Friday, Sept. 6, 2024 / Antibiotics for coral reefs

[HALF SECOND OF SILENCE]

[BILLBOARD]

BENJI JONES (environmental correspondent at Vox): My name is Benji Jones, and I’m an environmental correspondent at Vox.

SCORING IN <Carousel Of Bubbles - APM>

BENJI: So this last July, I went to a small island in the South Caribbean called Bonaire, and it's famous for its coral reef and for shore diving.

MUSIC BUMP

BENJI: And I'd heard that this reef is in really good shape. So I was really excited to see it because so many reefs around the world are just suffering from all kinds of issues. So I sunk down beneath the waves. And honestly, what I saw was pretty incredible. There were giant coral structures, sea turtles, sharks. It looked like this reef was doing really well. And it gave me hope for the future of coral reefs around the world. Like, I actually felt positive for once. And I'm excited to talk about it on *Today, Explained.*

[THEME]

*<BUMPER> Descending Theme\_11b*

SEAN RAMESWARAM (host, *Today, Explained)*: *Today, Explained* here with Benji Jones, an environmental correspondent at Vox. Benji, why did you choose to go to Bonaire? Their coral reefs are better than your average coral reefs?

BENJI: Yeah. I mean, I spend so much time writing about the decline and destruction of ecosystems, including reefs. And I heard that this reef was doing pretty well. And so I wanted to see, okay, is there something special about the coral reef here that could help reefs elsewhere that are not doing well.

SEAN: Why is this particular reef doing better than most, Benji?

BENJI: So scientists think that this reef is in really good shape relative to other reefs in the Caribbean because of a long history of conservation, and that includes restrictions on things like fishing. One other thing, which is definitely worth noting, is that Bonaire is just below the hurricane belt. So like the area where hurricanes in the Atlantic tend to travel and that prevents like massive impacts from the storms, which is also very important.

SEAN: And this is an urgent issue because coral reefs aren't just important for people who like scuba diving.

BENJI: Yeah, exactly. So for one, they are incredibly important if you live by the coast and are subjected to hurricanes because coral reefs are giant structures underwater. And they basically function like seawalls. So when a hurricane's coming ashore or big tropical storm, they can actually dampen the waves that are crashing against the coast and reduce flooding as a result. So super valuable if you live along the coast. They also are home to as much as a quarter of all marine life. So like fish, crustaceans, shrimp, all these animals need the reef to survive. Really important for seafood. And then also tourism. So I like to dive. Lots of people like to snorkel and dive. And that is a major driver of tourism in places like the Florida Keys, other islands in the Caribbean. So really, really important economic engines throughout the Caribbean and much of the tropics, really.

*<CLIP> Roxanne-Liana Francisca: This is part of our heritage. This is part of our history. It is what the majority of our economy depends on. So even though it is an uphill battle, we can't afford to just give up. If we just give up it is giving up on our history, giving up on our heritage, but also giving up on our livelihoods.*

SEAN: And as you've written about many times and many other people have written about, coral reefs all over the world are in big trouble. How bad is it?

BENJI: They're among the most imperiled ecosystems, period. So it's like literally half of these ecosystems are gone. And it's especially dire in the Caribbean where you see at least 50 percent coral declines, but perhaps much more. It's not totally clear yet. But, just in general, the Caribbean is really, really suffering from all kinds of threats.

SEAN: And the major threat here is climate change?

BENJI: So climate change is definitely a big one. So when ocean temperatures rise, which is happening right now, that ends up really harming coral, which is an animal. And coral depends on a kind of algae that lives inside of its tissue. It's like a symbiotic algae. And when it gets too hot, that algae leaves the coral, and then the coral doesn't have all these things that the algae provide, which includes food and its color. So the reason coral reefs are beautiful is because of that algae. But the big one is that if they lose that algae, they lose a big source of food, and they can starve to death. And that's what bleaching is. So when you hear about coral bleaching, it's this loss of that algae.

*<CLIP> Roxanne-Liana Francisca: So the water right now is at around 29 degrees, which is right below the bleaching threshold. You can already see paling in a lot of the corals.*

BENJI: But in, especially in the Caribbean, you have all kinds of other threats. So pollution, coastal development, all those hotels that are going up, they often get built atop corals. You also see a lot of overfishing. So when you take away fish that eat seaweed for example, seaweed is really harmful for coral. So you remove the fish that eat the seaweed. The seaweed competes with the coral. It's harder for the reef to recover. So there are just like a lot of different things going on in the Caribbean. And it's been a decline for many decades at this point. This is not just climate change. Climate change is just the more modern threat.

