

# Garology with Solomon David

## Ologies Podcast

### December 15, 2020

Oh hey, it's your Internet Dad, it's Alie Ward. This is a podcast called *Ologies* wherein you will think, "I don't think I care about this topic!" and then you will later google that topic when you're supposed to be doing actual work, and tell people weird facts, and maybe have a dream about the topic later. I dreamed about gar last night, so let's get into it.

First off, thank you for making this show a thing. Thanks to everyone at [Patreon.com/Ologies](https://www.patreon.com/Ologies). If you have been wanting to join that special tree house with us it's \$1/month but it lets you submit questions to the Ologists. Also, thank you to the people who leave reviews and who rate and subscribe to the show, keeping it up in the charts. Some days, I'm a sad creep and your reviews always cheer me up so I read them all; every one. I prove it by picking a new one, and this time it's from someone called Ali Reil, who wrote:

*I am but a soft pretzel. The podcast: my pot of cheese fondue. Alie's Ologies inspires me to use my meat computer differently while still feeding my childlike wonder for the world.*

Thank you for that. If you leave a review, I read it with my eyes. That's the deal, that's the truth.

Okay. You ready for gars? Let me answer that for you. No. You are not ready. This is a most loathed fish with an otherworldly face. But is it an armored creature of the deep, out to drag people under the surface of lakes and rivers and rip them apart? Or is it a gentle giant whose slime you would caress? We're going to ask a Garologist. One of the world's top Garologists, in fact!

'Garologist' – not a common word. In all of my digging I was only able to find it referenced one time, in one book. But what even is a gar? The word 'gar' comes from the old High Germanic for 'spear'. This is primarily a freshwater fish. It has a long, sharp snout like a crocodile with teeth coming every which way like sprouts of grass. The 'gar-' in garlic, by the way, also comes from 'spear' because the cloves can be sharp. Can you eat gar with garlic? We're going to find out.

This Garologist is truly an expert and a very impassioned one. He has amassed tens of thousands of social media followers for being a gar champion and for engaging in Birds vs Fish battles. He is an Assistant Professor at Nicholls State University. He got his Bachelor's from Ohio Northern University and his Master's and PhD from the University of Michigan, Ann Arbor, studying Aquatic Ecology. He is also one of the most truly beloved scientists I know. Everyone who knows that this episode has been in the works has nothing but glowing things to say about him.

He is also, though, a ruthless pun-maker, one of the finest in the game. And so, to celebrate gar puns (and there are many), you're going to hear a soft, subtle chime to alert you so you can blink, and nod, and say [*whispers intently*] "Yes. Yes." Perhaps do a tiny, imperceptible butt-dance on the bus.

Now, this episode has been in the making for months and months but it got preempted by TWO hurricanes and various other scheduling hellscapes. We finally connected and then something was not happening right with the recording portal that I usually use, but we made it work. So climb into hip waders and let's get deep to discover the wonderful world of gar, including a backstory that predates the T-Rex, the barges sent out to destroy them, the slime, the scales, the poisons, river monsters, pets, boops, the hundreds upon hundreds of teeth, and one illustration that changed the course of history with an absolute joy of a human specimen, Garologist Dr. Solomon David.

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**Alie Ward:** Oh wait, you went away! Are you still there? [*silence*] Okay, we're having some audio issues. [*video conference connecting noise, crackling*] Oh, you're back! Are you still there? Oh I lost you again, no! Oh my gosh, you went away again!

**Aside:** Okay, after 25 solid minutes of technical hiccups in this remote recording software we used, we just switched. We went over to Zoom because this interview was NOT not happening. Now, is Zoom the best in terms of audio? No! But Gar is happening and it's happening now. And also, now it was video! So behind Solomon I got to see a four-foot tank filled with alive, long-snouted gar of various sizes: in the flesh! (Almost.)

**Alie:** And you're not kidding. You *do* have seven of your friends behind you!

**Solomon David:** They're right behind me so you get some added guests in the background and everything! [*laughs*]

**Aside:** Seven slender beasts glided by behind him, kind of like alive baseball bats with 500 teeth each. But, I have a *gargantuan* list [*pun twinkle*] of questions to ask him, so let's dive right in.

**Solomon:** My name is Solomon David and my pronouns are he and him.

**Alie:** And you are a Garologist. Yes.

**Solomon:** I think we're inaugurating the term with this podcast, I had to google it and it looks like it hasn't really been used for anything else as far as I can tell.

**Alie:** How long have you been an expert in gars?

**Solomon:** Oh gosh, I feel like "expert," might be, you know... Sure, maybe now I might be an expert, but that's just because there's so much that nobody has bothered to worry about with these fish. I've been interested in them since I was a kid but I would say it was around grad school when I really got into them and they started taking over my life, if you will. I would say maybe grad school was when I started to work on them, so that makes maybe 20 years. Something like that.

**Alie:** I think that makes you an expert. 20 years of studying a fish? I think you're an expert in the fish. I saw that one of your early papers was titled something about "Underdog Fish," so have you always been into the least glamorous fish, and puns? Is that something that's just been part of your branding for a long time? [*laughs*]

**Solomon:** The Venn Diagram of dad jokes and puns overlaps. But yes, as far as the under-appreciated, underdog animals, for sure. I always liked snakes, and bugs, and the things deemed "creatures," if you will, and that leaped over into fish.

**Alie:** What type of fish do you study in the lab?

**Solomon:** The lab is called Gar Lab. We focus on, but are not limited to, gar; so members of the family. Their semi-close relative is the Bowfin, so there's really only one species that is formally described right now that's extant.

**Aside:** So his gar lab at Louisiana's Nicholls State University focuses on the migratory ecology of a few different types of fish. But screw those fish! I wanna talk gar. Gimme the gar. I'm here for a tender love of the river beasts.

**Alie:** What exactly is a gar? I did not know that they existed until I saw your Twitter with a picture of you holding one and I was like, "That is a rubber prop, that can NOT be real."

What is this thing? Is it a crocodile? Is it a fish?" What are they? Can you describe what they look like for people who are not familiar with the wonders of gar?

**Solomon:** I like to tell people to picture an alligator or a crocodile with fins instead of legs and that's a gar. You turn the tail of an alligator into a paddle, but really if you're looking for the basic visualization, that's what it is. They've got this primitive, ancient look to them – long snout, lots of teeth, that's a gar. Alligator: fins instead of legs.

**Alie:** Where did you get interested in fish?

**Solomon:** In fish... I was born in Washington state and I lived there for a few years. My dad would take me to the Stillaguamish river which is one of the rivers near the Seattle coast, a little bit further inland, and I remember chucking rocks into the water. That was my first memory of connection with the water. I was born in a town where the sign for the town had fish on it.

One of the questions that I feel has been valuable to me is telling the story of how I got interested in them, which I feel could be useful to others as well. The nature magazine *Ranger Rick* is what got me interested in gar. When I was a kid, I flipped through the magazine and saw this article about this animal that had fins instead of legs, it looked like a fish with fins instead of legs, this alligator gar. I saw it as a kid and it got emblazoned in the back of my mind. [*Alligator gar, baby!*"]

**Alie:** Can you describe that moment? Were you a subscriber to *Ranger Rick* or did you pick it up in a dentist's office? What was that moment like seeing this alligator gar?

**Solomon:** Oh my gosh, I had just moved to Ohio from North Dakota and the neighborhood kids there saw that I was interested in creatures; creepy-crawlies, the bugs, snakes, that sort of thing. So they gave me a bunch of back issues of *Ranger Rick*, so I never had a subscription back then. They were these old issues. I was flipping through them then and I turned to the page. Actually what caught my interest first was an illustration of two little softshell turtles (because I was a turtle person then). [*Turtle Boy: "I like turtles."*]

I saw that and then I zoomed out to see, like, "Wait, what is *this*?" And I thought it was really cool. I was like, "What is a gar?" It was actually called Mississippi King and it was in a pond in Louisiana. It's really interesting to think that now I live near a pond in Louisiana where there's gar. It was almost like foreshadowing. I was really excited then.

