Video Transcript: Deep Reef Biodiversity – Exploring the Unexplored

Maggy Benson: The ocean covers more than 70 percent of the Earth, yet it is one of the least explored areas on the planet. Why? Most of the vast watery world is cold, dark, and under high pressure, which makes it difficult to study. Since the beginning of ocean exploration, scientists have used and created technologies, like scuba, to better understand deep ocean life. These days scientists are still scuba diving, but have new tools, like underwater vehicles and submersibles, to help them explore ocean depths. Today, we'll learn more about the way scientists are exploring the ocean and discovery new life when we meet with Smithsonian ichthyologist, Carole Baldwin.

Maggy Benson: Hi. Thanks for joining us. I'm Maggy Benson, host of Live From Q?rius, Smithsonian Science How. We have a great show for you today, but before we dive in, I want to ask you a question. You can respond using the poll that appears to the right of your video screen. Do you think there are new species of fishes still to be discovered on coral reefs? Of course, no way, maybe you're not sure? Take a moment to think about it, and put your answer in the window to the right. Our results are still coming in, so let's go to our live guest. Today, we have with us Dr. Carole Baldwin, a systematic ichthyologist from the Smithsonian's National Museum of Natural History. Thanks for joining us, Carole.

Carole Baldwin: Thanks for having me.

Maggy Benson: Systematic ichthyologist, that is a mouthful. What is that?

Carole Baldwin: It sounds kind of icky, doesn't it?

Maggy Benson: Yeah.

Carole Baldwin: But it's actually a fascinating field of study. Ichthyology is the study of fishes, and systematics is the study of the diversity of life and how it's related. I study the diversity of fishes, and I'm especially interested in coral reef fishes.

Maggy Benson: Wonderful. So, given that you study the diversity of fishes, you'll like our poll answers. 100 percent of our viewers think that there are new species to be discovered on coral reefs.

Carole Baldwin: Yay.

Maggy Benson: What do you think about that?

Carole Baldwin: The viewers are right. Despite the fact that ichthyologists have been studying the diversity of fishes on coral reefs for about 200 years-

Maggy Benson: Wow.

Carole Baldwin: and there are still a lot of new species to be discovered. This is particularly true of deeper reef areas that haven't been well explored.

Maggy Benson: Why haven't they been explored that well?

Carole Baldwin: Well, we typically study coral reefs using scuba gear, but standard scuba gear only allows us to go down to 120, 150 feet or so. These deep reefs can occur much deeper, down to 1,000 feet or more. There are deep diving submersibles that will take scientists really deep in the ocean, even all the way to 36,000 feet.

Maggy Benson: Wow. That's deep.

Carole Baldwin: Yeah. That's as deep as you can go. But history shows that if scientists have access to these deep diving subs, they don't typically stop at 300 feet or 800 feet or so, so there's this zone in the ocean between about 200 and 1,000 feet that science has largely missed. It might be home to a lot of diversity that we still don't know about.

Maggy Benson: Is there a specific habitat that you're looking at in that range of 300 to 800, 1,000 feet?

Carole Baldwin: Yes. Specifically what are known as deep reefs. Deep reefs are just natural extensions of shallow water coral reefs. As I mentioned, they may go down to 1,000 feet or more. These aren't long barrier reefs, like you might find in shallow water. They're usually patched of reef, but just like the reefs in shallow water, the deep reefs are home to sponges, corals, fishes, lobsters, crabs, you name it, so the same players in shallow and deep, but the species are typically different.

Maggy Benson: So, you mentioned that scuba diving only gets you so far. How are you actually studying these deep reefs?

Carole Baldwin: Well, at one site in the Southern Caribbean I have access to a mini submarine that's called a submersible. This is the Curasub Submersible, and it's capable of going to 1,000 feet. In fact, it's restricted to 1,000 feet, so that's a good thing. It forces us to stay in this zone that we've missed in the past. But this is a fabulous vehicle. It has a big window in the front, so I can look directly out onto to the deep reefs.

Maggy Benson: That's very cool. It's docked in Curacao. Is this it right here?

Carole Baldwin: Yeah. That's it. It's housed in a garage. When it's time to dive, they wheel it out and lift it with a crane. You can see there that they just swing it over and then lower it into the water, into boat slip that's designed especially for it.

Maggy Benson: It looks like a big toy.

