Carcinology with Adam Wall
Ologies Podcast
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Oh heyyy, it's your favorite Thermos rusting in an airport lost and found, Alie Ward, and this is a banger. This episode is why I make this podcast. It's got everything you need in one package. Actually, two packages because as I began to work on it, I realized it would have been a two-hour episode, so we cracked it into two for easier digestion. It's one of those classic episodes people are going to talk about for years.

Okay, crabs. We got crabs. We got so many crabs. Come with me to my favorite place, the Natural History Museum of Los Angeles, through empty hallways down basement stairs to describe what a multimillion-dollar fortress filled with dead crabs is like.

[*clip from Alie's tour of the NHM's crab collections*]

Alie: And it's shelves and shelves and shelves of crabs. Like, I'm looking down the row and I'm like, "That's a crab, that's a crab, that's... probably a crab. Maybe not a true crab.

You'll also meet a very alive carcinologist, the museum's curator of crustaceans who has worked in this watery field for well over a decade. He agreed to meet me outside the museum. It was a recent chilly, Sunday morning and he was carrying a hefty jangle of keys, wearing a museum lanyard and a button-up shirt with lobster print under a fleece pullover that was embroidered with the word, 'DISCO' and I thought this was a pretty jazzy article of clothing, then I learned that DISCO stands for the Diversity Initiative for the Southern California Ocean, which is based in the museum's Marine Biodiversity Center. Still cool.

So, he has worked and studied at the Marine Biodiversity Center and is currently the Associate Director of Special Projects at DISCO. He oversees the collections of crabby specimens and more at the NHM, making sure they are cataloged and digitized and loaned out appropriately and his research focuses on taxonomy, population genetics, and apparently fielding not-smart questions from ladies that ask to meet up with him on a Sunday morning, even though he says lately he's been working seven days a week to get ahead on cataloging so I'm not that big a jerk. So, he looks younger than expected for someone who is so wise in the field of crabs. He also has the chillest vibes of any ologist to ever appear on this program. So, you'll enjoy his almost ASMR, laid-back, and very dry musings in a moment.

But first, thank you to everyone who submitted questions for this episode, we got so many. I recorded a tour of the crab collections in here, so this swelled into two parts and next week it's wall-to-wall your questions. You can submit questions for future episodes by joining the Patreon for a mere dollar a month at Patreon.com/Ologies, it's linked in the show notes. Thanks also to everyone wearing shirts and hats from OlogiesMerch.com so you can find each other out in the wild. And of course, thank you to everyone rating and subscribing which helps the show so much. As proof that I read every review, here is a just-harvested one from 756411 who wrote:

This is my go-to podcast. Pick any episode at random, it will be amazing.

Also, thanks Jennifer LS Chandler who left a review saying:

I'm in love. One suggestion, make it easier to select and keep playing your show on Apple Podcasts. It keeps playing other stuff after I'm done with one of your episodes, I just want to keep listening to you and I really wish I could stack up your episodes that I want to listen to.

Jennifer, thank you for touching on a recent change in Apple Podcasts which does not auto-play or auto-download, even when you're subscribed. Podcasters are freaking out about this, they hate this. So, either listen via another app that's not Apple like Spotify, or Pocket Casts, or Podbay, or Overcast, or whatever, or you can just download a bunch in a row. It's kind of a funky new interface for iOS 17, either way, we'll see what happens.

Okay, carcinology comes from the Greek, *karkinos* for crab, and yes, of course, we'll discuss related words in the episode. You're about to learn about what crabs are not actually crabs, the biggest land crabs in the world, the secret history of secret spices, Amelia Earhart rumors, the giant invasive crabs in Norway, behind-the-scenes Hollywood crabs, sea monkeys, hairy crabs, hermit crabs, pet crabs, crab dongs, crab butts, crab butters, and so much more with gentleman, scholar, curator and carcinologist, Adam Wall.

Alie: I'm going to make sure that your input level is good too because you're a more quiet talker than I am.

Adam: Yeah, I am.

Alie: No, that's great.

Adam: I am Adam Wall, he/him.

Alie: Carcinology. You are a carcinologist, your Twitter handle is @Carcinologist, correct?

Adam: Yes.

Alie: Yeah, so you were easy to decide on. I did not know about your work until the great Cinnamon Toast Crunch shrimp debate of two years ago.

Adam: Was that only two years ago?

Alie: I think it was two years ago... I think it was two years ago!

Adam: It can't be because it would have been, two years ago was during COVID and I was interacting with people in the real world, I thought.

Alie: Okay, I'll fact-check that and put it in an aside.

Aside: The year was 2021. The month, March. LA comedy writer and his wife purchased a family-sized box of Cinnamon Toast Crunch cereal at a local Costco and with an appropriate amount of horror discovered two shrimp tails in the bottom, like a children's prize. Now, Karp, with this popular Twitter account, let the world know, tagged Cinnamon Toast Crunch, and a media frenzy ensued when the cereal's social media insisted that the shrimp tails were just clumps of sugar and spice.

Alie: He was looking for someone to figure out if they were really shrimp. Do you remember anything that happened from there?

Adam: I remember being at the museum and people talking about this and everyone, because it's the museum, like you have an ologist to ask, right? So, people were asking me, "Adam, have you seen this Cinnamon Toast shrimp thing? What do you think?" And I'm like, "I don't know. Let me get on Twitter and look at this" because I'm never on Twitter at work, I swear. So, I remember seeing it and thinking, "This is ludicrous. Who cares about this?"

And then I remember thinking, I'm involved in this really cool project called DISCO, which is a museum project diversity initiative for Southern California Ocean, which is collecting DNA

sequences from all the marine animals up and down the entire coast of California, taking specimens, putting them into the museum's collections, putting those sequences into a DNA database that anyone in the world can use called GenBank, which is basically the perfect tool for taking any random tissue sample, sequencing the DNA out of that sample, and then definitively saying what it was, right. So, I was like, I think the best thing for this would be if someone was to do some DNA extraction on whatever thing is in this photo and then use this really amazing molecular tool that we're using to basically identify specimens, called DNA barcoding, and do that to it. And I suggested that we do that. And then the whole thing kind of just, like, went away. Basically, no one wanted to do anything.

Alie: Yeah. Did you ever get the shrimp tails?

Adam: I never got the shrimp tails.

Alie: [*sighs*] So we'll never know.

Adam: We'll never know.

Aside: So, side note. Within 48 hours of Shrimp-Gate hitting the internet, things got sticky when Karp's former girlfriends and colleagues entered the chat to assert that he was not the coolest dude. Note, I know Mr. Karp, and he was always cool to me, but as we know that means butkus. Anyway, a Twitter user named @Batmanda summed up the surreal shrimp episode thusly:

> *A man named Karp married to a woman named Fishel found shrimp tails in a box of Cinnamon Toast Crunch. The cereal was purchased from the Costco on Topanga Canyon Boulevard, and his wife played Topanga in Boy Meets World.*

And here we are.