SEAN: Did you say, Benji, that coral is an animal?

BENJI: Yes! Ok. Coral is an amazing creature.

SEAN: [laughs] I'm sorry. I've, I've been thinking about this since you said it. And I thought coral was a plant!

BENJI: I know! I mean, I'm glad that you didn't say coral is a rock, because…

SEAN: [laughs]

BENJI: …I think a lot of people think they’re rocks, they kind of look like rocks, especially when they're not super colorful. But yes, coral is an animal, and actually it is a group of animals, so it’s a colony. So when you see, like, a chunk of coral underwater, it's like hundreds or thousands of these little animals that build a colony and they build skeletons. That's like the hard structure of the coral. And those little animals are called polyps. If you look really closely, like under a microscope, they look like little sea anemones. They have tentacles that they use for feeding. But yeah, they're very much animals and I think they're amazing organisms.

SEAN: My mind was just blown by you, Benji. It's an animal! And we're not taking care of this animal. We're letting this animal die.

BENJI: Just one other fun thing. So, so coral needs this, like, symbiotic algae that's inside it, right, as I was mentioning. Coral animals are basically like little farmers. They, like, farm this algae, which they use to create like the sugars they need for energy. So like coral is, is this tiny animal, it doesn't have a brain or anything, but it has like this ability to farm algae, which I just think is, is very cool.

SEAN: Okay, Benji, quite a detour, but I had to go there. Let us get back to Bonaire.

BENJI: Yes.

SEAN: This island you went to in the Caribbean. Before we talk about the reef there, tell me about the island. What's it like?

BENJI: Yeah. Okay. So Bonaire is such an unusual place.

SCORING IN <Montego Bay - APM>

BENJI: So it is this small island not far from Venezuela, like, really far south in the Caribbean. It is Dutch, part of the Netherlands, and it is just half the size or so of Chicago. So, tiny. And one of the things that I love about this island is that on the surface, it's basically a desert. It's covered in sand and red rock, and there are cactuses everywhere, and there are wild donkeys all over the place that, like…

SEAN: [laughs]

BENJI: …were once brought there for some kind of labor. And there are goats. So it's, like, very bizarre on the surface.

SEAN: Wow.

BENJI: There's not much, like, abundance of plant life. It doesn't have a jungle. But then you contrast that with what's happening underwater, which is that there is this incredible, enormous reef that surrounds the entire island. And also the water is so freaking clear. I mean, it is like, it looks like paradise when you are looking at the water. It is this brilliant blue, turquoise-y, ugh, it's so inviting. And you want to be in the water at all times because it is like 100 degrees and super humid and, and it was, yeah, kind of unbearable on land.

SCORING OUT

SEAN: Ok, so the water was inviting you to get in. And you did.

BENJI: And I did, yes. So I was in Bonaire for about a week. I went diving with an underwater photojournalist, Jenny Adler, every day basically.

*<CLIP> Jenny Adler: Hey Benji.*

*Benji: Hey.*

*Jenny: How you doing.*

BENJI: And we went diving up to three times in a day. So it was super exhausting, but amazing because we got to see so much while we were underwater. And we really wanted to understand, like, A, how healthy is this reef? B, why is it healthy? And then like, C, are there lessons to take from this reef that will apply to coral reefs elsewhere that are really struggling to hold on?

SEAN: What did you find?

BENJI: So, what I love about Bonaire is that you don't need a boat to go out. You can just get a bunch of tanks full of air, which a lot of the hotels actually offer. Like, you have all your dive gear rented or you own it. You drive out. You park your truck…

<SFX> car door closes

BENJI: …you put on your gear, you wade into the water, kind of like walking over a minefield of sea urchins…

<SFX> fade in sfx of Benji above water

BENJI: …and coral that's really close to shore. And then…

<SFX> Benji: You ready?

BENJI: …you sink down…

SCORING IN <Coral Sea - APM>

<SFX> Benji: Yup!

