

## But Why: A Podcast for Curious Kids

### Why Do Whales Sing?

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**Jane** [00:00:21] This is But why: a Podcast for Curious Kids! I'm Jane Lindholm. If you've been listening to But Why for a while, you already know how things work. But if you're new to our show, let me fill you in. Melody Bodette and I make this show at Vermont Public Radio, but you're the ones who determine what topics we tackle.

**Jane** [00:00:41] Kids all over the world send us questions. This week. We've heard from kids in the United States, Rwanda, the Philippines, Canada, Australia, and that's just a few of them. We take your questions and we see if we can answer them. And we find other people, usually adults, but not always, who have a lot of knowledge or expertise to help answer your questions. We'll tackle anything you want. There's no topic that's off limits. And we'll tell you at the end of the episode how to send your own question if you're interested. In our most recent episode before this one, we answered questions about a really big topic. Well, I guess they were more regular sized questions about really big animals, whales. That drumming sound is actually a gray whale. We covered a lot when it comes to these huge aquatic mammals. But as we told you in that episode, there was one big topic we didn't get to, and that's how whales communicate.

**Dominic** [00:01:46] Hello, I'm Dominic and I am eight years old. I live in Blues Creek, North Carolina. And my question today is, how do whales sing? Goodbye!

**Jane** [00:02:08] What you're hearing right now is the sound of a humpback whale singing. We'll talk a little bit more in this episode about why some whales sing and which ones it is that do it because they don't all communicate in that way. All of the whale sounds you'll hear in today's episode come from the Whale Acoustics Laboratory at Scripps Institution of Oceanography or from the Fisheries Department at NOAA, the National Oceanic and Atmospheric Administration. And to help us better understand why and how whales talk or communicate, we called up someone who wanted to learn more about whales ever since she was a kid and now she gets to do it for her job.

**Amy** [00:02:51] My name's Amy and I study whales, how whales communicate, how they travel and socialize and what that means for them and their families on an evolutionary timescale.

**Jane** [00:03:06] That sounds like the best job ever.

**Amy** [00:03:08] It pretty much as I love it. I was one of those typical kids who wanted to be a whale biologist when I was seven. And I just I got lucky. I stuck with it. You know, it was a combination of stubbornness and just being in the right place at the right time. And I ended up here.

**Jane** [00:03:25] Here technically is NOAA Northwest Fisheries Science Center in Seattle, Washington, in the United States. And Amy is Amy Van Cise. She's a marine biologist. As Amy said, part of her work is studying how whales communicate and what their communication means. In a little while, she's going to tell us about the specific kind of

whale whose language she studies. But we asked her first to help us understand how whales make sound more generally.

**Jane** [00:03:54] The way that they produce sounds is really similar to the way humans produce sounds and any other mammal. So in humans, we have what's called a larynx in our throats and that larynx has a bunch of vocal folds and we push air through those vocal folds and it makes them vibrate and flap around. And those vibrations are what produces sound. And that's essentially what sound is as vibrations traveling through the air. Smaller whales, so dolphins and killer whales and short-finned pilot whales and all the toothed whales. They also have a larynx that they push sound through, but they make an additional sound called echolocation clicks. So, you know, little snaps that they use underwater and.

**Jane** [00:04:37] Not with their, they don't, they're not doing it with their flippers flapping together their flippers,.

**Amy** [00:04:42] They are not flapping together their flippers. Right. They actually have specialized air sacs that they use to create those sounds.

