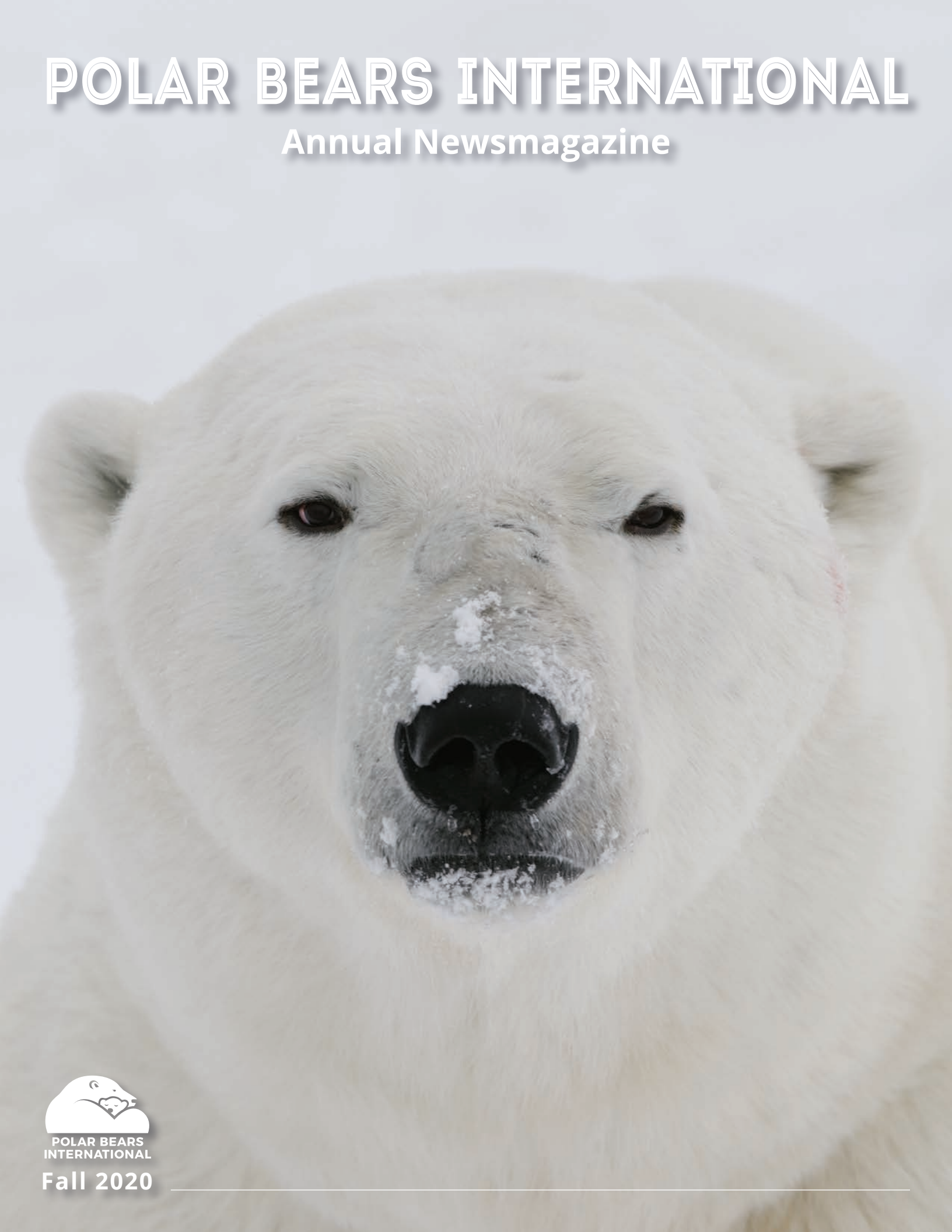
POLAR BEARS INTERNATIONAL

Annual Newsmagazine



POLAR BEARS INTERNATIONAL

Fall 2020

OUR CHANGING WORLD

As you read this, wild polar bears have gathered on the shores of Hudson Bay to wait for the sea ice to return. They have no idea that people around the globe are in the midst of a pandemic, with shutdowns altering daily life in ways none of us could have imagined a year ago.

The annual migration of polar bears in the fall, just like the burst of daffodils in spring, is a poignant reminder of the ancient rhythms of nature—and the responsibility all of us have, as citizens of this planet, to keep wildlife wild and to respect ecosystems and nature.

That respect lies at the heart of everything we do.

At Polar Bears International, our sole focus is on polar bears. We also work to inspire people to care about the Arctic and to understand that what happens in that fragile ecosystem ultimately impacts their own backyards.

Our annual newsmagazine takes you to the front lines of polar bear research and conservation, immersing you in the polar bear's world. Through stories and photos, we share insights on the bears and take you on a visual journey through one of the most remarkable places on Earth.

This year, our magazine includes findings from an important new study that, for the first time, outlines *when* various polar bear populations will start to disappear unless we meet the goals of the Paris Climate Agreement. The consequences of inaction are sobering, underscoring the importance of voting for leaders who will address the climate crisis while also doing all that we can to support meaningful change in our own communities.

The current pandemic has proven that bold, swift changes led by the government are not easy, but can be done. With global societies facing the task of rebuilding and restructuring, we have an opportunity to rethink existing systems and embrace the positive change we need. This includes ending our reliance on fossil fuels through a swift transition to renewable energy—a choice that will save sea ice, ensure the polar bear's future, help rebuild our stricken economies, and leave a healthier planet for us all.

Sincerely,

Krista Wright

Krista Wright
Executive Director

Polar Bears International's mission is to conserve polar bears and the sea ice they depend on. We also work to inspire people to care about the Arctic and its connection to our global climate.

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WORLD RANGER DAY AWARD 2020

By Geoff York

As our helicopter landed on the only visible part of fog-shrouded Wrangel Island in the fall of 2019, we counted four polar bears on a short stretch of shore, including one that poked its head from an old shack near a little-used cabin.

Landing in the midst of polar bears on a remote Russian island was a bit unsettling for our small research team, led by Dr. Eric Regehr of the University of Washington, but thanks to the excellent track record of the nature reserve's rangers, we held our concerns in check.

Russia's Wrangel Island Nature Reserve is home to one of the largest gatherings of polar bears in the world. The rangers who work in this remote and challenging environment follow a unique program to keep polar bears and people safe, one that involves a deep understanding of polar bear behavior—and not a single gun.

This year, in recognition of the staff's extraordinary achievements in preventing conflict between polar bears and people, we honored the team with our annual World Ranger Day Award, presented each year on July 31st.

Wrangel Island is critically important to the Chukchi Sea polar bears, a population shared by the U.S. and Russia. Most adult females in this population den on the island and polar bears of all types use the protected area as a refuge during the expanding ice-free season in summer and fall.

The reserve has created a highly successful program for managing a variety of interactions with polar bears, one that includes adapting methods from the Chukchi people along with more modern tools and techniques developed by staff. Rangers here carry no firearms. Instead they are trained to interpret polar bear behavior and to use an escalating set of responses depending on the situation—from simple aggressive body posture and noisemaking to the careful use of a long pole or staff and marine rescue flare pistols.

We are proud to recognize the team with this year's award. The honor comes with a plaque and an assortment of gear from Canada Goose.

Geoff York is Polar Bears International's senior director of conservation. Past recipients of our World Ranger Day Award include the late Vladelin Kavry of Russia's Umky Patrollers; Churchill, Canada's Polar Bear Alert team; Wildlife Officer Erling Madsen of Ittoqqortoormiit, Greenland; and the North Slope Borough's Polar Bear Patrols in Alaska.

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How Did Polar Bears Survive Past Warm Interglacial Periods?

By Dr. Ian Stirling and Dr. Kristin Laidre

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"Polar bears have evolved over a long period of time to live on fat-rich diets and cannot survive by eating plants like brown or black bears."

It is well known that polar bears need to use sea ice as a platform from which to hunt seals because they can't catch them in the open water. However, as the climate continues to warm the Arctic, the sea ice is breaking up earlier in the spring and freezing later in the fall. This means that the most important seal-hunting period of the year for the bears (late spring and early summer) is getting progressively shorter. The consequence of that for the bears, especially in areas with seasonal sea ice cover such as the western coast of Hudson Bay, is that they are now having to fast for progressively longer periods on smaller stored fat reserves while they wait on shore for the ice to freeze again so they can return to hunting. As the open water period has become longer over time, pregnant adult females have also been in poorer body condition before they start to den, are producing fewer cubs, and those cubs are not surviving as well as in the past.