Alie: Yeah, it went away but that's how I became aware of your work. And I was like, well, regardless of what happens with this shrimp tail and Cinnamon Toast Crunch, we may never know. I was like, good to know we have a local carcinologist who is really on top of this shit, even though shrimps are not crabs.

Adam: They are not crabs but they are crustaceans and carcinology talks about *all* crustaceans.

Alie: Does it really?!

Adam: Yeah!

Alie: Why did I think it was just crabs? It's not decapodology?

Adam: No. That would be like, a decapodologist, I guess.

Alie: What would a decapodologist study versus what a crustacean expert or carcinologist would study, because I know you love taxonomy and semantics.

Adam: Okay, so let us start at a higher level. So, there's life, animal kingdom, and then there's all these different phyla. So, the phylum *Arthropoda* is the things with exoskeletons and jointed appendages. And then below that there's a thing called a subphylum and that's what *Crustacea* is. Inside of that subphylum that is *Crustacea* are a whole bunch of cool things like shrimps, crabs, roly polies, like isopods, a thing that I study a lot, ostracods, sea monkeys, fairy shrimp, remipedes.

Alie: What's a remipede?

Adam: A remipede is a thing that was discovered by this absolutely amazing female researcher cave diver. They are animals that only live in subterranean caves with water, and they are really cool, pretty rare. We have a few in the collection.

Alie: Nice.

Adam: Yeah. And it was discovered super, like... It's *very* distantly related to everything else, it's like its own order maybe. So, it's in the Crustacea group but it's very distantly related to most of the things that we think of as crustaceans. So, below all those things are these other subdivisions. So, you have the Decapoda, which are the crustaceans that have ten legs, for all intents and purposes. And then dividing that into smaller subgroups, there are the *caridea*, which are the true shrimp which are a group of things that are very shrimplike, there are maybe 50,000 species of them. The vast majority of the things that people eat that are called shrimp are not true shrimp, they are in another group which are pelagic, and are in a different evolutionary group. And those are penaeid shrimp, non-true shrimp. And then also in the *Decapoda* are things like hermit crabs and galatheid lobsters. But the thing that most people really love are the true crabs, which are decapods, and they are in the group *Brachyura*.

Alie: Would you be a brachyuranologist, if we just did this episode on crabs? Would this be brachyuranology?

Adam: Yeah, that sounds good.

Alie: [*laughs*] I mean, because I could do a lobster episode, I could do a shrimp episode, I could do a fairy shrimp episode. There are so many ologies within one that it's kind of exciting to get deep into one.

Adam: Yeah. So, I really am more of a carcinologist than a crab researcher.

Alie: Okay. But you can be an entomologist and an arachnologist. So, if there were a crabs episode, we could get more granular and it would still apply to you?

Adam: Yes. I could be that person too.

Alie: Okay. Just because... crabs. Fucking love 'em, right? Okay, first thing I'm going to ask you: What is a crab? And why are some not true crabs?

Adam: Oh, that's a really great question... Arbitrary reasons.

Alie: Okay.

Adam: So, a lot of these higher taxonomic names, when we're talking about crabs and things like that, versus a species name, are just useful tools to begin with for humans. It was a way to subdivide all these amazing diverse forms and lump some together and separate them out so that we can have these discussions. So, what is a crab? A crab is a crustacean that shares a handful of morphological traits, at this point. So, those traits would be, for a true crab, a brachyuran, they have ten appendages, but that's a higher-level thing where it's a decapod as well. The abdomen is completely symmetrical, left to right and it is fully tucked under the thorax, so it's folded up and under. So, a lobster's tail, that's the abdomen of a crustacean. And to turn a lobster into a crab, a true crab, you take the tail, and you completely tuck it under and have it be very closely attached to the thorax on the ventral side.

Alie: If you've ever cleaned a crab, I feel like there's that little hinge type of arrangement. There's a little door to open on the underside.

Adam: Yeah, exactly. So, that's the abdomen.

Alie: I never knew that.

Adam: Yeah. So, that would be like the tail of a lobster, and it's been reduced. And you say you see how you have to open it, that's another characteristic of it being a true crab, that it's very tightly tucked up underneath there. It can be a little hook mechanism that kind of latches it, especially for males.

And for females that aren't gravid, that don't have eggs, females, that's where they store their eggs, on their pleopods so that will be really swollen, completely filled with eggs when a female is in that reproductive stage and it will not be closed at all, it will just be a wad of eggs in some species.

Alie: Do they reproduce by throwing the eggs out and then hoping someone comes by with a sperm confetti gun? Or do they actually say, "Hey, I saw you over by the rock, I liked what I saw. Let's make 1 billion babies."

Adam: So, there's a bunch of different strategies for reproduction among the *Crustacea* because they are so morphologically diverse. Within the true crabs, there is sperm transfer from male to female, and then the eggs get fertilized and then they get dispersed, or they can hatch on the females too, depending on which group it is. And then the larvae swim around the ocean.

Alie: And then it's, good luck. I bet a lot of them get eaten?

Adam: Yes, in that group. Now, is this a crabs episode or is this a crustaceans episode? Because the things that are near and dear to my heart, these marine roly polies, they don't have larval stages. They have mamas that really care about their babies, so they brood young in little pouches, and they develop inside the mother's brood pouch, marsupium, and then they emerge as little bitty baby copies of the adult form.

Alie: Precious.

Adam: So, on a crustacean level, I think there's a whole bunch of different strategies.

Alie: But just with crabs, it's going to be hard to just talk about crabs because they're all so interesting and related.

Aside: Okay, let's try to focus. Crabs. We can do this.

Adam: What makes a crab a crab? So, a brachyuran is a true crab, it has a symmetrical abdomen that is fully tucked underneath its thorax. In contrast, an anomuran does not have a symmetrical abdomen, so it is twisted left or right, it does not have it fully attached underneath the thorax or as tightly attached. It can be loosely attached, and it will hang down a little bit.

Aside: So, *Anomura*, not true crabs, and their name means "differently tailed." They include crabby creatures that have kind of like a bustle of a tail, like a hermit crab or a sand crab, or a squat lobster. The oldest fossils of these differently-tailed anomurans are about 200 million years old. Now, the true crabs are brachyurans, and if you know a little bit of Greek, *brachy* means short and so the true crabs have short little, tiny tails. If you've ever turned over a crab and saw a pointed flappy flap, like a flattened, tucked tail, that's a good way to spot the true crabs. They live pretty much everywhere, the brachyurans: in fresh water, salty seas, and every ocean.