Carole Baldwin: It does. A big bathtub toy. Right. The hatch door that you can see people getting in there, you go in through the top, and that orange hose that they're putting in there, that's air conditioning. Yeah, which is a good thing, because it gets kind of warm in the sub when you're sitting at the surface. You cool down some as you go, but they try to keep us cool at the surface. Then when the hatch door is closed, the sub starts motoring out. It'll blow off some air to try to sink the sub a bit, so we can descend and head down to the deep reefs.

Maggy Benson: So, what's it like inside the sub?

Carole Baldwin: The sub holds five people, four passengers and a pilot, so two people lie on their stomachs in the front of the sub, and they look out of hat big window. Then the pilot sits on a bench between their legs. Then there's a bench behind the pilot, where two people can sit, and there's a porthole on either side that they can look out of.

Maggy Benson: Very cool. You study fishes. What kind of fishes are you looking for in these deep reefs?

Carole Baldwin: Well, I'm really just trying to document what species do live there, and some of the things I'm finding are species that we already know exist, but maybe we don't know very well, but more importantly, I'm finding a lot of new species, and those are species that science didn't know existed.

Maggy Benson: How do you know it's a new species? Can you tell how it looks?

Carole Baldwin: Well, sometimes we can go by how it looks. Particularly, color patters often allow us to recognize a new species. If you look on the screen now, we thought there was one species of banded basslet on the deep reefs off of Curacao, but the pictures there, you can clearly see that there are two species. The one on the top has orange on the fins, and the one on the bottom has yellow, and the pattern of the black markings is different in the two.

Maggy Benson: So, which one of those was the new species?

Carole Baldwin: Well, we think the one on the top is the new species. That's because the original description of the banded basslet included an illustration that looked a lot like more like the one on the bottom. But it's an interesting find, because although both of those species are living on the deep reefs off of Curacao, they're not living at the same depths. The one on the top lives between about 200 and 400 feet, and the one on the bottom between about 400 and 600 feet. So, it's not just a matter of shallow reef diversity versus deep reef diversity. This deep reef is actually broken up into depth zones, each of which has its own inhabitants.

Maggy Benson: Wow. That's so interesting. We already have a student question. Are you ready to take it?

Carole Baldwin: Okay. Sure.

Maggy Benson: This is a really great one coming from Ben. Ben wants to know, "When do you use the two plural forms of fish, fish versus fishes?"

Carole Baldwin: Oh, Ben. That's an excellent question. If you're talking about more than one species, you refer to them as fishes. If you're talking about a single species, you use fish. If you have an aquarium that has all of one species, that's an aquarium of fish, but if you have a bunch of different species in that aquarium, then it's an aquarium of fishes. Even your English teachers probably don't know that, so you can teach them something new today.

Maggy Benson: Perfect. You talked about how you can tell the difference between those two species that we just saw, those banded basslets, why the color patterns. Are there any other tools that you bring to the table when color pattern doesn't help you tell?

Carole Baldwin: Sure. Sometimes we use DNA. One time DNA allowed me to identify seven new species of a little blenny fish from the genus Starksia.

Maggy Benson: They're very pretty.

Carole Baldwin: They are. Yeah. The particular DNA tool that we're using is called DNA barcoding, and this involves taking a small piece of muscle from the fish and then producing a short DNA sequence that's called the DNA barcode. Every species has a unique DNA barcode, so it's sort of like going into your grocery store. Every product has a barcode, and when you get to the checkout counter and scan that barcode, information about what the product is and how much it costs come up. But for me the fish DNA barcodes can help me figure out what species I have or how many I have.

Maggy Benson: That's very cool. So, you are able to identify these seven with seven very unique barcodes of their own.

Carole Baldwin: Absolutely. Each one has a unique barcode.

Maggy Benson: Very cool. So, I see these fish here that you're studying, and I know that you're being able to actually research them in a sub. How do you get the fish if you're inside of a sub?

Carole Baldwin: Oh. That's a good question, because I can tell you, often you want to just reach your hands out and pick up things, but it's a little more challenging collecting with a sub. The Curasub is equipped with a lot of tools that we can use to collect organisms. For things like sea stars, or sea urchins, or sponges that don't move or move very slowly we can just scoop them up with a basket in the front. For collecting fishes we take advantage of the sub's two hydraulic, robotic arms. One of them has a green hose that can eject a substance called a fish anesthetic,

and that makes the fish sleepy. When they start to nod off, then we can bring the other robotic arm in that has a blue suction hose and pick them up. Then they go into that hose, and around, and into a collecting canister at the bottom. So, when we come up in the sub and come back to the surface, we can take that canister of things we've collected, as well as things that are in that front basket, and take everything to the lab.