Figure 1. *Some of the more than 180 bears recorded feeding on a single bowhead whale carcass on Wrangel Island, Chukotka, Russia, in September 2017 (© O. Belonovich/Heritage Expeditions).*

Now, because of continued climate warming, a lack of sea ice in summer throughout the Arctic has been predicted to occur within the next few decades. Not surprisingly, concerns are being expressed for the long-term survival of polar bears in the wild because, if the bears lose much or all of the sea ice on a year-round basis, they will be forced ashore for increasingly long periods, where they cannot simply adapt to terrestrial food sources.

Polar bears have evolved over a long period of time to live on fat-rich diets and cannot survive by eating

plants like brown or black bears. However, because polar bears evolved from brown (grizzly) bears about 500,000 years ago, it is clear that they must have survived at least three or four warm and largely ice-free interglacial periods in the past, including the most well-known and warmest interglacial period, the Eemian (130–115 thousand years ago!). Not surprisingly then, the big question people quite reasonably keep asking is: How did polar bears survive with little or no sea ice in the past, and could they do so again, until humans are able to slow and possibly reverse climate warming?

CLUES ON TODAY'S SHORES

An obvious starting point is to consider is: Are there any possible alternative food sources that are very rich in fat that might be available to polar bears stuck on land for long periods? When you stop to think about it, the hints about a possible answer to that question are already visible on Arctic shorelines every year. The carcasses of large baleen whales that die of natural causes and wash up on beaches in different parts of the Arctic are well known to attract large numbers of bears to feed on them, often for durations of a year or more. In past warm interglacial periods, long before the slaughters of the commercial whaling period, the numbers of large whales of several species living in the open and biologically productive polar oceans would have numbered in the hundreds of thousands, or possibly even millions, compared with just a few tens of thousands at the most today. Most whales, of course, die at sea and their carcasses sink, where they would be inaccessible to polar bears on land. However, roughly 10% of naturally dying whales become buoyant as a result of gas in the body cavity generated by the decomposition of body tissues while they are drifting at sea. Some of these carcasses would have washed up on beaches in the Arctic where they could have been fed upon by any bears in the area.

Several times in recent years, substantial numbers of polar bears have been observed feeding on large bowhead and gray whale carcasses. In 2017, more than 180 bears were seen scavenging on a single dead bowhead whale washed ashore on Wrangel Island in Russia *(Figure 1, left).* Moreover, individual bears may return to the remains of the same carcass for a year or more, as illustrated by bears feeding on a fin whale carcass in a small bay on the western coast of Svalbard, Norway a few years ago *(Figure 2 a-c, below)*. When you consider that each polar bear in a population may require about 43 ringed seals, or ringed seal equivalents, every year (more for big bears, fewer for small bears) then the importance of just one large bowhead whale carcass to hungry polar bears is huge *(Figure 3, page 16)*.

DIFFERENT STORY TODAY

The presence of polar bear populations throughout the circumpolar Arctic today makes it clear that polar bears persisted successfully through several previous low-ice interglacial

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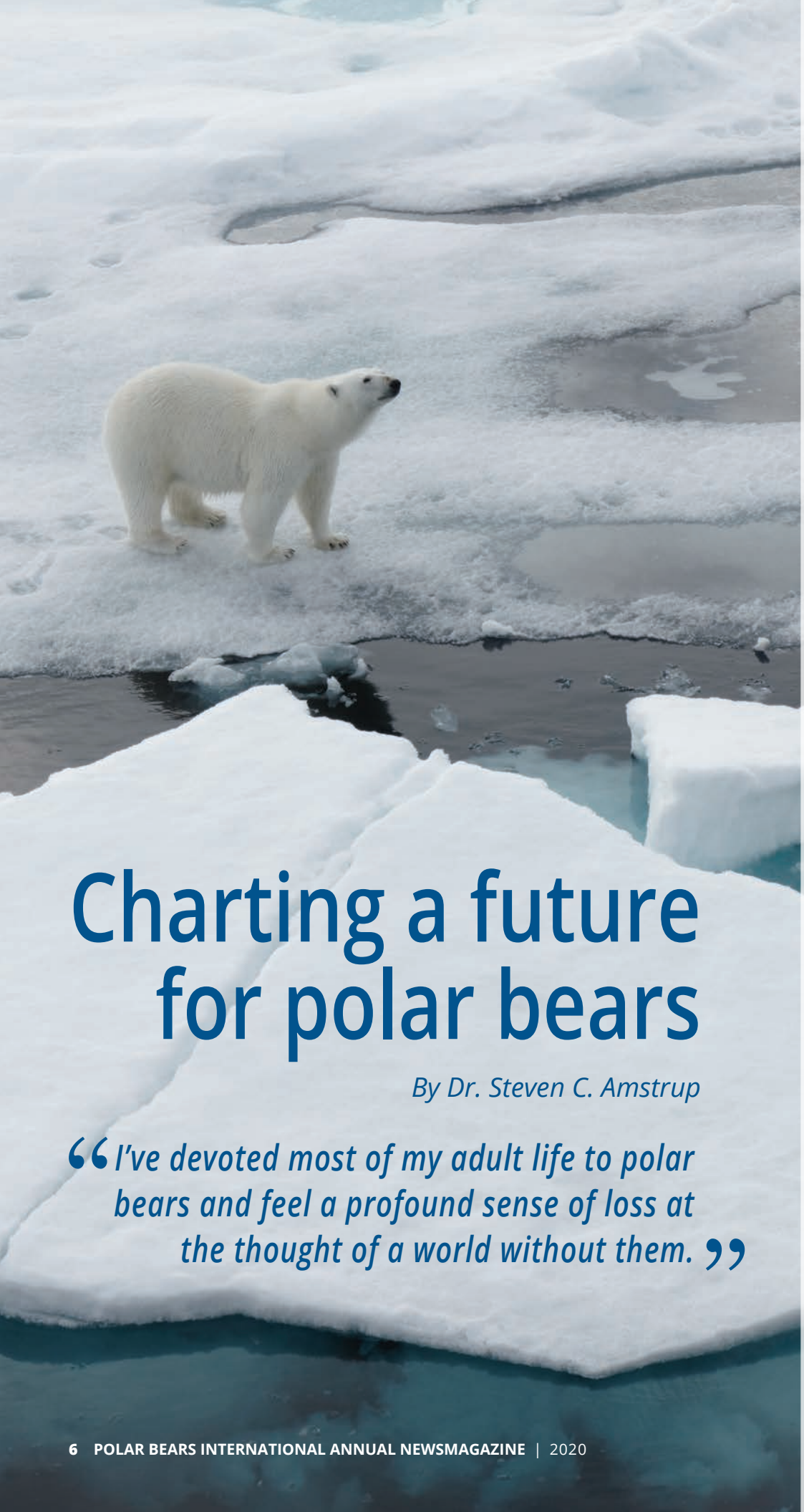
Figure 2. *Polar bears may scavenge on large whale carcasses for over a year, as shown in this series of images taken in Svalbard. (a) Four males stand on the floating carcass of a fin whale (Balaenoptera physalus) (© Daniel J. Cox/Arctic Documentary Project); (b) Two months later, the same carcass being fed on by six males and an unknown total number of bears throughout the following winter (© Norbert Rosing); (c) One year later, most of the carcass had been consumed but the remains, despite being largely submerged, were still being used by several bears, including this adult female and cub (© Ian Stirling).*



Charting a future for polar bears

By Dr. Steven C. Amstrup

“I’ve devoted most of my adult life to polar bears and feel a profound sense of loss at the thought of a world without them.”

In 2010, I led a study that predicted that polar bears could all but disappear across the Arctic by the end of the century unless we take action to greatly reduce greenhouse gas emissions.

But there are 19 populations of polar bears across the Arctic, living in four different sea ice ecoregions, and the critical question has always been: ***When** will each population begin to disappear?* ***When*** will they vanish from Alaska? From Churchill? From Svalbard? Is a world without polar bears an inevitable tragedy–or do we still have time to act?

Thanks to a brainstorm on a Tundra Buggy during the polar bear migration, followed by five years of hard work, we finally have answers to these vital questions.

