

Carcinology Part 2 with Adam Wall

Ologies Podcast

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Oh hey, it's your favorite Thermos rusting in an airport lost and found again, Alie Ward. Welcome, you've made it to Part 2 of crabs. You're here. If you skipped Part 1, what the fuck are you doing here? Go to Part 1. Part 1. Go to Part 1. This is Part 2. Okay, there's a reason we put these in order, and in Part 1 you're going to learn how a brachyuran true crab differs from an anomuran non-true crab, how some crabs hang out in pods, speculations about Amelia Earhart's fate, the weird history behind Old Bay seasoning, if you should eat the guts of a crab, huge land-dwelling hermit crabs that could crush a skull, and what cancers and cancers have in common and so much more.

We're now back with Part 2 to address questions from listeners who signed up at Patreon.com/Ologies. It costs one American dollar a month to belong, and you can submit questions before we record, and I might say your name. So, thanks patrons, as well as everyone strutting around in your *Ologies* T-shirts and such from OlogiesMerch.com. And of course, thank you to everyone who leaves reviews and subscribes and rates the show, that helps, genuinely, so much and it's free to do. Plus, I read every single review so I can read one. Here's one from JG0349 who wrote that:

Whether driving or dozing off before bed, this podcast has saved my last fighting brain cells from spontaneous combustion. If you read this, understand that all of your blood, sweat, and tears do not go unnoticed.

I feel very noticed and thank you for that review this week, JG0349. My two brain cells salute yours.

Okay, onto Carcinology Part 2. So, let's crack into all of your questions with a very dedicated, dry, wise, and wonderful crab expert. Does he hate me? Does he like being interviewed? Listen to the end for his honest assessment of hanging out with me on a Sunday morning at this workplace, the beloved Natural History Museum of LA County's dungeon of Dungeness and other crabs with researcher, taxonomist, crustacean enthusiast, and carcinologist, Adam Wall.

Aside: Okay, let's creep out of our shells with this first one from patron Allie Brown and...

Alie: Alia Myers: Do they have dicks? Crabs.

Adam: Yeah. Did you pluralize it on purpose because they have...

Alie: Do they have more than one dick?

Adam: Yeah. [*Alie gasps*] So, this is like a thing. Crustaceans in general tend to have paired reproductive structures. So, male crabs have gonopods and these are a thing that you could think of as fulfilling the same purpose as a penis. They're actually modified pleopods, two of them, and they transfer sperm from a male into the female's gonopores, a female has these two pores where she can receive sperm. And yeah, if you want to imagine, yes.

Aside: Just for the record, Adam did not say that crabs have dicks because they don't have dicks. But he said if we want to imagine gonopods as a pair of penises, you're incorrect but you may do so for the sake of simplicity or just for your own amusement. Also, if you wish that we just had a whole episode about dicks, we do. Phallogology is linked in the show notes, it's a real study. Okay, onward, upward, let's move on to some more serious questions.

Alie: Earl of Greymalkin wants to know: Do they have a butthole? As long as we're in that region of the crab. [*chuckles*] I mean, what does crab poo look like?

Adam: Crab poo can be pretty liquidy, that's what I would say. A lot of that. It depends on the crab's diet, yeah. All over the place.

Alie: Okay. Olivia...

Adam: Are all your patrons going to be asking...

Alie: No.

Adam: Okay.

Alie: This is just up top. [*"Sorry, you know, we just... We need to know."*] Olivia Eliasson wants to know: Why is their tooth in their stomach? Is that flimflam? Is their tooth in their stomach?

Aside: This is a question I never would have thought to ask because stomach and teeth is just a pair of nightmare words. But patron Alia Myers' boyfriend, Paper Wasp Enthusiast, and Earl of Greymalkin have questions about crabs, and their salty pie holes, and then what lies beyond.

Adam: They have a gastric mill. It's not... Because they need to chew things up, they need to break things down mechanically. Yeah.

Alie: Does their mouth collect things, it gets shoved in there, and then is it kind of like a crop in a bird?

Adam: Similar type of function but yeah, very different structures.

Aside: Okay, if you need to know more about this ASAP, you can see the 2011 paper, "Characterisation of cellulose and hemicellulose digestion in land crabs with special reference to *Gecarcoidea natalis*," which explains that the ossicles that form in the gastric mill extend into the lumen of the stomach and are formed into three calcified, chitin-covered teeth. And I know you're hungry for more on crab stomach teeth and gastric mills. So, according to the 2019 paper, "Growling from the gut: co-option of the gastric mill for acoustic communication in ghost crabs," ghost crabs clatter their little stomach teeth in a growling sound to scare things away. Ghost crabs, I'm sorry but that is haunting. But now, on the upside, the words, "Decapod gastric mill" have meaning to you and now you can begin your dates with "Crabs kind of have stomach teeth." How about that?

Alie: Jeannette-o-saur: How soft are soft-shell crabs? Are they leathery like a leatherback turtle?

Adam: So, soft-shell crabs are, I would say, softer than a leatherback turtle because those have... Leather is pretty tough, right? A molted crab is pretty fragile. [*"Please don't touch me."*] It's very fragile, nowhere near as tough as leather but maybe a similar type of texture kind of thing going on.

