Alligator Gar feat. Solomon David Part 1

Hey to all you fish enthusiasts out there. Whether you're an avid angler or just curious about fish, we'd like to welcome you to Fish of the Week. It's Monday, March 22, 2021 and we're excited to talk about ALL THE FISH. I'm Katrina Liebich with the U.S. Fish and Wildlife Service in Alaska...

And I'm Guy Eroh and I am so so ready for our vacation.

That's right…as much as we love Alaska, it's still pretty cold up here, so we've decided to head South for a little spring break getaway. Guy, wanna tell 'em where we're going?

We are going to Looooooooosiana.

[music]

And we've got so much planned, we've decided to make it a special two-part episode.

I'm just a really excited podcast co-host. You can hear it in my voice. I'm excited because this week's fish is an absolute super-star. One of my all-time favorite species and one of the most charismatic groups of fishes there is. We're talking alligator gar, folks, and joining us today for this discussion, all the way from Nicholls State University in Thibodaux, Louisiana is the Gar Guy, Solomon David. How are you doing today?

Doing great Guy and Katrina, thanks for having me.

So I'm curious…how did you get started in gar and how did you first learn about them?

For me I was always interested in dinosaurs. If you think of a prehistoric animal, of course dinosaurs come to mind. But gars have been around since the late Jurassic period. SO when I first saw a gar and this actually happened when I opened up a magazine issue of Ranger Rick which is a kids nature magazine that National Wildlife Federation puts out. I was about 11 years old, flipped to the middle of one, saw this fish that looked like an alligator with fins instead of legs. It's got this really primitive, ancient look to it. And I thought "wow, this is really cool" and it turns out it was an alligator gar and I read up everything I could about that fish and that group of fish and it really just captivated my attention and imagination during that time. And luckily I was able to cycle back by the time I got into grad school and was able to study gars for my Master's and dissertation research and now I'm lucky to be working in a PI for Gar Lab here at Nichols State University. So it's kind of interesting to be chasing my childhood fish fascination.

Can you remember the first time that you came across what you might consider a mega gar? Like a gar that was so massive that your jaw dropped.

Definitely. When I was a graduate student at the University of Michigan I came down to New Orleans for a conference that was about gar. Dr. **Allyse Ferrara** was putting together a symposium so I was excited just to meet a bunch of people that were studying gar. U.S. Fish

and Wildlife Service down here. Louisiana Department of Wildlife and Fisheries…a lot of agency folks were down here talking about gar. And at the end of the conference Dr. Ferrara and her grad students told me "like, hey, we're heading back to Thibodaux and we're going to be doing some field work…would you be interested in joining?" and I said "I gotta get on a flight back so I don't know if I can actually do that..." I said "what are you guys actually going to be doing?" and they said "actually we're going to be sampling for alligator gar." And I was like, "WHAT?!?" And so I quickly got on a computer, changed my flight, and made sure I could be a part of that. And we went out in January. It was January 2009. And they said we're not actually sure if we're going to get any gator gars it's a little early in the season. Me and this other guy were down there from Canada. So we were like the northern gar guys down there. And we kind of willed them to be caught. We were like "we need to see these alligator gars" and sure enough, I want to say we got one that was just under five feet long. So I've got a picture with that fish which we brought back for research where they were spawning them for research purposes. Man I mean seeing an alligator gar for the first time in the wild…that's definitely imprinted on my memory. And that was 2009. And it was at this small university in southeastern Louisiana called Nicholls State. And you know as of 2017, a job opportunity came up and now I'm down here working on gar alongside Dr Ferrara and other researchers here so it's been a great opportunity. But yeah, that first time in the wild was really cool.

SO how many different gar do we have here in the US and where are they found?

So they're nothing like the cyprinids or analogous the lucicids. The minnows, the shiners. They're not quite as diverse as that group. There's only 7 extant species of gars alive today. There used to be more earlier in the fossil record. And they're found from southern Canada all the way down to Costa Rica, mainly on the eastern half of the US. They used to have a range that spanned into Africa, Asia, into Europe. So they used to have what we call a Pangeaic distribution. But now, present day gars are found just in North America.

So if we're going to talk about Alligator Gar. I mean people can use their imagination in terms of what inspired their name. But we'd love if you elaborate just a little more on that species so folks can get a visual. You know, how big are they? What do they look like?

