Video Transcript – Ocean Biodiversity – Discovering Marine Invertebrates

Announcer: Our planet's vast oceans are full of mysteries. In the huge open water, creatures circulate the oxygen and carbon that bigger life forms, including us, rely on. How can we get a closer look into these complex ecosystems hidden below the ocean's surface? [00:00:30] Join us now for a conversation with zoologist, Karen Osborn, as we discover what awaits us in the ocean's depths. Now, here's your host, Maggy Benson.

Maggy Benson: Hi, welcome everyone. Thanks for joining us for another episode of Live From Q?rius, Smithsonian Science How? I'm Maggy Benson. We're really excited about our show today and would like to welcome Dr. Karen Osborn, a marine biologist from the Smithsonian's National Museum of Natural History. Thanks for joining us, Karen.

Karen Osborn: [00:01:00] Thanks for inviting me.

Maggy Benson: So Karen, you are a marine biologist here at the Smithsonian. Can we start off by having you tell us what you do here?

Karen Osborn: So as a marine biologist, I study life in the sea. Mostly, I study animals that live in the midwater, that's the water below the surface and above the sea floor. It's a huge habitat out there, and there's a ton of animals out there that are really interesting.

Maggy Benson: What got you interested in studying the animals in the sea?

Karen Osborn: Well, for a year I lived in Micronesia, which is little islands [00:01:30] between Guam and Hawaii out in the Pacific, and I did a lot of scuba diving while I was there, and I was totally blown away by the amazing diversity of animals. They come in all different shapes, and sizes, and forms, and colors. It was absolutely amazing and I couldn't ... I was just astounded by how they could all be doing essentially the same thing, surviving, not getting eaten, finding what they needed to eat, and reproducing with all these different shaped bodies. I thought it was really interesting and it has kept me [00:02:00] busy ever since.

Maggy Benson: Very cool. So what kind of animals do you study?

Karen Osborn: So I study invertebrates. They're animals without a backbone. Most of the animals you're probably familiar with have backbones, fish and mammals like dogs and cats and cows and things. They all have a hard, bony backbone. The animals I study, they don't have that at all. They have oftentimes soft, gelatinous bodies. They have an exoskeleton, like a crustacean or something. There're jellies, there're worms, there's this huge range [00:02:30] of different-shaped animals.

Maggy Benson: Do you have any examples to show us here today?

Karen Osborn: I do. So I brought a few specimens today. This first one is Parapsurus. It's an isopod that is a crustacean, so it has a crunchy outer shell, long jointed legs, and it's like a roly poly bug. Here, you see it on the deep sea floor walking around.

Maggy Benson: Very cool.

Karen Osborn: These guys are really fun. It's called Parapsurus giganteus. And then we also have Tomopteris, which is a polychaete worm or a segmented worm. And these [00:03:00] animals are absolutely beautiful when you see them alive. They have a long body that can reach up to two feet in length.

Maggy Benson: Wow.

Karen Osborn: They're almost all transparent or they have some kind of color on them. They come in red, orange, and purple. Absolutely beautiful when they swim around. They're really active predators constantly swimming around and looking for what they want to eat.

Maggy Benson: So beautiful. So you said that you study these kinds of animals, invertebrates, in the open ocean. What does open ocean mean?

Karen Osborn: So the open ocean, we refer to it as the midwater, and that's everything below the surface [00:03:30] and above the sea floor. It's a huge amount of space, a huge amount of habitat. It's the largest habitat on earth. It's 99 percent of the living space; it's 320 billion cubic miles.

Maggy Benson: Wow. I can't even begin to fathom that.

Karen Osborn: I don't even know what that means.

Maggy Benson: It's like the whole planet.

Karen Osborn: Yeah, pretty much. It's a gigantic space and there's tons of animals out there, and they're all really interesting, and they're really hard to get to to study. And so there's so much to learn.