**Jane** [00:04:49] OK, so just to recap, whales make sounds kind of the same way we do with their larynx in their throats. And when you heard the humpback whale sound earlier, that's an example of that kind of sound. Most of the biggest whales, baleen whales, communicate that way. Remember that baleen whales have these long bristly plates that kind of look like a big round brush in their mouths. And they use the baleen to help them catch their food by taking a really big gulp of water and then pushing that water out of their mouth through the baleen, all the shrimp and krill and other things they want to eat, get stuck in the baleen and the water gets filtered out. Baleen whales tend to be the biggest whales, and these are the ones who use songs and use sound in the way Amy just told us about. That's pretty easy to understand, right? Because it's kind of like how we make and use sound. But the toothed whales, which tend to be the smaller whales, they also use clicks and whistles that are produced in a different system altogether in their bodies. And they use those high frequency sounds in two different ways to communicate, but also to see what's around them without using their eyes. That's called echolocation. This is a little harder for us to wrap our minds around, right, because it's so different from how most of us use sound and how most of us understand what's around us. The whales send sound out and the way the sound travels through the water can give the whale a really clear picture of its surroundings. So if the sound of the whale sends out through its click, bounces off another fish or another animal nearby, and then reverberates back to the whale, the whale can sense by that sound what the fish or whatever it is that's out there looks like.

**Amy** [00:06:52] Yeah, that's exactly how they use echolocation. So clicks that they make rather than making those to communicate with other animals, they are making those to kind of perceive their surroundings so they can send these these little short clicks, these bursts of vocal energy out into the water around them. And what they receive back tells them what might be in the ocean around them. The thing that makes clicks really cool is that the dolphins can actually use them to get a really high resolution picture of what's going on. So when they're traveling through the ocean and light doesn't travel that well through the ocean, and anytime they dove down to depths, it's totally dark. It's really hard to see. And they can't rely on vision to find their prey. But sound travels really well in the ocean and they can use that sound to know what's around them.

**Jane** [00:07:41] And they use other sounds produced this way to communicate to one another, making sounds that are kind of like whistles. Amy says there's another big difference in the way whales produce sound from how we humans do.

**Amy** [00:07:56] I'd say the biggest difference between whales and humans and how they produce sound is, you know, is kind of where that sound is produced.

**Amy** [00:08:03] So we produce sound coming out of our throats and out of our mouths. Their vocal production also happens where their air travels through. But you have to remember that their air travels through their blowholes. So they're actually producing sound at the back of their heads where we're producing sound at the front.

**Jane** [00:08:22] I'm trying to picture my voice coming out of the back of my head right now. Another big difference is that we humans live above water. So when we produce sound, our voices carry through the air. But whale noises are, of course, being carried through the water.

**Amy** [00:08:37] Sound travels much, much faster through the water than it does through the air. Another big difference is kind of acoustic impedance or just the fact that sound tends to dissipate really quickly in the water. So it either gets absorbed into the water or it bounces off different objects in the water.

**Jane** [00:08:55] That means that for some sounds like the ones you and I might be able to hear. They don't always travel very far in the water. So the whales use different frequencies, very, very, very slow or very, very, very low sounds, even lower or higher than humans can hear to help the sound move better through the water.

**Amy** [00:09:15] So because water is thicker than air and can absorb certain sounds faster, basically what you get is all of the low, low frequency sounds will travel much farther than the higher frequency sounds and whales make sounds across a huge range of frequencies or pitches. Right, so some of the big whales they're, they are making sounds that are super, super low in pitch. And some of the smallest dolphins and porpoises are making sounds that are so high that we can't hear them. And actually, that's true of the larger whales. They're making sounds that are so low that we can't hear them. And and that huge range really affects how far you can hear those animals. So some of the tiniest porpoises, you can only hear them for maybe 100 meters. Blue whales have been recorded up to 500 kilometers away from where they made sounds. They are communicating across entire ocean basins and some animals are only communicating across, you know, maybe a couple hundred meters.

**Jane** [00:10:20] So that must change who these whales are communicating with, whether they're communicating with other whales that are nearby or whales that might be very, very far away.

**Jane** [00:10:31] Yeah, well, I think what it changes is your perception of what nearby is, right? So for a blue whale, a nearby animal could be any animal that's in the same ocean basin.