Maggy Benson: Then what happens in the lab?

Carole Baldwin: Well, we try to identify everything as best we can. We measure specimens. We label them. We take a tissue sample for DNA analysis, and very importantly, we take a color photograph, so we can document the living color pattern.

Maggy Benson: So, how do you decide when you're in the sub which fish to collect?

Carole Baldwin: Well, we try to be very conscientious about only taking what we need. We're trying to get at least one specimen of every species that lives on these deep reefs, but ideally we'd like to have more than one, at least a few. That's so that we can get a handle on variation within a species. Organisms that live in the ocean are just like humans. If you look around you, the people around you probably don't look exactly like you. The same is true of fishes and other organisms, so if we get a few specimens, that helps us look at the variation within a species.

Maggy Benson: Once you collect them and you process them in the lab, is that it, or do they go somewhere else from there.

Carole Baldwin: Well, after we're done with them in the lab, then we carefully pack them up, and we ship them FedEx back here to the Smithsonian. Actually, that's the same way that the nation's T-Rex came here last week.

Maggy Benson: Wow. Good delivery system.

Carole Baldwin: It is. When they get back here, then I unpack them and put the specimens in jars of alcohol, and take them, the fish specimens, to my lab to study them in more detail. Then after that, they become permanent parts of our biological collections here.

Maggy Benson: Why would we want to keep them permanently though?

Carole Baldwin: Well, the Smithsonian's biological collections are literally libraries of life. If you go into a library, and you take a book off of a shelf, you can look at the book and see who wrote it, when they wrote it, how many pages it is, what its catalog number is, what it's about. In the same way, I can go into our fish collection, take a jar of fish, and look at the label, and see what its catalog number is, what it is, who collected it, when they collected it, how they collected it, a lot of

information. We have about four million preserved fish specimens in our Smithsonian . . .

Maggy Benson: Wow.

Carole Baldwin: . . . fish collection.

Maggy Benson: That's a lot.

Carole Baldwin: It is. In fact, that's about the same number of people that live in the city of Los Angeles, so that's a lot of preserved fish specimens. But these collections are priceless. I mean, they give us an incredible record of what lives where, and we can use that to detect changes in populations in the future.

Maggy Benson: So, I see some of these specimens that you brought here, part of our collection, are from Curacao. Can you tell us about Curacao and the work you do there?

Carole Baldwin: Sure. Curacao is a Dutch island in the Caribbean, in the very southern part of the Caribbean. In fact, if you stand on the south coast of Curacao on a clear day, you can see Venezuela, so it's way down there.

Maggy Benson: Wow.

Carole Baldwin: That's where the Curasub submersible is based that I've been talking about. The sub is based in a complex called the Curacao Sea Aquarium, which is on the screen now. In fact, if you look at that picture, you see the buildings with the orange roofs. That's a hotel, and just right above them, near where that red arrow is pointing, are some buildings with white roofs, and that's Sub Station Curacao, where the Curasub submersible is based. That red arrow shows where the sub comes out of the boat basin, and that dark water that you saw right in front of the aquarium is deep. Those are the deep reefs. You can see how close it is, so within minutes of climbing in the sub we can be at those deep reef depths.

Maggy Benson: So, who are the we? Who are you doing this with? Are you working alone or with others?

Carole Baldwin: No. We have quite a big group of people. In 2011, I established a new Smithsonian research initiative called DROP, Deep Reef Observation Project. We have about 20 Smithsonian marine staff who are part of DROP. We're not just studying fish life. We have scientists who are studying sea urchins, sea stars, mollusks, hermit crabs, algae, you name it, pretty much everything that lives down there.

Maggy Benson: Have you found anything? What kind of discoveries have you made?

Carole Baldwin: Yeah. So far, we have about 30 new species of fishes and invertebrates.

Maggy Benson: Wow.

Carole Baldwin: What makes that remarkable is that the study area, this area where we're sub diving, right in front of the Curacao Sub Aquarium, is small. It's only about one tenth of a square mile. But remember that we're focusing on this zone that science has largely missed in the past, so it's not too surprising that we're finding some new life.

