Why do sharks have so many teeth?

But Why: A Podcast for Curious Kids

September 23, 2022

Jane 00:20
This is But Why: A podcast for Curious Kids, from Vermont Public. I'm Jane Lindholm. On this show, we take questions from curious kids just like you and we find answers. For today's episode, you're going to need to get out your flippers and maybe a wetsuit. We're going to be scuba diving, and we might even need a cage to protect us for some of our adventure. We're talking this week about sharks! Some people find sharks frightening. And it's true that some sharks like the Great White are apex predators, top of the food chain, with big scary teeth and a bad reputation. Those strong jaws definitely command our respect. But there's more to sharks than just their teeth. They come in all shapes and sizes and have been around since the time of the dinosaurs. You have sent us a lot of shark questions, and we thought of the perfect person to help answer them.

Kady Lyons 01:19
My name is Dr. Kady Lyons. I'm a shark research scientists here at Georgia Aquarium, which basically means that I look to see how sharks use their environment and how we can use that information to help conserve them.

Jane 01:32
How cool would it be to be a shark researcher?! The first thing we wanted Kady to explain to us is what a shark is. I bet a lot of you already know this first fact:

Kady Lyons 01:43
A shark is a type of fish. It's a really ancient fish. They've been around for millions and millions and millions of years. And essentially what that means is they have keyed in on a really cool evolutionary pathway that they have been able to sustain for a really long time. So their basic body plan hasn't really changed that much. But when we think about dinosaurs, that are now today's birds, that has changed a lot, but sharks haven't. So they're a type of fish. That means that they don't come to the surface to breathe, although there are some sharks that do come up and swallow air and put it in their stomachs. And they kind of get a little bloaty, and that helps them float around. But they breathe through their gills, same as like any other fish that you would see. And they also don't have any bones. They're made completely of cartilage. So the only really calcified portion is their teeth. Which is why, in the fossil record, that's the only thing we actually have of them, compared to what are called bony fishes or teleosts, which are which is what we're descended from as humans. So anything with bones originally came from those bony fishes. But sharks don't have any of that.

Jane 02:57

That is so cool. It hadn't really occurred to me that we don't have any fossil record of what prehistoric sharks actually looked like from their bones, because sharks don't have bones. But also, did you know that any animals alive today that have bones came from bony fish? So the next time your adults tell you, "You swim like a fish," you can just say, "Well, of course, I descended from one!"

Kady Lyons 03:20
Exactly. Just don't try to breathe, you know, underwater without some scuba gear.

Jane 03:25
You mentioned though, that, you know, when we think about birds, and their connection to dinosaurs, most of the birds today look pretty different from the dinosaurs of the past. And sharks don't look very different. But Melanie, who's six and lives in Florida is wondering about all of those connections.

Melanie 03:40
If dinosaurs, and sharks and fish were around, then why are dinosaurs extinct and sharks and fish not?

Kady Lyons 03:50
That's a fantastic question. It really has to do with you know, the meteor that hit the Earth, and it affected those ecosystems in very different ways. So luckily, I guess, you could think about that for for sharks and other fish, that that didn't have a huge impact on them, but it had a huge impact on the dinosaurs, which ultimately led to their extinction and the rise of mammals.

Theo 04:16
Hi, my name is Theo, and I'm eight. I live in Alberta, Canada. And my question is, were megalodons the biggest shark in the world?

Kady Lyons 04:24
Contrary to some of the movies that, you know, pop science puts out there are no megalodons around although it is fun to imagine, you know, what a huge animal like that would be, maybe terrifying is another word for it.

Jane 04:38
So no more megalodon, but they were the biggest sharks.

Kady Lyons 04:42
Very very, very large sharks, yeah.

Jane 04:45
It's hard to know how big megalodons actually were because, remember, sharks don't leave behind fossils in the shape of their skeletons because they don't have bones. Cartilage is softer than bone so it disintegrates more quickly. If you want to know what cartilage feels like, try bending your ear in half, or taking your finger and wiggling the tip of your nose with it. You have cartilage and bones. But back to megalodons. New research suggests that megalodons could have been as much as about 65 feet long. That would mean some megalodons were even longer than today's humpback whales. Now, that's a

big fish! And sharks are fish, not whales, as we heard at the beginning. Because they're fish, they breathe underwater. A couple of you asked how they do that.

Willem 05:32
Hi, I'm Willem. And I'm five and a half years old, and I live in Lubbock, Texas. How do you sharks breathe in their gills?

Everett 05:44
My name is Everett. And I'm five years old. I live in Calgary, Alberta. How do sharks breathe underwater?