Polar bears can only reliably catch their seal prey from the surface of the sea ice. They cannot outswim seals, and there are no consistent food sources on land that can match the energy content of fat-rich seals. By 2010, we knew there was a fundamental link between polar bear welfare and sea ice availability, and we could say with confidence that as sea ice disappeared, there would be ever fewer polar bears.

But quantifying reproduction and survival responses to sea ice loss for 19 polar bear populations was a difficult challenge. Even in areas where we have sufficient data to obtain these estimates, we don’t know what those vital parameters will be in future ice conditions.

While most polar bear researchers were ardently focused on developing better estimates for these parameters, Dr. Peter Molnar, now at the University of Toronto, Scarborough, was pioneering a physiological approach. His idea was to determine how many days polar bears can fast before reproduction and survival begin to fail.

I immediately recognized that Peter's approach provided a breakthrough solution to the dearth of reproduction and survival data. If we could combine fasting limits for polar bears with estimates of the future numbers of ice-free days in different regions, we could predict *when* individual populations would begin to fail. The problem was that, at that time, climate models produced values only for ice-free months, not days.

NETWORKING, TUNDRA-STYLE

I can still remember bumping along on the tundra near Churchill on a snowy, blustery day, stopping to watch a polar bear mom and cub wrapped around each other in a snow bed outside our buggy window. I've studied polar bears for nearly 40 years and am still endlessly moved by their amazing adaptations to their icy Arctic home.

With me on the buggy was Dr. Marika Holland, a sea ice expert at the National Center for Atmospheric Research. Marika told me that NCAR's latest model directly produced estimates of ice-free days. When I returned from the tundra, I called Peter with this news, and he was keen to finish developing his model with an eye toward this *when* question.

Without action to reduce emissions, longer fasting periods will ultimately impact cub survival rates and the polar bear's ability to reproduce.

After speaking to Peter, I called Marika. Alas, she was too busy to work on the project, which we knew would be difficult and time-consuming. But I was pleased indeed when she recommended I ask Dr. Cecilia Bitz at the University of Washington. I knew Cecilia well. She previously had joined us in Churchill and was key to the study mentioned above, which was published in Nature a decade ago. That paper not only predicted that polar bears would all but disappear without action on climate but also showed that there is no "tipping point" for Arctic sea ice—and that, instead, there is a linear relationship between sea ice extent and global mean temperature.

Cecilia and I talked about the challenge of creating timelines for when each of the 19 polar bear populations might start to disappear, answering the critical *when* question for managers and policy makers—and inspiring the global community to embrace climate solutions.

She was happy to join the effort, and so the project was born.

For this study, Peter looked at data from across the Arctic to estimate how fat and how thin polar bears can be when they enter their summer fast. He calculated their energy use and then modeled the threshold number of days that polar bears can fast before cub and/or adult survival rates begin to decline. Intersecting these with Cecilia's sea ice projections, we were able to create timelines of risk for when reproductive success and survival would begin to fail—the first time this had ever been done.

We released our findings in a paper published in Nature Climate Change in July of this year, with Peter as the lead author.

THE CHOICE IS OURS

In the study, we explored two alternative futures for polar

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POLAR *and* BROWN

Observations from the We

By Dr. Evan Richardson

"The silence was broken by a call over the radio: What is THAT?"

In the 20 years that I have been studying polar bears in the Arctic, I have learned a lot about their ecology and have been very fortunate to spend many amazing days out on the sea ice. Through all of that time, if there is one thing that I have learned it is to expect the unexpected.

In April 2012, I was part of a research team that was headed to Viscount Melville Sound, an area at the very western edge of the Northwest Passage. Viscount Melville Sound is home to one of the world's 19 polar bear populations, a place that is infrequently visited due to its remote nature. The last research team to check up on the polar bears in this area was there in the mid-1990s. It was time for another check-up on how the bears were doing.

Our research team would make use of three small cabins and two remote tent camps that we would have to establish. In total, we planned on being in the field for four to six weeks, depending on weather. Our jumping off point was a small cabin on the north end of Victoria Island in a place called Wyniatt Bay. On April 23, the thermometer sat at a brisk -25°C and the winds were calm as the sun crested the horizon. I rolled out of my bunk, put on my parka, and grabbed our Honda generator. I gave a couple pulls, and the Honda fired up. (I had kept it inside the cabin to help with the morning ritual of warming up the helicopter's engine. It is one thing to try to cold start your 1981 Pontiac Grand Prix in Winnipeg, quite another to cold start a million-dollar helicopter in the middle of nowhere!)

This was our first of three years in Viscount Melville Sound, and we set off to get a feel for where the bear activity was. Polar bears are usually not uniformly distributed; they're drawn to areas with greater seal densities and better hunting opportunities. We got geared up and headed east across Wyniatt Bay to work our way through a

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BEAR HYBRIDS

stern Canadian Arctic

number of small inlets that run like fingers into the rocky shore. These areas of consolidated sea ice attract ringed seals as they make for good pupping habitat and often attract bears.

We flew through several inlets, seeing nothing but old tracks and no bears. As we turned into the mouth of one of the larger inlets, the silence was broken by a call over the radio: "What is that?" I peered from the back seat of the helicopter and saw a dark shape moving quickly across the sea ice. As we approached, it was evident that it was a large brown bear, chasing what appeared to be a smaller polar bear. We swung in for a closer look. The smaller bear began running up a steep rocky slope. As we got closer, we could see that it was no regular polar bear. It had a brown streak down its back, brown circles around its eyes (almost like spectacles) and longer claws. It was a hybrid!

Hybrids had been previously observed by Inuit in this part of the Canadian Arctic, and this little bear fit the bill. The brown bear was standing at the base of the rocky slope, and the small bear continued to climb. It was evident from the steam coming from both of them that the chase had been going on for a while. With both bears too warm to safely handle, we snapped a couple of quick photos and marked the GPS location, hoping that we would find them another day.

SECOND CHANCES

The next day we returned to the area, but there was no sign of either bear. The following day we were flying over the sea ice north of Wyniatt Bay in Viscount Melville Sound. Tracking conditions were difficult, and we were not having much luck finding bears. We had been flying for almost two hours and had only seen a handful of old windblown tracks.

Scouring the ice for tracks and bears for hours at a time can be very fatiguing. We decided it was time to take a break and landed the helicopter close to a large iceberg. After a quick cup of coffee, we climbed up on the iceberg to have a look around. At the top, we could see to the horizon in every direction, looking out over the vast areas of sea ice that are so critical to the polar bear's existence.

As we soaked it all in, formulating our plan on where to go next, a familiar phrase was uttered again: "What is that?" A quick glance revealed a dark-colored object moving across the sea ice. A wolverine? A muskox? Another brown bear? We quickly slid down the snow-covered iceberg and fired up the helicopter to go take a closer look. As we closed the gap, there was no mistaking that it was a brown bear walking on the ice in front of us, likely the same one from two days before. With ideal conditions and a well-experienced pilot, the capture went smoothly and