My advisor in undergrad, he was into gar, and by then I had kind of forgotten about them. I was taking ichthyology and he was like, "Gars are this really cool fish, I think they're cool," and I'm like, "Wait a minute, I know what those are!" So that kind of started me back into them. From there on it expanded, maybe took some turns, following the sinuosity of a river maybe, to where I'm at right now, but that is where the fish interest started.

**Alie:** Is it weird for you to have seven gar right behind you all the time when you work on them? What happens in your brain and your heart when you look at a gar? Is it just heart-eye emojis?

**Solomon:** [*laughs*] Yeah! I would say so. I would say it's weird if I didn't have gar near me all the time. If I'm in my office, there's gars there, the preserved specimens. And the ones at home are the live specimens here, and so they're never too far off from where I'm at. I just have a real fascination with these organisms and so anytime I look at them I'm

really just excited about them! Even if it's fish I've seen for a long time. I've got fish that I've had for ten years.

**Alie:** What are they eating behind you? What do you toss in there?

**Solomon:** They eat shrimp. [*clip from Parks and Rec, Jean-Ralphio: "What are those, shrimp?"*] I give them frozen shrimp. It helps quell the aggression that they might have in the wild. Every now and then I may give them some feeder fish that I load with extra vitamins and minerals. But really it's just frozen fish to try to calm them down. There are different species in there, so you want to make sure everyone gets along. They have different growth rates, some are more aggressive than others. It's like dealing with a bunch of children, only these are nicely contained in an aquatic box.

**Alie:** [*laughs*] What is your field season like? What is your yearly rhythm? Do you spend summers in the field and then you're dealing with a lot of data? What's it like for you?

**Solomon:** The rhythm down here is usually synced up with the Mississippi river and some of the rivers that are connected to it. We have a floodplain inundation season when the water goes up and then it starts to come down. We monitor populations at various points during that time. We 'go with the flow' almost literally. When the river's up, we're out there. When the river's low, we're out there, but we use different techniques depending on what the water levels are.

**Alie:** What kind of *garb* [*pun twinkle*] do you wear when you're working?

**Solomon:** That depends too. If we're mucking around in the water then it might be waders, or muck boots, or something like that; something that you can try to wash because it's going to get covered in gar slime. There's fish slime and then there's GAR fish slime and they are almost two different categories altogether. One of them does NOT come out.

**Alie:** NOOO! Okay, tell me everything, because I didn't even know that they had slime. I thought that they had thick scales. Okay. Anatomy of a gar. Dish! What's happening?

**Solomon:** Sure, so they've got this elongated body which is considered to be more ancient fishes or "primitive" fishes. Those earlier-diverging fishes tend to have these elongate bodies, and so gars kind of fall in with that. They're covered with these diamond-shaped armored scales called ganoid scales. They're actually made up of a compound which is similar to the enamel on our teeth, so they're super tough. Native Americans in some places would make arrowheads out of the scales. Some folks still make jewelry out of them. Early settlers would cover the blades on their plows with them. In essence, the scales are really tough. The DoD has done studies looking at them as a bio-inspired armor and everything. The *garmor* is there. [*pun twinkle*]

**Aside:** Did I spend an hour on Etsy looking at brooches made out of gar scales? [*whispers*] Maybe. Imagine a flower made of glossy, cream-colored, jagged teeth; each one acting as a petal. Am I kind of considering purchasing one? Perhaps. Just imagine wearing it and people saying, "Ooh! What an intriguing statement piece. What is that?" And you'd say, "Oh, it's interlocking body armor from a fish that's been around longer than dinosaurs and has a face like a saw. [*with a smile*] It'll cut you if you touch it!" [*"Elegant."*]

**Solomon:** So, they've got these scales, but you're right, the slime is there. It's this coating... it's exuded from mucus cells on the fish, but they just have so much of it. And we have to

preserve fish for different reasons, so we have a group that we have to take back and we use for other types of internal analysis, that sort of stuff.

Dead gars seem to produce even more slime than live ones. It's a lot of slime... If we could just harness that sliminess into something else... Maybe that will be one of our next projects. Maybe we will inspire someone to look into that too.

**Alie:** Do you have any idea if that slime is similar to hagfish slime, in the way that it's tossed out and absorbs water to... where it's mostly water but slime filaments?

**Solomon:** I will say that it's not similar to hagfish in that way. They don't use it as a defense like hagfish would. But both types of slime are primarily water based though.

It's almost like, just, this superficial sliminess to them that reminds me of hagfish. I think that I posted a video of lifting up a gar that had been preserved for a while, or at least was frozen and thawed and the slime just drips down. The students seem to really get into that in the Biology of Fishes class. That's one of the first dissections we do is gars so they can see what it's like.

**Aside:** Yes, I looked this up, and it looked like a fish emerging from behind a curtain of mucus. Or wearing a cape made of snot. It's as gross as you think it is.

**Alie:** What do those smell like?

**Solomon:** Yeah, that's another thing. Some fish have somewhat of a pleasant smell to them. I used to work on lake whitefish which is found in the Great Lakes. They actually smell like cucumbers. So, that's actually a decent smell.

Gars, it's like a pungent, swampy-type smell. It's hard to describe, but it's unique to them. Certain species are even smellier than others. It doesn't really come out. You just sort of learn to live with it in the field gear that you have. It's pungent.

**Alie:** It's pungent and swampy. [*chuckles*] Sounds like the worst wine tasting notes you could possibly... "Pungent notes and a swampy body."

**Solomon:** I agree.

**Alie:** What about... Who eats them? Who eats the gar?

**Solomon:** So, as long as you're not a vegetarian, I feel like everyone should. Or at least try it.

So, folks in the South tend to eat it more than people up North, thinking about the United States here. Different countries in Central America, gar is a popular food fish. In certain parts of Mexico, it's just as popular as salmon is in the Pacific Northwest. So, you can get gar empanadas, tamales. You can get it on a grill.

In the South here, in Louisiana they actually make gar balls. Which is basically just taking the meat and putting it into almost, like, meatballs. They prepare them in a bunch of different ways. I have had gar and it's actually really good.

**Alie:** Really?

**Solomon:** It's one of those things, like, the appearance of the fish might make somebody like, "I'm not eating that, there's just no way." But if you look at a Patagonian toothfish, which is a Chilean Sea Bass... [*British male with pompous voice: Chilean Sea Bass, I believe.*"]

At this point, we shouldn't be eating them anyway. But if you look at them, not the most appetizing looking fish. So, I feel like that's just another category where they've got a

bad reputation. But gar is actually pretty delicious and people have been eating them for hundreds of years.

**Aside:** I actually meant which animals predate on gar... gars, but I was quite happy to take this globetrotting culture cuisine tour. I loved it. But what about non-humans? Who dares feast on the beast?

**Alie:** What about animals? I mean, we at least have nets and hooks, but if I were an animal in the wild would I just be like, "That thing has tooth-scales all over it and a bucket of slime. It's out of my league."? Is that how they persisted so long unchanged?

**Solomon:** Yeah, the armor definitely helps. They live in these areas that maybe not a lot of other more conventionally-respiring fish can survive. Because they actually breathe air.

**Alie:** Wait what? Fish breathe air?

**Solomon:** I digress, I'll come back to that. Alligators will eat gars. They'll just swallow them whole. Cormorants, there's a lot of pictures online of cormorants and other similar type birds eating gars. I kind of ask for that because I'll get into that whole birds-versus-fish argument all the time. People will send me pictures of birds eating gars. But gars will turn the table. They will eat birds. I have not seen that in real life, but I have heard from reputable sources that they do, do that. [*female with a Southern accent: "Oh my goodness, he ate a bird?"*] It's predator-prey; there's a balance to it.

**Alie:** You mentioned, they breathe air, NBD. It's a fish that breathes air and has been around since the Jurassic or... When did gars come on to the scene?

**Solomon:** Sure, the family Lepisostidae, it diverged and branched off around 157 million years ago. That's the late Jurassic period, so they're older than *Tyrannosaurus rex* and they've been around longer than they have too. So, a lot of our famous dinosaurs from the Cretaceous period, they're even older than that. They've been around for a while.

Gars used to be a much more diverse group than they are now. Right now we have seven extant species that are all found within North America, Central America, and Cuba. There used to be many more species, and they were found in North America, South America, Africa, India, Europe. Basically, worldwide. They had a Pangeic distribution. And yeah, things like air breathing helped them survive for this long. They kind of found a body plan that works and they've stuck with it for millions of years.