Maggy Benson: [00:04:00] So you can't possibly study that entire range, can you?

Karen Osborn: No.

Maggy Benson: Or is there somewhere specific within the midwater that you focus?

Karen Osborn: Well, for my work, I'm kind of constrained by the vehicles that I use or the methods that I use to study the midwater. And so the vehicles that I use, they're

remotely operated vehicles, and they can work from about 200 meters depth down to about 4,000 meters depth. So that kind of limits it a little.

Maggy Benson: It still seems pretty huge. So aside from the vastness [00:04:30] of your study area, what other challenges do you have? I know I myself am a scuba diver and when I dive, pressure is one of the biggest things that we have to learn about.

Karen Osborn: Yeah, when you're a scuba diver, you go down, you feel that pressure in your ears pushing. So what that is, is the water is pressing in and if you have an airspace like the airspace is in your ears or your lungs, it's pushing on that air and trying to compress it.

Karen Osborn: So as you go down through the water column, the pressure increases and increases. Every 30 feet it increases another [00:05:00] atmosphere worth of pressure. So the pressure we feel here at sea level increases another atmosphere every 30 meters. And as you go into the deep ocean, essentially it feels like 50 jumbo jets pressing down on you.

Maggy Benson: Oh my goodness.

Karen Osborn: Imagine the weight of that. It's immense. And so that's what it's doing to our technology. I use remotely operated vehicles, which means that we don't actually go in the vehicles; they're like robots we send down. And so all we have to worry about is our electronics that are on them. We don't have to worry about ourselves, which is a whole other level of complexity, [00:05:30] but our electronics have to either be in pressure resistant canisters or they have to be submerged in some kind of fluid that doesn't compress, like an oil.

Maggy Benson: So they're getting smushed.

Karen Osborn: They're getting smushed just as much, and it's really hard. It's easier to study the surface of Mars than it is to take a vehicle down into the deep sea.

Maggy Benson: Do you have anything to help us understand what pressure does to something?

Karen Osborn: Yeah. So if you take styrofoam down into the deep sea, you can see what pressure does to air spaces. [00:06:00] So here you have a styrofoam head that you would have in a wig shop or something to hold a wig. And so we'll decorate them up, and then we attach them to the outside of the robot and send it down to 2,000 meters or so. And it compresses or crushes all the air out of the styrofoam. And this is what you get when you're done.

Maggy Benson: This teeny tiny little one?

Karen Osborn: This teeny tiny little thing. No air left. That's what happens to styrofoam when there's no air in it.

Maggy Benson: So same with these cups?

Karen Osborn: Yeah. So those are regular kind of 16 ounce coffee cups. We stick [00:06:30] them on the outside of the vehicle, and they shrink down to thimble size, pretty much.

Maggy Benson: Do they get smaller the deeper you go?

Karen Osborn: They will get smaller to a certain point. Like they can't get any smaller. These two little ones in front can't get any smaller than they are because that's just the material. That's all the material that's left. There's no air left in there.

Maggy Benson: So considering this huge amount of pressure that is applied to anything that goes to depth in the ocean, I wonder what kind of animals can actually even live in the midwater.

Karen Osborn: So there's a ton of animals that live out there as long as they don't have air spaces.

Maggy Benson: [00:07:00] Should we quiz your students?

Karen Osborn: Yeah, absolutely.

Maggy Benson: Let's do it. All right, students. Now is a chance for you to participate in a live poll with us. Tell us what you think. What animals live in the ocean's midwater? Dolphins, squid, tuna, or white tip reef sharks? Take a moment to think about it and put your answer in the window to the right. Remember that this is the same place that you can post questions for Dr. Karen Osborn to answer during our live program [00:07:30] today. So Karen, 71 percent of our viewers say squid. What do you say?

Karen Osborn: We have some pretty smart viewers out there. So dolphins and tuna and sharks, they all occur out there in the open ocean as well, but [00:08:00] they tend to live at the very surface in that very top layer, the icing on the cake layer.