BENJI: …and really just like, right from the start of the dive…

<SFX> Benji breathing through scuba mask

BENJI: …you can see what makes this place so special. The best way to describe what you see is, like, an underwater rainforest. I mean, that really is what it, what it looks like. You have all kinds of different shapes and colors, just this incredible diversity of life. And I just love it because it feels like you are this alien creature that is like sneaking into this other world, this, like, other universe. One of my favorite things that I saw on these dives was a baby trunkfish. They look a little bit triangular when they're adults, but when they're babies, they're just like little tiny spheres that are polka dotted. They can barely swim. They look like little marbles, just like moving around the water. Just so uncoordinated, but so cute because they're just tiny little balls. Anyway, I love that. There were eels. Like giant moray eels, six feet, seven feet long. We saw a hammerhead shark. We saw a hawksbill turtle, which are endangered across the Caribbean. So just like so much in front of you. And, like, the shapes of coral are really, really diverse too. Like some of them are these giant cones. Some of them look like stacks of dinner plates, some of them look like fingers sticking out of the ground. And it's amazing to think that each of those structures is a colony of animals. In many cases, those animals are, like, hundreds and hundreds of years old because coral grows really slowly. So that was like the cool part of the dives.

SCORING BUMP

BENJI: On the flip side, we saw some of the same problems that reefs elsewhere in the Caribbean are experiencing. So some of the coral was starting to pale, which basically is the step before it bleaches. It's like a desaturation of the color. And then we also saw something even more alarming, which is the spread of a very, very dangerous and damaging disease that has been wreaking havoc across the Caribbean, and it hadn't been to Bonaire, has now arrived on this island where the coral is so abundant and healthy. And so this kind of pinnacle of marine health, what a reef should look like, is now at risk of this really, really dangerous wildlife disease that is starting to spread across the island.

<SFX> scuba bubbles fade out

SCORING BUMP

SEAN: Benji is going to tell us about this disease when we're back on *Today, Explained*.

[BREAK]

[BUMPER]

*<BUMPER> The Little Mermaid - Under the Sea*

*Up on the shore they work all day*

*Out in the sun they slave away*

*While we devotin’*

*Full time to floatin’*

*Under the –*

SEAN: *Today, Explained* is back with Benji Jones from Vox. Benji, you were saying that there's this disease spreading throughout the Caribbean right now, and it's just now arriving to the coral in Bonaire?

BENJI: Yeah. That's right. So, coral is an animal as I mentioned. And like other animals that means that coral can get sick. And in the past, coral has faced a number of different diseases. And the one that we're seeing right now is a disease called stony coral tissue loss disease. Scientists refer to it as SCTLD [skittle-D]. And it is super dangerous. So it's been around since 2014. So it's had a decade to spread around the Caribbean and it's gone from island to island. And it basically is liquefying the coral animals from the inside out and causing them to die extremely quickly. And so there is so much fear that it was going to make it to a place like Bonaire, so known for its healthy reef and as a tourist destination for diving. And yeah, it did. It arrived in the spring of 2023. So last spring, and it has been already devastating in the short amount of time it's been there.

*<CLIP> Jeannine Toy: SCTLD it’s a very fast killing disease of the corals. A lot of the other coral diseases can take a lot longer to kill one coral head. SCTLD will kill it within a matter of days or weeks.*

SEAN: SCTLD? It sounds colorful. Is it, is it nice to look at?

BENJI: [laughs] Yeah, it's like the opposite of that. It actually like…

SEAN: Oh…

BENJI: …sucks the color out of coral, so…

SEAN: Nooo!

BENJI: [laughs] Yeah. So like corals that are infected with SCTLD, the soft tissue of corals starts to dissolve. It, like, pulverizes the innards of these animals and it, like, kills off the algae that they are dependent on. So they lose the symbiotic algae that gives them color. So where you see SCTLD spreading on a coral, you see this like white wave start to wash over the coral, and then that white gets, like, colonized by seaweed. And so it starts to turn green. So it's like it's not a pretty sight. Once you know what to look for, you start to really recognize, like, these, they call them lesions, developing on corals all over the reef.

SEAN: Where does this disease, SCTLD, come from?