Alie: Is a soft-shell crab just a recently molted one? Or is it a completely, soft shell all the time?

Adam: Oh yeah, so this is fun. Yeah, not a different species. Soft-shell crabs are just crabs that they are serving to you right after it's molted. Now you're going to ask the question, how do you have soft-shell crabs because things only molt periodically? And it's really difficult to, like, catch a crab because we essentially, all the crabs that we eat are caught, right? So, they do this thing where they catch crabs and they put them into cages, and they keep them until it's time for them to molt. Then they molt and then they get turned into soft-shell crabs.

Alie: What kind of species are they?

Adam: There are several species. I think one of the more popular ones is actually a swimming crab, so something like the blue crab.

Alie: I had no idea. [*gasps*] I had no idea.

Aside: So yes, if, like me, you've often enjoyed a spider roll with that crunch and chew of kind of a bug-like texture, you now are burdened with the knowledge that that crab was harvested at its most vulnerable, within hours of molting. [*deep breath*] Are they like the veal of the crab world? That's for you to grapple with philosophically. I get it, I'm right there with you.

But what about crabs with steamy kind of shells? Patrons Mary Long's 2-year-old and first-time question-askers, Lizzie R and Jiann wanted to know about crustacean color schemes.

Alie: Why do their shells change color when they come in contact with very hot water?

Adam: Denaturing of proteins, I imagine. So, a lot of the coloration of crustaceans are these pigments that are probably getting denatured as broken apart and may stop being the thing that they are at these higher temperatures and their colors will change.

Aside: So yeah, when a pigment is exposed to heat, the pigment gets separated from a membrane and a bright color can shine through. For more on the shellfish particulars, you can see the 2022 paper in the journal *Physics Today* titled, "Why Do Lobsters Change Color When Cooked?" Innovative crystallographic techniques help solve an intriguing scientific and culinary puzzle."

Also, speaking of visual feasts, patrons Olivia Eliasson, Cate Muenker, Naomi Jane, Matt Hirschl, Fi Cameron, and Emily P want to know what they can see through their cute beady little peepers, in their words.

Alie: A lot of people want to know about eyes.

Adam: [*softly*] Oh yeah.

Alie: What's going on? What do they see with those stalk eyes? Kate Timms wants to know: Why do they look so cute when they're cleaning their little eyestalks? Real question, are they cleaning or are they just eating the stuff growing on them? Just nomming it?

Adam: Why can't one thing be two things?

Alie: I'm sure it can be both.

Adam: Yeah, I think it can be both. There are definitely situations where I think they're eating it and there's probably definitely situations where they're much more just concerned with getting it off of their eyes. Visual systems in animals in general are absolutely amazing.

Aside: This is Adam excited, and I love it.

Adam: They're complex. They're these multifaceted eyes. They don't resolve things the same way that human eyes do, for sure.

Alie: Yeah, what are they looking at? How do they see it?

Adam: I don't think they resolve images as well as we do so it's going to be a lot of light, not light.

Aside: Let's take a sideways stroll through a 1986 *Journal of Comparative Physiology* article titled, "Eyes, eyestalks and the visual world of semi-terrestrial crabs," which wants you to know that narrow-fronted species have their eyes close together on these elongated, vertically oriented eyestalks and they see in a narrow vertical band. But broad-fronted species have their eyes far apart on short eyestalks and they don't have this better band of vertical resolution. So, the narrow-fronted crab folks with the taller eyestalks are known to live in relatively flat terrains and it may help the critters get better info as to depth with just a single eye at a time.

I also figured I'd take a trip through the 2019 study, "Parallel processing of polarization and intensity information in fiddler crab vision" from the *Journal of Scientific Advances*. And this said, yeah, fiddler crabs process polarization and intensity information independently and in parallel. This uses what's called a dipolatic system, with two channels of photoreceptors, like some insects and cephalopods have. And this works really well for fiddler crabs because of their mudflat environment, where things are pretty goopy and brown, but polarization information can tell them a lot about the sky and reflections on the mudflat, much more than just contrast. Also, in looking this up, Google kept correcting, like, over and over, "dipolatic vision" and taking me to pages about "diplomatic missions" and I'm like, yo, I'm not here to learn about Molotov cocktails firebombing an embassy. Thank you, that's for another day. But right now, I need to understand crab eyestalks. Let's... Can we move on?

Alie: Is it appropriate to ask, in Nova's words: Is eating crab sustainable? Alexandre wanted to know if invasive king crabs were a thing.

Adam: Could they find invasive king crabs and make it ethically better for eating them? That would be lovely, wouldn't it? Is it sustainable to eat crabs... So, Monterey Bay Aquarium has a really nice list for sustainable fish options. So, that would be a good resource, I think.

Alie: So many people, obviously, are like, "How do I eat them?!"

Aside: So, I asked the Monterey Bay Aquarium, via just a search bar on their website, and currently, the best buys for sustainability are blue crab from Chesapeake Bay, blue king crab from the Bering Sea, golden king crab from the Bering Sea, and Dungeness from the Pacific is a good alternative buy. But just be aware of seasonal concerns and these harmful algal blooms that can happen. But of course, I don't know, if you're headed to Russia, or Norway, or I guess even the UK now, help eat all those invasive spider walking king crabs that were introduced in the 1960s that we talked about in Part 1. Also, send me a G-Cal invite, I want to help out. Or maybe you could not eat the crabs, you could adopt one of them, kind of like a feral chihuahua. Name it Roger, fall in love with it.