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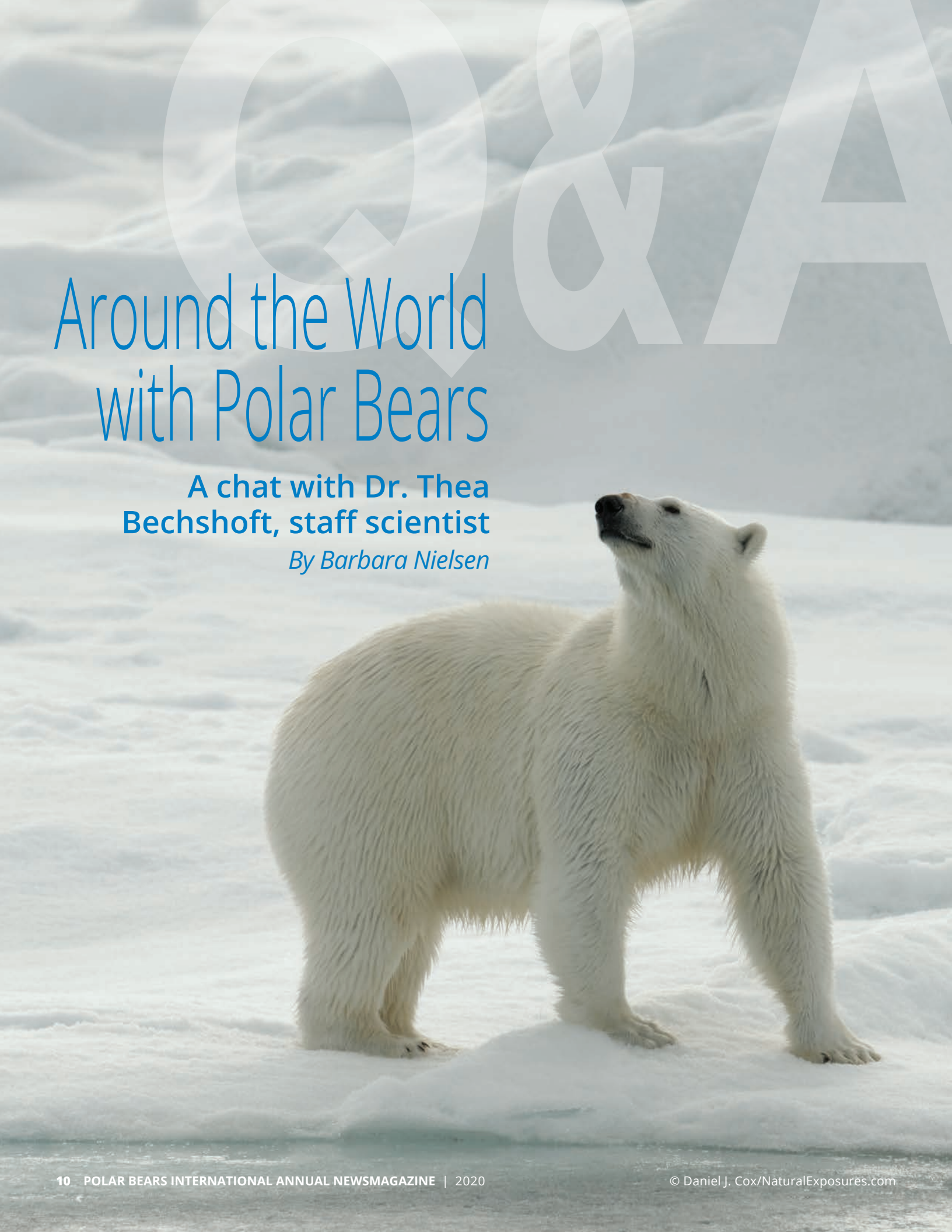

Q&A

Around the World with Polar Bears

A chat with Dr. Thea Bechshoft, staff scientist

By Barbara Nielsen

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The first time Dr. Thea Bechshoft stood on the sea ice next to a sedated polar bear, she felt incredibly nervous, keenly aware of the fact that she was in the middle of nowhere—and if anything happened, too bad.

"I didn't know how to judge if the bear was really out or not," she recalls. "But Dr. Andrew Derocher, who was leading our research team, looked comfortable, so I gradually moved closer for a quick touch. Then I overcame my fear and buried my face in its fur for a good whiff."

So, what did the bear smell like? Fresh, clean air is the closest Thea can come to—like a walk on a beach on a windy day.

Curiosity and a passion for research and science are driving forces for Thea, who began volunteering with Polar Bears International eight years ago and joined our staff in 2018. We caught up with her at her home in Denmark, chatting via Skype about her life and career.

Q: Tell us about your background. How did you end up studying polar bears?

Even when I was in high school, I knew I wanted to work with animals. I studied biology at the University of Copenhagen and, while there, almost made a choice to study ants in South America. But instead I became intrigued with the Arctic after seeing a brochure about the University Center in Svalbard, Norway. I applied for a semester but loved Arctic field work so much I stayed 1½ years. Afterwards, I worked on my master's under Dr. Øystein Wiig, a well-known polar bear scientist with the University of Oslo. He had a collection of 700 polar bear skulls and was looking for a student interested in doing a master's project on them. The key focus involved analyzing asymmetries in the skulls to assess the influence of chemical pollution.

It turned out to be a fascinating project. There were these little hand-written field notes attached to the skulls, many in old-fashioned handwriting. They had been collected over decades; some were over 100 years old. Each time I held a skull in my hand, I would think about that particular polar bear and its story—where it lived, where it roamed, why it had a broken tooth, and so on.

Q: From there, you went on to study polar bears in Greenland while working on your doctorate in Denmark. What was the focus of your research?

Greenland's polar bears are some of the most polluted in the world because of wind and ocean currents that carry many contaminants to this region in particular. I was part of a project to study the effects of those pollutants on polar bears. Our field work took place in East Greenland in Uunarteq, a tiny abandoned settlement about seven kilometers outside of Ittoqqortoormiit—all located at the mouth of the Scoresby Sound, one of the largest and longest fjord systems in the world. The project was led in part by my PhD supervisor, Dr. Christian Sonne of Aarhus University, and I spearheaded most of the logistics—months of hard work, but really enjoyable and well worth all the experience it has given me with planning field work in the High Arctic. Our team took tissue samples from hunter-harvested bears, which were sent to a unique polar bear tissue bank outside of Copenhagen. These were legal hunts by local indigenous hunters in Greenland, based on a limited quota system.

Q: What was it like working in Greenland?

Near Uunarteq there is a permanently open area in the sea ice that polar bears often visit to hunt seals. We were always under time constraints: We took several hundred samples from each bear, each processed and stored in its own finicky way—all while keeping an eye out for approaching bears.

I remember once there was an eight-year-old boy from town who was so curious. I was sitting on

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SAFER CO-EXISTENCE FOR POLAR BEARS AND PEOPLE

By Matt Brace

The Canadian town of Churchill, Manitoba, is working to establish the world's first polar bear safe community. It is the next step in a drive to minimize encounters between people and polar bears so both can thrive. More encounters are likely as retreating sea ice is forcing nutritionally stressed bears to spend more time on shore.

Churchill knows a thing or two about polar bears. It sits on the western shore of Hudson Bay and is visited by hundreds of bears each year. They leave the melting ice east of the town in spring and make their way overland, joining the new ice as the bay re-freezes in late fall. Churchill is en route, which has made it a nature tourism hotspot and earned it the nickname Polar Bear Capital of the World.

The bears are a major economic asset for the town and locals want them around—they just don't want to bump into them on a downtown street corner.

BETTER AND SMARTER

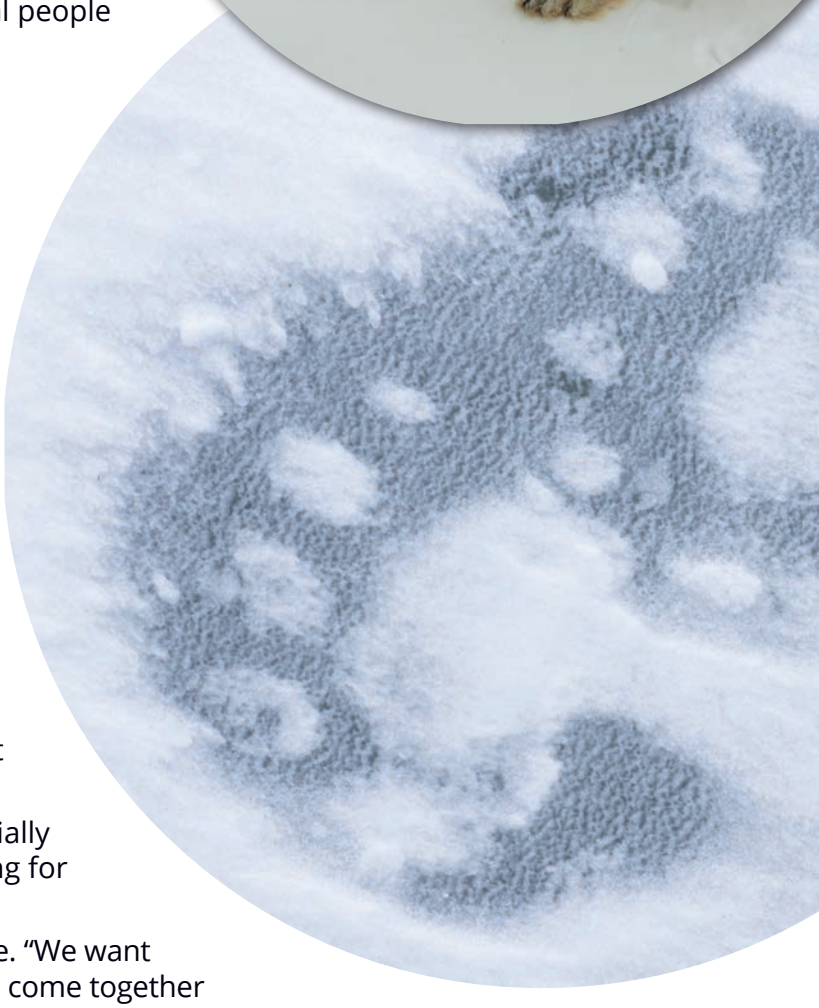
Historically, the community has focused on removing food sources that attract bears, educating people about bear safety, and keeping people and bears apart. It has also pioneered such initiatives as the year-round Polar Bear Alert Program, a 24-hour hotline with professional responders to whom people can report bear sightings that could pose a risk. In addition, it has introduced a polar bear holding facility, where bears who come into town are temporarily (but humanely) held before being relocated.