**Alie:** What *is* that body plan? Do they have swim bladders? You mentioned that in your biology of fish classes, it's one of the first things that you dissect. Do you flip in the gar early because they're the coolest and you want people to fall in love with fish also?

**Solomon:** Yeah, for sure. Given that class is biology of fishes, but with all the 30,000-some described fish species, yeah I want them to focus on the handful that I really like. But, you know, I introduce them to some of the others too. I'm like, "There's these seven species and then there's, like, 30,000 other ones too." Plus, we always have them on hand because of our research, so I've got them in the freezer.

But if you look at them internally, as far as that body plan, they've got that elongated body, they've got the long jaws with lots of teeth which helps them catch a lot of prey effectively. That gas bladder looks like a lung on the inside. It runs like the length of the dorsal side of the fish. So, when you dissect them, it looks like a lung. It's highly vascularized, it's like a big balloon. And yeah, they have to go up and they've got to gulp for air relatively frequently in order to function. They basically are an air breathing fish.

**Alie:** So, they're not just using the air that they are gulping for buoyancy. They're actually using it for respiration?

**Solomon:** That's correct, yeah. Because they live in a lot of these slower moving water areas, the bayous, sort of backwaters of the rivers and streams. Not that some gars don't live in rivers and streams or fast-moving water, but they live in these areas where the water is moving slower and also where the water might be warmer. Warmer water tends to hold less oxygen. So, they've got to find somewhere else to find their oxygen from, otherwise they can't stay there. So they just go to the surface, they take a gulp, and they can kind of go about their business.

**Aside:** Their business being, looking like a Tim Burton sketch, covered in slime and scales. Now, about this air gulping. Why does warmer water have less oxygen?

In short, warmer water holds less dissolved oxygen because warm water means that the molecules are raging in a faster moving mosh pit. All that bumping around means that the oxygen gas can get tossed out of the mix.

Now, if you swear you can hear the temperature of boiling water, you are not wrong or delusional. A paper with the delightfully long title, "Why Can You Hear A Difference Between Pouring Hot and Cold Water? An Investigation of Temperature Dependence in Psychoacoustics," this came out in 2018 and it studied this effect. Essentially scientists think that our brains are just very hip to the lower pitched sounds of more viscous water being poured and the higher pitched boiling water, which has more bubbles and it breaks apart more than colder water when it splashes.

**Alie:** Do they have gills as well?

**Solomon:** They do. So, they can breathe through their gills. They're considered to be facultative air breathers, which basically means they can do both. They don't have to really breathe air, unless certain conditions are met. So, they basically are air breathing almost all the time.

If they have the right mix of cool water and low activity, then they can just use their gills.

**Alie:** And they tend to be freshwater or brackish, right?

**Solomon:** Yes, they're mainly found in fresh water. They have to reproduce in fresh water. We've seen cases where there are eggs in brackish water. But they can venture out into full salt waters. So, there are alligator gars, spotted gars, longnose gars have been found off the Gulf Coast in full salt water.

The Audubon Aquarium in New Orleans, they've got an alligator gar, I think a couple of them, in full salt water. So, you can see them swimming with sharks, and sea turtles, and tarpon. It's actually like... well, I just go there and I just stare at that tank for the duration whenever I'm there.

**Alie:** Do they know who you are? Are they like, [*whispers conspiratorially*] "That's a famous gar scientist. He's staring at us."?

**Solomon:** I don't know. I think they know that *they're* famous and I'm just the fanboy up there trying to take a bunch of pictures. My wife will usually just wander the other exhibits and kind of leave me there and everything. So, definitely one of my favorites.

**Alie:** Does your wife share your enthusiasm for fish?

**Solomon:** I think by proxy, and also I think she does have a genuine interest in them. We met when we were both working at Shedd Aquarium, so that's a place with a lot of fish by default.

[“A lot of fish.”] So, we both worked there, and I was a researcher there, and she was working in fundraising. That’s how we met, so really the fish kind of started things off for us. We’d meet, we’d go through the exhibits, and I’d just show her my favorite fish. So, it was like the gars, the bowfin, the lungfish. I completely ignore the penguins, of course, and any of the other organisms there.

**Aside:** [as if on a vinyl record] “Ah. Fuck you, penguins.”

**Solomon:** So, I think that enthusiasm kind of carried over. The last toast in our wedding was to the gar fish. We held up this little figurine and said, “If it wasn’t for this little fish we wouldn’t have met each other.” So, she tolerates it, but also supports it. I think deep down she appreciates those fish too.

**Alie:** How can you not? I mean, the gar fish brought you together! That is amazing.

**Solomon:** For our wedding, instead of escort cards, we had little gar figurines that were called “escort gards.” [pun *twinkle*] And that was a surprise to me. It wasn’t me. She came up with the idea, I saw it on our wedding day. So, it’s really been infused with our lives, definitely my life at virtually any level.

**Alie:** You could not have picked a better partner. I mean, come on! Talk about being The One.

**Solomon:** I consider myself extremely lucky. [both *chuckling*]

**Alie:** What about gar in movies? Have they found their way into popular culture at all?

**Solomon:** Sure, you know... Popular culture... maybe to an extent. Not to the extent of, you know, *Jaws*, with the sharks, or anything with alligators. There’s no *Crawl* movie or anything like that, but they are there. So, if you’re familiar with the movie *Predator*, which was Arnold Schwarzenegger in one of his breakout roles. There’s this alien that would collect trophies through the galaxy and he would actually try to collect humans too, because they were considered one of the best prey. [clip from *Predator*, Arnold Schwarzenegger: “What the hell are you?”] They had necklaces with these skulls of their, sort of, trophies. It just so happens that one of the skulls is a gar skull that they had.

Somebody pointed that out to me along the way. So, I thought that gars are seriously cool animals because these aliens are coming from all over the galaxy to, like, hunt for them. So, that’s an example I use in class and in some presentations. There was another movie called... If you know who “Weird Al” Yankovic is? He does a lot of spoofs and like that.

**Alie:** [huffs indignantly] Yeah!

**Solomon:** His old ‘80s movie *UHF* had a lot of satire, making fun of different shows. One of the shows is “Wheel of Fish,” and one of the fish on the wheels was a gar. So, somebody sent me that picture. [clip from *UHF*: audience shouting “Wheel. Of. Fish!”]

**Aside:** All Yankovics everywhere: I love you.

**Solomon:** They’re even in *Creature from the Black Lagoon*. So, I don’t always see it but people will see it and if they know that I’m obsessed with gars, they’ll send the stuff to me. So, I like that I received that sort of information.

**Alie:** Okay, gar flimflam. What is a myth that you would love to bust about gar?

**Solomon:** Oh gosh. Probably the myth that they are bad for sport fish populations, they’re damaging the ecosystems. That’s one of the big myths, that they’re bad for fish that we



traditionally cared about more like bass, or walleye, some of the other sport fish. We think that these gars are taking over lakes and rivers; that if you see a lot of gar then it's bad for the other fish.

They're important components of native ecosystems. They're predators that are needed to maintain balance. Kind of like wolves in Yellowstone are maintaining proper balance there. So, usually if you have a healthy population of gars, you have a healthy overall ecosystem.

**Alie:** Oh! Why aren't people just eating more gar? Why are people going after the trophy fish when you're like, "There's pretty good eating over here."?

**Solomon:** I mean, it is, right? We've got alligator gars that can get over eight feet long. So, there's a lot of meat on those fish. Not that I'd recommend going after the biggest fish. But if you've ever prepared fish before, a lot of times they'll use a fillet knife to fillet the fish, right? With gars you need to use tin snips to get through the hide. So, you need extra equipment to process a gar, but it's worth it, is what I would say.

**Aside:** Did I watch a bunch of fish cleaning videos for this episode for you? You know I did. *[clip from YouTube, fisherman talking through a fish cleaning: "I've got a pretty tough pair of scissors, and you can hear it crunching as it cuts."]*

And yes, anglers use yard tools or medical trauma scissors to chew through these ganoine scales, which are indeed really similar to tooth enamel. Imagine sawing through a blanket made of teeth!