Alie: Red Cedar, and Ten Bowenz want to know thoughts on keeping crabs as pets: Hermit crabs are often kept in bad conditions, but the idea of a pet crab is whimsical. You mentioned coconut crabs being kept as pets.

Adam: Mm-hm. So, the coconut crabs that I'm aware of that are being kept as pets are like, they're just running around the island.

Alie: Oh, they're free range, they're like outdoor coconut crabs? [giggles]

Adam: Kind of, basically. They're being fed and they seem to be happy, type of thing. My research focuses on crabs in the wild. We do very minimal work with live specimens to do our research and it's when we do something with them, they're in a nice habitat and they're just there for a little bit. We're not keeping specimens and crabs in captivity for a very long time.

Alie: You're not putting little hats on them and celebrating their birthdays?

Adam: Me personally, no. I do know those people.

Alie: You know crab parents?

Adam: Yeah, I know people who have done similar things like that, yeah.

Alie: And you're like, "To each their own."

Adam: Yeah, yeah, yeah.

Aside: Patrons Olivia Eliasson, Johnna McHugh, Lovely Bites, Sarah King, Isabelle Newman, Twenty-Three Skidoo, and Jude Scout Campbell wanted to know about hermit crab instincts. If you've ever seen the David Attenborough BBC clip of hermit crabs, you will think about it at least once a week for the rest of your life. In it, Sir Attenborough narrates footage of hermit crabs lining up by size and waiting for just the right grouping and moment for a simultaneous shell swap. [*"They arrange themselves into an orderly queue. The biggest at the front, smallest at the back. They are lining up with one aim: to exchange properties.*] And that leaves each one with a bigger shell to grow into and though, for a moment, it leaves their soft little butt vulnerable to the roasting sun and hungry birds, it's better than 9% interest rates over 30 years in a precarious job market.

But how are they better at finding a home without a landlord or a mortgage than we are? According to the 1990 study, "Shell Exchange in Hawaiian Hermit Crabs," prior to a shell exchange, one hermit crab will approach and then rap on the shell of another like "Yoo-hoo! Knock-knock." And then the crabs size each other up to see if their shells are a better fit for the other one and this is called the negotiations model of behavior, as opposed to the aggressor model in which one crab is forcibly shell jacked. Now, you may be at ease though, I know I was, to learn that the negotiations model is more successful than the aggressor model and it all just takes place because one brave initiator approaches and drums on another shell.

Speaking of just, music to your ears, so listener Caitlin Morrison shares that their mom taught them that wild hermit crabs will emerge when you hum to them. So, I guess use that hot tip. But in terms of having hermit crabs as pets, it's pretty specific. Their enclosure should be between 72 and 82 degrees with a relative humidity between 60 and 80%. Hermit crabs in the wild have lifespans of over a decade but on average, they survive in captivity just a few months, like my childhood hermit crab, RIP, and I'm sorry.

But where do they come from? In case you meet one and you want to strike up a conversation? Most hermit crabs are sourced from the Caribbean, or the Florida Keys, or South America. And bad news, they are not farmed, they are usually captured, they are forced into not happy crabby conditions. And if they don't get sent to pet stores, their shells might be spray painted very tacky colors and then hocked like souvenirs to some local tourists with sunburns and beach braids. So, if you really want a hermit crab, you can rescue one from Craigslist from people who are like, "I'm so over this. Why did I get this hermit crab? I have many regrets in life, like this hermit crab." You can also find groups like the HermitCrabAssociation.com, they're crab swappers and rescuers, so they match people looking for crabs with people who are looking to get rid of crabs.

But what if you encounter any kind of crab and it tries to shank you? What does one do? So, patron J Ramsbald wants to know about the "epically relatable crab with a knife GIF," which originated with this 2014 YouTube clip titled, "Gangster Crab with Knife" starring a real-life medium-sized crab which is backing away from the camera and it is clutching a steak knife. It sparked this meme called, "You Mess With Crabo, You Get a Stabo." I wish I could tell you that knife-wielding crabs are rare, but kind of not. They're kind of around.

There was this June 2022 *New York Post* headline that read, "Camper awakes to knife-carrying killer crab at tent: 'Lucky to be alive,'" he says. The guy said that, not the crab. This article details how this man was staying on the uninhabited Komaka Island in Okinawa, Japan, and was woken at 2:00 AM by a scratching sound outside his tent and he investigated to discover that his adversary was yes, a giant crab, and yes, with a knife. [*"Something's out there. What the hell is that? ... Hey bro. Hey bro? Hey bro? I need that knife. I'm really curious what you think you're going to do with that."*] So, it's got to be the shininess, right? The metal knives, I'm thinking. No, I looked it up and crabs have pretty good snooters, or rather these chemosensory abilities and their weapons that they

picked up likely had residue of meat or other crabby favorites. So, if you're on an uninhabited island, you've got to wash your knives, watch out for crabo stabos.