Maggy Benson: So the very, very top.

Karen Osborn: Very top, very small portion of the entire ocean that they live in, just at the surface. But organisms like squid or worms, there's whole groups of animals, jellyfish, things like that. We find them all through the water column way down into the deep water.

Maggy Benson: So is there actually an order to the midwater? I mean, if those animals occur in one tiny layer at the top, is the rest of it layered?

Karen Osborn: It is. So the currents in the ocean [00:08:30] kind of set up a multilayered stratification. Think of it like a thousand-layer cake. So the currents are all

moving in different directions, but they all generally move in horizontal planes. And so that sets up a bunch of layers going different directions and animals tend to focus, they live in a certain layer, and they move around with the water in that layer. They don't necessarily move back and forth between layers, although some of them do migrate back and forth.

Maggy Benson: So it's actually really structured [00:09:00] out there. It's not just like a mishmash of animals out there in the ocean together.

Karen Osborn: Absolutely.

Maggy Benson: Do you have any examples of any animals that live in one very specific area?

Karen Osborn: Yeah. So most animals have about a 200-meter-depth range to a thousand-meter-depth range. We'll find them in that kind of an area. But one of the animals that I worked on at one point was called Hastigerinella digitata.

Maggy Benson: I can't repeat that.

Karen Osborn: It is foram, which is a single celled animal. [00:09:30] They're super abundant out there, but when we went to look for them, we found them all at 300 meters. About 98 percent of their population occurs in this very narrow depth range right around 300 meters.

Maggy Benson: So not much above and not much below.

Karen Osborn: Not above, not below. If you want to collect them, you know right where to go. You go to 300 meters, you stop the vehicle, and you start sucking them up because they're all over the place. They are kind of unusual in that they have such a very narrow depth range, but [00:10:00] they're amazing animals. They're super abundant there.

Maggy Benson: So do you have any idea why this animal lives at such a narrow range?

Karen Osborn: Yeah. So we've looked at the characteristics of the water to try to figure out, is it oxygen that they're queuing in on, or a temperature change, or something going on at 300 that they want to be right there? It's just the perfect habitat for them, and we haven't been able to identify anything obvious, but we have learned something about their biology.

Karen Osborn: So if you look at the picture here, the kind of yellowish part on the right on the left side [00:10:30] is the animal's body, and then you see part of its cytoplasm and its body extending out, and then you see all these spines. On those spines are sticky long fishing lines. What these guys eat are small crustaceans. So these are single celled animals that are out there fishing for these little crustaceans and essentially, these little crustaceans, they live below 300 meters during the

day because they go down to hide in the dark, and at night they come up to shallow water to feed where it's more productive.

Maggy Benson: [00:11:00] So really setting up a little minefield.

Karen Osborn: Yeah, it's like a blanket or a little minefield that these crustaceans have to swing back and forth through every day. It's pretty dangerous.

Maggy Benson: Yeah. Pretty sophisticated for a single celled animal.

Karen Osborn: Yeah. Pretty awesome.

Maggy Benson: So what other kind of invertebrates live in the midwaters? Is there a big diversity?

Karen Osborn: There is a huge diversity. Pretty much every group of animals, and there're about 30 major groups of animals; pretty much every one of those has representatives that live in the open ocean, within the midwater. Right now, you're looking at a bunch of pictures of [00:11:30] different kinds, sea butterflies, crustaceans, worms, jellies. Of course there's a lot of worms because I love the worms that live out there. They're amazing. But yeah, there's a huge diversity out there.

Maggy Benson: So are these animals in the museum's collection here at the Smithsonian?

Karen Osborn: They are represented in our collections here. We have a really large invertebrate zoology collection, about a million and a half specimens at least.

Maggy Benson: Wow.