Churchill's mayor, Mike Spence, said the town is now building on those successful initiatives to "up their game."

"We've definitely played a role in co-existence, but we can do a lot more," he said. "Our polar bears are such a valuable resource, and we need our nature tourism industry to flourish.

"We all have a responsibility to our community and the bears, so we have to do things better and smarter. We have to make the most of economic opportunities for local people while improving safety."

To this end, the town of Churchill, with support from Polar Bears International, has used their strong local partnerships to set up a working group with representatives from across the community. The working group engaged the whole town, from local authorities to tourism operators and the chamber of commerce. It also included Indigenous and community representation, along with a delegate from Manitoba Province. A federal government representative joined the second meeting.



WHAT IS A POLAR BEAR SAFE COMMUNITY?

As with any co-existence between humans and wild animals, safety can never be 100% guaranteed. A polar bear safe community, however, can make its area significantly safer for both people and bears. On the ground in Churchill, this means fewer bears in town and fewer bears that have to be locked up or relocated.

People will still be advised to exercise caution, especially when bears are gathering along the shore and waiting for the ice to form.

"We are trying to lead by example," said Mayor Spence. "We want to show the world that communities like Churchill can come together and make a difference. We want other communities to see us as an example of somewhere that has made some big changes which have improved how we safely co-exist with polar bears. We hope this will inspire more and more communities to follow our lead, so they become polar bear safe too."

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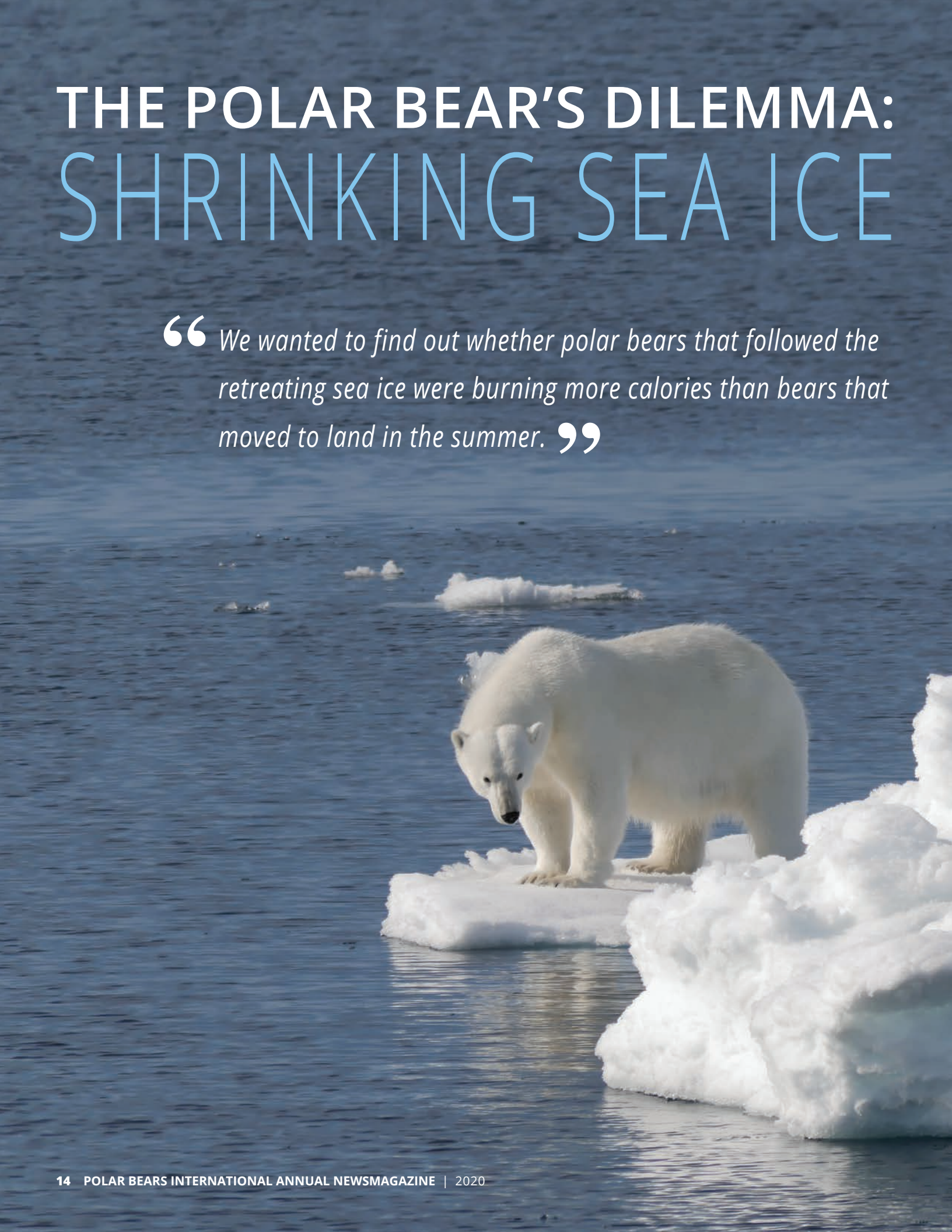
All photos © Daniel J. Cox/NaturalExposures.com

THE POLAR BEAR'S DILEMMA: SHRINKING SEA ICE

"We wanted to find out whether polar bears that followed the retreating sea ice were burning more calories than bears that moved to land in the summer."



By Dr. Anthony Pagano

Until recent decades, polar bears in the Beaufort Sea north of Alaska and northwestern Canada remained on the sea ice throughout the year where they fed on seals in biologically rich near-shore areas. However, as a consequence of climate change, summer sea ice in the Beaufort Sea now retreats hundreds of miles from shore. This increase in open water has driven a divergent movement pattern in this population, where about a quarter of the bears now come on land, while the remainder move hundreds of miles to follow the shrinking summer sea ice platform.

In a recently published paper in the journal Ecology, my colleagues, Drs. Todd Atwood and George Durner with the U.S. Geological Survey and Dr. Terrie Williams with the University of California, Santa Cruz and I sought to evaluate the implications of this divergent movement pattern on polar bear energy expenditure. Specifically, we wanted to find out whether bears that followed the retreating sea ice were burning more calories than bears that moved to land in the summer.

INNOVATIVE APPROACH

Tackling this question led us to some new technologies that have become popular with human athletes. We attached accelerometers, the same devices used in Fitbits®, to polar bear GPS collars to link polar bear locations and habitat use with their energy expenditure. In the same way that a Fitbit provides an estimate of energy expenditure (calories) and behavior for humans, we used these devices to estimate polar bear energy expenditure and behavior.

Of course, Fitbit and other activity-tracking devices have been calibrated for humans. To calibrate our devices for polar bears, we worked with polar bears at the San Diego Zoo and the Oregon Zoo, where they were trained to voluntarily walk on a metabolic treadmill, which allowed us to link the data from the accelerometer with the cost of their movement by measuring the amount of oxygen in the air they were breathing.

From these calibrations, we were able to measure the energy expenditure and behaviors of wild polar bears in the Beaufort Sea for five months, from May to October, to evaluate the energetic cost of this new divergent movement strategy. To our knowledge, this was the longest collection of continuous accelerometer data in a wild animal, which gave us new insight into the seasonal changes in energy expenditure of this remote apex predator as it navigates its melting ice habitat through the spring and summer.