Adam: And then also, true crabs, *brachyurans*, they have ten fully visible legs that you can see. *Anomurans* will often have the fifth pair because very reduced and they're either just so small that you can't quite see them, or they've been modified for a purpose other than locomotion and they'll be tucked inside of their carapace and they'll use them to clean their gills or something like that. So, one of the easy ways to tell a king crab is to look at it and see how many legs it has.

Alie: How many does a king crab have?

Adam: So, a true king crab has eight big visible legs, and then if you look very closely, there is a nine and ten, so another pair that are tucked toward the back and sometimes they're up under the carapace and sometimes they're just hanging back. But if you were to just look at it from ten feet away, you'd be like, "It has eight legs. Why does this crab have eight legs?"

Aside: Let's go back to the tour of the crab bunker under the museum where wet crabs rested in peace in jars, where dried specimens reigned from above, mounted on shelves and walls, or holding court over doorways.

[*clip from tour*]

Alie: How do you store your, like, king crabs with huge arm spans?

Adam: *You know what's really fun if you like being pedantic, and I like being pedantic. [Alie laughs] King crabs aren't crabs.*

Alie: No! King crabs aren't crabs? What the fuck are they?

Adam: Well, so king crabs are in that group that's called the anomurans, and by definition, they are not in what scientists consider to be the true crab group. So, they're not really crabs.

Alie: I had no idea.

Adam: But then again, it's a common name and I try not to get too worked up about it.

Alie: I can't believe that a king crab, it's given a royal title and it's not even really a crab. Are they pretty rare and how long does it take for a king crab to get that big?

Adam: Oh wow, that's a really good question. They are not rare. So, everything that I showed you in our collection, those are rare crustaceans, and we keep them in the collection because they are rare and we need them to study biodiversity, we need them to compare new species as we discover them to them, to make sure that the new species is actually new because we have a collection of all the crustaceans that exist in the world. If you asked me to show you a king crab, I might have one or two in there because they are so common that we don't keep them, in a strange way. Like, I really should have some in my collection, but I can also walk down to the store and buy one today. [*Alie laughs*] So, they're very, very, very, very common.

Aside: According to the Alaska Department of Fish, Game, and I guess almost-crabs, there are about 18 species of Alaskan king crab, and the red king crabs of the male variety can man-spread those spiny legs up to six feet across and weigh more than a toddler. But they love 20 to 30 years, old enough to buy booze, if they could obtain a legal ID, after all, they do party. So, king crabs hang out in the depths offshore, and then as horny adolescents, around the age of 4, they saunter to more shallow waters, about 30 meters deep, and they hang out in these huge pods with the adults, hoping to spawn, and traveling up to 100 miles to do so.

But these recent headlines from the AP news kind of say it all: "Alaskan fishers fear another bleak season as crab populations dwindle in warming waters." This is after a 2021 survey found this population crash and red king crab fishing was closed, and snow crab fishing dropped to a tiny fraction of previous years. So, with these crab populations in crisis, Alaskan-based crab fisherfolks in the Bering Sea are in a crisis too. And even when the season is good, studies have found that crab fishing bears 80 times the number of fatalities than the general workforce, with Dungeness crab fishing now more dangerous than Alaskan crab fishing. Hence, they call crab fishing, "the deadliest catch." And after working really long shifts at sea, the chances for a tumble into very cold water and hypothermia, or a tangled in rope go up.

Now, if you've heard of Russian crab, it was introduced into seas there by scientists in the 1960s. According to the 2005 Norwegian paper, "The intentional introduction of the marine red king crab *Paralithodes camtschaticus* into the Southern Barents Sea." So, in the 1960s, these 10,000 or so crabs were collected near the Bering Sea, between Russia and Alaska, and transported to the

Barents Sea north of Finland. And yes, the Barents Sea sounds like the Bering Sea, so bear with us if you barely understood that. But these introduced Russian red king crabs were supposed to provide a commercial fishing boom, and boom they did, because they're now munching up mollusks aplenty in Norway and even all the way south off the coast of the UK. People are not happy... Except the crab fishers.

You're not going to find many Russian red crabs on the markets in the US, as President Biden recently issued an executive order extending the Russian seafood ban to fishy things that have been sent to China first for processing before landing in the US, which was kind of a loophole in sanctions with Russia after its 2022 invasion of Ukraine. So, pods. Nautical dangers. Frigid waters. Weird butts. Invasive ocean spiders! Crabs... There's a lot of drama. There's more drama in Part 2 so you're going to want to come back next week too.

Now, between all of this, speaking of passports and world traveling, Adam mentioned to me that last month he was on the Yucatan peninsula where he saw a lobster that was three feet long! But this is not a lobster episode! Now, can one be a crab person and see the whole world?

Adam: I have, for crustacean research, it has taken me to Panama, it's taken me to Australia, it's taken me up and down the west coast, it's taken me to the east coast of America, it took me to azotic Provo, Utah, turns out that Brigham Young University had one of the preeminent *Crustacea* research labs in the world.

Alie: So, how did your path lead you to get to study all this stuff in all these cool places?

Adam: I had a really fun, non-traditional path. So, I studied robotics and I worked for NASA, and we did this amazing thing where a bunch of engineers went into a room and we invented this thing, we called it a Spider-Bot, which was a small autonomous research robot, was walking. Everyone there was an engineer, not a biologist so our spider bot had six legs. [*Alie laughs*] Problematic, I know but alternating tripods are a great way to walk. Did a bunch of research on that, and did some stuff with machine vision, but mostly focusing on converting text to digital characters. So, like OCR, optical character recognition, back when that was like a research field, not just something you could ask your phone to do instantly.

I came to the museum, and I was working on a grant to basically convert all the ancient literature that we need for taxonomy where Linnaeus is like, "This is what a crab is." Turns out, that had never been digitized, and as we were digitizing it, I was like, so we can scan these things and make them machine searchable, and we were like, "Oh, that would be great. Let's do that." So, that was the first thing I did at the museum. And I was sitting there, digitizing Linnean papers and someone walked in the room and was like, "Oh man, we found like, five more species. Does someone want to name them?" And I just turned around and I was like, "You name species? Who names species?" And they were like, "Whoever is dumb enough to take this job." And I was like, I am that dumb. [*Alie laughs*] So, I was like, "Yeah, let's go name that one species." We actually thought it was one species at that point and it turned out to be just so many species that we stopped at about 12. So yeah, I just kind of was in the room and said yes.

Alie: What did you name them after?

Adam: Some of those got named after the person who discovered it, Dean Pentcheff. He discovered one of the species as he was leading a field trip in the intertidal. So, that one is *Exosphaeroma pentcheffi*. So, that one's a great one. This was early on, so I was still naming species after people I really cared about so I named a species after my favorite uncle, so *Exosphaeroma russellhansonii,* which is great. And then we sold the rest of them for naming rights.

Alie: That makes sense.

Aside: Back in the archives he told me a little bit more about that.