But what if you are the crab? This next question was asked by so many people, over 50 people, so I'm just going to shout out the first-time question-askers like Sam Gretz, Hannah Beyl, Mariah Schemmel, Vero Tavares, and in Jeanette Moss McCurdy's words: Will Earth one day just be a big crab party? With human crabs and all the other life forms as crabs waving our big claws around? And in first-time question-asker's Kaelyn Iglesias's words: Crabification?

Alie: Let's talk about carcinization.

Adam: *[laughs]* Okay.

Alie: Adam Weaver wants to know: Will I too one day become a crab? So many people want to know, evolutionarily if it's flimflam that everything evolves toward crabs? *[Adam takes a deep breath and stays silent, Alie laughs softly]* Is this an appropriate question?

Adam: It's just a really difficult question. So, I intellectually have a really hard time engaging on this. As someone who studies crustaceans overall, crabs are toward the end of the evolutionary tree of *Crustacea*, so they are the form that has required the most number of changes to get there, a lot of changes to become more crab-like. There are a lot of species that have branched into different ecological niches and do really cool things where they just eat completely different things. So, there's a lot of separation of resources so that there can be a lot of species like, in the same area. So, I know. *[sighs]* This is probably the question that the internet wants to know the most about because I have people ask this question to me in my personal life and I'm just like, "Uhhh... it's problematic."

Alie: *[laughs]* So, we're not necessarily all turning into crabs, it's just a later form of evolution because it's very specialized. Or rather it's... *[crickets]* No.

Adam: Your listeners really need to be able to see my face right now. *[laughs]*

Alie: I know. You look horrified. *[laughs]*

Adam: Yeah. No one should worry about our evolutionary trajectory. It would require a lot of really difficult changes for us to become crablike.

Alie: Okay. *["Man, that's a bummer."]*

Adam: One of the reasons why crabs are so special is that it is really easy for crustaceans in general, arthropods in general, and crustaceans have done a really amazing job of it, is very small evolutionary tweaks can result in very different morphologies, and sizes, and functionalities in crabs. Like, very subtle mutations will make a claw much bigger and have a slightly better shape for eating a particular type of animal, right, and that's a good evolutionary accident that makes an advantage and that's great, and that makes for a new species very quickly. So, other things evolving into crabs that aren't like arthropods, totally doesn't seem like it's going to happen. Could other arthropods converge on a crab form? Yeah. That could make sense.

Aside: For more on this you can see the 1997 article, "Carcinization in the Anomura - fact or fiction? Evidence from adult morphology." That was published in *Contributions to Zoology* which looks at the idea put forward by early-1900s carcinologist Lancelot Alexander Borradaile, who coined the term carcinization to describe what is essentially convergent evolution. So, that's when a strategy for survival is so fitting to an environment that many species' mutations persist into similar forms. They're like, "That works. Every animal that has that mutation seems to do pretty well." This includes the king crab's evolution to appear more like a brachyuran than its anomuran

wonky-tailed relatives, or the coconut crab losing that hermitry need to live inside a snail shell and just come on land. Lancelot Alexander Borradaile described this as "the many attempts of nature to evolve a crab."

I have more terrible news though. In order to become crabs as humans, we'd first have to move our skeleton to the outside, and then we'd have to grow 150% more appendages than what we've got, we've got to redevelop tails and then we've got to gradually lose them. Our belly would have to nest touching our sternum, which is honestly a feat only attainable by Cirque Du Soleil performers, and maybe some daredevils who have survived motocross accidents. Also, you'd pee out of your face. So, it's a lot of evolutionary work to become a crab. You could split the diff though and just cram your legs into a big paper-mâché snail shell, but even then, you'd be an anomuran rather than a true crab. So, you know, I'm not going to judge you but do what you want.

Oh, and you'd need claws, which a lot of patrons were curious about, such as Lauren Seibert, Jeanette-o-saur, Emily Hebert, Lovely Bites, Hope, Paper Wasp Enthusiast about to change their whole self-image, and Clark Bennett who asked: Why do some of them have one really beefy giant claw and then one really tiny claw?

And we will address that right after the break. But first, we're going to donate to a charity of Adam's choosing which is the Natural History Museum of LA County, and Adam's research specifically on fairy shrimp, which are also sea monkeys, which you can hear all about in Part 1. That donation was made possible by sponsors of the show.

[Ad Break]

All right, claws. What's going on?

Alie: On the topic of those big claws, what is the evolutionary advantage of, like, a fiddler crab, or not necessarily evolving toward bilateral symmetry? Is it advantageous to put more resources into one big claw instead of two medium-sized claws?

Adam: Mm, interesting question. [*"Thank you."*] So, you said evolutionary advantage, can you define that for me?

Alie: Maybe they only really need one claw to defend themselves so why spend more time making more muscle? Maybe evolutionarily-wise they're like, "Well, I'm making less of an exoskeleton and I really just need one. So, let's have this other one, kind of, hang out smaller."

Adam: So, you can actually rip claws off of a crab and as it molts it will regenerate that missing appendage very quickly. [*"I wouldn't do that." "Don't do that."*] And there are lots of crabs that survive just fine with like one claw until it grows back. Crabs that are in fights, they really want to have two claws. The second they're in a fight where one crab only has one claw and the other crab has a second claw, they're done. So, I actually, off the top of my head, couldn't tell you what the purpose of a fiddler crab's massive asymmetrical claws are, where one's very small one's like, really big. If you made me guess, it's probably a mating display. And in this particular group of animals, apparently maybe bigger is better.