Karen Osborn: It's a lot, and we did have a lot of pelagic specimens or midwater specimens when I got here a few years ago. [00:12:00] But since I've been here, I've tried to increase our collection with specimens that are in particularly good shape. When you collect something traditionally, you usually do it clicked in a trawl net.

Karen Osborn: So you're dragging it through the water and pull it up to the surface. Things get pretty damaged. So some of them don't look so great, but if we collect them with ROVs that we use, they come up in beautiful, perfect condition, and we can actually really learn a lot more about their biology when they're in good shape.

Maggy Benson: So you can actually add to these [00:12:30] beautiful specimens, the actual imagery that you have too.

Karen Osborn: Exactly, what they look like when they're alive.

Maggy Benson: So we have a question from one of our viewers. Are you ready to take it?

Karen Osborn: Sure.

Maggy Benson: Okay. This one comes from McKenna. What is your favorite creature to see?

Karen Osborn: Oh, that's a great question, McKenna, but it's a hard one to answer. There're so many beautiful animals out there. I almost have to say, even though I do really love the worms that occur down there and some of the crustaceans, comb jellies, [00:13:00] or ctenophores, are just breathtakingly beautiful. They're really gelatinous, really fragile animals. They have these rows of hairs down their bodies and the rows of hairs are what they use to swim. They just refract the light from the ROV. They're just absolutely beautiful to watch, and so graceful.

Maggy Benson: Very cool. We have another question, but this one is on video, so let's take a look.

Sasha: Hi, my name is Sasha, and I go to Mount Vernon Community School, and I have a [00:13:30] question. When you study the ocean, do you ever capture bacteria?

Karen Osborn: That is a great question. So we do. Every time we take a water sample or we collect an animal, we get bacteria. There's millions and millions and billions of bacteria cells out there, all different kinds. They're doing all different things in the ocean that we don't understand many of the things that they're doing, lots of important stuff that they do.

Maggy Benson: Great. This question comes from Mr. Thompson's class. [00:14:00] Do these animals have internal organs like hearts, lungs, and brains?

Karen Osborn: Many of them too. That's an interesting and good question. And one of the questions that I always have when you look at all these weird different body shapes, most of them do have internal organs of some sort. They don't necessarily all have specific parts that you can pull out as that, but they have something that functions in all of those ways for them.

Maggy Benson: So somebody has a related question. Do they feel the great pressure?

Karen Osborn: [00:14:30] The animals don't actually feel the pressure because they are essentially made out of water and tissue and they don't have any air spaces in them, so they don't feel the pressure. They definitely feel the difference when we bring them up from the depths. They probably can feel the difference; at least their enzymes, their chemicals, can feel the difference.

Maggy Benson: Great questions. Keep them coming. So Karen, you study the midwater and the midwater is huge, and it's all over this earth. So is [00:15:00] there a very specific location that you actually study?

Karen Osborn: There is. So I work with Monterey Bay Aquarium Research Institute. It's where I do pretty much all of my field work, and they're located in Moss Landing, California. It's about halfway down the coast of California. They're right at the mouth of the Monterey Submarine Canyon, which means that we can take the ships out and in about an hour and a half we can be in 2,000 meter deep water, which is pretty unusual. Usually if you're going to do oceanographic or deep sea stuff, you have to drive for hours and hours to get out there.

Karen Osborn: [00:15:30] With this great location, we can get to deep water and start doing science right away. They have several ships and they have several remotely operated vehicles that allow us to go down and look around with our cameras and collect animals, bring them back up to the lab to study. It's a fabulous place.

Maggy Benson: Is that the ROV that you actually use to study?

Karen Osborn: That is the ROV. It's a remotely operated vehicle; it's essentially a very high tech robot. We stay on the ship and the ROV goes, (the [00:16:00] robot), we send the robot down. We can see what the robot sees, we can read all of it sensors, and we can tell it what to do. So that's our eyes and ears and nose in the deep sea.