[*clip from tour*]

Adam: We have sold several of the names for isopods for naming rights for donors as a nice way to recognize someone. Because if someone tries to buy you a star name, just be like "Oh, that's so sweet of you," but that's like 50 bucks. [Alie chuckles] You want like, a fossil bear named after you, that's like $100,000. [Alie laughs] You want a crab named after you, come talk to me, we work on sliding scales [Alie laughs] but it's way more than a star. But it's really nice to honor people.

Alie: Have you ever thought about naming them after pop stars for publicity? For fairy shrimp? I know that worked for dipterologist, Bry the Fly Guy, and a millipede expert I talked to.

Adam: I would never be so crass... that's not true, I totally would do that. [Alie laughs] Species naming is its own thing, it's just a crazy world. I do species naming because I think it's really enjoyable and fun, it's just completely non-sustainable for marine invertebrates and invertebrates in general. There are not going to be enough taxonomists to name them so one of the main things that I've been working on is developing DNA, molecular-based tools for identifying species outside of their physical morphology, just to make it faster. At some point we're just going to stop naming the new species, I feel, because I don't have that many aunts that I want to name something after, there's not that many places. The vast majority of the ocean doesn't have a name. How many things are we going to name after this one chunk of the ocean for different species? So, we're just going to probably need to start using numbers and then if people want to have a name for something that's important or charismatic then we can name the species.

So yes, his job now involves discovering species of tiny shrimp that live on methane vents in the deep sea and also, roly polies and crabs, and lurking around these thousands of jars of crabs that are bobbing in ethanol, preserved for future carcinologists that he's never going to meet because we're all going to be dead, including you, but don't think about it. This is a good time to cut bangs, text your crush, we're all going to die.

But flashback to when Adam told the NASA robotics lab that he was moving on to crabbier pastures.

Adam: So, we were making robots that were becoming candidates to possibly send to Mars.

Alie: Oh my god.

Adam: Yeah.

Alie: Well, I was going to say, when we were looking at all these preserved specimens, just in general, one reason why I love bugs and arthropods is because they look like robots, they look like Transformers. Was there something about that that you also liked or was it just coincidental?

Adam: I definitely really liked it and there's this whole field, biomimicry and learning from nature, and that's why I was saying that we were stupid engineers. I remember us building this walking robot and independently thinking we were geniuses because we reverse engineered– We didn't reverse engineer, we independently designed muscles, like how muscles work. And if any one of us had ever taken a real biology class at the time, we would have been like, "Oh man, let's just make it like a muscle," and it would have saved so much time. So yeah, I was really attracted to the fact that we

were solving similar problems to what I had worked on before but in a really just, elegant way as nature does.

Aside: And with his background and degree in biological sciences, he went right into a role as a Curatorial Assistant at the Natural History Museum in LA, eventually becoming the Collections Manager for the Crustaceans Department.

Back in the stacks, Adam opened this large show box and delicately held up something the size of an Australian shepherd but with 250% more legs.

[*clip from tour*]

Alie: Woah! What?!

Adam: So, this is a coconut crab. This is another example of just how cool carcinology is. The largest living arthropod that lives on land is a coconut crab. Coconut crabs are also called robber crabs, they have these amazing desires to collect shiny things so that's why they're called robber crabs. They'll go and steal someone's watch and take it back to their nest, which is in a coconut tree usually, hence the other name. This is another mystery to the science; this does not look like any other decapod. This is completely wrong. All the things that I would tell you that are synapomorphies – so things that are shared traits of all of the hermit crabs and all of the other types of crabs – this has a little bit of both at this stage in its life. Scientists for a very long time thought it was a completely unique species.

What this is, is it's just the largest hermit crab in the world and when it's younger it lives in the ocean, and it keeps finding bigger and bigger shells and it lives a hermit crab life with an asymmetrical abdomen that twists into the shell wall. And then once it gets so big it can't find shells to live in anymore, secondarily, it comes onto land and that abdomen that was soft becomes hardened and really quite straight and then it starts living in trees. It'll go to the top of a tree, pinch off a coconut, crawl back down, use these pincers, which are massive. They have the strongest pinching force of any, I think, arthropods.

Yes, I did look this up and a 2016 study titled, "A Mighty Claw: Pinching Force of the Coconut Crab, the Largest Terrestrial Crustacean," told me that scientists borrowed a few moments of time from 29 wild coconut crabs and found that their pinching force rose in accordance with their body mass. The largest coconut crabs, weighing in at eight or nine pounds, can drag around 60-pound objects. They could also exert potentially 3,300 Newtons of force, or 740 pounds in a pinch, surpassing the bite force of guard dog breeds like the Italian Mastiff and the Cane Corsos, which is actually pronounced "Kan-ay Corso," but I said it both ways so you'd know I was talking about that beautifully terrifying, glossy, black behemoth of a dog with sharp clipped ears and a face that could scare the devil out of his own underworld. But in a 2016 article titled, casually, "Coconut Crabs Pinch With an Insane Amount of Force," the lead author of the study had his hand pinched twice during fieldwork, and while only lasting a few minutes, reported that, "I felt eternal hell." So yes, Adam says...

[*clip from tour*]

Adam: So, they tear coconuts apart like nothing, they do this amazing thing for humans in the sense that they marinate themselves for the last few years of their life in coconut, so they taste delicious, they are slow-moving, they have been extirpated on basically any island where there are humans and these, we ate all of them. So, in the wild, you'll find them on small little islands that are too small for humans to inhabit. Some people keep

them as pets. This is actually a small one, they can be, I don't know, maybe up to almost three feet across by the time you're measuring across the leg span.

Alie: My word.

Adam: Yeah.

Alie: I mean, it's terrible that the predator in me is like, "That looks like good eats!" [laughs] It's hard not to think of it steamed at a seaside restaurant, you know?

Adam: Yeah. It's problematic for me. It was easy and hard because I grew up kosher and then I started doing more crustacean research and marine biology in general and the first thing I got broken in was raw oysters. We were studying raw oysters looking for Pinnotheridae crabs that would live inside of them, which are the smallest crabs in the world. An adult of the species is 1.5 millimeters across, and they live inside of other animals largely. So, you have to open up a bunch of oysters to see if they're in there. I was eating so many because my colleagues were like, "Well, we're opening hundreds of oysters a day, we have to at least eat them." So, I got turned onto seafood pretty quickly after 25 to 40 oysters a day for like, three days in a row. [Alie giggles]]

But still, Adam just is not a big fan of eating crab. But for me thinking of a steamed coconut crab turns me into one of those cartoon wolves with its tongue hanging out, drooling onto a bib made out of a kerchief. But I will likely never eat one, ever, and it's better that way. Where there are humans, there are scant coconut crabs left and I get it.