Oh, speaking of saws, I asked Solomon if, after you were done eating the meat, could you use a gar mouth as a saw for anything? He was like, "Eh, no." They're really better at grasping than they are at cutting. So, now we know.

Also, anglers have called these critters *garbage fish*, *[pun twinkle]* but they're starting to accept that they're pretty good eating. And some fisher people suggest baiting a hook with carp heads. But when scientists need to get a head count for science reasons, they might electro-fish, which is applying a current underwater which attracts the fishies to the anode and then it stuns them. If this sounds like shooting fish in a barrel, it pretty much would be, which is why it is considered poaching in many states. But more on this in a bit.

Now, you also can use a drone like Solomon did on a recent expedition with the Nature Conservancy's Matt Miller.

**Solomon:** We use drones to actually take the line away from the boat, and we bait it with chunks of carp. You've got this chopped carp on a fishing line that's flown by a drone 400 feet away. Basically, you're looking at a flying fish head going through the air, and then you tug on it, it'll drop the line, and you kind of set your lines around the boat that way.

We were able to land a fair number of fish and it was all catch and release that way. We got the biggest fish that I've ever landed. It was between 80-100 pounds. It was a six-foot-long alligator gar, which is on the average side for those fish, but it was really exciting. But yeah, we were drone fishing. We were using a sort of futuristic technology to fish for this ancient fish. It's an interesting parallel there.

**Alie:** How old is a six-foot or eight-foot alligator gar?

**Solomon:** It's hard to say. Alligator gars grow fast early in life and they tend to slow down, but they can live for over a hundred years. A seven-foot alligator gar could be 40 to 50 years old. It could be a hundred years old. We're finding techniques for how we age them, so we're finding out that all gars are actually much older than we originally thought they were. Back when I was in grad school, we thought that some species only lived to about 10 years old. We've now learned that they can live for probably over 30 years. That's a significant increase in what we're learning.

**Alie:** How are you actually dating them? Are there rings in their scales or something? What's going on?

**Solomon:** For some fish, you can use the scales. For others, you can use some of the fin rays and they have what we call 'annuli' (like rings on a tree). With a lot of fish, gars included, we get the best estimates from something called an 'otolith', or an ear stone, which is in the head.

**Aside:** "Alie! Please, please tell me what a fish ear stone looks like." Okay, calm down, tuck in, and imagine something just a few millimeters in length, that can come in all shapes, usually characteristic to a certain species. They look like teeny tiny apple fritters, or if you put a very small chicken nugget in your pants pocket and sat on it for a seven-hour train ride, but the texture of rock. A treasure.

**Solomon:** We take those out and look at those. We grind them down and we can see the rings there. As you count those rings, you can get a good estimate of how old those fish are. Nowadays you need really high-tech methods in order to get the best estimate that we can. Now what we're finding out is that fish that we thought were maybe 10 years old might be 30 years old. Fish that we thought were 60 might be, who knows, 70, 80 years old. Fish can live for over a hundred years, as far as gars are going.

**Alie:** What bad asses! Seriously.

Okay. I have so many questions from patrons. Can I lightning round? Are you ready?

**Solomon:** Sounds good.

**Aside:** Okay, but before we do we toss some dollars at a good cause in the name of the ologist, and Dr. Solomon David pointed our money cannon toward *Ranger Rick Magazine*, which is a part of the National Wildlife Federation. Hello to all the Rangers there, including Hannah Schardt, the editor of *Ranger Rick*. That donation was made possible by sponsors of the show, which I will quickly tell you about and give you some discounts!

[Ad Break]

Okay, all your questions regarding this fish. [pun *twinkle*] First up, Charlotte Fjelkegård, Ashley Arancio, Felix Lasselle, and Ellen Skelton had questions about our changing planet.

**Alie:** Oh my gosh. Okay. Number one, because we were supposed to record this around September 3rd, right around... which hurricane was it that preempted this?

**Solomon:** Oh gosh, I lost track, honestly. We had Eta and I don't know, maybe there was Zeta. We had a record five or six named storms that might've been hurricanes this year. So, lots of hurricanes.

**Alie:** Are the gar surviving [*hesitantly cringing*] climate change?

**Solomon:** It seems to be. Yeah, that's a great question. Some fish are going to be more affected by climate change than others. Fish that depend on cold water or cold temperatures, we're probably going to see their ranges contract in a lot of areas. Whereas warm water fish, we'll probably see range expansions there.

Gars are warm water fish. They'll probably do better in some areas, but climate change is going to affect habitat. It's going to affect all kinds of things. Climate change is most likely going to be bad for everybody. It's just going to be problematic in different ways. Right now, gars are doing okay, but habitat loss is probably the biggest threat to gars.

**Alie:** Habitat loss caused by, just, human development and building?

**Solomon:** Yeah. Whenever we're damming rivers or cutting off floodplains from their river systems, we're cutting the fish off from spawning grounds. We're removing vegetation in some places, which is what gars need to reproduce. That can be problematic. Habitat loss is the big thing and it can be exacerbated by invasive species, climate change, and again, like you mentioned, anthropogenic inputs too.

**Alie:** Ooh okay. Hanna Vaughan wants to know: What's with the gar with the sharp teeth? My friend from Alabama is always talking about trying not to get bit while swimming. Does that happen? Will they bite you?

**Solomon:** No. They're not going to bite you. The only way you're really going to get bitten by a gar, maybe even just slightly intentionally, is if you're messing around with one on the boat. Let's say you're an angler and you're trying to dislodge a hook, or get them out of the net, or that sort of thing. That's really it. They're not going to come after you and attack.

**Alie:** Okay. If you're swimming in Alabama will other fish bite you?

**Solomon:** I can't speak for other fish. Really, sunfish. They call them perch down here. They will come in and they will nip at you. Now, they don't really have the teeth that gars do, but some of the fish that we think aren't aggressive actually are aggressive. They're just not really going to do any harm or anything.

**Alie:** Okay, more Patreon questions. Julia McDonald wants to know: Do fish feel pain? I know this is kind of a silly question, but I've heard conflicting accounts of it and would like to hear from the source. Do fish feel pain?

**Solomon:** I don't know if I'm the source because you'd have to go to the fish for that, but there is a lot of research being done on fish and pain. I would probably summarize it in that fish feel pain. It's not exactly in the way that we do. I'm not a fish pain expert.

What we do with our research is that we make sure that when we're handling the fish, if they are experiencing any sort of pain, it's the most minimal version that they could feasibly experience. We anesthetize them. We're quick to get them out of the nets. Safety of the animals is definitely a priority. I would say that fish do feel pain, but how they feel pain? I am not a fish neurobiologist, so I couldn't tell you much more specific than that.

**Aside:** Okay quick aside. I looked into this because I do feel like the "shrug, fish don't feel pain" seems entirely antithetical to, say, evolution and avoiding dangers. But it's a pretty convenient justification for choosing the fish dish on a wedding menu instead of the veggie option, of which I was frequently guilty before all weddings happened on a screen.

According to Dr. Lynne Sneddon, a University of Liverpool researcher and Director of Bioveterinary Science who is the global authority on fish pain, they probably do indeed feel pain. They express physical symptoms when injected with an acid and those symptoms subside when then administered morphine afterward. The research finds that our aquatic friends may feel pain strikingly similar to that in mammals. Also Dr. Sneddon has a website called The Fish Indicators of Stress and Health. Acronym: FISH.

So, if someone says these slimy guys love getting caught, it's a pretty fishy claim. Okay, if you like vengeance, you'll love this question on the minds of many, including Patrons: Calvin Dowling, Rayden Marcum, Hannah Quist, Jamie Kishimoto, Chris Brewer, Morgan Alexandra Coburn, Alora Smith, Jess Swann, Rachel Moore, Aviva Elizabeth, and Allison Tuuri.

**Alie:** So many people, this is probably the biggest question I got, want to know: What is up with their toxic eggs? What is their life cycle? Like, how are they doing it? How many babies do they make? How big are their eggs? What's going on?

**Solomon:** The egg. So, first of all, there's no gar caviar. No *garviar*, if you will, [*pun twinkle*] [*"There are so many gar in here today."*] I mean, not that they don't have eggs. You just shouldn't try to eat them.

