POLAR BEARS INTERNATIONAL

Annual Newsmagazine

INSIDE:

The Amazing Breeding Behavior of Polar Bears

POLAR BEARS INTERNATIONAL

Fall 2019

SPIRIT OF COLLABORATION

Ten years ago, I visited Churchill for the first time, volunteering to help with Polar Bears International's Leadership Camp. As an environmental educator with a passion for wild creatures and wild places, I was overwhelmed with emotion when we saw our first polar bear, not only the sight of the bear itself, but the effect it had on these young people.

Seeing that impact—and how it carried over into the next decade, as these passionate students went on to do great things—reinforced my belief that connecting people to nature is a critical component of conservation.

A decade later, I'm now the executive director of PBI, gratified and humbled to see how—with the help of a highly committed team, dedicated partners, and generous donors—our education and outreach on polar bears and the Arctic has expanded to worldwide audiences and the many seeds planted during those early days are coming to fruition.

From research and outreach to boots-on-the-ground conservation programs, in just ten years, we've come so far and accomplished so much, thanks to the spirit of collaboration between those who care about polar bears. As one of our long-time partners puts it, "It's not about being the first or the only, it's about our shared focus on polar bear conservation."

This year, we're proud to open the doors of our new Polar Bears International House in Churchill, the community where it all began. At the same time, our work continues across the Arctic to help ensure the polar bear's future, from joining others in the fight to address the climate crisis—the overarching threat to polar bears—to working to reduce tragic encounters between polar bears and people and conducting research projects that inform conservation efforts.

In this issue of our annual newsmagazine, we invite you to journey to the Arctic with us, to immerse yourself in the polar bear's world, to learn about their biology and new research, and, above all, to join hands with us in our shared goal of polar bear conservation.

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.

INSIDE

WORLD RANGER DAY AWARD

©Mike Lockhart/Polar Bears International

A polar bear family gathers at a whale carcass site in northern Alaska, close to a community. Our annual World Ranger Day Award recognizes the brave men and women who work to keep families safe—whether polar bears or people—across the Arctic.

By Geoff York

What is it like to spot a polar bear strolling down the street or raiding food caches? Such encounters are increasing in coastal communities in northern Alaska, yet there hasn't been a single polar bear attack in the state since 1993. This is due in no small part to the courage and commitment of the North Slope Borough's Polar Bear Patrols.

In recognition of their work and success, this year we're proud to honor the Patrols with our 2019 World Ranger Day Award.

The North Slope Borough's Polar Bear Patrols work tirelessly to keep polar bears and people safe along Alaska's northern coast, where an increasing number of polar bears have been coming ashore as the sea ice retreats. These include bears feeding on the whale-bone piles in Kaktovik, a town that attracts the highest density of polar bears anywhere in Alaska, along with tourists who arrive to photograph them.

"Members of the North Slope Borough's Polar Bear Patrols often work under challenging conditions with a considerable amount of risk," said Susi Miller, a polar bear biologist with the U.S. Fish and Wildlife Service, which collaborates on the program. "In communities like Kaktovik, patrollers work around the clock for months at a time during the ice-free season to prevent human-bear incidents from occurring. We wholeheartedly thank them for their continuing efforts to provide community safety."

The Patrols are active in six coastal communities in northern Alaska: Kaktovik, Nuiqsut (Cross Island), Point Hope, Point Lay, Utqiagvik, and Wainwright. All occur in polar bear habitat and all have experienced problems with polar bears.

Polar Bears International presents the award each year on World Ranger Day, rotating the award among the five polar bear nations (Canada, Greenland, Russia, Norway, and the U.S.). Past recipients include the late Vladelin Kavry of Russia's Umky Patrollers; Churchill, Canada's Polar Bear Alert team; and Wildlife Officer Erling Madsen of Ittoqqortoormiit, Greenland.

Geoff York is Polar Bears International's senior director of conservation. He has worked with polar bears for more than 20 years and has a special interest in conflict-reduction efforts. He is the prior chair of the Range States Conflict Working Group and remains an active member.