Jane 05:54
One of the coolest things to know, regardless of whether an animal breathes air through its lungs or water through its gills, is that both types of breathing are a way to get oxygen into an animal's system. Even though they're underwater, fish need oxygen.

Kady Lyons 06:10
Yeah. And yeah, it's a really important thing, because oxygen is a key to life for all of us that undergo what's called aerobic respiration. And essentially, it's just a really fancy way of saying we need oxygen from the air that's either created by plants or phytoplankton in the ocean. And we use that to create energy. And that's what we use to power our bodies and run around and, you know, do things. So what a gill basically is, if you think of your lungs, and you were to invert them, and have them go from, you know, the inside out, that allows water to pass over the gills. And they're really, really thin. So we're talking, you know, very, very, very thin, delicate pieces of anatomy. And blood runs through those skills. And it's allowing it to pick up the oxygen from the water and put that and to diffuse that into the blood. And then the blood will circulate around the shark and provide that oxygen to all the tissues that are in the body of the shark or the fish.

Jane 07:14
When we think about sharks, I think one of the things that people immediately think about are teeth, and people picture rows of teeth and really big teeth and teeth that are gonna bite and chomp and maybe hurt people, but definitely hurt the prey of the shark. So let's talk about teeth and we can talk about some misconceptions about sharks and shark teeth. We have lots of questions.

Greyson 07:38
I'm Greyson. I'm seven years old. I live in Rock Hill, South Carolina. Why do sharks grow different rows of teeth?

Fox 07:49
Hi, But Why. My name's Fox. I live in New York and I'm six years old. My question is why do sharks have so many layers of teeth?

Aubrey 07:58

Hello, my name is Aubrey. I am seven years old. And I live in North Carolina. My question is why does sharks have to have so many teeth?

Clark 08:07
My name is Clark and I live in Seattle, Washington. And I'm five years old. Why do sharks have such sharp teeth?

Carter 08:18
My name is Carter. I'm four years old. I live in California. My question is, why do sharks have so many teeth?

Kady Lyons 08:30
It's a great question. So it's really interesting when we think about, again, the different ways that an animal has adapted to best use its environment. So like us as humans, you know many other mammals, we, we don't grow our teeth continuously, right? We shed our baby teeth, and then we have our set and adult teeth. And that's it, right? I'm sure many of us actually would love to have teeth that would regrow. So we don't have to go to the dentist as much. So for sharks, because of their habitats and the types of things, that's just part of how their evolutionary strategy, so that's how they're best to using their physiology to exploit their environment.

Jayden 09:13
My name is Jayden and I'm from Fairfax, Virginia. I am seven years old. And my question is, why do sharks lose teeth every day?

Kady Lyons 09:25
You know, if they break a tooth, they don't--you know that will allow them to regrow that tooth so they can still be an effective predator at catching those prey. Whereas if, think about us, right, if we lose a tooth, it's gonna be really hard to bite into that apple afterwards if you again don't go to the dentist and have some help. So you know, because of the types of ways that they hunt, allowing them to be able to replace those teeth when they break off can be really effective strategy for them to be able to be good hunters.

Jane 09:56
And how do they, how do they keep growing those teeth? How does that work inside their bodies?

Kady Lyons 10:01
Yeah, so in their mouth, they--think of like a conveyor belt. Or if you've been to the airport and you see your luggage on one of those things, it's the same sort of thing. So they're producing their teeth kind of like underneath their gums in a place where you can't even see. And as those teeth rotate forward, they mature. So they become hard, they become calcified, and they rotate to the front, and then they eventually do fall off.

Jane 10:29
So they're not all mature when a shark is born. That shark isn't born with a billion teeth.

Kady Lyons 10:34
Not a billion teeth. No, they will, they will grow teeth their whole life. So it's pretty cool.

Jane 10:40
And some sharks when they lose a teeth, a tooth, they lose a whole row of teeth, right? So not just one tooth at a time, like we do with our baby teeth.

Kady Lyons 10:47
Yeah, exactly. And some stingrays, which you can think of them as flat sharks, they also have teeth, but they have more plates of teeth. So they too also will go through this conveyor belt as well. And you can actually find like, you know, these chunks of those row plates of their teeth.

Jan 11:07
Hi, my name is Jan. I am from Canada. I'm five years old. Why are shark's teeth sharper than humans?

Sophia 11:16
My name is Sophia. I am four years old. I live in Virginia. And my question is, why do sharks have big teeth? And why do they eat fish?