BENJI: Yeah. So that's like one of the many mysteries of this illness. Scientists think that it stems from Florida. That was where it was first observed around Miami. But it's not clear, like whether this came from dredging the ocean floor, which they did to create the Miami harbor, or if it just was already spreading elsewhere, and all of a sudden became dangerous, like, they don't know. And among the other things they don't know, scientists don't know, is what it is. Is it a bacterium? Is it a virus? Is it something else? Is it a combination of bacteria and virus? Like, that's also a total mystery, which doesn't make it easy to treat.

SEAN: Do we have treatments for it or is it a mystery as well?

BENJI: It's a really difficult question because first of all, even if you know what it is, you’re talking about trying to treat something out in the ocean under water, and it's in the wild. It’s totally different. And that's what scientists have been working on for a while. And there actually is a solution to this problem that seems to be effective, which is essentially antibiotics.

SEAN: Hm.

BENJI: Not only antibiotics, but like the same antibiotics that humans use to treat human illnesses.

SEAN: Which makes sense because we're both animals, us and the coral.

BENJI: We're both animals! One of the many things we have in common with coral. But yeah, basically what scientists have figured out is that you can mix a powdered version of amoxicillin which you would take as a human to treat like pneumonia or other bacterial infections. You can mix that amoxicillin with this paste that looks like toothpaste. And it's super sticky and it apparently sticks under water. And what scientists will do and I got to see this, which was very cool, is they'll have this, like, antibiotic toothpaste that they will bring with them on a dive. And while they're going around the reef, they'll find a coral that has an infection with SCTLD, and they will squirt some of this paste into their hand and then literally, like, press it onto the coral body…

SEAN: Hm!

BENJI: …where the disease is spreading. And like seven times out of ten or something, it seems to actually stem the spread of this disease.

*<CLIP> Jeannine Toy: And our goal in general is not to treat every single coral. Our goal is to treat enough corals so that when they spawn they can have that resilience and they can breed for more resilient corals, we’re not trying to treat every single one.*

SEAN: Wow. Sounds miraculous. Are there downsides to just spreading antibiotics all over coral in the sea?

BENJI: I mean, maybe? Like, that is also kind of a question mark. So some scientists are worried that just like we hear about antibiotic resistance, there is some concern that the same thing could happen with the corals, where if you put antibiotics on them all the time, especially like a really general antibiotic, like amoxicillin, you could see antibiotic resistance, but the real concern there is just that, like, the treatment won't work as well.

SEAN: Well, what do we do? Can we like arm fish to do this for us? How do we…

BENJI: [laughs]

SEAN: How do we apply the sort of turnaround in Bonaire to, to the Great Barrier Reef or to Florida where they've already lost a ton of their reef, or, or anywhere else?

BENJI: Yeah. No. Okay. This is a very important question because, like, this disease is really widespread in the Caribbean. And there's also a concern that it's going to spread to the Pacific where like the Great Barrier Reef is, the largest barrier reef in the world. And the disease is like moving towards the Panama Canal, which is how it would get to the Pacific. And Bonaire is kind of an example of how it is getting closer and closer. So it is…

SEAN: Hm.

BENJI: …super scary. So yeah, so antibiotics is one approach. It does work. It literally requires divers to give corals antibiotics like one by one. So very labor intensive. Another approach is probiotics which is like very, even, like, sounds higher tech it kind of is higher tech. So basically what scientists do is they…

SEAN: Give them kombucha?

BENJI: Basically like take a thing of kombucha and dump it into the ocean, and, and they're healed.

SEAN: [laughs]

BENJI: No, I love that idea. But sadly, that, I don't think that'll work. But, basically what the scientists are doing is they are trying to identify corals that seem to be resistant to SCTLD, they seem to be resistant to this disease, and they think that some of that resistance might be in, like, the microbiome of the coral.

SEAN: Hm.

BENJI: So there's like so much crazy stuff going on that we just can't even, we can't see it all. We don't understand. Coral are not that well studied, but they have microbiomes like we have microbiomes, which implies that there are certain bacteria or certain microbes of other kinds that are in some ways like helping certain corals resist this disease. So the scientists are then trying to identify those, like, disease-fighting microbes, and then inoculate wild corals with those…

SEAN: Hm!