THE AMAZING BREEDING BEHAVIOR *of* POLAR BEARS

By Dr. Ian Stirling

> **“We let the bears show us, at their own speed, what it meant to be a wild, undisturbed polar bear on the sea ice.”**

With the exception of family groups, most polar bears on the sea ice are solitary, traveling extensively over home ranges that may vary in size from a few thousand to hundreds of thousands of square kilometers. This makes extended observations of the undisturbed behavior of wild polar bears difficult to obtain but extremely valuable when opportunities arise.

For several years, beginning in 1973, I led a study to observe the undisturbed behavior of wild polar bears—hunting, interacting, sleeping, and otherwise just being bears. To do this, we watched through telescopes from cliff-top observation cabins in the Canadian High Arctic, letting the bears show us, at their own speed, what it meant to be a wild, undisturbed bear on the sea ice.

> **“Males may travel long distances in search of a mate, pausing only to carefully sniff the tracks of any bears they cross in their travels.”**

Because of 24-hour daylight in the late spring and early summer, we could watch the bears continuously. Often, we had to take turns between watching inside (and sometimes out in the cold) and sleeping in an unheated tent outside the observation hut. We recorded observations of individual bears non-stop, as long as they weren't obscured by fog or blocked from view by land forms.

In the spring of 1997, we were extremely fortunate to have the unique and rare chance to witness the complete behavioral sequence of a mating pair of polar bears, the only such sequence observed to date.

Superficially, one might think the breeding behavior would be quite straightforward: the bears simply have to meet up out on the sea ice at the right time, mate, and sometime later cubs are born. In reality, however, the behaviors and physiological adaptations are highly evolved and definitely not straightforward.

FINDING MATES

For starters, most adult females keep their cubs with them for 2 ½ years. Thus, on average, in most years, only about a third of the adult females are even available for breeding. Consequently, adult male polar bears are tasked with locating females that might be available to breed but range at low densities over vast areas of sea ice.

Thus, males may travel long distances in search of a mate, pausing only to carefully sniff the tracks of any bears they cross in their travels. This is because adult females appear to have glands in their paws that leave a chemical scent capable of informing an adult male that she is potentially available for breeding. When a male detects such a track, he immediately starts following the female until he catches up.

BUILDING TRUST

However, polar bears don't just start mating soon after they first meet. Individual adult bears of both sexes are widely dispersed and travel and hunt independently over vast areas on the sea ice most of the time. Thus, female polar bears don't ovulate spontaneously as the females of many mammals, including humans, do, because, if they did and there was no suitable male close by, the egg would simply die and be wasted. Thus, the females have what is known as induced ovulation, which means they will not actually release an egg to be fertilized until they have been accompanied by an adult male for long enough, and with sufficient interaction between them, to stimulate release of the egg at a time when being fertilized is highly likely.

Even after an adult male has located a potential reproductive female, both still have to overcome their biggest behavioral barriers: fear and aggression. Under normal circumstances all adult females, and especially

