

Ocean Gazing: Episode 11
Penguins in the hot seat
Hugh Ducklow: Marine Biological Laboratory

<begin music>

Ari: You guessed it. I'm Ari Daniel Shapiro, and you're listening to Ocean Gazing.

Ari: You ever dream about Antarctica?

Ducklow: I certainly daydream about it. You know, I've never gotten tired of going. When I start taking it for granted, it'll be time to hang that up. And I still get excited. I'm already thinking about my trips down there this coming year.

Ari: That's Hugh Ducklow, the director of the Ecosystem Center at the Marine Biological Laboratory in Woods Hole. He'll talk with us about his work on the biology of Antarctica. Stay tuned.

<fade up music; play until it ends>

Ari: The climate's changing all over the world, and entire ecosystems are reacting. That's certainly the case for the Antarctic. To understand what's going on there, we should start with the sea ice.

Ducklow: The defining characteristic of Antarctic marine ecosystems is the existence of sea ice. So we've had a record of sea ice since 1978.

Ari: That makes 31 years of observations, long enough to find a long-term trend in data that are noisy in the short term.

Ducklow: You see the sea ice expanding in the fall and winter, <fade up Tchaikovsky> you see a big area of whiteness that just expands outward from Antarctica and then in the spring it contracts back. So you know, it's almost like a beating heart or kind of a throbbing rhythm of expanse and retreat, year by year. Some years it's a little later or earlier, some years it's bigger or less big. And so there is a kind of a rhythm. All the organisms in the Antarctic marine ecosystem depend in some way or other on the rhythm, and the extent, and the advance, and the retreat of the sea ice. Their life histories are all keyed to that sea ice.

Ari: Some of the small ocean plants called phytoplankton actually live and grow *inside* the ice and on the bottom of the ice for part of the year. <fade down Tchaikovsky>

Ducklow: When we go there in the spring and these big blocks of ice are turned over by the vessel, you see all the brown color on the undersides, which is from the

plankton in the ice. It looks just like somebody poured a giant vat of coffee into the ice. So you can really see there's biology going on in that stuff.

Ari: And that stuff – that ice – is immense.

Ducklow: It's about the size of the whole US including Alaska. So you can think about an entire continent made out of ice filled up with biological communities, and we know very little about that community.

Ari: And it's not just the phytoplankton inside the ice. Krill are shrimp-like creatures. They're small –

Ducklow: Maybe the size of your little finger when they're an adult.

Ari: – and when they're young, they use the underside of the ice to hide and eat the phytoplankton. A lot of other kinds of animals eat these krill, and some of these animals are eaten by yet other animals. So it's no exaggeration to say that the sea ice helps support the Antarctic food web.

Now let's go back to climate change, which has increased temperatures across Antarctica. Over the last 30 years, that heat's been making the sea ice sweat. Ducklow's watched it happen on the Western Antarctic Peninsula, an icy arm extending from Antarctica towards the tip of South America.

Ducklow: The amount of time that the sea ice covers the ocean in our study area on the Antarctic Peninsula has decreased by fully 90 days, so that's already just a gigantic change.

Ari: It'll certainly impact all that biology living in and on the ice.

Ducklow: That whole community will be broken up as its relationships and links with the rhythm of the sea ice begin to disappear.

Ari: One of the species falling victim to the disappearance of the ice and krill is the Adélie penguin.

Ducklow: It's about as high as your knee. These penguins are true marine organisms. They dive under the ocean to capture krill and fish. And especially in the winter, they need to be out on the sea ice and able to get into the ocean. So as sea ice has been retreating, they've got less platform to stage their foraging trips from.

Ari: And that's meant trouble for the penguins.

Ducklow: In the area around Palmer Station, –

Ari: That's the US Antarctic research base where Ducklow does his science.

Ducklow: – the penguin population, which we've also been censusing carefully since the mid-1970s, has declined by about 75-80%.

<fade up penguin colony noise>

Ari: Here's what that population sounds like. It's the answer to the last sonic stumper.

In fact, here's one person who called our voicemail line and got the sonic stumper right.

Hotaling: Hi, Ari. This is Liesl Hotaling. Is it penguins? Bye bye.

Ari: Good one, Liesl.

Ducklow: Further south, there's still plenty of Adélies. It doesn't mean they're going extinct. Antarctica is full of Adélie penguins. But at least on the peninsula, where the Adélie penguins have had colonies at least over the past 10,000 years or so, they're now declining pretty rapidly and it's sort of like the population is contracting in response to the loss of sea ice.

Ari: Are there other species that're coming in and taking their place?

Ducklow: Yeah, there's actually two closely related species and they're commonly known as gentoo penguins and chinstrap penguins. And their typical habitats are further north in the sub-Antarctic and both of these species are now migrating further south. They appear to be physically replacing the Adélies. They're even taking over the same colony areas.

Ari: Is there really a concern? I mean, you say there are plenty of Adélies. It sounds like penguin diversity – in terms of the number of species – is going up. I mean, what's the issue?

Ducklow: Well, the issue is it tells us that the climate is changing and the ecosystem is responding. You know it's not just Antarctica. What we call the cryosphere – which is snow, glaciers, permafrost, ice on rivers and lakes – it's decreasing everywhere globally. The cryosphere is basically just being pulled away from the surface of the planet by global warming.

Ari: On the range of optimistic to pessimistic, where do you fall?

Ducklow: So I don't like to be pessimistic, but these changes are profound. You know, and they're not just happening in a couple of isolated places like the Antarctic Peninsula. They are influencing the whole planet. Climate change is affecting the

poorest people on the planet disproportionately. You know, that goes back to the sense of responsibility that we have to do this stuff right, and derive the best and most precise, most reliable information so that people have a basis to make policy decisions. You know, that's the really hard part. The science is easy. But making decisions about where we're going to go as a society is really complicated.

<fade up transition music>

Ari: Here's the new sonic stumper.

<fade up sonic stumper; transition to outro music>

Ari: Send us your guesses, and your questions for Hugh Ducklow. Go online to www.coseenow.net and click the podcast link to find out how. Ocean Gazing's a product of the Centers for Ocean Sciences Education Excellence, and we receive funding from the National Science Foundation. Thanks to Zena Cardman, Zak Vassar, Jim Yoder, Janice McDonnell and Sage Lichtenwalner. Our music's by Evan Sanders. See you in two weeks.

<fade up music and play until end>