ECOLOGICAL TRAP

Surprisingly, we found that bears who moved to land expended 7% more energy on average over this five-month period than bears that remained on the receding sea ice. This higher energetic cost to move to land was driven by a higher frequency of swimming as bears swam to land from the melting sea ice. This meant that bears that moved to land spent 22% more energy to get to land than bears spent to follow the receding summer pack ice—even though bears are having to move much greater distances to follow the retreating sea ice than they would have historically. This helps explain why the majority of the bears in this population continue to remain on the sea ice throughout the summer despite the significant decline in summer sea ice.

However, prior research has shown that bears on land in this region have access to whale carcasses harvested by indigenous residents in the summer, while bears on the sea ice appear to be fasting. This suggests that the decision by each bear to stay on the ice, over areas with limited food, is creating an ecological trap. These bears are selecting a habitat that requires less energy expenditure in the short-term, but that appears to be more energetically costly overall once prey accessibility is accounted for. This ecological trap from following the retreating sea ice is likely a contributing factor in the population declines that have been documented in this population.

Dr. Anthony Pagano is currently conducting a postdoctoral fellowship at San Diego Zoo Global, collaboratively supported by Polar Bears International, San Diego Zoo Global, and the U.S. Geological Survey in Alaska.

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WARMING PERIODS

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periods that resulted from naturally occurring climate cycles. The most likely explanation available to date seems to be that polar bears likely survived primarily by scavenging on whale (or other marine mammal) carcasses which, considering the large populations that must have been abundant in the Arctic before the arrival of humans, may have occurred relatively frequently in areas where prevailing winds or sea currents brought them to the coast. The polar bears in areas where whale carcasses washed up probably ate and stored large amounts of fat from them in order to survive periods when hunting seals was not an option.

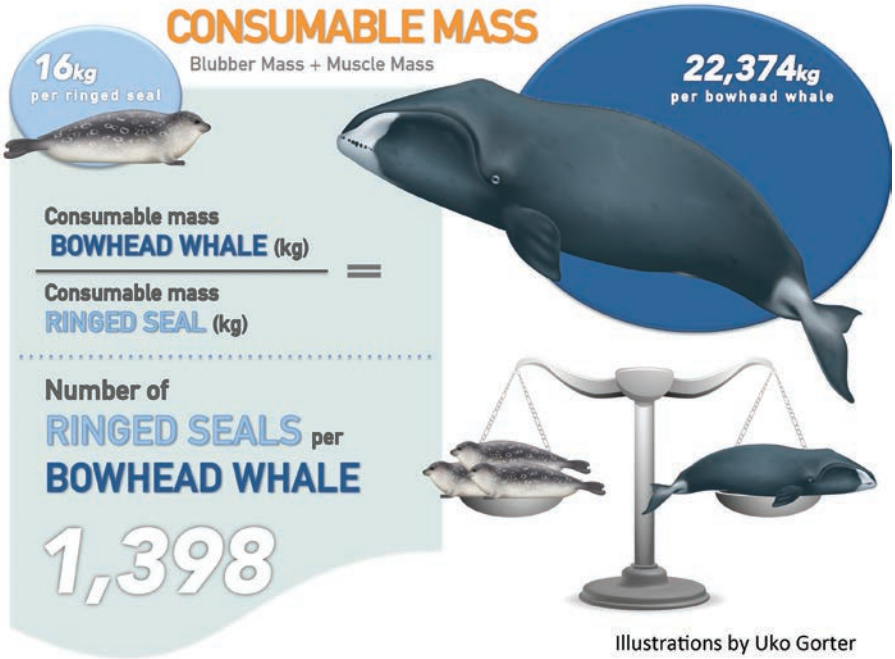

Figure 3: *Calculation of the value of the blubber and muscle mass of an adult bowhead whale carcass to polar bears, as measured in ringed seal equivalents (© Uko Gorter).*

However, when we look at the present situation in the Arctic marine ecosystem, with respect to possible alternative food sources for polar bears if they were largely unable to hunt seals, it's a very different picture. Whale carcasses may still be important in a few areas but, quite simply, the potential overall availability of carcasses to scavenge on is substantially less than was likely the case before commercial whalers arrived in the Arctic, devastated many of the whale populations, and, later, developed large-scale offshore industrial and shipping activities.

Of equal overall importance though, the potential ability of whale carcasses to help polar bears survive in a future relatively ice-free Arctic will not only depend on a supply of carcasses over time but also that they recur reliably in predictable locations. For example, the present-day healthy populations of gray and bowhead whale populations offshore from the coasts of Chukotka (Russia) and Alaska produced an average of about 11 large whale carcasses between June and November each year from 1963-1993. Clearly, the predictable amounts and locations of whale carcasses, potentially augmented by lesser amounts of dead walruses and other seals, still has the potential to significantly augment the diet of polar bears in the area for some time. In contrast, in recent years, variable but small numbers of whale carcasses are periodically stranded on the western and northern coasts of Svalbard, after being transported there from the North Atlantic via the Gulf Stream.

The diet of resident polar bears may be augmented by these carcasses but, because carcass numbers are low and the locations where they are deposited are less predictable, their potential value to supporting a polar bear population at present is fairly low. Thus, even though whale carcasses will always be important for scavenging polar bears wherever they wash ashore, they are not expected to be able to replace seals as the nutritional resources for the circumpolar population of polar bears as we move towards an ice-free Arctic. In most regions, the environmental changes are too large and the whale carcasses too few. In summary then, although it appears that whale carcasses may have helped polar bears persist through previous warm periods, the only real solution for the conservation of polar bears throughout the circumpolar Arctic remains to slow and ultimately stop climate warming.

Dr. Ian Stirling is a research scientist emeritus with Environment and Climate Change Canada and an adjunct professor with the Department of Biological Sciences, University of Alberta. Dr. Kristin Laidre is a research scientist at the Polar Science Center, Applied Physics Lab, University of Washington.

Q&A *cont. from page 11*

the ice for at least two hours, working on a bear that had just come in, and he asked questions about everything I was doing. His mom later told me, "That was so amazing for him. He wants to be a biologist when he grows up."

During the down time, we prepared for the next bear. We had to make sure everything was stored just right—and labeled just right—so when it was time to go, we were ready. When it came time to write my dissertation, I focused mostly on what we can learn from polar bear hair samples, which was a new approach at the time. Dr. Andrew Derocher of the University of Alberta was one of the opponents at my PhD defense, which is how I ended up doing a postdoc in Canada for 3½ years.

Q: What was the focus of your research in Canada?

Two-thirds of the world's polar bears live in Canada, but compared to East Greenland, little work had been done on how contaminants were affecting them. I started working with Dr. Derocher on a study on the impacts of pollutants like mercury on the polar bears of western Hudson Bay. I also further developed earlier work I had done with polar bear hair samples. These can be collected non-invasively and can tell us so much—about the health of the bears, their diets, the load of pollutants. I've become keenly interested in developing minimally invasive ways of studying polar bears.

Q: While living in Canada, you started volunteering with Polar Bears International and later joined our staff. How did that come about?

All thanks to Dr. Derocher. He wants his students to have the opportunity to see polar bears in the wild. He serves as a scientific advisor to Polar Bears International, and he arranged for me to volunteer as a Tundra Connections panelist in 2013. I found PBI to be an amazing group of people whose values I recognize in myself. PBI invited me back for additional broadcasts, and I also volunteered as a field ambassador. I returned every fall before joining the staff in 2018.

Q: As a staff scientist for Polar Bears International, based in Denmark, what is your role?

I do a lot of research and also spend time connecting researchers who work with wild polar bears to staff who work with polar bears in zoos and aquariums. Zoo bears play an essential role in developing and validating less-invasive research methods and can help answer questions that we can't study in wild bears. A lot of scientists don't know what the zoos can do, especially in Europe. So, part of what I'm doing is raising awareness and connecting people to facilitate research. When I talk to zoo people, they are so eager to contribute. My work with zoos also includes serving an advisor to the European Association of Zoos and Aquaria's Endangered Species Program, in particular the new Polar Bear Research and Welfare Working Group.

In addition, I do a lot of outreach for PBI, from media interviews to live broadcasts and blog posts. I really like live Q&As where I don't know what the next question will be. In fact, after my first trip to Churchill, I was so motivated and inspired that I came home and started a "Polar Bear Questions" page on Facebook, a series that is also featured on PBI's website. People ask such unexpected and interesting questions, and quite often I learn new things myself, which I love.

Doing the outreach motivates me. It makes me feel that I'm not alone in caring. It's clear that people care about polar bears and want to know how they can make a difference—and that's incredibly important to me.