Alie: Hm! They're very cute.

Adam: They are cute.

Aside: Okay, but are they cute or are they hot-cute? So, you can see the 2018 *New York Times* piece titled "For Fiddler Crabs, 'Size Does Matter'" which I'm sorry, grosses me out because I'm not sexually attracted to fiddler crabs. But more than half of male fiddler crab's body weight is that one giant claw, up to 65% of their body weight is just that one claw. Huh? The fiddler crab females, they

dig that, they love it. In these studies, conducted by a Ruskin University team, they found that the faster the (they used robot crabs for this) but they found that the faster the males wave that sex hammer around, the hotter they appear to the females. This *New York Times* article explains that “The wave means, ‘Come hither, I will dig a burrow for us and our eggs, and we will populate the mud flats with fiddler crabs uncountable.’” Nice. Oh, the bigger the crab too, the longer it survived, which bodes well for your uncountable babies.

But how do you break the ice? What do you do? Well, like Bumble, or parties with a lot of engineers, the lady usually makes the first move. She sees something she likes, she approaches and then she tickles the crab on one side of its body and things just heat up from there. Speaking of which...

Alie: Curly Fry and Anna Frazier want to know if climate change is affecting crabs, temperature-wise?

Adam: I have to believe that climate change is affecting everything. I have not seen a ton of data where people are tracking, like, range shifts, for instance, which would be a very plausible thing that would happen with crab populations, for instance. Like, “The ocean is getting warmer here, I’m going to move in a direction where the water is a better temperature for me,” right. That is totally a thing that I would expect to happen.

Aside: Adam says that likely, dissolved oxygen levels decrease with higher temperatures, and that drop in dissolved oxygen can also result from better conditions for these huge algal blooms that eat up a lot of the oxygen and affect other marine life. One crab that’s been threatened by habitat loss and fishing is the horseshoe crab.

But Amanda, Keegan Newman, Rick T, Shannon Ryan, Mary of the Grapefruit, Tamaris, Mish the Fish, Jenn Macgillivray, Jane Nelson, first-time question-asker Keely Chavez, and Isabelle Newman, in Isabelle’s words says: I just NEED to know more about horseshoe crabs... Are they even crabs??? They’re so wacky-looking.

Alie: Keegan Newman asked: I know horseshoe crabs aren’t true crabs, why aren’t they? Also, do all crabs have blue blood like a horseshoe crab? I’m going to guess no.

Adam: No.

Alie: Do crabs have blood?

Adam: No, they don’t really have what we consider blood. They have other fluids that serve a similar purpose. It’s not blue. Those fluids can have several colors in true crabs. In horseshoe crabs, which your patron correctly points out is not a true crab, that blue color is from the copper-based blood that they have which I think also isn’t really blood, technically.

Alie: So, no. Not crabs at all. In fact, more closely related to scorpions. And yeah, we do have a Scorpiology episode we’ll link in the show notes. But this horseshoe blue blood is called hemolymph and contains hemocyanin and it’s dazzling – it looks like a melted blue raspberry Slurpee or a Gatorade Frost Glacier Freeze which is kind of apt because not only have these 450-million-year-old creatures survived dinosaur-killing asteroids and several ice ages, but they might also survive the glaciers that are melting, might not faze them. I’d say, “We’ll see,” but honestly, we’re probably not going to be around for that. But maybe neither will they. So, many populations around the world of horseshoe crabs are stable, but some are listed as vulnerable because these slow-moving horseshoe crabs make good fishing bait, and they’re harvested for medical research...? Excuse me?

So, horseshoe crab blood has bonkers antibacterial abilities and it contains something called *Limulus amoebocyte lysate*, or LAL, and it helps biomedical researchers test if vaccine batches are

tainted by bacteria. It's one of the only substances that can do that and they're even trying to synthesize it with some success but mostly, they're still just using horseshoe crab blood. They're bled, they're thrown back in the ocean. But they don't always survive the bloodletting, which is another threat to their survival. So, how do you repay horseshoe crabs for all of their vaccination help? Well, if you see any alive horseshoe crabs and they're flipped upside down, that is a cause of death for up to 10% of them. So, you can gently approach one, and you can pick up a side of the shell and flip them back. And if you can, put them back safely into the water. Don't grab them by the tails though, they don't like that and they're going to shit-talk you forever... Like another 450 million years.

Adam: So, yeah. Totally different systems.

Alie: Does it piss you off that they're called horseshoe crabs? Be honest.

Adam: No.

Alie: It doesn't piss you off?

Adam: No.

Alie: Okay. You're just, you're like, I'll let that one slip because they're so old.

Adam: Yeah, yeah. I'm not sure why.

Alie: We'll let it go. ConnieConnieBoBonnie wants to know: Has there ever been a species of giant crabs, like horse-sized crabs?

Adam: Well, like right now outside of my office is a 12-foot-wide crab so, yeah.

Alie: What's that?

Adam: That's that Japanese giant spider crab.

Alie: *[hushed tone]* Oh my god.

Aside: Let's pop back to the tour of the museum's crab basement to see a spider crab, shall we?