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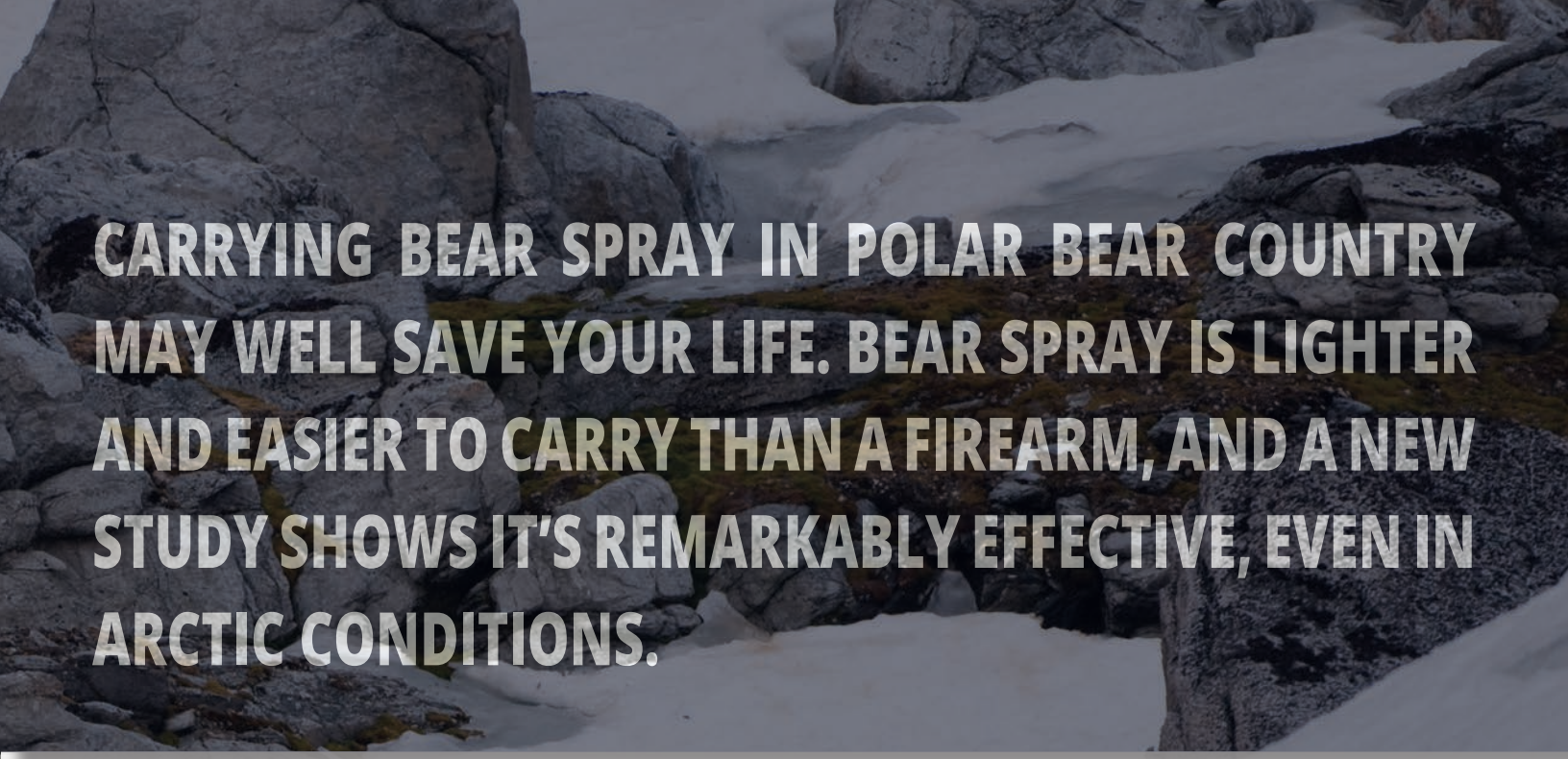
BEAR SPRAY AND POLAR BEARS

By Dr. Tom Smith, Jim Wilder, Geoff York, and Dr. Martyn Obbard



CARRYING BEAR SPRAY IN POLAR BEAR COUNTRY MAY WELL SAVE YOUR LIFE. BEAR SPRAY IS LIGHTER AND EASIER TO CARRY THAN A FIREARM, AND A NEW STUDY SHOWS IT'S REMARKABLY EFFECTIVE, EVEN IN ARCTIC CONDITIONS.

The study of human-bear conflict reveals many insights that can help all of us avoid these unfortunate events. A common thread running through many encounters is the lack of a deterrent, a way to stop an angry or menacingly aggressive bear. Without a way to stop an advancing bear, people resort to desperate measures: running, tree-climbing, even laying down—none of which are reasonable responses.

The two most effective deterrents are firearms and bear spray. Many people carry both because situations exist where one is superior over the other. Carrying none can lead to dire consequences. Firearms, while effective, are bulky and can be dangerous if left unattended around children. Conversely, bear spray, much lighter and easily carried on a belt, is non-lethal and is a less risky option.