Barbara Nielsen is Polar Bears International's communications director.

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CHARTING A FUTURE *CONT. FROM PAGE 7*

bears based on different levels of greenhouse gas emissions.

The first scenario models what will happen to polar bears if people take no action on climate change and continue to maximize the use of fossil fuels with business-as-usual carbon emissions. In this scenario, the average end-of-century temperature will be 4.3 degrees Celsius above pre-industrial levels. This would mean that a few populations of polar bears may survive in the most northern parts of their current range, but most would collapse by the end of the century—only 80 years from now.

The second scenario models what will happen if people make moderate reductions to carbon emissions, with an average end-of-century temperature increase of 2.4 degrees Celsius above pre-industrial levels. In this case, more polar bear populations may persist to the latter part of this century.

Although moderate mitigation is better for polar bears in the short-term, the long-term temperatures would still continue to rise beyond 2100, and the polar bear's long-term future would still not be assured.

Ideally, we would follow a different scenario, not modeled in our study, where people come together and take swift, bold action as a global community to meet the goals set during the Paris Agreement of 2015—which will keep global temperature rise below 2 degrees. This is still an option, and doing so could preserve polar bears over much of their current range *indefinitely*.

MY LIFE'S WORK

I've devoted most of my adult life to polar bears and feel a profound sense of loss at the thought of a world without them. The urgent need to motivate action is why I retired as Polar Bear Project Leader for the U.S. Geological Survey to take on the role of chief scientist for Polar Bears International, where I can focus my efforts on communicating the looming threats to polar bears and their sea ice home.

Polar bears have long been considered messengers of the climate change symptoms that will impact all life on Earth, including us. We know that floods, droughts, and wildfires are becoming more frequent and severe as the world continues to warm and that these impacts will intensify as global temperatures rise.

The coronavirus pandemic shows how vital it is for our governments to embrace

continued on page 19

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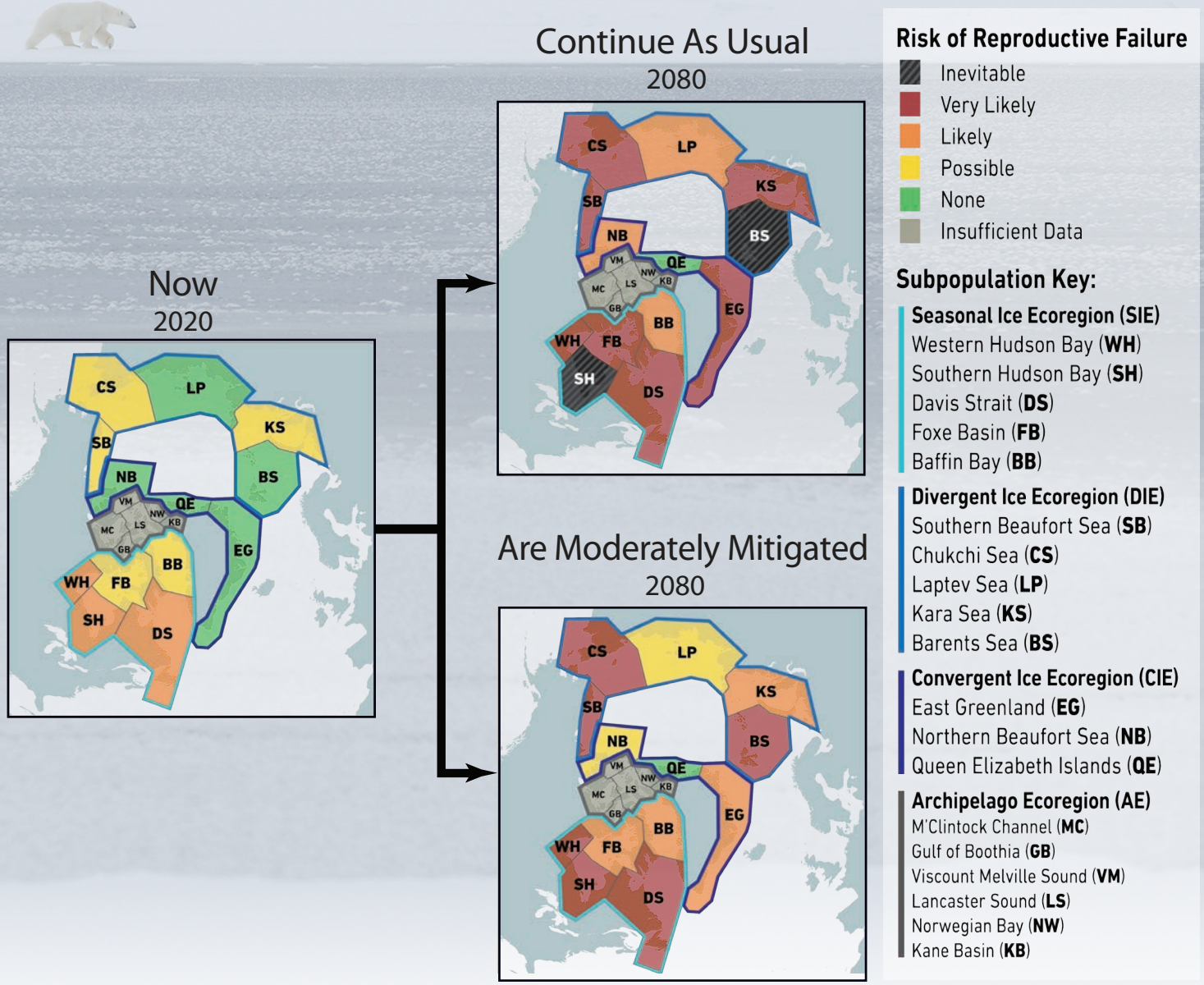
Risk of Reproductive Collapse in Polar Bears if Greenhouse Gas Emissions. . .



needed solutions, even when the timeline of the threat feels uncertain. Showing how imminent the threat is for different polar bear populations is another reminder that we must act *now* to head off the worst of future problems faced by us all. The trajectory we're on now is not a good one, but if society gets its act together, we still have time to save polar bears. And if we do, we'll benefit the rest of life on Earth and leave a better world for generations to come.

Dr. Steven C. Amstrup is Polar Bears International's chief scientist. He has researched polar bears for nearly 40 years.

HYBRID BEARS

cont. from page 9

before we knew it, we were standing on the sea ice with a brown bear in the middle of the Canadian High Arctic. What was this bear doing out on the sea ice? How was he making a living? There wouldn't be any vegetation on the surrounding islands for months, and there were no caribou or muskoxen to chase out on the sea ice. However, if this was indeed the same bear that we saw in Wyniatt Bay, he likely wasn't looking for food—he was here to mate.