[clip from tour]

Alie: Oh my gosh. Wow, a spider crab.

Adam: Yeah. So, that's definitely the biggest, the Japanese giant spider crab. The smallest will be a Pinnotheridae, which the common name for that is pea crab. If you guys like oysters, a great game that you can play is you can every time you get a fresh oyster served to you, you can look for a small crab that's inside of it. If you see what you think is a small crab, there's almost certainly an even smaller crab, which is the male, which has to live inside of the same animal as the female. And then they reproduce and then they disperse their young.

I actually know an amazing carcinologist, Darryl Felder who discovered a new species of pea crab at dinner. He was about to enjoy an oyster, it was in his mouth, he felt something, [Alie laughs] spit it out, saw that it was... And he's one of a handful of people in the world who can just look at it and be like, "That's a new species."

Alie: Oh my god.

Adam: "I guess I have to go talk to the chef now and find out where he sourced his oysters from because I need that for my paper. Also, I need to find the male that's somewhere in this thing that I just spit out of my mouth."

Alie: Are they crunchy?

Adam: I've never... So, I actually found some for the first time. I found them in oysters from a very upscale, well-known, local grocer and I had been looking for more than a decade for these things inside of oysters and I finally found a bunch inside of a couple dozen that I'd bought for a party.

Alie: Oh my god.

Adam: But because I saw them, I preserved them for science and did not eat them.

Alie: Of course.

Adam: Also, the species I found was a super common species. The species I found is almost the size of a nickel.

Alie: Oh my god.

Adam: Yeah, and the smallest one is smaller than a grain of rice.

Alie: Holy smokes. I love that there are some people hoping to get a pearl and you're like, "Hope there's a crab in here. Hope there's a pair of crabs in here, honeymooning."

Adam: I would be much richer if I was wishing for pearls but no, I'm wishing for crabs. So yeah, smallest crab, biggest crab.

Alie: A few people want to know how you feel about yeti crabs.

Aside: Which are not true crabs, they are anomurans with the different tail, and they look like big hermit crabs and a little lobster, they are, in fact, squat lobsters, and two things are remarkable. So, they have a cream-colored shell and are covered with silky seemingly sun-kissed, hair-like bristles called setae which makes them look like hard-shelled golden retriever puppies with claws. They were discovered in 2005, meaning that as they made their grand debut into the frenzy of public consciousness, it was to the tune of the *Garden State* soundtrack. Also, their scientific name means "hairy goddess," *Kiwa hirsuta*. Naturally, Elaine Wong, first-time question-asker, and Gemma needed thoughts on them.

Adam: I think they're a poor man's Hasselhoff crab which was another closely related crab that was named I think after the yeti crab that they decided to name the Hasselhoff crab.

Alie: After the Hasselhoff that we all know?

Adam: Yeah, after David Hasselhoff because it had a hairy chest.

Alie: [*softly*] Nice. Are those hairs actual hairs? Are they setae? [*pronounced set-ee*] What are they?

Adam: They are setae, [*pronounced see-tee*] yeah.

Alie: Setae, thank you.

Adam: Yeah. One of the last forms of elitism is anyone trying to pronounce or correct anyone else's pronunciation when they know what they're talking about. Like, yeah, I know what you're talking about, I'm not going to make you say it the same way I say it.

Alie: How do you feel about GIF [*pronounced with soft G*] and GIF [*pronounced with hard G*]?

Adam: [*sighs*] Do you want to get upset?

Alie: You're going to say GIF. [*pronounced with hard G*]

Adam: No, I'm going to say GIF. [*pronounced with soft G*]

Alie: I say GIF. [*pronounced with soft G*]

Adam: Why do you say GIF?

Alie: Because! He says it's pronounced GIF.

Adam: Exactly. So, that's a reason why.

Alie: Yes!

Adam: Like, are you going to tell someone how to pronounce their name?

Alie: Exactly!

Adam: Yeah. I mean, do you want to look at them and say, you did a really bad job of spelling your own name? But you want to pronounce it that way? Okay.

Alie: Yes. I feel like you have to respect how people want themselves to be represented so yes, thank you, I say GIF. And I get shit for it.

Adam: Yeah, me too.

Alie: Of course, because we get shit for everything.

Aside: This next question about hitchhikers of the crotch was asked by Jennah Oshiro, Storm, and Mish the Fish.

Alie: Does the STI even look like a crab? Body lice named crabs. Does that piss you off?

Adam: Does not piss me off, it's the source of a lot of really fun jokes which I think are adorable. This is where I'm going to say, mercifully, I have no idea what they look like. [*Alie laughs*] And if you made me guess, you should probably talk to... I don't know, they're mites? I think they're...

Alie: I think they're mites, yeah.

Aside: So yeah, though they have front little pincers like crabs, these underpants roommates are actually insects. And despite everyone's assumption, including mine, they're not even mites! They're technically in the class *Insecta* and not *Arachnida*. And, I don't know, as long as we're learning things, I'd also like you to know that despite being called *Pthirus pubis* they can infect your eyelashes, if you get too close to other areas. I also want you to know that my computer's search history is an absolute shitshow.

Alie: A few people wanted to know about their walk. Do all crabs skidder sideways?