**Amy** [00:10:41] Well, because that because they can communicate that far and they do tend to be, you know, much more spread apart. These animals, blue whales travel across, you know, whole ocean basins and they're kind of in a year and, you know, our research is starting to show that they have abilities to communicate for really far distances, too.

**Jane** [00:11:02] So that explains a little bit of how physically they make the sounds. What do you know about what kinds of things whales want to say to one another, what they might be communicating?

**Amy** [00:11:14] Yeah, whales use sound and a lot of different ways. One of the most common and popular ways to think about whale sounds is this concept of whale song. It turns out that not all whales sing, it's actually mostly the larger the larger baleen whales that sing, so humpback whales and fin whales and blue whales produce song, and a couple other species. But for example, killer whales don't sing none of the toothed whales sing and sperm whales don't sing. They produce different kinds of sounds.

**Amy** [00:11:54] We are familiar with song and song is actually mostly a mating behavior, so it's only the males that sing and they sing during mating season and they're singing to attract a female.

**Jane** [00:12:12] Many scientists think that these male whales sing to make themselves look like a good partner for a nearby female whale or to compete for a partner with other male whales nearby. But there's a lot that's unknown about why whales sing and what it is they're trying to say. One of the things about whale song that researchers want to understand better is why the very complicated songs of the humpback whale in particular change over time.

**Jane** [00:12:47] Individual whales will sing the same song over and over and over, but over the course of many years, that song will change. Why? Another thing some scientists want to know is if whales sing just because they like the way it sounds, because they find it beautiful or fun. Maybe you will become one of the marine biologists who help the world understand whale song in a better way.

**Jane** [00:13:19] But as Amy mentioned, not all whales sing. In fact, only a few of the biggest baleen whales are known for their songs. So, as we mentioned, there are a few other ways whales communicate and how they communicate helps us understand what they might be saying.

**Amy** [00:13:37] Toothed whales have whistles, social calls, whistles or burst pulses that they will make to communicate with their family units or communicate with, you know, other animals that are in the area, and when they're communicating, you know, there's a lot that researchers don't know about what it is exactly that they're communicating with each other.

**Amy** [00:14:04] But a lot of it is group membership. So, you know, kind of your individual identity. So a lot of species are thought to have a whistle that identifies them specifically much in the way that we have a first and last name that identifies us, specifically who we are, some dolphins have whistles that identify specifically who they are.

**Jane** [00:14:25] So you mean when they're calling out, they might be saying, hey, it's Jane, just wanted to tell you guys this...

**Amy** [00:14:31] Or they might just be saying, hey, it's Jane. Hey, it's Jane. Hey, it's Jane. And they just kind of do that over and over again. And then sometimes another, you know, another dolphin will come up and will respond. And they might respond by saying, hey, it's

Amy, hey, it's Amy. Or they might or they might say, hey, Jane, and they'll produce your whistle. It's very simple, but it's just kind of an individual recognition of each other.

**Jane** [00:14:59] So they're not saying, hey, it's Jane, I'm feeling a little low today. I want to, you know, swim around and see if we can hang out for a little while. Maybe I'll feel better.

**Amy** [00:15:08] You know, it could be we have not gotten that far at all. Yeah, I think we're still pretty...the science as a field as it is and really early stages in terms of what we understand about dolphin communication and whale communication.

**Jane** [00:15:24] Again, another opportunity for all of you aspiring whale biologists to crack the code. Coming up, we'll hear more about Amy's research on one specific type of whale and what she's been able to learn about how different groups of this same type of whale kind of speak different languages.

**Jane** [00:15:46] This is But Why, I'm Jane Lindholm. Today, we're learning about how whales talk to each other with Amy Van Cise of NOAA's Northwest Fisheries Science Center. She's been telling us about the different ways whales make sounds and a little bit about how they use those sounds to communicate and sometimes to map the ocean around them.