Kady Lyons 11:29
Different sharks have different numbers of teeth, they have different shapes of teeth. And they have different rows of teeth and some of that has to do, again, with the type of prey that they're eating. Because that makes them, again, a good predator for that particular thing. So let's say you're like, you know, really focused on eating slippery fish. You know, you might want a lot of really needle-like teeth, so you can be able to grab on to that really slippery fish. But if you're something like a tiger shark that specializes on eating on turtles, you might not need a lot of teeth, but you're going to need really big teeth that have those real large serrations in it to cut through the shell. So the teeth are adapted, or the shark is adapted again to specializing on its particular prey item.

Jane 12:14
Well, I'm glad you're talking about what sharks eat because Ezra wants to know more. Four years old.

Ezra 12:20
I live in Ogden, Utah, and my question is, do sharks eat fish?

Kady Lyons 12:27
A lot of sharks eat fish. Yeah. And if we think about fish, that's right, a really general way, there are hundreds and hundreds and hundreds of hundreds of species of bony fish. They actually are one of the most numerous taxa, and they have all kinds of really, really cool adaptations themselves. But that also means that, you know, we're generalizing pretty broadly about, you know, eating fish. But their are all kinds of them. So I just want to focus on the fact that there's not just one type of prey, even though that whole word encompasses the word fish.

Jane 13:01
Do all sharks eat meat?

Kady Lyons 13:04
Yes, so all sharks are carnivorous in some form or fashion. You do have some sharks that specialize in filter feeding, and they're feeding on zooplankton and phytoplankton, but mostly they're there for the small zooplankton. So if we think about a food chain, right, we have the sunlight that comes down to the ocean, we have the phytoplankton--phyto means plant. So we have those plants, those we'll call them sea plants for now, that are you know, taking that sunlight and harnessing it into chemicals that then a zooplankton, so even an even tinier thing, is eating. And then that could be eaten by a whale shark or a basking shark. So some other large, you know, larger predator. But in general, yes, they're all carnivorous.

Jane 13:52
And do some sharks eat other sharks?

Kady Lyons 13:55
Oh, yes. Yeah. Definitely.

Jane 13:58
Who? What sharks are eating other sharks?

Kady Lyons 14:00
Well, you have great whites that will eat other sharks. You have tiger sharks that will eat other sharks. You have sand tigers, and sandbars. So, pretty much all those animals except for the white shark, obviously, we have here at Georgia Aquarium.

Jane 14:15
When we come back: shark attack! Okay, not really. But we will talk about why sharks occasionally bite humans, which by the way, is a very rare occurrence. And we'll learn about why you should respect but not fear sharks, and in fact, you might want to help protect them.

BREAK 14:32
[BREAK]

Jane 14:34
This is But Why: A Podcast for Curious Kids. I'm Jane Lindholm. We're learning all about sharks today with Kady Lyons, a marine biologist with the Georgia Aquarium who studies sharks. Even if you don't know much about sharks, you know that a lot of people are afraid of them. A lot of movies and TV shows feature shark attacks. And occasionally there's real news about someone getting bitten by a shark. I'm not surprised that some of you have questions about that.

Desmond 15:01

My name is Desmond. I am eight years old. And I live in Pennsylvania. I want to know, why do sharks eat people?

Willem 15:13
My name is Carson. I am nine years old. Do sharks attack you for the fun of it?

Sienna 15:19
My name is Sienna. And I am from Sable and I am four and a half. And my question is, why do sharks bite?

Elias 15:31
My name is Elias I am six and a half years old. I live in Shelton, Washington. Why are sharks dangerous?

O 15:38
My name is O and I'm five and a half. And I want to know why sharks sometimes think people are food.

Kady Lyons 15:47
I don't think any shark particularly likes to eat humans; we're not great prey. I mean, we're, you know, generally lean, we don't have like a blubber layer, like a seal. And really what the shark is after is fat, is fat and oil. That is a really energy heavy item. So you know, think about if you were eating marshmallows all day or peanut butter sandwich, right? You're gonna want the peanut butter sandwich, because you're getting a lot more nutrients, you know, from that. These animals, you know, they're not wanting to eat us. But sometimes mistakes can happen. And that's, you know, usually where, you know, it becomes a very unfortunate event.

Jane 16:26
But some people because of that are afraid of sharks. Can you talk to us a little bit about whether we should be afraid of sharks and how we can be safe if we live near or are visiting the ocean where there might be sharks like great whites?