Sure. Alligator gar are the largest of the gar species alive today. And as far as I know it's actually considered to be the largest species that we know of out of anyone in the gar family. So even compared to fossil gars Alligator Gars are the biggest. They can get easily up to eight feet long. Supposedly they can get to nine feet long, maybe even close to 10 feet long historically. We don't have great records of that. And they can weigh over 300 pounds. These are, you know, pretty large fish. As far as what it looks like, Alligator Gar gets its name from alligators. They look like an alligator with fins instead of legs. They've got a relatively long snout compared to what you might think of typically for a fish if you're looking at something like a salmon or a trout, and it's kind of flat and broad like an alligators. Now, I often describe them as an alligator with fins instead of legs but gars have actually been around for a longer time than alligators. So I actually think we should be calling alligators – they're actually gars with legs instead of fins if we want to be fair to who came first.

Nice.

They've got these diamond-shaped armored scales that cover the entire body. Their face is extremely bony. And they've got lots of teeth. If you look at a gar and you look at that long snout filled with lots of sharp conical teeth. I think that's what first stands out to people when they first see a gar.

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Some of the things that makes them successful is that they're air breathers. Not a lot of fish breathe air. More fish than we think, but it's not the most common trait across fish. That allows them to persist in environments where maybe more conventionally respiring fish can't do as well. They've got these armored-plated scales. Their scales are called ganoid scales. They're made up of a material very similar to enamel on our teeth. So they're coming with the "garmor" as we like to call it. And some of them grow to decent size. Mostly by the time they're adults the only major predators they have are humans, maybe alligators, or really large water birds. So I think all of those in combination have contributed to them being successful for a long time, you know, over 150 million years.

That's crazy.

I'm curious: the gar has these wicked scales, too. Can you tell us more about those? What are the advantages and disadvantages, that kind of thing.

So I would say one of the distinct advantages is they're very armored. They're not quite impenetrable but, you know, very difficult to get through if you're a predator. So often times, say if an alligator is going to feed on a gar, they can definitely smash the head or they can swallow the fish whole. But it is pretty tough to get through that relatively tough hide. And they're interlocking scales as well so it almost works like chain mail. Now with that comes a little bit less flexibility compared to your ctenoid or cycloid scales. So they may not be able to turn on a dime, but gars are much more flexible than we give them credit for. They can do a little S-curve or C-shape bend to them. Maybe not as much as, you know, an American Eel or a trout or a salmon, but they're pretty mobile even though they've got those heavily armored scales.

They've got a lot of other characteristics like poisonous eggs that probably help with predation when they're at those early stages.

What about these eggs makes them poisonous and why is it unique to the gar?

The short answer is we don't know exactly what makes them poisonous. Dr. Gary Lafleur down here at Nicholls State, his lab has been looking at the gar eggs and trying to determine the specifics of their toxicity. And I think a recent study that just came out in 2020 I think they

determined it might be a particular phospholipid. But we don't know. We don't know if it's bacterial-based or if the fish is producing it which is actually extremely rare for the organism itself to be producing it. But, what else is unusual about is that so bowfin they've got eggs that are edible and they're the closest relatives to gars even though they're still separated by a decent chunk of time between divergence of those two groups. But, what's also interesting about gar egg toxicity is it's toxic to mammals and it's toxic to birds and it's toxic to invertebrates, but it's not toxic to other fish apparently to some reptiles too. So you would think your eggs are going to be toxic why not have them toxic to some of the animals you're sharing the area with. But gars spawn in relatively shallow water and that water's going to be extremely warm. So our working hypothesis is you're not going to find those conventionally-respiring fish there like your bluegill or other egg predators, but you do find crustacean predators like crawfish. And then you've also got your water birds. So we think maybe that's how that toxicity might have evolved so it actually prevents the predators that are in that general vicinity. As far as humans, mammals, don't eat gar eggs. You're going to get violently ill.

Dang that's a really cool adaptation. They're so old, that's just a really, really cool adaptation.

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Guy: Now usually, this is the part where I jump in with a little tip to help y'all fish safely, but since we're in Dr. David's house, I'm gonna let him take this one. Solomon, how should the folks at home prepare to fish in Louisiana?

I think you know make sure you've got your permits your fishing license and you're following the boating regulations. Right now we're getting into flood plain inundation stages where the river might be getting unexpectedly higher. So just be wary of what the water depths are because that can change from week to week. We were supposed to go out on do field work this coming Friday but the river went six feet higher than we thought so we're kind of pushing that back. We're in that time of year where water levels can fluctuate greatly so I would say keep tabs that and accessing particular areas of a lake.