BENJI: …to prevent the spread of SCTLD on, like, otherwise healthy corals. And there's some evidence so far suggesting that this at least works in the lab. It's like another question about whether, again, you can do this on a large scale underwater in, like, the open ocean where everything is connected, like, it is just kind of a nightmare to do these kinds of treatments. And there are a couple other ways that scientists are trying to save reefs in the short term.

SCORING IN <Carousel of Bubbles - APM>

BENJI: So, one of them is restoration. So scientists actually take little bits of coral, like baby corals. They grow them in nurseries sometimes on land, sometimes in the water. And then they plant them like you might plant like a sapling in a forest. They plant them onto the reef to help a reef recover.

*<CLIP> Roxanne-Liana Francisca: So we also want to really try to focus on finding these corals that are potentially resilient to stony coral tissue loss disease, so that when we move into more reef restoration and ecosystem restoration activities, basically these are going to be the forefathers of the reef that we're hopefully going to have in 30 years.*

BENJI: So that's one of them. And then there's also efforts to build, like, a coral ark. So trying to preserve every type of coral that we know exists today in like a laboratory setting that is super safe from hurricanes, from bleaching, that's not going to be impacted by what's happening in the wild.

*<CLIP> Roxanne-Liana Francisca: So that basically means taking coral fragments, pulling them out of the water and then keeping them somewhere for safekeeping for the future.*

BENJI: So when the time comes, when the oceans are cooling off, which hopefully will happen, you can take samples from that ark and put them back onto the reef.

SCORING OUT

BENJI: All of these approaches are great. Like, it is worth doing this kind of work because it is saving individual corals that might otherwise die, like, every coral saved as a coral that could potentially harbor wildlife that could potentially help safeguard coastlines. But yeah, ultimately, like, this is not going to save reefs in the long term. It's just a way to, like, prevent them from dying as quickly. And I know that sounds super bleak, but it is actually kind of a key point here, which is that the work that scientists are doing and that conservationists are doing is helping reefs hold on for longer, until the kind of bigger solutions come into place. And the most important one, and like, I cannot stress this enough, and I know it has been said before, but like it's just reducing climate change, reducing emissions that cause it. Like, that is the only way to ultimately save these reefs, because that's just going to get worse and worse. And reefs don't stand a chance unless climate change is figured out. And unfortunately, like that is very much an open question if we're going to be able to figure that out.

SCORING IN <Subaquatic Dream - APM>

BENJI: Coral reefs are just, like, magical places. Like, they are just so full of color and life. And so to be down on a reef, you're just completely removed from, like, the negative aspects of life and totally immersed in this wondrous place. Everything is connected and you get to see that in real time. And so, like, these, like, little translucent shrimp that are hiding inside sea sponges which are built atop coral. Like, really, really cool. I saw, like, conchs, those like giant sea snails with their little eyes poking out. They look like cartoons. They're amazing. Like, we came across a turtle sleeping. Like it's just. It really is this other world. And yeah, I know that it's a privilege to get to dive, but I really encourage everyone to just at least get a chance to snorkel somewhere, because it really is a special experience.

SEAN: Well, invite me the next time you go, Benji!

SCORING DIPS OUT

BENJI: We should dive together. It's actually less scary than it sounds.

SEAN: I'm more of a snorkeling guy.

BENJI: I get that. It is a little scary when you're like, wait, I'm a human, and I'm very much not designed for this world.

SEAN: I'm going to let you do all the diving, but I'll, I'll hang out at the surface and watch you.

BENJI: Fair enough. I will let you hover above me.

SCORING RETURNS

SEAN: Benji Jones! Read about his trip to Bonaire at Vox dot com.

His piece is titled “These beloved sea creatures are dying. Can human medicine save them?”

You know the answer, but there are some fun underwater images you didn’t get to see on the show today.

Our show today was produced by Avishay Artsy. We were edited by Amina Al-Sadi, fact-checked by Laura Bullard, and mixed by Patrick Boyd.

The rest of the team includes Haleema Shah, Hady Mawajdeh, Amanda Lewellyn, Miles Bryan, Victoria Chamberlin, Peter Balonon-Rosen, Andrea Kristinsdottir, Rob Byers, and the host with the most, Noel King.

Our supervising editor is Matt Collette.

Our Executive Producer is Miranda Kennedy.

We use music by Breakmaster Cylinder.

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[10 SECONDS OF SILENCE]