Gar eggs are weird. They are toxic to humans. They're toxic to mammals. They're toxic to birds. They're toxic to a lot of different invertebrates, but they're not toxic to fish. It's kind of a weird gap in the toxic bingo card. Like, if you're going to have poisonous eggs, you would think you'd want it to be poisonous to the animals that are in the same area. Ostensibly, that seems like a weird thing. There's other folks at Nicholls State University working on this as well, Dr. Gary Lafleur's lab is looking at gar egg toxicity and trying to figure out: What are the proteins? Is it bacterial based? What are the details there?

From an evolutionary perspective, we're thinking that gars live in this water that is going to be low oxygen. It's relatively warm. It's relatively shallow, especially where they're laying their eggs. So, you're probably not going to have a whole lot of other predatory or egg predator fish out there.

What you do have is crustaceans. Down here in Louisiana, we've got crawfish around. I say crawfish because I'm speaking for Louisiana, but it's crayfish to everybody else. [*laughs*] You've got a lot of wading birds like herons and everything that I want gars to have revenge back on. So, it would be toxic to those bird predators. It would be toxic to the invertebrates there. It would be toxic to other mammals. That's one of my working theories as to why that toxicity is there, but not to fish.

The eggs are toxic. They're toxic even inside the fish. Every now and then we'll read about somebody who caught a gar and decided to try to make gar caviar and they ate the eggs. They're toxic even inside the fish; they don't have to be laid in order to be toxic.

Also, what we've found out is that even the larvae are toxic for a little bit too. They're actually poisonous to predators. That toxicity shrinks as they get older and older, but for those first several days to a week or so, the larvae are also toxic.

**Alie:** Do their predators learn that pretty quickly early on? Are they able to eat an egg and barf it up and be like "Bleh! Never again!?" Or do their predators straight up die if they eat them and it's just sort of instinctual to avoid them?

**Solomon:** I think there's a fair amount of research that's still out there to be done on that because humans have learned. They've gotten sick. I don't think anyone has actually died from eating gar eggs, thankfully, but they have gotten violently ill.

But invertebrates seem to get sick and they die. It seems like birds get sick from it and they'll die off too. I don't know if they live long enough to tell their friends "\*cough, cough\* don't eat this." I think it's a pretty high level of toxicity.

The way they lay their eggs is in groups and in clusters, so that might be an amount that they're ingesting. I couldn't speak to the learning curve beyond humans. Humans now know. We have the internet to try to spread that information. Don't eat gar eggs.

**Alie:** Don't do it! Don't do it. It's so tempting, It's like the forbidden foods. It's the Tide Pod of the ancient fish world. *[laughs]*

**Solomon:** It really kind of is.

**Aside:** So, don't eat it unless you're excited to have violent gastrointestinal distress and maybe death. So, don't.

This next question was also asked by quite a few of you Patrons including Claire Meyer, Margaret Re, and Liz Roepke. Honestly, it's a little nosy.

**Alie:** Katie wants to know: What is the ecological niche for their long snouts? What's the most likely reason they evolve like that? And Nicole Coan says: I catch gar all the time with my dad and I always wonder what determines the bill length. Does the length have any status to the fish or is it just how the fish is? Like some humans are taller than others? So why do they have these really long bills and how different are those between individuals of the same species?

**Solomon:** Great questions. As far as the long bills, I think you could loosely make an argument for convergent evolution. If you look at crocodiles and alligators, they've got those long snakes and lots of teeth. Gars don't have the same biting power that crocodiles and alligators do, but it's a similar principle where they use that long snout as a range extension to go after prey.

If you're familiar with this fish-eating crocodile called a 'gharial', it has no relation to gars. It's not even spelled exactly the same way, but they've got these long snouts. They specifically feed on fish. They sideswipe with it and they open it very quickly to grasp on that fish.

Different gar species have different lengths of snouts, usually depending on what they're eating. The longnose gar primarily eats other fish, so it's got a long and skinny snout. Alligator gar will eat fish, but it'll eat a lot of other types of animals, and they'll even scavenge. They've got a shorter snout and a wider snout. It allows them to eat some different things.

Now, as far as the sexual dimorphism across the snouts, they believe that some female spotted gars have longer snouts than male spotted gars, but we found this varies with population. It probably varies with the locality and even across species. There's no great way to show that longer snout means female and shorter snout means male, but bigger gars tend to have bigger snouts.

**Alie:** Alanda Kohl wants to know: Do gar have electromagnetic sensory organs? And if so, what are the primary functions of it? You mentioned electrofishing. And I was like, "What?!" What is electrofishing? Do they have any magnets in their face?

**Solomon:** Sure. Electrofishing is, to be simple, not what gars do. They don't have electroreceptors. They do have taste buds on their snout though. I have watched them, and they'll poke around with their snout and look around for food, almost like a little long-snouted dog looking for food. We get to see that in the aquarium, and you can see that in the wild too. Their tails stick straight up out of the water and they're head standing. They can sniff out food, but they aren't electrosensitive in the way that a paddle fish would be, or a sturgeon would be.

**Aside:** Wait, sturgeons are electrosensing? It's true. I looked it up. This is similar to how sharks go about locating prey; electrosensing tends to be more prevalent in aquatic species, including dolphins, since the dissolved metals in water conduct electricity better than air, but it's also seen, for some reason, in terrestrials like echidnas, bees and platypuses. Platypuses, it was recently found, fluoresce an alien greenish glow under ultraviolet light. That was a discovery recently made when Dr. Paula Spaeth Anich and other researchers at Chicago's Field Museum held a small, quiet rave and invited a drawer full of preserved monotremes. Yes, these egg laying mammals are the animal equivalent of psychedelic posters you'd buy at a bong shop. Back to electricity in your fish face.

**Solomon:** Now, electric fishing is a technique that we do in fisheries, where we run a weak current through the water, and fish within a certain vicinity of that current are drawn towards that electrical field. And if they're *really* close, they get stunned and we can net them up; we put them in the boat, we can tag them, measure them, and within seconds, they'll come to, [clip from *Land of the Lost*: "What haaappened?"] And then we can release them back and they kind of go about their business. So, it's a good way of sampling a population if you need to get a large number of fish with a minimal amount of contact time.

**Alie:** And you mentioned when they go up to gulp air, does that not make them more visible to predators?

**Solomon:** It does. And so gars will do it relatively quickly, but if you're a gar of a certain size, once they reach adult sizes, there's really not many other predators that are going to threaten them. Alligators can eat certain large gars, but a big alligator gar, its only major predator may be a big alligator – but they'll usually go for smaller prey – but it's really humans.

Now, gars also exhibit what we call synchronized respiration. So if one gar goes up for air, oftentimes *another* gar will go up for air, *another* gar will go up for air. We think this might've evolved because if other gars see that it's safe to go up for air, then they'll go up for air at about the same time. So, that works for gars versus almost any other animal, not so much versus humans.

**Alie:** Ah!

**Aside:** Right now, somewhere, there's a bunch of gar, asking each other, [underwater effect with bubbles in background] "Are you going?" "I mean, I'd go, if you go... We could ride together, if you want. But I mean just *one* gulp and then I *have* to go home, I *have* to get up early."

**Alie:** Okay, Miranda Panda wants to know: Are there any fish who have evolved from this fish,

and reversely, is there any way of knowing what they evolved from, or have they just been around too long to tell? What's their backstory, and who's evolved from them?

**Solomon:** I would say gars have been doing their own thing. The way, sort of, phylogenetically, the tree of life has sort of branched off, they kind of went off on their branch, and they branched off from the rest of the ray-fin fishes group – again, about 157 million years ago – and they've been kind of doing their thing and haven't changed it since then. So I wouldn't say there's other fish that have evolved from gars. Now, evolution is sort of an ongoing process, so even within populations, we see that they're changing with things like climate, with different mutations that might pop up.

So, over time, you might get a gar species that's present today that splits into two different species. We also think that there's some unknown sort of cryptic species out there. People just haven't studied gars enough that we're pretty sure that there's other gar species out there besides the seven that we know.

**Aside:** What seven are those? I'm going to run down a who's who of society gar, at least the discovered species: there's the longnose gar, which has the most redundant of the gar names; then there's the leopard-printy spotted gar. There's the Florida gar, which looks a lot like a spotted gar, but it's Floridian, which means that it's wearing denim cutoffs in January, and maybe has a bedazzled license plate holder.