"Without a way to stop an advancing bear, people resort to desperate measures: running, tree-climbing, even laying down—none of which are reasonable responses."

In a study on the use of bear spray to deter aggressive grizzly and black bears (71 cases reviewed), researchers found that less than 2% of cases resulted in users being hurt by the attacking bear, and those injuries were minor. However, those who work, recreate, and live in polar bear country have been slow to adopt this tool as a non-lethal deterrent for polar bears. The conventional wisdom seems to be that bear spray is not effective against polar bears because the cold and wind render it useless or that the chemicals in bear spray are not strong enough to deter a determined polar bear.

In some countries where polar bears range, including Norway and Greenland, bear spray is considered a controlled weapon and is banned from general use. Across the Arctic, bear spray is challenging to find in communities because it is classified as a hazardous material and is more challenging and expensive to ship. In order to responsibly recommend bear spray as a tool to mitigate human-polar bear conflicts, the Conflict Working Group of the Polar Bear Range States decided to conduct a data-based assessment of its effectiveness under Arctic conditions.

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Tracking Problem Polar Bears

By Dr. Andrew E. Derocher

> **“It’s too early to get a full picture of the issue, but it’s clear that as the climate has warmed, conflicts with polar bears have increased across the Arctic.”**

As remote as polar bears seem to most people, for many northerners, polar bears are their next-door neighbors. As with any neighbor, sometimes the relationship is fairly neutral. But one can see the problem when your neighbor strolls over to your place and eats your food, threatens your family, and then destroys your property.

Monitoring human-polar bear interactions has increased over the past years as the five Arctic nations in the polar bear’s range developed a coordinated system to record conflicts. It’s too early to get a full picture of the issue, but it’s clear that as the climate has warmed, conflicts with polar bears have increased across the Arctic.

While some Inuit and social scientists believe the increase in conflict is the result of “too many polar bears,” most polar bear scientists view the issue as a response to the bears being on land for longer periods due to sea ice loss and an associated decrease in body condition that results in the bears seeking alternative food sources (e.g., garbage, cached food, dog food).

One particularly fraught situation is taking place in Nunavut, where conflicts with polar bears have led to the deaths of both people and polar bears. The polar bears in that area are part of the Western Hudson Bay population, which is shared with the adjacent province of Manitoba and includes Churchill’s polar bears. Studies show that this population has declined from about 1,200 bears to about 800, even as the number of “problem” bears in Nunavut has increased—a seemingly contradictory scenario until you realize that it’s entirely consistent with nutritionally stressed bears spending longer periods of time onshore.

Churchill and the Government of Manitoba have gone to great expense to reduce conflict. The Polar Bear Alert Program is a model solution, but it’s expensive and communities farther north lack the funding and infrastructure to replicate the program. Prevention and early intervention are at its core. The primary goals are to remove attractants, educate people about bear safety, and work to keep people and the bears apart. A key activity involves transporting problem bears to the polar bear holding facility, also known as the “polar bear jail.”

Polar bears that can’t be deterred from entering town or are causing too much trouble spend some time in the slammer. We know that the program works incredibly well in Churchill, but what happens when conservation officers release those bears? Do they go on to cause problems in Nunavut, farther north? This is a niche for research.

In 2017, in collaboration with the Manitoba Government, we started deploying ear tag satellite-linked radios on polar bears of all ages and both sexes after they were released from the polar bear holding facility by the Polar Bear Alert Program. The ear tags send us one location per day for up to six months, allowing us to follow the path of the newly released "offenders." Many of these problem bears are shepherded northward in a net under a helicopter in the hope that they'll continue their northward migration and not return to Churchill to cause trouble. The bears aren't flown a long distance, but until we started tracking them, we had little insight on what they did. Do the relocated bears just get a boost on causing trouble farther north? Do they chill and wait for the ice to return? We're just starting to analyze our data but a preliminary look suggests that most of the problem bears move directly out onto the sea ice and only a few head into communities farther north or back to Churchill. We'll have more answers before long and we hope to provide concrete recommendations on which bears may get into trouble farther north.