Maggy Benson: So that seems like a really big ROV to be catching some of these animals that can fit in the palm of your hand. How are you operating this large machine to be able to capture these creatures?

Karen Osborn: Or even smaller. Some of the animals we collect are about a half an inch in size, and they're transparent, and they move really fast. So [00:16:30] basically, what you have to do to collect these animals is drive this huge vehicle up to them and put the canister over them or suck them up with the suction gun. It's really amazing. It takes some very skilled pilots. The pilots that fly the ROV are amazing as far as their ability to maneuver that vehicle and not disturb the animal while they're doing it and collect things we ask for.

Maggy Benson: I saw a picture of you, what looks like, playing a giant video game. Is that you in the control room?

Karen Osborn: That is. So [00:17:00] it is like playing a giant video game. I mean, essentially we're sitting in a dark room. We have an entire wall full of monitors that we're watching all the different cameras and all the sensors from the vehicle, and the pilots are sitting over there. They're flying the ROV with a joystick and a bunch of control buttons, just like a video game. They actually practice flying on video game flight simulators.

Maggy Benson: So for all the gamers out there that love to play all their video games, you can say that it's practice for piloting an ROV.

Karen Osborn: Exactly. [00:17:30] All you need is an electrical engineering degree and you'll be good to go.

Maggy Benson: Awesome. So when you deploy the ROV, do you have any idea of what you're looking for that day?

Karen Osborn: So we definitely have an idea of what we're looking for, but we have no idea what we're going to find. Because the midwater is so large, because things that live there are seasonal, so they are there some times of the year, not there other times of the year, it's always a little bit of a mystery what you're going to find when you go out that day.

Karen Osborn: We try to hone in. If we want to collect [00:18:00] a Vampyroteuthis, like this squid that we see here, we know that they live from about 600 meters down to about a thousand meters. So if we really want to collect one of those, we'll go to that depth and we'll spend time looking around. Hopefully we find one. Sometimes we don't, but usually we always find something interesting.

Maggy Benson: So given the difficulty of studying this area and how big it is, do you ever find any new species?

Karen Osborn: All the time. Probably more than 60 percent of the animals that we look at are new to science. They're undescribed, [00:18:30] they don't have names, nobody's ever looked at them. We don't know what they do, what they eat, any of that stuff. So we find new material, new species all the time.

Maggy Benson: Can you tell us about a species that you've named in the past?

Karen Osborn: Sure. So there's one that I'm particularly fond of. The pilots, actually, for the ROV named it pig butt. So you can see from the video here of this charming little animal, why it got its name.

Maggy Benson: Yes, I definitely can.

Karen Osborn: We translated that into Latin [00:19:00] and named it "pugaporcinus. "But it actually was really hard to figure out what that animal was. We saw it on the video, like ping pong ball? What is that? So we collected it, brought it up, examined it under the microscope, looked at it, took tissue to do genetic work on it, see what it's DNA was, and I was able to figure out what kind of animal it was and that it was a species that had never been described before. It actually [00:19:30] has a lot of characteristics of the larvae or the babies of the worms that it belongs to, but it looks nothing like any of the other adults. It looks like a baby except it's 10 times bigger than any of the babies.

Maggy Benson: So is there a specific tool that you use to help you definitively decide that this was a new species?

Karen Osborn: Yeah, so first you have to start out with really detailed morphological works. You have to look at it, look at all the pieces and parts and how they fit together. But a tool that we've had in the last 20 to 30 years that is super helpful and makes midwater work [00:20:00] really easy, is using DNA. So we can use DNA to tell species apart, we can use DNA to help us identify species, we can use DNA to help us figure out what groups, what other things they're related to and where it came from in the evolutionary scheme.

Maggy Benson: So it sounds like there are a lot of really cool new tools in the last 10, 20, 30 years, like ROVs and genetic testing. I wonder if that has contributed to maybe missing some midwater species in the past. What do you say we ask our students? [00:20:30] All right, if you're just joining us, here's another opportunity for you to tell us what you think using the poll that appears to the right of your video screen.