There's the tropical gar, which is a popular menu item in Central America; it's eaten like we enjoy salmon here, just hold the roe. There's the shortnose gar, which snoot-wise, it's kinda closer in proportions to a dolphin than a swordfish; it's also a common pet. Oh, let's not forget about the alligator gar, a river giant that can reach 8 feet in length, and 300lbs of scaly chonk.

Moving on, lastly, the most rare of the seven: the Cuban gar, which is a freshwater species that can also inhabit brackish water as well, but sadly, it's not a saltwater species, as then, we could call it the Cuban *Seagar*. [crowd booing] [quietly] I'm a monster.

And speaking of, this next question about a certain show was asked by patrons Kendyll Burnell, Jenella Lindauer, Jennifer Stone, Meggie Bender, aaand...

**Alie:** Rich Pasenow wants to know if you've seen any of Jeremy Wade's shows, like *River Monsters* or *Dark Waters*, and if so, what's your opinion? [clip from *River Monsters*: "Gar don't bite pieces off their prey, they only eat what they can swallow whole. This puts humans off the menu."]

**Solomon:** It's a great question. I think Jeremy Wade has done a great job for science communication of these sort of "river monster" type fish. I think he's done a great job of getting away, maybe, from them being *called* monsters. The show is called *River Monsters*, so you might think of these threatening organisms that are really bad. They present these, sort of, sensationalized accounts of this "crime" that's been committed, somebody who's bitten by something and it turns out usually that it wasn't the fish. [Alie laughs]

In the case of gars, it ends up that that was the case. Although I did spend a lot of time yelling at the TV when that first *River Monsters* episode came on; all my roommates left by that time. They're like, "We can't sit with you and listen to you: 'That wasn't the right name for that fish!' and 'that wasn't the right thing.'" But I think overall, bringing it to public view has been net beneficial for that. So I think overall he's done a great job with

it. I just like watching people catch big fish anyway. [*Alie laughs*] [*clip from River Monsters: "I believe I've seen enough to clear the gar's name. It's time to return this specimen to the wild and reflect on other possible suspects."*]

**Alie:** Do people ever wrestle gar?

**Solomon:** They might wrestle them when they get them to the boat, but not like they're wrestling alligators or anything like that. Alligator gars are actually pretty chill once you get them up onto the boat. Like, they realize, "I'm huge and there's really not much you can do to me." So I mean, especially if you're doing catch and release or whatever and that sort of thing, but like, they'll usually kind of sit there. When we get fish, whether it's a small gar or a large gar, we put a wet towel over their eyes, so that calms them down. That's the case with a lot of different organisms. And so they kind of chill out, and then we take our measurements, and get them back into the water, and everybody's happy.

**Aside:** Sometimes I feel this way when I scroll on Twitter for too long. So I just have someone put a wet towel over my head and I just sit there, blinking in the dark. Peace at last. Nothing exists.

Now, a lot of folks, including patrons Miranda Panda, Ava Schaefer, Linda Mattson, Susan Kennon, Anna Vallery, Janelle Shane, Michael Hamby, Jennifer Lewis, Adam Weaver, Natalee Bates, Orion McSmith, Lydia Zimmerman, Sadie Baker, and Allegra Sundstrom wanted to know more about their evolution, the fossil record, and essentially their history, presumably to write more nuanced fanfic about gar.

**Alie:** So many people want to know more about their long backstory. Margaret Re says: How did they survive the KT asteroid impact that took out the dinos? Daniel Donaldson wants to know: Since it appeared that they stopped evolving around the late Jurassic, what is it about their niche that made them say, [*slowed down, deep pitch*] "Okay we're good, we're just going to stop the mutations now." And Sean Washington begs: Please, please, please, 100000% debunk the "living fossil" fallacy. What is that "living fossil" fallacy, and why did they stop evolving?

**Solomon:** Sooo many questions there! [*Alie laughs*] Where do I start with that one? So, first of all, they didn't stop evolving; they are very *slowly* evolving compared to other organisms. So, every organism that's alive today is considered to be technically a modern organism. We're living in modern times. It's alive today; it's had the span of time to evolve. Gars just tend to evolve at slower rates. Basically, all animals are still evolving, so populations are changing, natural selection is taking place on individuals, so I would put out there that evolution is an ongoing process. It hasn't stopped for gars, it's just that they're already slow at doing it.

So, we might see more changes, but it's probably at a timescale that we won't be able to observe very effectively, at least moving forward. Now, getting to the "living fossil" question, this is something that I have my students answer as their first exam question, so if any future students are listening to this, now they get a freebie out of this. [*Alie laughs*] But it's: Why was Darwin's idea of a living fossil *technically* incorrect, but the idea is there? Darwin said living fossils were kind of like organisms that are alive today that look the same as they were way back when, or in the fossil record.

What we like to use to, sort of, adjust that is: they look like that at least as far as external appearance, but they've been evolving over this entire period of time. So, from a science communication perspective, I *like* the term "living fossil," you just have to use the right



caveats with it when you're explaining it to somebody.

It's almost like saying "primitive fish." People tend to know a coelacanth is a primitive fish; a gar is a primitive fish. It's not necessarily the exact terminology that's correct, but if I were to say they're 'non-teleost Actinopterygians', you lose people by the second syllable. [*Alie laughs*] So I like "living fossil," I think you can use it if you use it in the right way.

**Aside:** A coelacanth, sidenote, is an ancient, nubby-lobed fish and everyone thought they were extinct for 65 *million* years until 1938, when a South African fisherperson called up a museum and was like, "Hey, in case you want to look at my trash-fish bycatch, come down to the pier! There's a weird one in here," and biologist Marjorie Courtenay-Latimer hopped into a taxi to the pier and was like, "Hot dog! What in the [*slowed down, deep pitch*] boy howdy is this?" And then made a sketch of it, which looks kind of like a police sketch of a coelacanth (I'm not gonna lie to you), and confirmed that *this thing*, in this guy's net, was the *not* extinct lobed fish that was the predecessor, essentially, to terrestrial tetrapods.

This was a big deal, like the natural science equivalent of someone on a telenovela who is long dead showing up on a doorstep and everyone being like, "Bom, bom, boohm! They're alive! You fleshy-finned bitch, I love you!"

Willa Rowan, first time question asker, who *loves* a coelacanth: no, they are *not* a close relative of gars, sorry. But also, coelacanths are said to have just a speck of brain matter amid a big ole lump of fat. Which also feels like me, many days. Speaking of:

**Alie:** Stephanie Broertjes and Jess Swann both wanted to know what their brains are like. Jess wanted to know: How do they compare intelligence-wise to other sea creatures? How do you even measure or quantify that?

**Solomon:** Yeah! I would say that they're smarter than we might give them credit for. I mean, I think fish overall are smarter than what we, that pop culture has given them credit for. Like, I think *Science Friday* dispelled the rumor of like, "You have the memory span of a goldfish." Goldfish can remember quite a bit and they can live for a long time, too.

Gars, also, they can recognize individual people. We've seen that with pet fish and that sort of thing, so they're pretty smart. Now, I've never seen a head-to-head, gar versus octopus brainteaser contest or anything like that. I think there's plenty of sea organisms out there that are smarter than gars, but I think they're still pretty smart. I think most animals would surprise you with how intelligent they are.

**Alie:** Mmhmm. And if people are falling in love with gar also, Patron Terry Goss wants to know: I've seen gar in aquaria all my life. Is this a suitable habitat? It seems too small, but they're pond/lake fish, no?

Also, points to Terry, for saying 'aquaria' and not 'aquariums'. I know you can say both, but 'aquaria' just is like, "Oooh that *is* the plural isn't it?" So, pet gar: you obviously are a gar expert, so you're making it work, and they're living the life, but if someone wanted to have a pet gar, is that a hard thing to do?

**Solomon:** Yeah, I would say there's certain things that make them easy to keep because they breathe air, so they're very robust fish, they're very durable fish, and they can easily be trained to eat non-live food like frozen shrimp. But, they get *big*, that's the biggest thing. In most cases, that's the only thing. So, as these fish get big, I've got lab space for them;

we've got ponds they can go into, we've got other homes. Having raised gars for 20 years, I can tell you, we start them off in a small tank, we move them into a bigger tank, move them into a little bit bigger tank... But yeah, for the average aquarium, hobbyist, or fish keeper: not exactly ideal, unless you have plans for a pond or some sort of larger housing for them, larger aquaria, if you will.