**Jane** [00:16:07] Amy has spent a lot of time studying one particular kind of whale, the short-finned pilot whale.

**Amy** [00:16:15] Short-finned pilot whales are actually dolphins, even though they're named pilot whales and they are the second largest dolphin in the dolphin family. The largest dolphin in the dolphin family is the killer whale. So they are large like killer whales. And they actually look kind of roughly like a killer whale, too, except that they're all black and they have a big, big giant bulbous melon on their head, and that's actually their scientific name comes from the fact that they have this very, very round head. It's actually *globicephala* is the the genus name of these animals, which literally translated means like balloon head, essentially.

**Jane** [00:17:00] Short-finned pilot whales live all over the world in non-Arctic waters where things are a little warmer, more tropical or temperate than Arctic. So you'll find them in places like the Hawaiian Islands, the West Coast of the United States, all the way down to Peru, in the Pacific Ocean, in the Atlantic Ocean. You might see them in the Caribbean and even as far north as Maine. So remember how Amy said the toothed whales use clicks and whistles to essentially see the ocean around them, but also to communicate? These short-finned pilot whales do that, and we also talked about how each whale has a whistle that's kind of like its name.

**Jane** [00:17:41] So the Jane pilot whale makes one whistle and the Amy pilot whale makes a different whistle. But the real human Amy's research shows that groups or pods of whales that travel around together also might have their own group whistle that they use to identify who else is in their group. So their group whistles sound different from the group whistles of any other pilot whale group or pod.

**Amy** [00:18:07] They travel around in these family groups and those family groups are stable for decades or generations at a time. And you see that in their vocalizations that they make. So different families will have different vocalizations that are specific just to those families. And I think actually another really cool thing that you see is that, you know,

sometimes different families will meet up and you'll get these extended family gatherings kind of like a family reunion type deal. And when a bunch of these family groups are together, they'll start producing very calls that are shorter and lower in pitch and simpler than the ones that they would produce, maybe when it's just a single family all together.

**Amy** [00:18:57] And I think this is really cool because, you know, if you think about your in your own family group all alone, just kind of traveling through the water, then you can kind of produce lots of fun variations on sounds that maybe start to get at some of these things that you were talking about before where, you know, like if you're if you're feeling playful, you might add some trills or, you know, funny little variations to your whistles. And we've seen that, that they can they can really do a lot of really interesting variations on the whistles that they make. And they tend to do that when they're in these playful moods or socializing at the surface of the water. And then when they're in these bigger groups, they go back to these simpler whistles. And it's kind of this idea of you're just calling out to your family so that when you're in this big crowd of other whales, you can identify where your family is.

**Jane** [00:19:50] So, Amy, if two different groups of short-finned pilot whales were to come in contact with one another and they'd never seen each other before, would they be able to understand each other? Is their language similar but kind of unique to their group? Like slang would be like, you know, my friends and I have some things that we say that we know what each other means, but our other people wouldn't. But we could all still speak the same language. Or, you know, how much how much difference is there in different groups?

**Amy** [00:20:18] Yeah, it's it's not that different. So they would still be able to kind of, quote unquote, understand each other. They're going to recognize each other as members of the same species they kind of make really, you know, sounds that are kind of at the same pitch and at the same level. And they just might have little variations. And if they've never seen each other before, then they they might be more different than two groups of animals that come in contact. But they're still short-finned pilot whales, yeah, in the same way that we're still humans. You know, I speak English. I might come across another human that speaks French, but I still know that that animal is a human.

**Jane** [00:20:59] The idea that different pods have their own whistles and that they communicate differently in these bigger groups is pretty new. And Amy is one of the people who helped discover it.

**Jane** [00:21:10] What we did to try to figure it out was take some underwater recording devices and go out to the waters off shore of the Hawaiian Islands, where there are a lot of sort of pilot whales. And we would find a group of pilot whales and we would put a recorder down and we would leave that recorder in the water for, you know, 45 minutes or an hour. We would let the whales just swim around and and make their sounds. And we would observe what the whales were doing while while they were vocalizing. And then, you know, we did that over and over and over again for a number of years. And then I took all that data back and I sat in front of a computer for many, many hours. And I found every single vocalization and every single recording. And I traced them and I looked at the shapes and how they changed from, you know, from one day to the next and between different social groups.