But one remote place that remains a robber crab party is Nikumaroro, once known as Gardner Island, which is roughly 1,000 miles northeast of Fiji in the middle of the Pacific. You may have heard of this island as it's controversially speculated to be the final destination of pilot Amelia Earhart who disappeared with her navigator, somewhere over the Pacific, in 1937 on this transglobal journey. A year later, scientists discovered recent skeletal remains of what was presumed then to be a man because this was before osteologists knew that tall women existed. These bones were scooped up, they were put in a box and sent to Fiji, and then subsequently misplaced. So, maybe they await their second discovery in the dusty collections of some museum that's still trying to fund its digital archives.

But in the 1990s, a group of history hunters found a 1930s-era shattered cosmetics compact mirror, some bits of rouge, some pre-World War II bottles, a long finger bone that could have been human or a turtle's, and they found a folding pocket knife and a piece of riveted metal that is hypothesized to come from a plane like Earhart's. But this latter expedition group has a fair number of critics. But one member who has visited the island nearly a dozen times searching for signs of Amelia has said of the coconut crabs that, "The crabs close in on you. If you shine a flashlight outside the shadow ring are a thousand crabs." And there was this Nat Geo article I read that concludes that this foreboding line, "Clauss has learned not to sleep on the ground," which is kind of confusing because from what I understand, these crabs can climb the hell out of a coconut tree. But whatever. Could other, say, castaways have succumbed to nature's ravages of this remote atoll?

Alie: One question on everyone's minds: Coconut crabs, can they eat people?

Adam: [*softly*] Oh gosh.

Alie: I've seen what they can do to a pig carcass.

Adam: This is an interesting question, the diet of a coconut crab. So, one of the things that this lab and me study a lot is environmental DNA and one of the applications for that is scat research, scat analysis.

So, you can take the poop of any random animal and sequence the DNA of the leftover bits and figure out what they were eating so we could collect the poop of a bunch of coconut crabs and see if they're eating it. Could they? I don't know.

Aside: For more on this delightful line of thought, see the Scatology episode about this woman we interviewed who has several freezers full of zoo animal poop. She is known as Dr. Poop, and I love her. We'll link it in the show notes, of course.

But yes, coconut or robber crabs, technically hermit crabs that ascended from their youth in the sea, and the biggest crab you'll be unfortunate to encounter on land.

Alie: I mean, they're pretty strong. If they can get through a coconut, they can get through a [*clicks tongue*] noggin. You know what I mean? I'm just curious because coconut crabs, I feel like, have been... A picture went around of a coconut crab climbing a trash can. I'm sure you've seen it. And it's horrifying.

Adam: Yeah.

Alie: Is that a typical coconut crab specimen?

Adam: Yeah.

Alie: And can they get into garbage cans?

Adam: They can. They can do a lot of things. So, in the war between coconut crabs and humans, we're definitely winning. [*Alie laughs*] I don't think any coconut crab is ever going to be a predator on a human. Could there be, like, a carrion situation? Yeah.

[*clip from tour*]

Adam: You've reminded me of a fun story about the coconut crab. So, the largest living arthropod right now is a crustacean. And this represents the largest form that you can be on land right now with a primitive respiratory system. So, there used to be arthropods that looked something like dragonflies that were much bigger than this, but that existed in a period of time in Earth's history where oxygen levels were much higher and inefficient respiratory systems could still support a larger animal. So basically, this is about as big as you can be and be an arthropod with the amount of oxygen in our atmosphere. The absolute largest arthropod is also a crustacean and that's a giant Japanese spider crab and those can be 12 feet across or more.

Alie: 12 feet?!

Adam: Yup. And it's a crustacean. You asked me, why can that one be bigger than the one that lives on the land? And it turns out that crustacean respiratory systems with gills are much more efficient in water. So, getting the dissolved oxygen out of water, it can do that, it can grow larger.]

Aside: I'm trying not to bring this back to coconut crabs again but damn, you guys.

But before I do, first let's donate to a cause of the ologist's choosing. This week, it's the Natural History Museum of Los Angeles County, specifically earmarked for their fairy shrimp research program. That donation was made possible by sponsors of the show.

[Ad break]

Okay, next week we're going to get to all of your questions which is a wild ride, and trust me, you're going to want to listen to that episode. But for now, I'm sorry, let's get back to coconut crabs.

Alie: Why don't more people grow coconut crabs for industry? Because they appear to be such a meaty crab.

Adam: This is great. So, actually, this would be a really fun thing, talking about the study of aquaculture.

Alie: Oh! I've got a guy for that in Santa Barbara.

Adam: Oh, nice. There are a bunch of people who have tried to rear coconut crabs and we just haven't been successful at it. And that is the story for the vast majority of things, we have not been successful at it. We have no capacity to, like, actually rear the whole lifecycle and it's that way for a bunch of marine organisms. So, people want to, and they've tried. It's just, it's hard.

Alie: Do they not mate in captivity? Or do they just like, in a tank, they're like, "I'm not thriving, I'm not a happy crab."

Adam: If you made me guess I think it's going to have a lot to do with making the larval stages happy. So, after they've hatched out, keeping them alive and supplying them with the correct nutrients. They go through so many life stages.

Alie: Well actually, let's talk a little bit about those life stages because they don't just come out a full hardened crab. They go through so many puberties, right? So, what is the typical crab life like?

Adam: A typical crab life would start as an egg that's inside of the pleopods of its mother.

Aside: Okay, quick aside here. So, a pleopod is a little appendage inside a preggers – or really, a gravid or berried – female crab's abdominal flappy flattened tail. She uses these bristled, hairlike little appendages to clean off the eggs as well, kind of like a feather duster that's also a fan to wave oxygenated water around her thousands of little grainy roe babies. They call her berried because they're all snug, like little berries in her belly flap.

Adam: It's going to get dispersed and then it's going to become one of several larval stages. And there isn't one set of larval stages that all crustaceans go through. Some species skip stage three, some skip stage one. It's just craziness. And that is a whole thing unto itself is larval development of crustaceans. But the typical lifecycle of a crab is it's going to emerge from its mother, or eggs that get dispersed by its mother depending on the type of crustacean it is. And then you're going to go through several larval stages and your final larval stage will be very, very similar to the adult stage. In crabs, that last larval stage, it's called a megalopa and it looks like a really baby crab at that point. Before that, in the very early stages of *Crustacea* larvae, they all kind of tend to look like sea monkeys a little bit.

Aside: So, they may hatch from an egg and look like tiny little seawater brine shrimp or freshwater fairy shrimp aliens for an awkward half a dozen or so stages before molting and looking like an actual crab.

Excuse me, let's go back. Fairy shrimp? Which are not crabs. In the stacks, Adam had shown me a shelf to the ceiling filled with these large jars, each containing dozens of smaller capped and labeled tubes.