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So like a lot of fish Alligator Gar face some conservation challenges with one being how they've been perceived through history as well as some habitat issues. Can you talk a little more about what challenges gar face?

Sure. I think you've got the public perception of gars which is a reputation a lot of us work to improve. One of the big threats is definitely habitat loss. So as we've dammed rivers and leveed in certain sections of flood plains – you know, modifying how certain river, streams and waterbodies work – we've cut off gars from their spawning areas and that's caused issues with their populations...just like with paddlefish, sturgeon and other migratory fishes that need access to floodplains, that need access to spawning grounds. I think that's a plight of a lot of freshwater fishes.

And there's this idea that they eat game fish or they eat all the young-of-the-year fish of the fish that we want to catch. And in most cases that's just not true. Gars are predators, they add balance to the ecosystem, and they're going to eat what's most abundant. So in many cases it's fish like shad and other forage fish. In some cases it is pan fish or game fish but if that's what's most abundant in the system we need predators to maintain balance in any given fish community or any broader ecosystem. So I think that lends itself to the poor reputation of gars. I say they've had a historically bad reputation but really if you go back further in time Native Americans and other indigenous people used to eat gar. They still eat gar. They make jewelry and arrowheads out of the hides. They were much more highly utilized. And then when we think of a more Colonial perspective, different fish took a higher ranking. I think it's a matter of perspective with how gars have been treated over the years. Now we're trying to improve that reputation, showing that they have value as food fish, as bringing balance to ecosystems, and even recently showing they have value for genomics work and potentially for biomedical research.

You were mentioning dams and hydrological changes that people put in place to control flooding. I mean you're down there between Mississippi and ANGIPOLIA there's a lot of work that goes on in terms of infrastructure. And a lot of times when people think about how dams affect fishes they think about migration. But you also mentioned that they need these floodplains to spawn. I was wondering if you could go into a little bit of the life history of gars and what they actually need to spawn.

So you know a lot of times when we think of these sort of longitudinal migrations, right? We think of salmon swimming up stream and getting to the spawning grounds. And some gar species do something similar like Longnose Gar populations in some areas do leave the waters of the mainstem river and will swim into tributaries. So they might leave a lake and then move up into a river to spawn. But further down south different gar species including Alligator Gar, but also Longnose Gar, Spotted Gar, Shortnose Gars perform lateral migrations. So when your water levels come up in the spring, they move out onto the floodplain. So a lot of gar species with particular populations will take advantage of that floodplain inundation. When the floodplains are inundated that allows fish to use additional habitat for spawning, for feeding, for nursery areas. And so when we modify rivers and sort of regulate them for different purposes—obviously where people live we don't want those areas to be flooded or anything—but in areas where we can return the river or floodplain to the more natural type of inundation, that's beneficial for fish, it's also beneficial for other vertebrates as well like water birds. So yeah the gars will move up into the floodplain, they'll spawn in the vegetation. In some areas Alligator Gars will actually target more terrestrial vegetation that is inundated for spawning where they lay their eggs. And then with Alligator Gars the adults will eventually move off the floodplain and back into the mainstem river. So in some rivers, Alligator Gars actually require floodplain inundation to successfully spawn. In other areas, coastal environments, they may not be as dependent on that. It's really the population level that's important when we're thinking about conserving these species.

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Katrina: Well, that's it for the first leg of our Louisiana spring break! Big thanks to our guest, Dr. Solomon David, who'll be back next week to tell us all about how to fish and prepare alligator gar. Meantime, we're gonna go relax with some gumbo and a Sazerac while we take in the sights.

Guy: Mmmm, etouffee all day.

We'll see y'all on the boat next time!

Thanks for listening to Fish of the Week!

My name is Katrina Liebich, and my co-host is Guy Eroh.

Our production partner for this series is Citizen Racecar. The show is produced by David Hoffman, Co-Produced and Story Edited by Charlotte Moore. Post-Production by Garrett Tiedemann. Publication facilitated by Kelsey Kohrs. Fish of the Week is a production of the US Fish and Wildlife Service, Alaska Region, Office of External Affairs. As the Service reflects on 150 years of fisheries conservation, we honor, thank, and celebrate the whole community – individuals, Tribes, the State of Alaska, sister agencies, fish enthusiasts, scientists, and others – who have elevated our understanding and love, as people and professionals, of all the fish.