**Alie:** Aquaria, yes. Claire Meyer has kind of a technical question here, wants to know: What happens if you boop a gar snoot?

**Solomon:** That's a good question. You can do it, but I would not advise it. [Alie laughs] They move at lightning speed with their jaws, it's usually moving side to side, so I wouldn't recommend it. They might open their mouth; they might keep it closed. You just never know. I would keep your face clear of a gar snoot, unless there's a pane of glass in between.

**Alie:** [laughs] Earl of Greymalkin had the same question, so now they both know. But Earl of Greymalkin also asks: Wikipedia says they have *green bones*?! What is this?? Is that true, they have green bones?

**Solomon:** Yes and no on it being true. That's a common name issue. So there's a fish called a garfish, mainly around the Indo-Pacific, Pacific Ocean, and other places too. It's the larger group called needle fishes or Beloniformes. They have green bones. So, not gars like Lepisosteidae. So, *these* gars don't have green bones, but if you go to Australia, where they call them garfish, it's the type of *needlefish*. They have green bones.

**Aside:** So yes, a case of mistaken identity. That other garfish is the garpike or the sea needle, and their bones are in fact green because of a bile substance called biliverdin, which is also what turns some bruises a remarkable shade of avocado.

**Alie:** Okay. So, Julia Splittorff and Hannah Quist had similar questions. Julia says: I only just googled what a gar is and my only question is: what did I do to deserve this nightmare fish, and why does nature hate me personally? [Solomon laughs] And Hannah Quist wants to know: Why are they so frickin' cute? [both laugh] Where do you fall on the looking-at-gar? I'm going to guess you're more on the Hannah, less on the Julia.

**Solomon:** Yeah, I just think they look cool no matter what. But what I do tell people is, and you can see this now, that there is gar Twitter out there, so there's a lot of pictures. [Alie laughs] A lot of the pictures you see of a gar from the side view, you see those teeth, and you see that long snout; they look really fearsome. I would challenge people to turn them so they're looking at you head-on, and they look like the derpier fish you've ever seen. [Alie laughs]

Blobfish doesn't look like a blobfish, right? They brought him up from the depths and they look all weird like that. But a gar, when you look at them head-on, they look that derpy.

**Aside:** Okay, it was not easy to find a head-on photo, as googling 'gar head-on', it'll get you a lot of pictures of just plain gar heads before they were decapitated. But I finally found a quarter shot, and y'all... That overbite, those big, unblinking eyes, that cute cluelessness: this thing 100% belongs in a *Simpsons* episode.

**Solomon:** So, maybe it looks fearsome to you, that sort of thing. I think, as with anything, it's a matter of perspective. [Alie laughs] They're valuable predators to native ecosystems. They're useful even now in biomedical research, we're finding. So, they've got a lot of

use *for* us, but also use *in* nature. So, you know, fearsome or cute, I think they're valuable and cool fish, but I challenge them to do the lateral look and the head-on look and you'll see both sides.

**Alie:** Allegra Sundstrom wants to know: Is the plural 'gar' or 'gars'? Embarrassing.

**Solomon:** [*laughs*] The answer to that question is yes. [*Alie laughs*] My advisor and I went back and forth with this when I was in grad school. Technically back then the American Fishery Society, who sets a lot of those rules for fish, said that the plural of 'gar' is 'gars'. But now they've changed the rules to say, "You know what? It's whatever you feel like." So 'gar' can be plural. 'Gars' can be plural. It can be a bunch of different species of gars, it'd be multiple... you know, the same species. 'Gar', 'gars', it's whatever you're feeling like that particular day.

**Aside:** Gars: some call them ugly trash fish river monsters, but we call them ancient, patient, boopable, long-boi sweetie peeties.

**Alie:** Tam Tran wants to know: Can gars crawl on land?

**Solomon:** Short answer is no, they can't crawl on land, but they can survive on land probably for at least a couple hours. There's stories – myself included when I was in grad school – a gar jumps out of a tank, it can survive for a long time out of the water. If they're kept wet they can survive for an even longer period of time. They're pretty durable, so they can survive on land, but they're not going anywhere.

**Aside:** I like to think of someone in a prehistoric landscape telling a gar, "You're perfect. Never change." And the gar was like, "Okay!"

**Alie:** Skylar L. Primm wants to know: Do they shed their scales?

**Solomon:** They do not. Some fish – it's easy for the scales to come off, and they very quickly regrow them. With gars it's an interlocking sort of chain mail. So they don't tend to shed them, but if they are damaged, they will grow back. Gars will regenerate their fins; they'll regenerate the bases of their fins. They're really just... I wouldn't say quite indestructible, but they're pretty cool in what they can do and what they can survive. [*serious voice: "They can be VERY tough."*]

**Alie:** Ooh! Vespa Clercx heard a rumor that gar are bulletproof. Is that even remotely true?

**Solomon:** Maybe. The thought is that small-caliber weapons do deflect off of them, so maybe at the right angle. That's what one of my advisors had told me back in the day – they used to be used as sort of a form of body armor. And so I don't know if that was straight-up bulletproof, but while they're on the fish, I have heard anecdotal stories about them being resistant to small-caliber weapons. So maybe not bulletproof, but again, like I said, the engineers are looking at those scales and those biological properties as sort of a bio-inspired armor. So, you know, there's something there.

**Aside:** Shout out to all the biomimicry experts out there, including listener Christa Avampato of New York. Special hugs to her right now as she tells cancer what's what.

**Alie:** Sam Kilgour has a great question: Have you ever kissed one on the snout?

**Solomon:** You know, I'm trying to think. Maybe not on the snout. Maybe just on the cheek. Just on the cheek. So that's probably as close as I've come.

**Alie:** It's pretty close. It's snout-adjacent.

**Solomon:** Yeah. Yeah.

**Aside:** Okay, so maybe he has not kissed one on the snoot, but as someone who loves nothing more than reuniting with lost treasures, I had to ask – did he ever find that *Ranger Rick* article? He said he spent a long time looking for this obscure, backdated magazine that changed his life. I mean, there was this image he saw that cut a watery path to his life’s work, to his bride, to his reign as the king of fish puns. And he searched... in vain.

**Solomon:** I’d like, ravenously go through them, and I searched online, my parents searched for them, my friends searched for them. And it wasn’t until I tweeted at *Ranger Rick* one day and said, “Look, *Ranger Rick* got me into gars back in the day.” And the next morning when I woke up, they said, “Is this the issue?” So they sent me that picture and I was like, “Oh my gosh!” They sent me a copy of the article and I got in touch with them. And yeah, this year I was able to write my own, you know, *garticle*, if you will, [*pun twinkle*] in *Ranger Rick*. So it was kind of a cool full-circle story with that.

**Alie:** Ah! What was it like when you saw that picture again, after not having seen it for so long? Was it just as you remembered it?

**Solomon:** Oh my gosh. Yeah. I mean, the turtles were there. It was just like it was in my head – it was actually trying to eat this wood duck. So it was like the original Birds vs Fish for me too. Like, I had it in my head, but I had not seen it for, you know, 20-some years.

And it turned out it was from a 1983 issue, too. I’m not that old for 1983 to be when I was a kid, but that shows how old those issues were. And I looked it up on Wikipedia: *Ranger Rick* still has a big circulation with those back issues. People donate them to libraries and other places. So I’d encourage people to do the same because you never know who’s going to see those and get interested on their own with who knows what out of nature.

**Aside:** If you’re sitting next to a stack of vintage *Ranger Rick* issues and screaming at me to tell you the date – it was April 1983, pages 38 and 39, and yes, of course I will post this image on the *Ologies* Instagram. And if anyone knows the article’s author, JoAnne Chitwood, say hello. She became a hospice nurse and has written several books on the topic, including *My Gift: Myself: A Step-by-Step Guide to Becoming a Hospice Volunteer*. She also wrote a book titled, *A Horse Called Mayonnaise*. So thank you JoAnne, we all love gars and *Ranger Rick* because of you. And horses. And to a lesser extent, mayonnaise.