[*clip from tour*]

Adam: *These are, their common name is a fairy shrimp. You might know them also as sea monkeys.*

Alie: Yes! I was looking into your work and was like, wait you study sea monkeys for your job, that's amazing. [laughs]

Adam: I don't know how I got this job, it makes no earthly sense but it's really cool.

These types of aquatic acrobatic swimming crustaceans are sold as tiny pets and you can rehydrate their eggs and have a miniature aquarium of these long-tailed sea monkeys, or *Artemia* if you'd like to maintain a more formal relationship with them.

[*clip from tour*]

Adam: These things are insane. A fairy shrimp's eggs, we don't even know how long a resting egg from a fairy shrimp can sit around and still be viable. We know it can be decades because scientists keep them in their labs for decades at a time; they find an old sample and throw them in water. Definitely know they can do decades. Some people believe that there's a population in England that hatches out every 113 years when the conditions get just right inside of a quarry that has been around since the 1400s.

And then there are these anecdotal instances where people find the resting eggs inside of anthropological objects. So, maybe like a water skin that someone had thousands of years ago, and they find it in an archaeological site, they look inside of it, and oh, there's a resting egg in there. They'll take that out and they'll hatch it and they're like, well, does this meme that this egg has been there for 3,000 years? Or does that mean that it got washed in there a couple hundred years ago? Because it's also just been kind of sitting in the ground.

Alie: Whaaa!

Adam: So super amazing fun stuff.

Alie: Love a fairy shrimp.

Adam: Yeah, who doesn't? [Alie laughs] I haven't had a fairy shrimp cocktail yet.

Alie: [laughs] Very tiny, so tiny. Just little tiny dippers.

So yes, that was about brine shrimp and fairy shrimp, again, not crabs which is why this has to be a carcinology episode and not a brachyurology episode, which would be only true crabs, as you now know. But yes, fairy shrimp are delicious little popcorn snackies to a lot of animals. Since baby larval crabs look a lot like them, does that mean that they too become snared as babies in the great oceanic food web?

Adam: Oh, they're definitely eating the larval stages of a crab too, yeah.

Alie: Okay. [*laughs*] These poor baby crabs.

Adam: Yeah, they're so small it's like, they're getting swept up in filter feeding. Basically, they're pelagic largely, so they're in the midwater swimming around doing their thing and then they become megalopa and they will settle out and they'll go to the bottom of the ocean, the benthic environment or they'll go to the intertidal and they'll start to develop very crablike morphology and they'll just start living a crabby life.

Aside: So, they go through between two and nine larval stages, just makeover after makeover that no one, except probably carcinologists, see coming. And when they make their debut as a crab, the costume changes are still not over.

Alie: How often are they molting? Because that's how they get bigger, yes?

Adam: It is how they get bigger. The main driver for that, I believe, is essentially when the animal has grown internally so much that its muscles and its organs are putting enough pressure on its exoskeleton, it needs to molt [*"I gotta get out of here."*] and that's what's driving. But there are definitely molting seasons for some crabs, like the Dungeness crabs, there's a molting season that

happens and almost all the crabs go and they molt at that time and then they'll grow. That is a time when you're not allowed to do fishing for them, for instance.

Alie: Is that why in late December now it's Dungeness crab season? Because they're not molting?

Adam: Yeah. I believe it's late enough after their molt that they have filled in and it's a good time to harvest them. They actually kind of track that, the fisheries department, they'll take boats out and they'll take a crab and if it had recently molted, a 10-inch crab will actually only have as much meat in it as a 6-inch crab [*Alie gasps*] because when it molts, in a day or so, it hardens and that exoskeleton gets 30% bigger but the insides of it are still small, right, and it's growing into its new shell.

Alie: Yeah, like shoes or something, right?

Adam: Yeah. And it's basically the fisheries department is waiting until that crab has filled up most of its exoskeleton and that's a good time to open the season.

Alie: So many questions. When we're eating crab meat, we're eating muscles?

Adam: Depends on what your personal preference is. I have a lot of people in my life who just eat everything in a crab, basically.

Alie: Oh!

Adam: I have people in my life who are engineers and have actually, I believe they patented a machine that will clean a crab perfectly to where the internal organs essentially never touch the meat, or as little as possible, so that it is you're just eating muscle. And then I know people who are like, "Oh yeah, that's the best part of the crab." So, I would say Western European people are largely just eating crab muscle, like in my legs and things like that. Other people and other cultures tend to eat whatever is delicious. And I advocate for eating whatever is delicious.

Alie: Right. My mother [*"Hi, it's fancy Nancy."*] who is Italian and we're from the Bay Area where Dungeness crabs are like a delicacy, it would be a holiday meal for us. My mom flips it over, whatever is that soupy, dark, ochre kind of color, that buttery color, my mom mashes it up with a fork, salt pepper and she calls it "crab butter" and then you dip sourdough in it. As a child it was horrifying, I wanted to call some authorities, I wanted to be taken out of the home. but now, as an adult, I'm like, that shit is good, it tastes like uni! A lot of people toss it and you're like, that stuff is good!

Adam: It's very good.

Alie: What am I eating when I'm eating crab butter? Mom.

Adam: [*deep breath*] It's a little difficult. So, crustaceans don't have, like, the same suite of organs that we do so it's not quite easy for us to translate it. They have less organs that do more things.

Aside: So yes, this substance is technically the organ hepatopancreas, but if that sounds too medical, you can feel free to call it crab butter or tomalley or muster. Don't call it dinner too often because this viscera's job is to filter out mercury, neurotoxins, and PCBs, which are potentially carcinogenic. So yes, cancer gets its name from the leg-like spread of tumors. So, find out how polluted the waters may have been. But yeah, this is a delicacy, and it tastes like uni. I love it, so does my Italian mom, and it's worth trying. But like oysters and mussels, don't just pluck a crab out of the waters near a polluted beach and you'll probably be fine. Also, see the sea urchin episode linked in the show notes for info on where scientists are begging you to harvest uni.

Also, if you saw the Tom Hanks vehicle called *Castaway* and like me, if you have burned into your memory the scene where he spears a crab and the raw muscles are a slime-like abomination, I

checked into that for us, and IRL, it's apparently much firmer than that, the muscles. And in the film, Hanks isn't even spearing a real crab, it's an animatronic crab and it's filled with a mixture of egg whites and food coloring for the scene. So, while the crew probably ate seafood every other night for dinner, no real crab legs were cracked in the making of the movie, at least not on film, which always really confuses me because a chicken was probably harmed in the making of that egg white. But I'm neither vegan nor in charge. Anyway, crabs...

Alie: So, when we're dealing with the anatomy of most crabs, we've got ten legs, muscles in them, they got a hemipancreas, a lot of the marine types have gills? Those fingery things?

Adam: They all have gills. All of these crabs. Not all crustaceans have gills. Yeah, they all have gills.

Alie: Okay. Even poser crabs like the king crab?