Maggy Benson: So, we want to learn about some of these fish specimens that you've brought here. Can you tell us about this one in particular?

Carole Baldwin: Sure.

Maggy Benson: It's very cool.

Carole Baldwin: This is actually something called a sea toad. It is a very colorful fish in life. It's yellow and pink, but it's related to ... Actually, you can see the colors on the screen now.

Maggy Benson: Oh. It's beautiful.

Carole Baldwin: It is a beautiful fish. Unfortunately, when we put things in ethanol and alcohol, they lose all those colors, so that's another reason why we take those color photographs before we preserve the specimens. This fish is actually related to a fish that I bet the students are familiar with, and that is the angler fish, the deep sea angler fish, the one that has the lure coming off of its head with the luminescent tip.

Maggy Benson: Oh, yeah.

Carole Baldwin: If you look very closely at this, you can see the lure on this one here. It's very short on this, and it's not bioluminescent, but it does have its own little lure. This is a relative of the angler fishes.

Maggy Benson: That just black area actually stays preserved in that?

Carole Baldwin: Exactly. Yeah. We lose all the yellows, and oranges, and reds, and blues in the fishes, but the black, which is melanin, is retained in preservative.

Maggy Benson: I see that you have another fish right here that looks really interesting, and it has a cool color pattern. Can you tell us about it?

Carole Baldwin: Yeah. I'm gonna pull this one out actually, so you can get a better look at it. So, this is a relative of a flounder. It's a type of flat fish. We don't know yet whether this is a new species or not. It looks very similar to a flat fish that is found on shallow reefs, but that one is restricted to about 70 or 80 feet. We found this one at 500 feet.

Maggy Benson: Wow.

Carole Baldwin: That's a big difference in the depth range. We're gonna get the DNA data back for this specimen next week, so-

Maggy Benson: So, next week you'll know if this is a new species or not.

Carole Baldwin: We should know, because we have a DNA barcode from the shallow species, and so we can compare it to the one we get from this, and we should know whether or not they're the same or we have something new here.

Maggy Benson: That's really exciting. Can we stay in touch with you and let our viewers know if this is actually a new species or not?

Carole Baldwin: That would be fun. Sure.

Maggy Benson: Wonderful. So, do you expect to find more new species and rare species in your research?

Carole Baldwin: We do, and in part because the owner of the Curasub submersible has bought a big research ship. He can now carry the sub on this ship. He put a crane on it. The crane can lift the sub off of the ship and place it in the water. I mentioned how many new species we've been finding in this tiny plot of water right off the aquarium. I think you can imagine if we start moving this sub around to different deep reefs in the Caribbean, that we're gonna find a lot more.

Maggy Benson: A lot of discoveries to be made.

Carole Baldwin: There are.

Maggy Benson: How much fun. I can't imagine that you always have a ship and a submarine at your disposal. Do you do any research in shallower water?

Carole Baldwin: I do. In fact, prior to beginning the deep reef work off of Curacao, almost all of my research was based on shallow reefs, so I had the chance to work in the Galapagos Islands, Belize, Central America, Tobago, Trinidad, or Trinidad and Tobago, Turks and Caicos, a lot of wonderful places.

Maggy Benson: That sounds great.

Carole Baldwin: Yeah. But I'm not just interested in the adults of reef fishes at these places. I also specialize in the study in the young or larval stages of fishes.

Maggy Benson: So, do you have any examples to show us today?

Carole Baldwin: Yeah. Oh. Actually, there's one on the screen now. This is a lovely larval sea bass, only about an inch in length, that was taken on a plankton net off of Florida.

Maggy Benson: What species is it?

Carole Baldwin: Well, that's an interesting story. You know, I mentioned earlier that you can sometimes distinguish species by their color patterns, and that larva has a cool color pattern.

Maggy Benson: It was beautiful.

Carole Baldwin: Yeah. But unfortunately, for identifying larval fishes the color pattern doesn't help us. That's because the color patterns in the larval stages and the adult stages are different.

Maggy Benson: I think we should challenge our viewers right now and actually ask you what species you think this is. We have another poll up for you. Which larval fish do you think matches with the adult fish? Take a moment to think about it, and put the answer over to the right. Again, match this larval fish to its adult. So, Carol, the results are coming in, and people are split between A and D. What do you think the answer is?