**Amy** [00:22:07] And we just kind of compared and looked for, you know, like I said, whistles that might be specific to certain groups or differences that you get between

different situations, like whether multiple groups are together or if you get groups that are all alone, how how things like that might affect the sounds that you were hearing.

**Jane** [00:22:27] Amy says that just like there are so many different kinds of whales, there are a lot of different kinds of. Sounds they make, too, and there's still a ton left to learn about whale communication.

**Amy** [00:22:38] Baleen whales, a lot of them, they make pretty simple calls. And so, you know, they only have a few variations on a call, three or four different call types. And then they'll have that song that they make in the song can get very complicated and it changes over a season and there's lots of variability in there. But when you take that kind of relatively simple set of calls that a large baleen whale will make, and you compare that to all of the variability that you get in a toothed whale, it becomes very complicated very quickly. They make so many different sounds and they have so many different variations that they can put on those sounds.

**Amy** [00:23:20] And we really are just at the very beginning of sorting out what the different sounds are and and how how they differ in time and how they differ with group membership. I think that one day scientists would really like to understand more about which sounds are associated with which behaviors or what what specific sounds might mean. But at this point, we're trying to get down just the very basics of what are the sounds and when do they make them.

**Jane** [00:23:51] So if understanding more about what different sounds might mean and what whales are saying to one another sounds like something you might want to learn more about. Maybe you'll become a marine biologist. Amy says she's really excited about all the future whale researchers listening right now.

**Amy** [00:24:09] Yes, absolutely. We need more people to help. Help us learn about whale communication. It is it's still a new field and we still have so much to learn and if we're going to figure it all out, we need as much help as we can get.

**Jane** [00:24:27] And there's other work to do that might help whales to. One of the threats to whales is increased noise in the ocean. That might be because of all the ships going back and forth with goods from one country to another or oil and gas and military activities that happen underwater.

**Jane** [00:24:46] That's what you're hearing right now. The ocean is noisier than it used to be. Amy says there's evidence that whales are actually making their calls louder, basically shouting to try to make themselves heard over all that noise. But scientists worry that it's getting harder for whales to find mates and communicate in other ways because of all the noisy distractions. So maybe you'll grow up and join the people who help figure out how to fix this problem.

**Jane** [00:25:14] I'm sure we could talk about whales for a dozen more episodes, but let's leave it there for now. Thanks so much to Amy Van Cise. She's a post-doctoral research biologist at NOAA's Northwest Fisheries Science Center in Seattle, Washington. And thanks to the Scripps Institution of Oceanography and NOAA Fisheries for allowing us to use their sound recordings.

**Jane** [00:25:37] Now, do you remember way back at the beginning of this episode when I promised to tell you how to send in your own question? If your adult has a mobile phone,

there's usually a sound recording app that comes with the phone and there are others that can be downloaded for free. So get your question ready and then go to a quiet place with your adult and have them record you asking it on one of those apps. We love it when you include your first name, where you live and how old you are, mainly because it's just neat for all of us who are listening to hear where everyone else is coming from. I will say that we can't use all of your questions. We've gotten thousands of them. But Melody and I do listen to every single one of them and every single one of them is awesome. After you're done recording, have your adult e-mailed the audio file to questions at [But Why Kids.org](mailto:questions@ButWhyKids.org)?

[00:26:32] And you know, if you can't record yourself or if maybe you're shy or talking isn't easy for you, you can definitely have your adult write down your question and email that to us. Again, send it to [questions@butwhykids.org](mailto:questions@butwhykids.org). But Why is produced by Melody Bodette and me, Jane Lindholm at Vermont Public Radio.

[00:26:52] We're distributed by PRX and our theme music is by Luke Reynolds. We'll be back in two weeks with an all new episode. Until then, stay curious.