Maggy Benson: Tell us, why were some midwater species overlooked in the past? Scientists did not explore the midwater habitat, scientists did not use the right equipment, scientists did not look in a particular location, or some species could not be identified. Take a moment to think about it and put your answer in the window to the right.

Maggy Benson: [00:21:30] I know this question, the responses are still coming in, but most of the responses are the last three answers. It's pretty much a toss-up. What do you think?

Karen Osborn: I think they're all good answers. I mean all of those things play into why there's so many things out there that we don't know. It's such a huge habitat. We can't possibly have explored all of it yet. [00:22:00] Working on it, but it's pretty difficult to get there and pretty expensive. Now, we have more of the right equipment.

Karen Osborn: For 200 years, they've been dragging nets through the water, so we know quite a bit about hard-bodied animals and things that we can pull up in nets and still come up in pretty good shape. But all those gelatinous things out there, all the soft, squishy, beautiful, delicate jellies and stuff like that, we can't tell anything about them from trawls. So now with ROVs, we can fill in this extra piece of the puzzle. We can see what the rest [00:22:30] of the community looks like.

Maggy Benson: Have you discovered any species recently that have been thanks to ROVs and DNA technology?

Karen Osborn: Yeah, absolutely. So one of my favorite groups of animals is Swima worms.

Maggy Benson: Swima?

Karen Osborn: Swima.

Maggy Benson: Great name.

Karen Osborn: Can you guess what they do?

Maggy Benson: I think they might swim.

Karen Osborn: I think they do. So these are beautiful little worms-

Maggy Benson: Very beautiful.

Karen Osborn: We happened to collect a couple of these and we pulled them up, and I looked at them. And I've studied the group of worms [00:23:00] that these belong to for a long time, and I didn't recognize who it was. I couldn't identify what it was because it was very different from anything that had been named before. So we got interested in and we started collecting them every time we went out. They're very abundant and they're quite large. They're a couple inches in length, and so they were easy to get.

Karen Osborn: We collected a bunch and within a year, we found four species all living in the same area. And that's pretty amazing for pretty big, pretty abundant animals to be completely under overlooked for a long time. Since then, we've continued [00:23:30] to collect them and we found nine species that are all pretty closely related to each other.

Maggy Benson: Wow. That's very cool.

Karen Osborn: Pretty cool, and they all swim.

Maggy Benson: Do they have any cousins?

Karen Osborn: They have cousins. They have cousins that their name is Flota. When I named them, I was thinking about that. It's very hard to come up with names for animals. Basically, there's really strict rules about how you can name animals. There's this entire book of rules. Basically, you have to choose a Latin word [00:24:00] or a couple of Latin words and put them together in a certain way or something like that. And I wanted to name them for their swimming ability because it's an amazing thing, and none of their relatives, other than these nine species, can do that.

Maggy Benson: And that was them swimming.

Karen Osborn: And that was them swimming. And so I wanted to say something about swimming, but all the cool Latin words had been used. So there's a little clause in there that says you can name them, you can make up a word. So that's what Swima became, and it was playing off of Flota, their cousins who kind of float around.

Maggy Benson: Very cool. [00:24:30] We have more student questions, and this question comes from Mrs. Kestery's class. How can animals be made up of water? Maybe how do they have fluids in their body?

Karen Osborn: Yeah. So a lot of the animals in the midwater are primarily gelatinous. A lot of their tissues are gelatinous, so they have this matrix of protein, but there's water interspersed through that, not just loose, but it's incorporated into the tissue. So they're really soft animals. It makes them so they can grow [00:25:00] really fast. If you don't really have to build that much tissue, you just fill it up with water and grow really fast, which is helpful if you don't want to be eaten.

