Ocean Gazing: Episode 46
An imminent thaw

<intro music>

Ari: This is Ocean Gazing. It's the podcast where we wing our way through the salty waters of our planet. I'm Ari Daniel Shapiro.

Stabeno: Ice may be beautiful but it's immensely dangerous. It's nature. It's powerful, and you have to treat it with respect. A lot of respect.

Ari: Phyllis Stabeno is a physical oceanographer at NOAA – the National Oceanic and Atmospheric Administration, and she admits that ice shapes the physics and biology in the Bering Sea between Alaska and Russia. It's also hugely important to the people that live up there. Stay tuned.

<fade up music and sustain; sounds of sea ice formation>

Ari: These are the sounds of the formation of sea ice in the Bering Sea. You talk to anyone in this part of the world, and you realize pretty quickly how important sea ice is. Vera Metcalf is the director of the Eskimo Walrus Commission based out of Nome.

Metcalf: A lot of our hunters look for good ice because that's where our marine mammals such as walrus are…hoping that there are good sea ice conditions for hunting purposes.

Ari: So how do you track a walrus on ice?

Metcalf: Well, I'm not a hunter, but… where a hunter explains, you can't approach a walrus if it's a certain wind direction. They can smell you, they can smell danger. The overall message is that spirituality and common sense is very important.

Ari: Zoom out a bit. It's not just the walruses and the hunters that rely on sea ice. Pretty much everything alive in the Bering Sea is connected to that ice. Here's Phyllis Stabeno.

Stabeno: Ice is the mechanism that really structures the Bering Sea ecosystem. If you have ice in March or April, there's enough light to get a phytoplankton bloom underneath the ice. That bloom is occurring in water that's -1.7°C. So it's very cold. There tends not to be a lot of zooplankton, and zooplankton is what eats the phytoplankton, which are the plants. So that phytoplankton bloom largely falls to the bottom of the sea and it feeds the benthic communities.

If on the other hand, you have a much warmer year, you tend to have a bloom in May or June and then the water temperature is a warm 3 degrees. You have a lot of zooplankton there. And so the zooplankton eat the phytoplankton. Then the fish come and eat the zooplankton. So you're supporting a more pelagic or upper water column community. So you can see how you can end up with two ecosystems depending on how much ice you have.

Ari: To understand the formation of sea ice in the Bering Sea, you have to zoom out a bit more…to get a sense for how the water and wind are circulating up here. Tom Weingartner enjoys talking about the water in the long-term, considering its movements over many years. He's a professor of marine sciences at the University of Alaska Fairbanks.

Weingartner: If you want to think of it as a conveyer belt that's carrying water and dissolved and suspended material in that water, it's sort of a pathway that leads from the south all the way up around along Alaska's coasts and then northward and ultimately into the Arctic Ocean. We're interested in understanding that pathway from a purely physical point of view.

Ari: So there's this conveyer belt of water moving northwards along the coast of Alaska. But in the wintertime, it's the wind that really makes the ice.

Stabeno: All the ice is made in things that're called polynyas.

Ari: Polynyas are areas of open water that're surrounded by sea ice. And very cold wind blowing from the north cools that water.

Stabeno: And it forms more ice, and then the wind blows that out. It forms as huge sheets, and you can go out there, and it's like being on a plain.

Ari: If you zoom out a bit more…all this ice, it drives our climate too. Hajo Eicken is also at the University of Alaska Fairbanks. He's a professor of geophysics.

Eicken: Ice – because it deforms, it melts, it refreezes – in the summertime you can be walking on top of sea ice. You got these pools of blue melt water sitting on top of the ice. And it's almost like you're in a plane flying across the landscape of Minnesota where you have all these lakes. That's exactly what the icescape looks like, but on the sea ice a lot of these lakes are less than a foot deep. Some are just a couple of inches.

But whether you have these lakes and how far they extend makes a huge difference in the way ice heats up and melts in the summer. If you wouldn't have these lakes, the ice cover would be reflecting most of the radiation. And the Arctic, in fact, would be a much cooler place even in the summertime. But because you have these lakes, they absorb a lot of the heat that comes in from the sun. And they contribute very much to the seasonal melting and the retreat of the ice.

All of this goes on…it looks beautiful as you're out there. It really is a landscape in miniature. But all of these processes – they're also very, very important if we want to understand better how ice helps regulate the climate of the planet.

Ari: But the ice is also responding <u>to</u> our climate, which, as you know, is changing.

Stabeno: And so a whole ecosystem that has evolved around having a month, 6 weeks, maybe two months of ice is going to change. It's easy, for instance, to look at losers in a

changing climate. The polar bear is an example that certain animals that need ice. If you need ice and you're under a warming scenario, your population is gonna go down 'cause you don't have your environment. So they're a loser. But who's gonna replace them? And that is what's very difficult – it's hard to predict winners because it depends on how the new ecosystem sets up.

Ari: So climate change is altering the very fabric of life up here. Noah Andrew Senior – an Eskimo from Kwigillingok, Alaska also sees what it means for the…human community. Here he is speaking on a video series called "Faces of Climate Change."

Andrew: Ice that freezes during the winter is not freezing out as far as it used to. It used to go out about, maybe 20 plus miles. And the ice used to stay there for quite a time. Now, these days, it doesn't stay that long.

Ari: All this change – it's why the oceanographers and the local communities are working together to understand this system that's slowly – yet surely – thawing. One approach is to use ocean observing systems that can record data at sea even in the worst conditions.

Stabeno: No one in their right mind goes to the Bering Sea in November and December and January and February if you can help it. It's cold, it's stormy, and it's icy. And most of the ships we have are not capable of going into the ice.

Ari: The science team – which includes Stabeno, Weingartner and Eicken – has moorings in the ocean that track the temperature, the salinity, the currents, how thick the ice is, whether there's a phytoplankton bloom, and how much sunlight is getting through the ice. They've also set up stations with an array of sensors that monitor the ice and how it's changing, accumulating, and melting. The team even drives around on snow machines, towing instruments that measure how thick the ice is. All this scientific information is integrated into Alaska's Ocean Observing System, or AOOS. But there's more to it than simply using all the technology. That's where partnering with the local communities come in. Here's Vera Metcalf from the Eskimo Walrus Commission.

Metcalf: Community knowledge of the environment can go a long way to assist scientists. Something that our hunters in our communities have is a very specialized information and knowledge that Western science doesn't have. Local observations of weather conditions can be very helpful if it's incorporated with Western science.

Ari: It's not about choosing one way or the other, but figuring out how to draw on both traditions. Stabeno couldn't agree more.

Stabeno: There's more to an ecosystem than what we measure. It's how all of those parameters interact. And that's not an easy thing to understand. And the people who live in those environments – they understand the complexity of the system. Their life depends on it. For instance, I know how much ice is out there and I'll probably know how thick it is. But the ice has changed. This has been a real report of a lot of the people who live along the coast is the ice is quote "rotten." It breaks easier. A number of their seals that they consume is, "It tastes different." So there's a variety of things that are changing that we're

not measuring. They are the integrators of the ecosystem. I measure parts of it, but I'm an amateur.

<fade up transition music>

Ari: Curious about some of the results from the observatory studies we just described? Well, hear more at oceangazing.org, where you'll also find some photographs of the sea ice and of the team at work.

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