then, let's say Moby Dick was the movie instead of Jaws. Would sperm whales be more endangered now? Like, is there a correlation there? Are you able to see when Moby Dick was first written like, did people go out and start hunting sperm whales more? Were sharks more prevalent before Jaws came out?

### **David**

So it's a little different because Moby Dick was about an existing whaling industry, and they weren't being hunted because they're scary, but because of the whale oil and whale blubber, but people were definitely afraid of whales. Part of that is based on a real story, there's a movie that was made about the real story that inspired Moby Dick called "In the Heart of the Sea." It's tricky because the peak of industrial overfishing of sharks did start in the 1980s, shortly after Jaws, but not because of that. So definitely Jaws inspired people to go out and kill a bunch of sharks, but that's not what's happening with their populations. It's the commercial fisheries.

### **Kaylee**

Can we talk a little bit about what the implications are of this overfishing and the loss of biodiversity of sharks? Like you were talking about how they're pivotal to marine ecosystems. So what will our oceans look like if we have fewer sharks? What are the repercussions of that?

### **David**

So predators are always important for keeping the food chain in balance. Where I'm from in Pittsburgh. 100 years ago, there were wolves. We got rid of the wolves because who wants wolves in your backyard, wolves are scary, and now there's too many deer, and there's not enough food for the deer or space for the deer in the forest. So the deer leave the forest, and they cause billions of dollars of property damage a year, and they spread Lyme disease to humans. So that's what's called predation release. When you lose a top predator, prey populations grow out of control with nothing to keep them in balance anymore. Then if that ripples through the food web further, that's called a trophic cascade. The classic example of this is off the west coast of North America with sea otters, and urchins, and kelp forests. You can picture these kelp forests as these beautiful vibrant ecosystems, three dimensional habitat of these giant seaweeds. They're attached to the bottom only by a tiny little part, and sea urchins eat that part and then that destroys the



kelp. Sea otters keep sea urchin populations in check, you see them on their back adorably crushing sea urchins with rocks. When you lose the sea otter, sea urchin populations grow out of control, and then they eat all the kelp, and then the kelp forest, which was habitat for hundreds of species is gone. Even though the sea otters don't eat kelp. The loss of sea otters affected the kelp. So the short answer here is that food chains are really, really complicated, and every time we mess with them, it's bad usually in ways we can't predict.

### **Kaylee**

You even had a piece recently, I made a joke with pee, because it was all about urine, urine and fish and ecosystems, and so there's even this consequence of losing animals and the nutrients that they provide.

### **David**

Yeah so fish pee is actually really important to have a healthy functioning ecosystem. With places like coral reefs, fish may hang out there during the day, and then they go out and feed at night, so they get nutrients somewhere else, and then they bring them back to the reef in the form of waste when they're hanging out during the day. That article was about my favorite new scientific phrase, which is super-urinators. So with any population of any animal there's variation in every trait. Some of us are taller than others, some of us have more hair than others, and some of us can jump higher than others. One of those things is how much you pee, and there are fish that are super-urinators, that removing those super-urinators from the population has more of an impact on the nutrient flow in that population than moving 50 or 100 fish that are not super-urinators. The thing is you can't tell by looking at them, so every marine conservation study can be basically summarized as the effects of removing something are a lot worse than we thought and totally unpredictable. So maybe don't kill as many things.

### **Michael**

Alright, let's get to some audience questions. Our first question comes from Ashley who asks, I read somewhere that if sharks stop moving, they die. Is that true?

### **David**

The short answer is, it is true sometimes. There's a huge diversity of shark species they come in every shape and size and color that you can imagine, and they have a huge range of behaviors, and a huge range of physiologies. For some of them, yes, that's true. Sharks need to be swimming, in order to breathe, it pumps water over their gills, and they extract the oxygen from that water, and if they're not moving forward, or if there's not a strong current, not enough water passes over their gills. There are some species that can sit on the bottom, but there are lots of species of sharks that are swimming constantly their whole lives, which means they don't ever sleep.