Kady Lyons 16:39
Yeah, I mean, I think it's important to have a healthy respect for the ocean, right? We have to remember that we're entering their environment, right? And so we do have to be conscious of our actions and making sure that we're being safe, right? So you know, if I was in a place where, you know, great whites lived, I might not choose to go surfing at six o'clock in the morning during times when I know that they're around, could because I'm just you know, I'm gonna look like a seal on a surfboard. So I might choose maybe maybe I'll go surfing and you know, at 3pm Instead, when hopefully less of those mistaken identities can occur. So I think we have to be conscious about the choices that we're making, and have a healthy respect. But we don't want to be so fearful that we don't learn more about these animals and the important roles that they play in the environment, because even though they have lots of teeth, and they can be scary, they are really cool animals, and they play important roles in our ecosystems.

Jane 17:41
Has people's fear of sharks lead to bad things for sharks?

Kady Lyons 17:46
Yeah, I mean, sometimes our fear can drive us to do things that maybe aren't the most, you know, scientifically sound. So sometimes, you know, when accidents happen that can cause people to say, hey, we want to go out and, you know, kill a bunch of sharks to try to find the one that bit this person. Well, that's pretty much an almost impossible thing to achieve. And it doesn't necessarily mean that you know, an accident won't happen in the future. You're just, you know, kind of killing a bunch of animals for no reason.

Jane 18:17
So while we should respect the role that these top predators have in the ecosystem, most of us don't have any reason to fear them. And if you live near or are visiting the ocean, ask your adults to help you learn more about all the really cool creatures you might encounter there, and what you need to know to be safe, so you are armed with knowledge, not fear. You all have so many questions about sharks that we actually gave Kady Lyons a kind of a lightning round here at the end.

Valerie 18:45
My name is Valerie. I seven years old, and my brother Ben is three. And we're from San Diego. And we want to know: do shark sleep?

Josie 18:57
My name is Josie. I'm eight years old. I live in Murfreesboro, Tennessee. And my question is, do sharks actually sleep?

Kady Lyons 19:07
We do know that sharks can go through periods of rest. There's some really cool research where people have been looking at the brain activity of what happens when a shark is swimming around and when it is resting. And you do see that that brain activity does lower. Now whether that means like sleep as what we would consider sleep of like, you know, crawling into our bed and having dreams at night, I think that would be that's a little hard to know, but they certainly do go through periods of rest where they are reducing that brain activity. Obviously different species have different needs. Some species can lay on the bottom and respire or breathe by what's called buccal pumping, which basically means they have the ability to suck water in over their gills like we were talking about earlier. Other species have to move continuously in order to force the water over their gills because they can't, you know, suck it in themselves. So for those species, obviously that's a little more challenging to try to study, but it's likely that they probably do go through periods of autopilot, right? Where you're kind of just like staring off into space, you're walking, but you know, your brain activity at that level might not be as much.

Binney 20:25
My name is Binney, and I live in Pittsburgh, Pennsylvania. I'm five and a half years old. And my question is do sharks have noses?

Kady Lyons 20:36
Sharks most definitely have noses. Yes. They're really great animals at being able to detect odor sense in in the water. So if we think about a swimming pool. If you were to drop one drop of blood into a swimming pool, they would be able to detect it. Now, I say that also saying that it's not that--we need that one drop to diffuse, or spread out over the entire swimming pool. So it's not like if you drop one drop in this corner, a shark is automatically going to know what that is. It's just to give you an idea of the scale of the sensitivity. So they're very, very good at smelling.

Jane 21:17
Oh, I see. So they're not smelling that drop of blood from very far away. It's just that when that drop of blood sort of blends into the water, it can even be such a such a miniscule part of something, but they can smell even the tiniest little whiff of it.

Kady Lyons 21:32
Absolutely.

Everett 21:33
How do sharks easily spot dolphins?

Jane 21:36
That's Everett, who's three and lives in California and wants to know how sharks spot dolphins. But Kady, do they spot dolphins?

Kady Lyons 21:45
Well, some sharks have decent visions, some not so much. But they also have this other really cool sense called a lateral line. And a lateral line basically means that on the side of their body, they have these special pores that are able to detect vibrations in the water. So that would be one way that a shark, without even seeing a dolphin, would be able to detect that a dolphin's there. And they probably will Skedaddle from the area if I'm being honest.

Jane 22:13
They don't like to be around dolphins?

Kady Lyons 22:14
Not so much. Yeah.

Jane 22:17
Why is that? Why aren't they friends with dolphins? Or why don't they eat dolphins?

Kady Lyons 22:21
That's that's a good question. You know, dolphins are a top predator, a very intelligent animal. That's not to say that, you know, all sharks are dumb or anything. But they and they, like, have pods. You

know, it's a strength in numbers thing that might come down to it to where it's like, you know what, I might just remove myself from the situation and not tempt fate.