Adam: Scuttle?

Alie: Scuttle. Skidder. Alyssa Gregory said skidder. Is it scuttle? Skittle?

Adam: Scuttling or crab walking, yeah. Do they all? Some of them do it more than others. I think it's a very easy walking gait for something that has legs of that particular orientation and structure. So, a lot of them do it but I don't think all of them do it, no. I think they can all do it. I don't know if all of them use it as their primary mode of locomotion.

Alie: I mean, some of them swim. That was new to me.

Adam: Yeah. The swimming ones also will crawl around.

Alie: God, they're so cute. Kae Gatensby wants to know: What is your personal favorite crab and why?

Adam: Oh, personal favorite crab and why... Why does it have to be crabs?

Alie: I know. I know you've got others. Fairy shrimp are up there.

Adam: Oh, I have so many things. [*Alie laughs*] I honestly really love these *Pinnotheridae* crabs, because they're just adorable, small, microscopic crabs living inside of oysters and other animals and inside of burrows and they're just really fun. They do a cute thing where they're always in pairs, so they're always mated. If you find one, you'll find its mate.

Alie: Got a little buddy.

Adam: Yeah.

Alie: That's very good! That's very cute.

Aside: Okay, so some folks needed to know about mass media crab representation such as Sarah Piette and Stephanie Schmid-Falcon. They both asked about this internet-famous Howie the Crab, which is this Omaha-based rainbow crab, it was purchased from a pet store that's lived to the elderly age of 6. Howie wears tiny hats; Howie's owner says the crab can use sign language when she's hungry. I think it all sounds great, but Howie's lifestyle does have its critics. Others say, you know what, if a rainbow crab is going to end up at a pet store, and then is lovingly cared for past its optimal lifespan and not being eaten but becoming rich and famous, that's as good as it gets for this crab. But given that Adam is, as we've discussed, not an extremely online person, I lobbed some general media questions at him from Amanda and Average_Pi.

Alie: Have you ever been watching a movie and there's a crab in it and you're like, they got that right or wrong? Are there ever crabs in movies?

Adam: I don't watch enough movies, unfortunately.

Alie: What about Sebastian the crab in *The Little Mermaid*?

Adam: That's what I was thinking. I was trying to remember back. I haven't seen any of the recent ones and the last time I saw *The Little Mermaid*, it was before I was a carcinologist so I had far fewer opinions on what Sebastian should be doing.

Alie: Mm-hm. I wonder how many legs he's even got.

Adam: I really hope he has the right number.

Aside: Okay, so Sebastian from *The Little Mermaid*. Full name, Horatio Thelonious Ignacious Crustaceous Sebastian, is supposed to be a tropical ghost crab. I read this in an article in the publication *Screen Rant*. But sit down, friends, I've got news. Sebastian only has eight legs, and I even found some original character sketches that were sold at auction in December of 2023, yeah, eight legs on that. But you know what? Let's let it go. Water under the bridge, under the sea. Oh, speaking of rants though.

Alie: What sucks about your job the most? Something's got to suck other than getting interviewed on a Sunday morning by some crackpot with questions that are not related to crabs.

Adam: It's really hard. There are so many new species that oftentimes you'll be looking at something and it's just really hard to know if it's a new species or one of the many thousands, tens of thousands that we already know about. We were talking about the smelly crab smell. I'm just a little crazy and I'll shove my hands in crab jars all the time and I get very self-conscious afterward because I did it out of a necessity, desperation situation. And I feel like I smell like crabs [*Alie laughs*] but I think I exclusively hang out with kind people who have never said a thing about it so...

Alie: You don't smell like crabs to me.

Adam: Okay, that's good. Yeah, the fear of smelling like crabs, that's the worst part of my job. It's not even that I'm sure that I smell like crabs, but it's the fear that I smell like crabs.

Alie: Has your partner ever told you that you smell a little crabby?

Adam: No. This is why I'm like, I'm only involved with the kindest, sweetest people in my life. So, I'm really lucky.

Alie: Would it be a kindness for them to tell you that you do smell like crabs? Or is it better to not know?

Adam: Oh, I do believe that it would be a kindness to tell me so that I could do something about it.

Alie: Okay. What's the best part about your job?

Adam: The best part about my job is the absolutely amazing amount of diversity that happens with crustaceans in general. Just, they have solved so many different problems in so many different ways. They live in such extreme environments. I have studied roly polies, like, in my actual backyard, that are terrestrial species. I have studied crabs that are walking around Costa Rica, land crabs. I have studied marine species. I've studied that hydrothermal vent or gas vent shrimp, which is really cool.

Alie: And you don't eat a lot of crab?

Adam: I have probably eaten part of five crabs in my life.

Alie: Oh wow! How do you feel about imitation crab being called Krab?

Adam: I grew up a vegetarian as well, I was vegetarian and kosher, so I eat a lot of Krab meat. I'm okay with it, actually.

Aside: PS, just so you know, Krab is actually this string cheese-like stick of Alaskan pollock, wheat protein, egg binder, and this magical substance called transglutaminase, which is an enzyme that has been called "meat glue." Krab. Okay!

Alie: Any other flimflam about crabs that you want to get on a soap box about? Any other scientific flimflam? This is your chance; you've got a megaphone.