### **Michael**

So it's Speed, they just have to keep going...



**David**

Yes, they can't ever go below 50 miles an hour. That's part of why if they're caught in fishing gear, why they die so fast, they can't breathe even if they're not there very long, so they suffocate in discomfort.

**Kaylee**

That takes me on a side question. What are better fishing practices for sharks considering that that can be a devastating way for them to die?

**David**

So bycatch, this idea that if you're fishing for something and you accidentally catch something else near it, is a solvable problem. Sometimes the solution is technology, it can be different fishing gear. Your goal is to catch the tuna and the swordfish, and not catch the shark, and the sea turtles, or the seabirds'. So sometimes it's just using a different hook that can still get caught in a swordfish or a tuna's jaw, but not in a seabirds. Sometimes it's using different bait that tuna like but sharks don't. Sharks have the ability to sense electric fields. So there are hooks made out of rare earth, metal magnets that make an electric field. Tunas can't sense that so they just go for the bait, and sharks are theoretically repelled by it, although some are attracted to it. So no solution is super easy.

**Kaylee**

That's amazing what a diversity of things you can do and that electromagnetic field, that is wild.

**David**

If there's something that's hiding under the sand where you can't see it or hear it or smell it, sharks still know it's there because they can sense the electricity of its beating heart.

**Michael**

Next question comes from Kim who asks, "Do sharks have a social system? Or are they the lone wolf of the ocean?"

**David**

So again, lots of different species of sharks are out there. Many species of sharks are solitary, except when they come together to mate. Some do have schooling behavior like the spiny dog fish, which is the animal that I came to British Columbia to study, and the fishermen that we spoke to said you never catch one spiny dog fish. The fishing gear they use has thousands of baited hooks on it, and they say they're going to catch zero spiny dog fish, or they're going to catch 800 or thousands of spiny dog fish, because the fishermen call them swarms. There are also those epic photos of Hammerhead schools in the Galapagos. They come together, they're not there all the time, it's only part of the year. So some animals do have social systems. There's been some really cool work done with juvenile lemon sharks in the Bahamas, and babies that grow up in the same estuary will have friends, and they'll have enemies. They'll have individuals that they associate with more than you'd expect by random chance, and individuals they associate with less than you'd expect by random chance. Sharks also have what's called social learning, which means they can watch another member of their species do something, and then they know how to



do it, which is something that you don't usually think of fish being able to do. So social stuff tends to be correlated with brain size, and so a question I get related to this: How smart are sharks? There's this old cliché, and probably every school in the world has a poster with this on it somewhere that says, "if you judge a fish by its ability to climb a tree, you'll think it's stupid". Sharks are not going to compose a symphony anytime soon, but if you plot all of the animals that we know this for their body mass on one axis and their brain mass on the other axis, and draw a line through the middle average, sharks have a bigger brain than you'd expect for their body size. Humans are right about on that line. So, that doesn't mean that sharks are capable of advanced problem solving, though some can do simple problem solving, but they're a lot smarter than most people think, and they do have some social hierarchies.

**Kaylee**

Which shark has the biggest brain?

**David**

So the manta ray has the biggest brain of any fish. They are actually capable of recognizing themselves in the mirror.

**Kaylee**

I can barely do that.

**David**

These days I don't recognize myself in the mirror. But yeah, manta rays have the biggest brain of any fish. Which shark does? I would assume would be the whale shark, which is the biggest fish of anything, but it's still smaller than a manta ray's brain.

**Kaylee**

So you mentioned that they don't really have social systems in a lot of cases unless they're coming together to mate. So what is shark sex like?