Adam: Yeah. So, gills are a structure that happened later in the evolutionary history of crustaceans and the common ancestor of the anomurans and the brachyurans all had gills.

Alie: And gills can also work on land?

Adam: They can, they are less efficient doing gas exchange with the atmosphere as a gas versus in a liquid like water. But they have to stay moist so the only way that crustaceans can exist on land is they manage to keep themselves pretty moist. And a large part of that is for doing gas exchange too. It needs to have that little surface coating of water.

Alie: How are they doing that? Are they taking a dip in the ocean or is it humid enough in those spots where there's enough vapor?

Adam: It's a little bit of both. Some of the shore crops, they are living in that little Goldilocks zone of the intertidal where they get to kind of stay wet just by getting dipped by the ocean every so often. Additionally, they will kind of secrete mucuses and stuff like that that keep them moist longer than just water would. This does tend to happen when it's a fully terrestrial thing. They have to live in pretty moist environments. Like, roly polies that live in your backyard, you probably have obviously noticed that you find them, like, under a damp thing. and when it's wet out, they go wherever they want because it's damp everywhere but they need that extra moisture when it's drier outside, like underneath the log.

Alie: Well, I've wondered this about crabs because they have dang hard shells, which seems expensive, like an armored car. So, where are they getting the ingredients to make that shell and how expensive is it to molt?

Adam: It is expensive to molt in several ways. [*"Fancy."*] I would say the biggest expense of molting is giving up that expensive armor for that period of time because they become very, very susceptible to predation. So, they are getting the nutrients from their food and then they're sucking elements out of the ocean to calcify and harden their exoskeleton. So, the proteins and chitins and things like that, they're making that themselves and generating that from their food, and then they are taking minerals out of the water to harden their exoskeletons.

Aside: And okay, before a crab levels up and molts, it'll leech some calcium carbonate from its old shell, like, "Thank you very much, me" and an enzyme helps it separate from its old shell and it starts to grow a wafery, delicate new shell. And then it swells up with seawater to bust the seams of the old shell, like an old prom dress you should have left in the back of your closet. That shell is composed of a biopolymer called chitin, which has sugars and proteins and yeah, calcium. So, as the ocean grabs more carbon dioxide from our choking atmosphere, the acidity of our oceans is rising, and the larval stages of crustaceans are the most vulnerable to the changes in bioavailability

of minerals. You can see our Biomineralogy episode, which we'll link in the show notes if you're hungry for a shell of a lot more hard facts. All right.

Alie: Crabs, what are they eating? Are they bottom feeders? Are they eating poop? Are they eating dead things? What's going on?

Adam: Crabs have a very wide range of niches that they fill. Some of them are definitely eating poop and some of them are eating dead animals that they find on the ground. Others are really great predators, and they hunt for what they want. So, like that adorable little shamefaced crab I showed you, yes, right there, *Calappa calappa,* it's a cute crab.

Aside: So, Adam points over his shoulder to a framed photograph. It's a close-up, kind of like a pet portrait, of the same crab he showed me back in the stacks, and it resembles a little puppy curled up in a nap, with its little claw paws covering most of its face. It is a box crab in the genus *Calappa* and it's maybe my favorite crab ever because I identify with it emotionally.

[*clip from tour*]

Adam: This is also a decapod, completely different body shape.

Alie: Oh my gosh.

Adam: This is a Calappid crab, or some people call them shamefaced crabs because they're adorable, they kind of look like they're hiding their face in shame. These things are amazing predators. So, if you're ever lucky enough to spend any time in the Caribbean and you're swimming around and you hear something going off every, I don't know, few seconds, that kind of sounds like a small gunshot, it's this crab in a battle with a gastropod marine snail where it's using this special little hook and one of its claws that is specially adapted to crack through really thick gastropod shells. And then it has this really fun, like, its claws are asymmetrical; one is adapted to doing the crushing and the breaking into the shell, and the other one is lawn and recurved and kind of scary looking and it reaches in and pulls the gastropod snail out of its shell once it's actually chipped it away. But that kind of shotgun sound that you hear in the water is this breaking the shell. And they are just really beautiful, amazing things.

Alie: And what's that one called? The shamefaced crab?

Adam: Shamefaced crab. The group is Calappid crabs. I think they're really adorable. I had the really amazing opportunity to watch one of these molt in the wild; crawl out of its own skin, pump itself up, get about 30% bigger, and start to harden itself. It was really magical.

So yes, some crabs eat poo and dead stuff. And others, like these *Calappa* or box crabs or shamefaced crab, they might just be demure-looking killing machines.

Adam: So, that is going to be very predator-driven and they are out there hunting sea snails very actively, they're definitely earning their dinner.

Alie: Are they fast enough for that? Are some crabs pretty fast and some pretty slow?

Adam: Some crabs are very fast, some crabs are very slow. And this is an interesting, like, aside. So, that shamefaced crab, it only has to be faster than a sea snail, right? [*Alie laughs*] For its hunting purposes, right. And right now, it's winning this evolutionary arms race so it is faster than a sea snail and it has that special little can opener-style claw on one side that breaks gastropod shells right now, right? I imagine there is probably selection going on evolutionarily for gastropod shells

that are so thick and hard that these crabs can't actually break through them, right? So, it's like a dynamic race of a thing.

Alie: What are some fast crabs?

Adam: There are shore crabs that are very fast on land. Swimming crabs, like blue crabs on the East Coast, they move pretty fast through the water, honestly.

Alie: Are they swimming?

Adam: Yeah. Have you had blue crab?

Alie: I have, yeah. I think those are like, in Baltimore. There were crab cakes where they're like, "We don't use breadcrumbs, that's disgusting." It's just all crab, you know what I mean? You know how sometimes you'll get like...

Adam: It's mostly bread versus like mostly crab? Yeah.

Aside: Okay, let's be quick about this but it's quite a ride. So, most crab cakes have a bunch of breadcrumbs and eggs and mustard and such and the proportion of crab to other stuff is a lot lower. Maryland crab cakes or Baltimore style, feature blue crab with minimal binder, and just a dash of Old Bay seasoning and they are chilled to firm up before they're cooked. So, I was like, "Why does Old Bay seasoning have a ticket into a Maryland crab cake but nothing else does?"

Okay, so this spice is a blend, it's a local favorite along the Chesapeake Bay and it was created by a man named Gustav Bunn. Gustav was a German Jew who in 1938, was arrested in Weimar Germany alongside 30,000 others in what became known as *Kristallnacht*, or the "Night of Broken Glass." Gustav Bunn was sent to Buchenwald concentration camp, which was one of the first and the largest. And having been in the wholesale spice business and prosperous previously, Gustav's wife was able to spend a considerable amount of their savings on a lawyer to get Gustav released, as their family had already secured American visas.