Maggy Benson: Very cool. So this question comes from our viewers here at Smithsonian in our Q?rius Lab. Has the ROV ever been attacked by a giant squid or another big animal?

Karen Osborn: That's a great question. It hasn't been attacked by other large animals.

Maggy Benson: You say that with hesitation though.

Karen Osborn: Attacked. So there was this one story, which I absolutely love, [00:25:30] and we have this incredible video of a Moroteuthis, which is not the biggest one-

Maggy Benson: Not the giant squid.

Karen Osborn: But it's big, it's 20 feet long.

Maggy Benson: Wow.

Karen Osborn: It's a squid but it's 20 feet long. So they were out doing a geology dive where they were headed straight to the bottom to pick up a bunch of rocks, and they saw this huge squid. So they stopped and looked at it, and it was huge and it was interesting. It was just hanging out, kind of like it was watching them. It was interested in them. What? What is that thing? What's it doing down here?

Karen Osborn: They watch it for a while, but they're geologists [00:26:00] and they're like, yeah, whatever. We're going to keep going. They kept going. 45 minutes later, they turned around the sub and it was still hanging out behind them.

Maggy Benson: That's like the plot to a scary movie.

Karen Osborn: It was just curious. I mean, we hang out down there and watch animals for a long time too. So it's not surprising they watch us.

Maggy Benson: The animals are watching us too. So we have another question. This one comes from Todd. Why are so many of these creatures see through?

Karen Osborn: Oh, well, when you live in the midwater, this is such an awesome question. When you [00:26:30] live in the midwater there's nothing to hide behind. You know, it's not like a coral reef where you can, a predator comes and you can dive behind a coral or into an anemone or something like that. There's nothing out there except other animals, and most of them just want to eat you.

Karen Osborn: So the only option is to be transparent or to blend in with your background. So some things are mirrored so it just reflects back the rest of the ocean at them. Many things are transparent or you see a lot of things that are red. Red is essentially black, and so a lot of animals down there make bioluminescence and [00:27:00] that's how they search for their food. And if you're red, then you look black and they don't see you there.

Maggy Benson: You're hiding from predators.

Karen Osborn: It's all part of camouflage, yep.

Maggy Benson: Very cool. Karen, why are all of these animals important to actually study?

Karen Osborn: So the ocean itself is incredibly important for our climate, for our water supply, for oxygen that we breathe, for taking care of the carbon dioxide that we produce. The ocean is intrinsically linked to all of those activities, and to have a healthy ocean to do all those things for us that we want [00:27:30] it to do, it has to have the animals out there, absorbing the carbon dioxide, using the oxygen, and doing all of these things and maintaining a healthy ocean. So they have to be there.

Maggy Benson: So studying and finding all of these new creatures is helping us really better understand our planet.

Karen Osborn: It definitely does.

Maggy Benson: Karen, it's been so wonderful learning about your work as a marine biologist here at the Smithsonian, the midwater, and all of the cool creatures that live inside it. Can you tell our viewers where they can learn a little bit more about your work?

Karen Osborn: Yeah, absolutely. So [00:28:00] the Smithsonian has an Ocean Portal, a website which has a ton of information about the oceans, our impact on it, and the different organisms that are out there. The department that I work in here, the Invertebrate Zoology Department, has a blog that has a lot of interesting stories about the different things that we're doing and the animals that we study. And then finally, the Monterey Bay Aquarium Research Institute has a webpage that talks about their ships and their researchers and the things that they're doing. So those are all fun places to explore around.

Maggy Benson: Wonderful. [00:28:30] Thank you so much for being here today.

Karen Osborn: Absolutely. It was great.

Maggy Benson: And thank you all for submitting all of your awesome questions. If you miss part of this program or want to see it again, it'll be archived later this evening on qrius.si.edu. We hope to see you next time on Smithsonian Science How.

Announcer: Thanks for watching. You can explore more Smithsonian Science How shows on our website, [00:29:00] qrius.si.edu.