LOVE IS BLIND

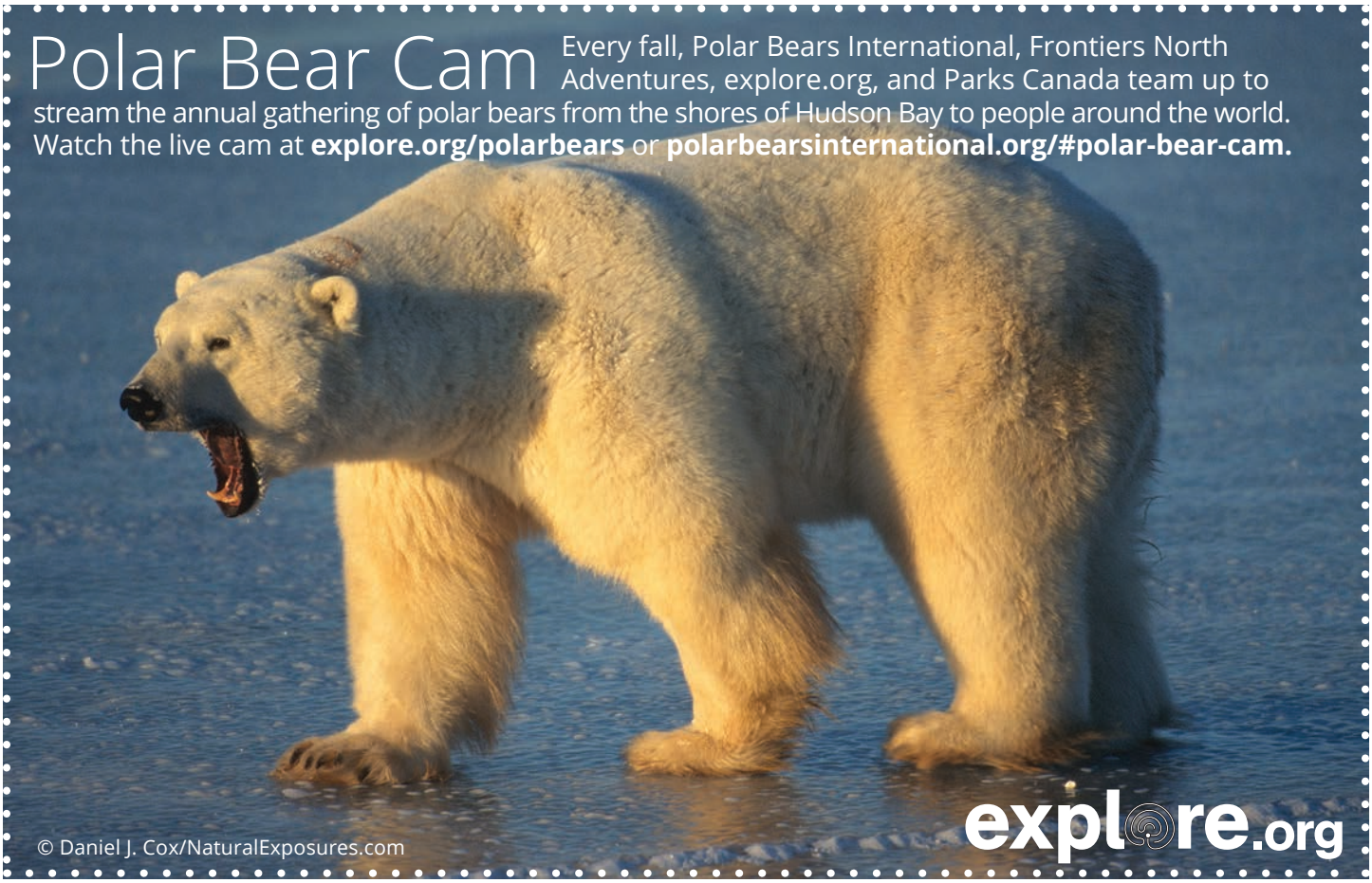
Both brown bears and polar bears mate in the spring, with females coming into estrus as the days lengthen. One of the interesting aspects of brown bear sightings in the Canadian Arctic Islands is that they are almost exclusively male. Many large mammals have male-biased dispersal, with males dispersing to outlying areas to establish home ranges away from their close relatives, including mothers and sisters. This is likely partially driven by territoriality as well as to avoid inbreeding. Regardless, this male-biased dispersal means that when the spring mating season begins, and big males like the one we had captured are ready to breed, there are likely very few or no female brown bears in the area to breed with. From an evolutionary perspective, surviving and reproducing are the two biggest drives in an animal's life. In the absence of female brown bears, the only other option for these male brown bears is to look for female polar bears. Polar bears and brown bears are very closely related species, and it has been known for some time that they can hybridize. Why this particular male left his den early to pursue potential mates is anyone's guess, but a small tissue sample from him would prove to be very informative.

Although polar bear-brown bear hybrids are rare, they do happen. The mix of traits makes these bears poorly adapted to both sea ice and land. © Daniel J. Cox/NaturalExposures.com.

LAST CHANCE

Fast forward two years later, and we were back in Wyniatt Bay for the final year of our research program. It was April 14, 2014, and we were working the same series of inlets on the east side of Wyniatt Bay in which we had observed the brown bear and suspected hybrid. As we worked our way down the very same inlet where we had spotted the male brown bear and suspected hybrid two years before, we spotted four animals moving across the sea ice. If I hadn't been harnessed into my seat, I think I would have fallen out at the sight of a cream-colored bear (with a brown stripe and circles around her eyes) trailed by three little chocolate-brown cubs. Hybrids! This time the conditions were ideal for taking a closer look, and before I knew it, we were standing on the ice with four brown bear–polar bear hybrids.

From all appearances, the female bear appeared to be the same bear we had last observed scrambling up the rock slope almost two years to the day previously. Even more shocking were her three little cubs, which looked like brown bears from all appearances. The only logical answer was that the female hybrid in question had bred with a brown bear and that her cubs were second-generation hybrid backcrosses. This would make her offspring 75% brown bear and 25% polar bear. Subsequent genetic analysis revealed this to be true. In addition, the big male brown bear we had captured



in 2012 was, in fact, her father. Further genetic analysis revealed that another unknown male brown bear in the area had fathered her three young cubs as well as two other first-generation hybrids reported by Inuit hunters.

EVIDENCE FROM THE PAST

So how common are brown bear–polar bear hybrids? In the Canadian Arctic only four first-generation hybrids and four second-generation hybrids have been observed over a brief period from 2006-2014. However, genetic studies have shown that hybridization between brown bears and polar bears is not new and has likely occurred in several places in the past. For example, genetic work on brown bears demonstrated that brown bears on Admiralty, Baranof, and Chichagof Islands in Alaska contain up to 8.8% polar bear ancestry. Similar instances of hybridization between these two species have been documented as far away as Ireland.

People often ask if "grolars" or "pizzlies" will be better adapted to the changing Arctic? The most likely answer is no. In general, hybrids likely make for pretty poor brown bears and pretty poor polar bears. Their mix of physiology, coat color, dentition, and behavior is likely not well suited to either a terrestrial or marine existence. Indeed, the genetic work I mentioned shows that hybridization can and has occurred in the past, but that hybrids don't persist over the long term. Polar bears evolved from brown bears to occupy a specific niche, and, if anything, as the climate continues to warm and the ice-free season lengthens, it is likely that brown bears will continue to expand their range northward. With greater overlap between these two species, the opportunity for more "grolars/pizzlies" may increase. However, for the time being the last hybrids were seen in Wyniatt Bay on April 14, 2014. It is anyone's guess whether they will be seen again or if more hybrids will result from the expansion of brown bears into the Arctic Islands. The only thing that is for certain is that you should always expect the unexpected!

Dr. Evan Richardson is a polar bear research biologist with Environment and Climate Change Canada.

SAFER CO-EXISTENCE *cont. from page 13*

A UNITED FRONT

The biggest cause of conflict between polar bears and people is food. As a first step, the working group is considering what can be done to enhance Churchill's efforts to reduce food sources in town. It's important not just to secure waste so bears can't get to it but also to reduce food smells, which attract them in the first place.

This is one action that the town is getting on with. Some other actions, however, must be approved by the Manitoba Province or the federal government. A major reason for setting up the working group was to show these governments that the polar bear safe initiative is being promoted not just by Churchill and its tourism operators, but by a broader, united group representing a wide range of sectors of society and with considerable combined expertise.

RELOCATION RE-THINK

One of those higher-level government decisions is where to relocate bears who come into town. The working group is floating the idea of relocating them within Wapusk Park, instead of farther up the Hudson Bay coast, which has previously been done.

Wapusk covers 11,475 square kilometers (4,420 square miles) and already protects one of the largest polar bear maternity denning areas in the world. If this can be done in line with improved garbage handling, the working group believes it will reduce the incentive for the bears to come into the townsite. Instead, they'll remain safely within the park, providing more viewing opportunities for tourists but staying away from communities. It's a potential win for everybody—and every bear—if the working group can convince the governments of its merits.

Other working group priorities include stationing a provincial wildlife biologist in town, improving bear awareness materials and strategies for visitors and locals, and supporting efforts to test and adopt improved bear tracking systems.

NEXT STEPS

The working group has been delayed slightly by COVID-19, but it is making progress. Delegates held a second meeting in June. At that gathering, wildlife biologists from Manitoba Province and the Canadian Government presented updates. Several follow-up meetings are scheduled for later in the year.

These may sound like small steps, but they are essential in the design and long-term effectiveness of the world's first polar bear safe community.

Matt Brace is an award-winning writer and editor. He is a former reporter and foreign correspondent for The Independent and The Observer national newspapers in the UK.

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Polar Bears International Calendar of Events

INTERNATIONAL POLAR BEAR DAY
February 27th

ARCTIC SEA ICE DAY
July 15th

BELUGA CAM
Mid July-mid September

POLAR BEAR CAM
Late October-late November

POLAR BEAR WEEK
First full week of November

NORTHERN LIGHTS CAM
November-March

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