So, in 1939, they came to Baltimore with just a small spice grinder. Gustav found a job at a spice company called McCormick and was quickly let go because of his immigrant status and because English was his second language. So, he started up his own business, he was making spices for a sausage shop and fishmongers would come to him to buy spices in bulk to try and make seafood blends. And so, he decided, having been a man of spices, to craft his own proprietary blend of 18 spices and it included celery salt, red and black pepper, paprika, maybe laurel leaves... Who knows what else!

Most rich people were eating crab with all kinds of buttery sauces and the poorer folks would eat simple steamed crab. But after Old Bay comes on the scene, simpler ingredients, including Old Bay, take off and the crab market gets even bigger. He calls this signature blend, "The Delicious Brand Shrimp and Crab Seasoning," until a friend was like Gustav, "Love you but that name sucks shit." So, he changed it to Old Bay after a passenger ship line that traveled the nearby Chesapeake Bay. The blend is obviously a success. Brunn continues to hire immigrants and refugees, helping them learn English and trade skills, and he referred to his company at one point as "A United Nations in miniature."

Gustav died at the age of 92, in the year 1985. And a few years later the Old Bay banner was sold for the equivalent of 23 million dollars. The buyer was McCormick, who had fired him 45 years earlier. Now, if you're even in Reisterstown, Maryland, you can visit his final resting place at the Baltimore Hebrew Cemetery, and maybe you can sprinkle a pinch of Old Bay out for a real one. But yes, Maryland seafood delicacies, more than crabmeats the eye.

Adam: So, East Coast thing, those are actually the crabbiest of crabs, actually. So, as a naturalist and someone who has to collect animals for my work, the only animal I've ever had actually try and attack me was a blue crab.

Alie: What happened?

Adam: Well, it was actually a swimming crab. I was in the Caribbean, and normally, I go and I collect specimens and I pick them up and I put them into a bag and I take them back to the lab and then we take them back. I was trying to pick up this crab to do the same thing to it. I went towards it, it swam away. I swam towards it again. It turned around and it was ready to fight me. [*Alie laughs*] And it did fight me. Only animal ever to actually draw blood on me... so far. It's a very feisty crab.

Aside: So, Adam was trying to help this species by taking it on a little tiny alien abduction adventure, just do some measuring and such, and then safely re-release it. Plus, he doesn't even like eating crabs! Pinched the wrong guy, man.

Adam: The pinching force is pretty darn good. And actually, as a person who studies blue crabs, you have this one problem. They're also so mean you can't keep two blue cab crabs in the same tank without putting rubber bands around their pincers, for instance, because they'll just kill each other.

Alie: Dang.

Adam: Yeah, and it's a real problem. They're ferocious animals.

Alie: Okay, I'm going to get to Patreon questions because we have so many. Is that okay?

Adam: Yeah.

And okay, we are going to get to your inquiring waters next week. Your questions are bonkers, and his responses are also bonkers. So, that is next week. join us for that. You want to subscribe and check back so you make sure to get it. Please go follow the show, make sure that you're getting our downloads because we're putting them out every week, people! To find out more about Adam's work and crabs in general we have so many links up at AlieWard.com/Carcinology. We'll also link to my beloved Natural History Museum of Los Angeles County which is like a second home to me. Adam is very much not online but we are @Ologies on Twitter and Instagram and also Bluesky. I'm @AlieWard on both.

Erin Talbert admins our Ologies Podcast Facebook group. Long time ologite and professional transcriber, Aveline Malek makes our transcripts. Noel Dilworth is our scheduling angel, Susan Hale is managing director who runs the whole ship. We have *Smologies* episodes that are kid-appropriate and swear-free and they're easy to get to AlieWard.com/Smologies which is linked in the show notes. Thank you, Mercedes, for editing those as well as Zeke Rodrigues Thomas and Jarrett Sleeper of Mindjam Media. Kelly R. Dwyer makes our website. And the king of the crabs is lead editor, Mercedes Maitland of Maitland Audio. Nick Thorburn made the theme music.

And if you stick around until the end of the episode, I tell you a secret. This week, you get two, okay? So first, I was really sick two weeks ago with RSV, a respiratory virus, and what I thought was norovirus. But y'all, it lasted so long, and I had so many fevers. It turned out to be... we think salmonella from a fruit cup at a local diner. The diner then mysteriously and suddenly closed for some spring cleaning, so we were probably not the only ones. Because it turns out there's a salmonella epidemic from cantaloupes going on right now. So, hands off the melons for a bit everyone because it is potentially fatal. Also, just personally, not an experience that I would ever want to relive. I would just beg for a medically induced coma until it passed. So, no cantaloupes.

The second secret is that when I was about 6, I was so taken with the empty shell of this Dungeness crab that we had had for dinner that I cleaned it and I held onto it for at least a week like a stuffed animal and I asked my parents if we could sew legs on it and I'm pretty sure my parents just quietly slipped it into the garbage while I slept and I forgot about it pretty quickly until I was working on this episode and I remembered. Looking back, honestly, I'm Team Larry and Nancy Ward on this one, I think. That's a hard sell to have a 6-year-old cuddled up to a stinky crab shell. But anyway, next week we're going to learn about what it's like to fear smelling like crab as well. So, come back, it gets weirder. You can also hear what Adam Wall thought of being interviewed. Okay, see you next week. Berbye.

Transcribed by Aveline Malek at TheWordary.com

Links to things we discussed:

Growth Model for Alaska King Crab (Paralithodes camtschatica)

A Mighty Claw: Pinching Force of the Coconut Crab, the Largest Terrestrial Crustacean

Colossal crabs may hold clue to Amelia Earhart fate

The Life & History of Alaska King Crab

The Real Reasons Crab Fishing Is So Dangerous

RUSSIAN INVASION Giant red king crabs from Russia which can grow to 6ft are invading Britain

The intentional introduction of the marine red king crab Paralithodes camtschaticus into the Southern Barents Sea

Executive order bars imports of Russian fish that is processed in other countries

Crab Reproduction 101

These crabs pinch harder than most animals bite

What the Hell Happened: Shrimp Tails in Cinnamon Toast Crunch

Tragic Passing of Christoph D. Schubart, brachyurologist

This $600-Million Room Contains the World's Largest Collection of These Tiny Endangered Animals

Shame faced crab video

Sea-Monkeys Opening Title Sequence

Photos of the Calappa "shame-faced" crab

Revealing the Shamefaced Crab Calappa granulata (Crustacea: Brachyura) from the Adriatic Sea, Northern Basin of the Mediterranean

Growling from the gut: co-option of the gastric mill for acoustic communication in ghost crabs

Characterisation of cellulose and hemicellulose digestion in land crabs with special reference to Gecarcoidea natalis

Decapod gastric mill illustration

The Real Reasons Crab Fishing Is So Dangerous

The intentional introduction of the marine red king crab Paralithodes camtschaticus into the Southern Barents Sea

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