Carole Baldwin: Well, I know what the answer is, and it's D, so congratulations to those of you who got it, but I think you can see why it wasn't obvious to us when we first got that larva what adult it would grow up to be. In fact, the story's even more interesting, because that adult, that sea bass that was in D, that you see on the screen now, that's actually one of our new species from deep reefs off of Curacao. We collected it at about 600 feet. So, it's just remarkable that we were able to match this larval fish from Florida to a new species of adult from deep reefs all the way across the Caribbean Sea, living off Curacao.

Maggy Benson: I mean, why does that larval stage look so much different from the adult stage?

Carole Baldwin: Well, for marine fishes, regardless of where the adults are living, they typically have their egg and larval stages in the surface current. They broadcast spawn, and the eggs go up to the surface. The larvae hatch out, and they drift along in the surface currents. The surface currents are a dangerous place for a little, tiny fish to live. There are a lot of predators out there. It's a completely different environment from where the adults are living, and they've evolved adaptations to survive that period that they're in that surface currents.

Carole Baldwin: The larval fish that we had up there, you may have noticed the elongate fin rays on the dorsal fin. We don't know precisely what those are for, but they certainly make that fish look bigger. It may be enough to deter certain potential predators. Also, some of those fin rays are encased in a sheath that have some

pigment spots on them, and they kind of look like jellyfish tentacles. It may be that this larval fish is actually mimicking a jellyfish as a way to avoid predation.

Maggy Benson: Great adaption. I'm a scuba diver myself, and I've seen this fish here on the table, the lionfish, while I've been diving. Has it been collected from Curacao?

Carole Baldwin: Yes. That's another interesting story. The lionfish are actually from the Indian and Pacific Oceans, and that's where they belong, but in the early 1990s, the lionfish were introduced into the Atlantic off of Florida. They're popular aquarium fishes, so we think they just got released from and aquarium. But they didn't stay in Florida. They moved north, up to Rhode Island, south, through the Caribbean, to South America, and west, all the way to Central America.

Maggy Benson: So, why are you studying it if it's not native to the Caribbean and it's not a new species?

Carole Baldwin: Well, I'm worried that the lionfish may be impacting the deep reefs. These are voracious predators. They can eat a lot of fish in a short amount of time. Although they're shallow fish in the Indian and Pacific Oceans, off Curacao we found them all the way down to 500 feet.

Maggy Benson: Wow.

Carole Baldwin: I'm worried that these predatory, invasive species are sitting down there on these barely explored deep reefs gobbling up biodiversity before we even know it exists.

Maggy Benson: That would be a big problem. How is your research helping to inform this problem?

Carole Baldwin: Well, we had our research plan, which was to go and collect lionfish with the sub on deep reefs, the same way we do other fish, which is to hit them with the fish anesthetic, and then when they get sleepy, suck them up with the suction tube, but it didn't work. Actually, you can see in the video right now, that fish is just swimming away from us. They wouldn't swim fast, but they would just never stop long enough for us to collect them. Actually, that one just ate something even while we're chasing him. One of the sub-pilots came up with a plan to spear lionfish with the sub, and you can see the spear on the right side of that basket on the front of the sub. The sub's getting very close to a lionfish. When we get close enough to it, they're gonna pull the trigger on that spear, and see if we can get him that way. There. Got him.

Maggy Benson: Got him.

Carole Baldwin: Not your typical use of a submersible-

Maggy Benson: Wow.

Carole Baldwin: ... but it does work to spear lionfish with the sub.

Maggy Benson: It takes some ingenuity. So, what are you doing once you pull those back up into your lab?

Carole Baldwin: Well, we cut open their stomachs and take out the gut contents. Even if they're partially digested, we can still get a piece of tissue and DNA barcode them. Because we have this database of DNA barcodes of what we've already collected, we can look at the barcodes of the stomach contents and see if they are known species or things that we don't know yet.

Maggy Benson: So, you're able to discover their impact really.

Carole Baldwin: Exactly. We're just starting this work, so stay tuned. We're gonna be targeting a lot more lionfish. We've only looked at the gut contents of a few so far.

Maggy Benson: Wonderful. Okay. This one comes from Emma. Emma wants to know, "How many fishes have been discovered by your group?"

Carole Baldwin: Oh, Emma, I think of the 30 new species that we've discovered through the DROP Project in Curacao, about two thirds of those are fishes, so that's a lot.

Maggy Benson: Wow. That's wonderful. Guy from Alexandria asks "Why did you become a systematic ichthyologist?"