Adam: So, basically, I would say my soapbox is right now, there are so many marine species that need to be studied. We're in this climate crisis, right? And I'm part of an institution that wants to study them and to preserve a record of the biological history of Earth. I'm just really all about using new molecular tools, so DNA, kind of like we were talking about with the Cinnamon Toast shrimp guy, these new tools that will allow us to study biodiversity in animals using genetics instead of the morphology of crabs, and getting as much representation of all the biodiversity in the world captured right now. We're using technology that's called environmental DNA, where we will sample whole environments by taking a scoop of water and filtering out all the free-floating DNA, essentially, that's in that sample, and then that will tell you the biodiversity that has been within, I don't know, a mile of that one spot.

Alie: Wow.

Adam: We need big data to answer these questions about climate change and range extensions and right now, we don't have that. We're doing that for California, but we don't have money to do all the things that live on land, and we don't have all the money to do all the things that live in the deep ocean that we barely know anything about. So, that's my soapbox.

Alie: Do you think the world needs more carcinologists to help with this?

Adam: We definitely do right now in this transitional stage. The biodiversity research that I'm talking about that uses these different tools is going to discover the 90% of biodiversity that is so cryptic to us that we don't even know it exists. But yeah, we need more people studying crabs.

Alie: So, if someone has a love of crabs, think about it. Think about becoming a crab scientist, maybe.

Adam: Yeah, if you want to be poor, [*Alie laughs*] that would be a great way to be poor but have all the crab you want to eat, I guess.

Alie: Do you get crabby about studying crabs? Are you a crabby person?

Adam: [*sighs, Alie laughs*] You should interview my coworkers. I'm either... I think that I react to the energy that is presented to me so I can be a little crabby I think, yeah.

Alie: I'm sorry I'm so annoying.

Adam: No, you're not. I'm just all sugar and spice all the time.

Alie: That's okay. You're a multidimensional human being.

Adam: We all are.

Alie: Thanks for doing this.

Adam: Thank you for having me. It's been actually really fun answering your questions.

Alie: Really?

Adam: Yeah.

Alie: I thought you hated me. I was like, "Oh no, this guy is so cool he hates me."

Adam: So I... The sighing and all that stuff, [*Alie laughs*] this is just who I am. I give off this energy that... Yeah, no. All right. literally, this is out of enjoyable conversations, this is like an 8.

Alie: That's amazing! That's great.

Adam: Yeah, this was very enjoyable.

Alie: Okay. I was like, oh no, I'm never going to have a crab friend.

Adam: [*both laugh*] This was great, very enjoyable.

Alie: You're a patient, patient human being.

So, ask crab questions to crab people because even if they seem like they'd rather plunge themselves into Arctic waters, they might actually just be shy and having a good time. So, Adam Wall, you're wonderful and I loved this, and I'd invite you to a game night if I ever had one. You're a good one. Adam's Twitter is linked in the show notes, where he just sometimes peeks from his shell to share carcinological research. We'll also link the lovely Natural History Museum of LA County.

We are @Ologies on Twitter, Bluesky, and Instagram, I'm @AlieWard across the board. *Smologies* are shorter, kid-friendly versions of classic episodes and you can download them all for free at AlieWard.com/Smologies which will be linked in the show notes. We have so much *Ologies* merch at OlogiesMerch.com and if you hashtag your pictures #OlogiesMerch, then we'll repost you on our Instagram. I love seeing it out in the wild.

Erin Talbert Admins the *Ologies* Podcast Facebook group, Susan Hale is our overlord managing director, thank god. Kelly R Dwyer makes the website and can make yours as well. Aveline Malek makes our professional transcripts. Happy Belated Birthday to the truly astounding Dr. Sarah McAnulty who founded Skype a Scientist, you can listen to her Teuthology episode to learn all about squid, as well as her return for Teuthological Ludology about squid games but absolutely not the TV show, we talk about actual games cephalopods play. And if you're feeling up to it, send a donation to

SkypeAScientist.com to help get more experts in classrooms for free, we will link them in the show notes. Even if it's \$5 or \$10 you can help change a kid's life. And our life-changing lead editor is Mercedes Maitland of Maitland Audio.

And if you stick around until the end of the episode, I tell you a secret. This week, as long as we're talking crabs, when I was a kid, my family would drive 2.5 hours to the beach, all loaded up in a station wagon, listening to cassette tapes of Prince and Madonna. You know who would come with us is Erin Talbert, admin of the *Ologies* Podcast Facebook group because I've known her since we were 4. But anyway, once we went to Ocean Beach, I think, in San Francisco and my sister Janella and I marveled at these dome-backed sand crabs that were hopping around the shore so we put a few in an empty sandwich bag that still smelled like salami and we took a few of them home as pets and found out pretty quickly the hard way that that's not feasible, or good for the crabs, or something that anyone wanted to smell in a hot car in the summer. So, whilst on vacation, just leave the crabs to do their crabby business, unless it's a horseshoe non-crab and then you can go ahead and help them when they're flipping out. Okay. Everyone be good to each other. Berbye.

Transcribed by Aveline Malek at TheWordary.com

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[A Mighty Claw: Pinching Force of the Coconut Crab, the Largest Terrestrial Crustacean](#)

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