**Solomon:** It’s been cool being involved with *Ranger Rick*. I’ve gotten to know the editors and we’re going to be working on some other stories and stuff. So to me it’s really an opportunity to do some science communication back in that direction. I’ve got the actual issue hanging in my office and everything. So it’s there. I copied it. I stored it everywhere so it would never get lost again, too. It’s not going anywhere.

**Alie:** [*laughs*] You’re going to have to send me a picture of that so that I can put it up on the Instagram.

**Solomon:** I will!

**Alie:** It’s interesting how those memories can really ignite something where you just have such an affinity or such an obsession with that kind of creature in that moment. I love when that happens.

But among all of your love for gar (gars?), there must be something that sucks. Like, what about your research or your life as a garologist is just the worst?

**Solomon:** Yeah, I would say it's probably a conservationist dilemma too, depending on what you're studying, but gars have this reputation we've tried to improve over the years. There's a lot of other people involved with this – Matt Miller from Nature Conservancy, Dr. Allyse Ferrara at Nicholls State – that are really pushing gar research: showing that they have value, that they're important components of ecosystems. So that's something that's extremely important.

I try to do that, but there isn't a week that goes by where there isn't some sort of boat fishing picture or article that comes out where people are just shooting gars, there's piles of dead fish, because people don't see value in them. And so they'll put them into dumpsters; they'll get dumped into landfills or turned into fertilizer, killed by the hundreds. There was actually a thing called an electric gar destroyer that used to be used decades ago because people thought that they were just trash fish, that they were bad for the environment.

So I'm trying to improve that, you know, waking up to that. But I think as environmentalists, conservationists, it's an uphill battle no matter what we do. I think it's just important that we keep doing what we're doing. So I'd say if anything sucks, it's that, but it also keeps me going.

**Aside:** PS, if you need to know what an electric gar destroyer vessel from the 1930s looks like, just imagine a barge equipped with state-of-the-art (for then) electricity. It patrolled the waters mercilessly targeting gar and is essentially the Death Star, helmed by *Garth Vader*. (That does not deserve a twinkle. Don't let me have it.)

**Alie:** You want to keep fighting for gar, for them to be appreciated?

**Solomon:** Yes. For sure. Showing that they're valuable members of the ecosystem, they have value to humans as far as ecosystem services. There's new research where we're learning more about the human genome through gar species now because of their genome organization. So it's not just what they're doing out in the bayous for us, it's what they can do at a genomic level too.

**Alie:** Ooh! Is there something genomically similar to humans in a way that's surprising?

**Solomon:** There is. A good friend and colleague of mine, Dr. Ingo Braasch sequenced the spotted gar genome. And what they found is that the gar genome is organized more closely to the human and other tetrapod genome than it is to teleost fish, which are considered our more modern fish.

So there's a little fish called the zebrafish, which is sort of our aquatic lab rat used in all kinds of genetic and genomics research. But it's got some differences that make it hard to compare back to the human genome. Even though it's like a lab rat, we use it to compare it to other organisms, right? Because the gar can serve as a go-between, we can compare the human to the gar genome, and the gar genome to the zebrafish genome, and it helps us understand more about the human-to-zebrafish comparison, and therefore it's sort of like this extra translator, sort of a Rosetta stone or a bridge. Genomically, we can now learn more about the evolution development of human disease with some help from the gar.

So using this sort of primitive fish is actually helping us literally too. I don't think it will

ever replace zebrafish, but... I mean, they're way cooler than zebrafish (now the zebrafish people are going to @ me). [Alie laughs]

But I think it works hand in hand. I think it works alongside zebrafish, alongside fruit flies, alongside a lot of other organisms. But now we've got this once-hated organism that actually has some additional utility, which is great. They have intrinsic value on their own, but it helps that we can see some additional value.

**Alie:** And between their boopable snoots and their derpy head-on look, and their amazing ability to survive, there's obviously a lot to love about a gar. But what is it that you just love the most?

**Solomon:** Oh my gosh. I feel like I've gotta... I've gotta do a sort of a cop-out. It's the big picture I think. Just the look of them. I think alligators and crocodiles are cool, but they're this fish that has these long jaws. It's this swimming dinosaur; it's this relic of ancient times that is still alive today, so that sort of primitive look overall. I just think they're awesome. That's what makes me want to just share about them to everybody else.

**Alie:** What are your plans in terms of science communication for gars? Do you want to write like ten books about gars? Pitch a feature about gars? What is your ultimate dream?

**Solomon:** Oh my gosh. You know, books would be great. I think the *Ranger Rick* article to me was the publication I'm most proud of. That's going up on my wall, too. To me that's probably going to have a wider reach than anything I put in a scientific paper.

But also we came down to Nicholls State here in Thibodaux, Louisiana, and I started Gar Lab. I think it's training future scientists and using the platform on social media and also as a professional to spread the word of gar, if you will. [Alie laughs] And to show that they're valuable for all these reasons, and they're really cool animals. I think they show that diversity is important. So even the creatures that look like this, that might look a little bit fearsome, maybe a little too slimy, maybe they've got poisonous eggs, but they're important parts of biodiversity. And we need biodiversity in order to function as an ecosystem, as a planet.

**Alie:** If you had one tip to give someone who is getting into science communication, what do you think that would be? Because you're so good at it!

**Solomon:** I've learned from others. And so I would say: Learn from others that have come before you, but don't try to replicate or be what anyone else is. One of my favorite episodes of yours was the Bill Nye episode. There's already a David Attenborough. There's already a Bill Nye out there. Don't try to be them. Stick with what you're doing, but work on the techniques to share that and to show how that has value. And you can add your own diversity to that. I would be remiss if I didn't say I didn't see people like me in nature programs or in the fields that I'm in. Now I feel like this is an opportunity to do that, moving forward.

**Alie:** Ah, this is such good advice! I just hold you in such high regard. [pun twinkle]

**Solomon:** Same to you Alie!

**Alie:** I so appreciate you doing this and I'm so glad we didn't have a hurricane today.

**Solomon:** I know! Me too. I'm still looking out the window. It's still there behind me.

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So ask smart people fishy questions because, you know? There have been bulletproof toothy snoot-nosed ancient babies gliding under the water for longer than the dinosaurs. Just when you think the drugs have worn off, you realize that life on Earth is just a kaleidoscope of weird.

To get more gar and great sci-comm in your life, you can follow him on [Twitter](#) @SolomonRDavid, and on [Instagram](#) @Solomon.R.David, and his website is [SolomonDavid.net](#) and there are links to all of those in the show notes as well as to *Ranger Rick* and the sponsors of the show.

You can put Ologies merch on your actual body, or walls, or friend's body at [OlogiesMerch.com](#). Thank you Shannon Feltus and Boni Dutch of the podcast *You Are That* for managing merch. Thank you Erin Talbert for adminning the Ologies Podcast [Facebook group](#). Thank you, Emily White and all of the *Ologies* Podcast transcribers for making sure that transcripts are available for Deaf and hard-of-hearing folks. Those are available for free on our website to anyone who wants 'em on our website, and there's a link in the show notes. Caleb Patton bleeps episodes so they are kid- and your grandpa-safe, and those are at the same link.

Thank you Noel Dilworth who schedules the ologists, and thank you to co-quarantiner Jarrett Sleeper for assistant editing. And of course to all-around great guy, Steven "Rayfinned" Morris, lead editor who puts all my pieces together each week. Nick Thorburn wrote the theme music; he is in a band called Islands. You can follow [me @AlieWard](#), say hello. *Ologies* is @Ologies on [Twitter](#) and [Instagram](#) (I forgot to say that earlier).

If you listen to the end, you get a secret. And this week I feel that I should tell you that Jarrett sometimes pretends to be Jack White, riffing garage rock to ordinary situations. And about six months ago I asked him if I had a spider bite on my ass, and this week he got an iPad with GarageBand and like 15 minutes later, he had created this opus, which will forever haunt and delight us all. Enjoy. [*clip of power chords with distorted vocals: "Got a red bump on her butt. A li'l red bump on her buuutt."*]

Thank you and good night. Berbye.

*Transcribed by*

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