Carole Baldwin: Oh, Guy, that's a good question. Well, you know, I didn't know that I wanted to be a marine biologist when I was young, but I did grow up in coastal South Carolina, so I developed an early love for the ocean. My dad was a big fisherman. I have a twin sister, and she and I grew up fishing with dad. I think that fish and the ocean was sort of in the blood from an early age.

Maggy Benson: This is a great question from Peyton. Peyton wants to know, "What are the scientists doing to get rid of the lionfish?"

Carole Baldwin: Oh. That's an excellent question, Peyton. Well, the main thing that people are doing are having these what they call lionfish roundups. They get as many people together as possible, and they go out spearing lionfish. They just spear as many as they can, but I think you can imagine that has a pretty local impact. I think in the future, the best way that we're gonna be able to get rid of these lionfish is to eat them, because I don't think we mentioned earlier that ... Oh. There was a great picture of a lionfish sashimi.

Maggy Benson: That looks delicious.

Carole Baldwin: It is. It's a delicious, white, tasty fish. It's good as sashimi, as ceviche, or pretty much any way you want to cook it. I think going forward trying to get lionfish on

the table as a commercially harvested sea food is gonna be the best way to control their populations.

Maggy Benson: I'll eat it next time I see it on a menu.

Carole Baldwin: Definitely.

Maggy Benson: Jacob wants to know, "How do you prevent other fish from getting sleepy from the fish anesthetic?"

Carole Baldwin: Ah. Well, Jacob, you don't. If your anesthetic happens to hit other fish and they get sleepy, you just leave them alone, because within a couple minutes they'll wake back up, and they're fine. The only problem we've had with the fish anesthetic is that sometimes the fish that we're targeting, when they get sleepy, we have other fish come in and try to eat them. This is particularly problematic with some of the big snappers down there. They will actually follow the sub around. They've learned that when we're down there that we're often making fish accessible for predation. We've tried all kinds of things. We've been taking laser pointers and shining them out of the sub window to try to distract the snappers from-

Maggy Benson: Kind of like a kitten.

Carole Baldwin: Exactly. Right.

Maggy Benson: This one comes from Ryan. Ryan wants to know, "Is pollution affecting reefs that are further down the water, rather than just the shallow reefs?"

Carole Baldwin: Oh. Ryan, that's a great question. The answer is we don't know. In fact, in addition to the biodiversity studies we're doing in Curacao, we've also started some long-term monitoring, because as you mentioned, we know that pollution has impacted shallow reefs, but what's happening on deep reefs? We don't know. We've started some long term monitoring of biological and physical conditions on deep reefs that we hope will go for decades, and we'll be able to answer your question.

Maggy Benson: So, we see something up on the screen now. What's that?

Carole Baldwin: Oh, yeah. That's one of our temperature loggers or basically a thermometer. We deployed 11 of those off Curacao between 50 and 800 feet. They're out there right now. Actually, on the screen is year one temperature data. We have these loggers out there taking temperature at these 11 depths every minute. Every year we go and pick them up and bring them in. You saw the data on the screen. Those temperature loggers are meant to last for several decades. We know that sea surface temperatures are rising, but we don't know what's happening on a vertical reef profile, so our data will tell us that.

Maggy Benson: That's so fascinating. Unfortunately, Carole, we're out of time. Thank you all so much for sending in your great questions. We'll try to answer your questions and post them online in the coming weeks. Can you tell our viewers where to learn more about your research?

Carole Baldwin: Sure. If you want to learn more, definitely visit the Smithsonian's Ocean Portal, Oceans.SI.Edu. You can even search for DROP, if you want to learn more about our Deep Reef Observation Project. I also highly recommend a web bog by one of my colleagues in Curacao, Barry Brown. That's at CoralReefPhotos.com. Barry is a professional photographer, and he photographs not just shallow reef and deep reef things, but also things on land. You can learn a lot about the natural history of Curacao from his blog.

Maggy Benson: We've seen some beautiful images from him today.

Carole Baldwin: You have. Yes.

Maggy Benson: Wonderful. Thanks again. Thank you so much for tuning in today on Smithsonian Science How. If you missed part of this show or want to see it again, it'll be archived later this evening on Qrius.SI.Edu. Carole, thanks again for joining us, and we hope to have you here again on Smithsonian Science How.

Carole Baldwin: Thank you. It was fun.

Maggy Benson: Thanks for joining us, and see you next time.