Mason 22:43
How do sharks communicate?

Jane 22:45
That's Mason, who's eight and lives in Arizona.

Kady Lyons 22:47
So definitely body language, right? So there are some folks from--early researchers in shark biology that have looked at shark behavior. And you can see differences in their body language, similar almost like we can think of humans, right? As you know, if we shy away from somebody, or we want to be close to somebody, right, we're going to alter our body language to to communicate that. So sharks can do some of that same thing as well. It's likely that there's probably odors too, that we don't even know how to how to sense, but they know how to sense it, because again, they have those really good noses. So those are probably some of the ways that sharks do communicate with each other.

Jane 23:29
But they don't make noises?

Kady Lyons 23:31
Not to my understanding.

Jane 23:33
Do you have a favorite kind of shark?

Kady Lyons 23:35
I have a favorite flat shark. And that is the round stingray, which is a native species of ray to Southern California, where I'm from. And it's a species that I did all of my masters and my PhD work on. And so they're very near and dear to my heart. And they have a lot of really cool biology too.

Jane 23:54
Will you tell us about them?

Kady Lyons 23:56
Oh, sure. I mean, think of a dinner plate. That's about as big as they'll ever get. They're brown with like, really pretty spots. And they have a tail that has like a little paddle on the end, again, very endearing. Females will give live birth. And one of the really cool things about this animal along with other rays is that when mom is pregnant, she'll actually secrete a fluid where the babies are held, and those babies will drink that fluid, which is called uterine milk. And that is one way that mom can provide a lot of resources to make her babies nice and big and strong, so that when they're born, they're born with a lot of resources and have the bes headstart possible.

Jane 24:38
What's another cool shark that kids might want to do more research about?

Kady Lyons 24:42
Oh, gosh. I mean, we have a lot of really cool animals here at Georgia Aquarium, which is what makes it a really a great place to work. One of the species that we're doing a lot of conservation work right now is the zebra shark, also called the leopard shark in Australia. So these are animals that lay eggs. So, contrary to the stingray that I was just telling you about, these animals, which give live birth, these animals will lay an egg and a shark will actually hatch out of that egg. And when they're born, they're born black with white stripes. So they look like a zebra, which is why we here in United States call them a zebra shark. But as they grow up, those stripes turn into spots, which is why they're called a leopard shark over in Australia.

Jane 25:27
Huh! What's the smallest shark that there is?

Kady Lyons 25:31
I believe that's a species called the pocket shark. It's a deep water species. And it literally is a shark that you can put in your pocket. You know, it's about the size of your hand, if not smaller.

Jane 25:43
A pocket shark sounds pretty cool. But I don't think I'd actually want to pick it up and put it in my pocket. We could probably talk about sharks all day. That's because there are hundreds of different species and they're all a little bit different and really interesting. Kady says that's what makes sharks important to learn about, too.

Kady Lyons 26:00
Sharks are a super fascinating group of animals, I think. You know, you have the whole tooth aspect, right, that is just inherently fascinating to us. And all the amount of adaptations. They, you know, have everything from again, the whale shark, which is this huge, huge animal all the way down to that little pocket shark that we were talking about and everything in between. You know, they occupy the deep ocean, they occupy the coasts. And they have all kinds of really cool biology that, that they have evolved that makes them really cool to study. But besides that, I think they're also really important ambassadors for the ocean. And us, you know, wanting to protect these animals, if any, for any other reason, because they're cool, besides all the really important ecosystem functions that they perform to help keep the ecosystem in balance.

Jane 26:53
So if you want to be able to keep the ocean safe for all kinds of sharks, you need to do your part to make sure you're keeping trash from getting into the ocean, and that you're helping to encourage adults to keep our environment healthy for all kinds of animals.

Jane 27:06

Thank you so much to Kady Lyons, shark researcher with the Georgia Aquarium. If you live near an aquarium, they're often good places to learn more about and actually see marine animals in person that you might otherwise never get a chance to lay eyes on.

Jane 27:21
That's it for this episode. If you want us to tackle one of your questions about whatever makes you curious, send it to us! Have an adult grab a smartphone to help you record yourself telling us your first name, where you live and how old you are, along with your question. Then your adult can email that file to questions@butwhykids.org We can't answer every question you send, but we do listen to all of them and we love hearing what you're curious about. Also, we always send a note to your adult to let them know when you're going to be in an episode. But Why is produced by Melody Bodette and me, Jane Lindholm, at Vermont Public. Our theme music is by Luke Reynolds and our show is distributed by PRX. We'll be back in two weeks with an all new episode. Until then, stay curious!