**David**

So shark sex is extraordinarily violent. Animals like a salmon, or a tuna, they spawn. They have external fertilization, they release clouds of sperm and eggs into the water, and they fertilize and make little baby fish which are plankton, and then they grow up to be adult fish. Sharks don't do that they have internal fertilization, and they have external genitalia. If you saw sharks mating, you'd recognize what you were looking at, except male sharks have two genitals, and they use whichever one is closer to the female. The reason why shark sex is so violent, is because in order to be near the female enough to mate, they need to hold her still, because they're in a three dimensional environment. So they're not against the sea floor or anything. So they bite really hard. So shark females have skin that's about twice as thick as shark males in many species because of this, and we've encountered sharks that just have like horrifying scars all over them, and that's just normal day to day life for them, it's mating scars. Where baby sharks come from is actually kind of an interesting story. It's a lot more diverse than most groups of animals. Some sharks lay eggs, some sharks give live birth, just like mammals. Some sharks have a weird mix of that that's only found in sharks, where the eggs hatch inside the mom and then are born as if



live birth. Some sharks are capable of parthenogenesis, which is self-cloning. If there's not a suitable male around...

**Kaylee**

There never is!

**David**

Yeah, yeah! The female will just become pregnant, and instead of the babies being a mix of a mom and the dad they're exact genetic copies of the mom. Sharks also have what's called multiple paternity. So during this violent mating period, the female might mate with multiple males, and she will become pregnant with several of them simultaneously and give birth to a litter of half siblings. There are also some female sharks, if they mate and say, "you know what, now is not really a great time for me to get pregnant", they can store the sperm for up to four years, and then become pregnant when the conditions are right. There's a lot of videos on shark sex on YouTube, I have a blog post summarizing it with some diagrams and videos that are my favorites. The blog post is called "50 Shades of Grey Reef Shark". Yeah, it's shocking.

**Kaylee**

I have so many questions about like how much sperm can be stored for four years, and if it degrades over time...

**David**

Apparently not enough that pregnancy doesn't work, this happened and the babies were normal, and that was in an aquarium.

**Michael**

All right, last audience question comes from Elizabeth who asks, "What's the best shark?"

**David**

What's the best shark? I encourage everyone to follow #BestShark on Twitter and Instagram to see years of me talking about my favorite shark: the sandbar shark. I love sandbar sharks, and this actually came in handy recently I was asked to do a national public radio in Phoenix, Arizona interview about sandbar sharks because the aquarium there just had baby sandbar sharks born, and they googled sandbar sharks, and I'm apparently the only person in the world who's excited by them. They were my masters research study animal which means they're not the first shark I ever saw, but they are the first shark I ever saw a lot of. Also, for millions of children around the world, they are the first shark you ever seen because they're really, really common aquarium species, and they do well in captivity. So they're just a basic model shark. They don't have a fancy head or a fancy tail or stripes or spots or whatever, but they punch above their weight in terms of public outreach, because they're so common in aquariums.

**Kaylee**

It's great to hear your reasons behind it, as I was always wondering like, why not Greenland sharks?





**David**

Greenland sharks are cool. I do like Greenland sharks. Chrissy Teigen just retweeted me talking about Greenland sharks this past week, and it ruined my Twitter mentions for like a day. But yeah, Greenland sharks are cool, but they're not the best shark.

**Kaylee**

But they can be so old and they can eat polar bears?

**David**

Yeah, Greenland sharks can live to be over 400 years old. They're the longest lived animal in the world, vertebrate animal, and they eat reindeer and polar bears. Pretty cool. But yeah, they're maybe the coolest shark, I do like Greenland sharks, but they're not the best shark.

**Michael**

Alright, should we do a segment?

**Kaylee**

Bring on that segment.

**Michael**

All right, we'll start with you, David. What are you nerding out about?

**David**

What am I nerding about lately? So there is a new video game that is being released soon, which is a first person massive multiplayer online RPG from the perspective of a shark, and it is called Maneater, and the YouTube videos for this are incredible. So you can just destroy the world. There used to be a Sega Genesis game where you could do this, but this is like that with better graphics. I can't wait for this. I'm going to just take like a week off work, and just sit on the couch, and just be destroying the world as a shark. I have been relentlessly trying to get in touch with the company to see if they need a spoke shark scientist for the game, and thus far have not had success. Yeah, I can't wait Maneater. Check it out.

**Kaylee**

I'm already playing Cat Quest. So I'll ramp up to that. Michael, what are you nerding about?

**Michael**

So the other day I rewatched Captain America, the Winter Soldier and I'm not a big Marvel guy, but this one is one of the better Marvel movies, and I have a few thoughts. First, Steve Rogers, I think is probably the dorkiest of all of the Avengers, and here's why. Before he becomes Captain America, he's just a dorky kid, he's just a scrawny, skinny kid, he gets enlisted in the Army, but everyone did back in the 30s. Then of course, he becomes Captain America, beats up the Nazis, and gets frozen and then you know, comes out in 2016 or 2015 whenever the new MCU movie comes out. The thing is that culturally he has no context for anything that's cool in the world. There's a really funny thread line in the movie, where people keep referencing things, but he



doesn't get the reference. So if somebody says something about the band Nirvana he's like "Who are they? Then he brings out this notebook to check off. Because, you know, who makes lists?"

**Kaylee**

Nerds make lists.

**Michael**

Nerds make lists. So Steve Rogers, I've slowly come to realize, is probably the nerdiest of the Avengers, and I think he's really neat. Which then led me to myself, because I love making lists. There's a museum scene that's really integral in the movie, and as a little quarantine project, I'm going to start making a database of all the movies that have integral museum scenes in them. So if anyone out there knows of good museum scenes in movies, send them to me, I'm making a database. Kaylee, what are you nerding about?

**Kaylee**

Oh, well, it's actually been forever and a day, since I read a book. When you are writing your thesis you spend a lot of time reading academic papers, and I really haven't felt like I've had much of a bandwidth to read anything else lately. So I just submitted my thesis for external examination last week, and immediately decided to read a book. So I picked one that I have been wanting to read for ages, which is Ted Chiang's *Exhalation*. It was released last year, it's a series of sci-fi short stories. It is stunning. I enjoyed every moment of it. I read it all in one day. It answers, or goes into these questions around what is consciousness? Do we have free will? What is memory? What is the value of memory and as it fades is that valuable? There was one story in particular, I won't spoil it, but it was all about the potential of sort of digital pets, and owning digital pets and it reminded me of Giga pets. Do you remember Giga pets? I used to play Giga pets and then later on Neopets. Did any of you have Neopets online? I had this one which I went online and I fed every single day and I was obsessed with buying things for. It sort of talks about, you know, what, what would digital pets look like? What would animal welfare look like in that respect, and it's a really beautiful story about a future where that's a possibility. I absolutely loved it. So if anyone's looking for a read, that's a good one.

**Michael**

Nice, yeah, I'm a big advocate for bringing more robots into our lives, robot pets. As soon as they're on the market. I'm gonna get a robot cat. Oh, well, David, thank you so much for joining us on the podcast. You are on social media. Where can people find you on twitter.com?

**David**

Yeah, I am on Twitter, Facebook and Instagram @WhySharksMatter. I am always happy to answer any questions anyone has about sharks. I should also note that throughout this quarantine period, I have been zooming into people's living rooms. I've talked to thousands of kids about sharks, and I'm available to do that for anyone listening at home. If any teachers are still meeting virtually with their students, I'm happy to hop on a call, and talk about marine biology and yeah, thanks for having me. This was fun.

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**Kaylee**

It was so fun to get to chat with you more about your work. If you liked this podcast you can follow us @NerdNiteYVR on Twitter, Instagram, and Facebook, and we'll be back with another episode in a couple weeks. Until then just keep swimming.

*Transcribed by <https://otter.ai>*