The data is important. One solution proposed in Nunavut is to reduce the number of bears through more liberal harvest. The peril of such an approach is that we have no experience with how many bears would need to be killed for people to be absolutely safe. Would reducing the population by half make it safer for people? This is also a shared population and reducing the number of bears would have major consequences for the tourists that come to Churchill every autumn.

Science can't save polar bears, but it can help both the people and the bears find a way to smooth their relationship in a changing Arctic. It won't be easy, and it won't be cheap, but we owe it to the people that live day to day with polar bears and the bears themselves to find smarter ways to co-exist. In the longer term, it's a greenhouse gas emission issue that will determine the fate of the bears (and us), but along that path, we have to find solutions at each fork in the trail.

Dr. Andrew E. Derocher is a biology professor at the University of Alberta and a long-time scientific advisor to Polar Bears International. He has studied polar bears since 1984.

RUSSIAN ENCOUNTERS:
Research on Wrangel Island

By Dr. Eric Regehr

All photos © Dr. Eric Regehr

The polar bear had been following us for some time, on a slow and seemingly casual path that—if I judged correctly—would intersect with ours about 100 meters before the cabin.

Polar bears have an uncanny ability to approach without appearing to do so. They'll take an indirect route. They'll stop and look away when you look at them, or act interested in a puddle or patch of tundra. Contrary to popular belief, most polar bears are risk-averse unless they feel threatened or are motivated by food. But at the same time, they're pure predator: intelligent and curious. And the best way to find out if something qualifies as food is to get a little closer and see if it looks, smells, or acts like food. So, I kept my pace steady and posture erect, redoing the mental trigonometry every few minutes and fighting the inevitable fear when confronting the world's largest four-legged predator, unarmed and on its own terms.

The sighting took place last autumn on Wrangel Island, Russia. By then, we'd already seen over 300 polar bears in the first 10 days of our research season and had several weeks to go. The study on Wrangel is one of the simplest, yet most challenging, projects that I've been part of in nearly two decades of Arctic fieldwork. Each year since 2016, American and Russian scientists travel together over 1,000 kilometers of tundra, bogs, beaches, and riverbeds on the remote island. From all-terrain vehicles we record observations of bears and collect genetic samples using hair-snare traps (boxes with a scent attractant and wire brushes to snag a few hairs) or from daybeds where the animals have lounged.

SHARED POPULATION

Wrangel Island is paradoxically both far from, and close to, the United States. Socially and culturally, the Russian Far East is near the other end of the earth. Because access to the region is restricted

"Arctic fieldwork is a chance to be in places that humans may never have been before, to see landscapes that are forbidding and mysterious and unimaginably grand."

and there are no direct flights from the West Coast, to get there you have to go the "long way around," spending 48 hours circumnavigating the globe and then days or weeks waiting for a helicopter to go the final leg. At the same time, Wrangel Island is physically closer to Anchorage, Alaska than Anchorage is to my home in Seattle. And it's close ecologically as well, with birds, bears, walrus, and whales moving regularly between American and Russian waters. I've seen bears on Wrangel wearing ear tags that I applied the year before during live-capture research in Alaska. This is why we're there in the first place: to collect information that our two countries can use to manage and conserve this shared polar bear subpopulation during a time of rapid ecological and anthropogenic change.

TYPICAL DAY

I've been asked what a typical day in the life of a polar bear researcher on Wrangel Island is like. In many ways, it's the same as in other parts of the Arctic. There are a lot of logistics to figure out, heavy things to lift, and data to enter. There is weather to watch and, inevitably, more weather to watch. There's difficult travel and perhaps the most common Arctic pastime: "Hurry up and wait" (for weather, wind, fuel, parts, transportation, food, etc.). Arctic fieldwork is these things, but it's also a chance to be in places that humans may never have been before, to see landscapes that are forbidding and mysterious and unimaginably grand. And Wrangel Island, more so than other areas where I've studied polar bears, provides an opportunity to slow down and simply observe. There are musk oxen, caribou, wolverines, and

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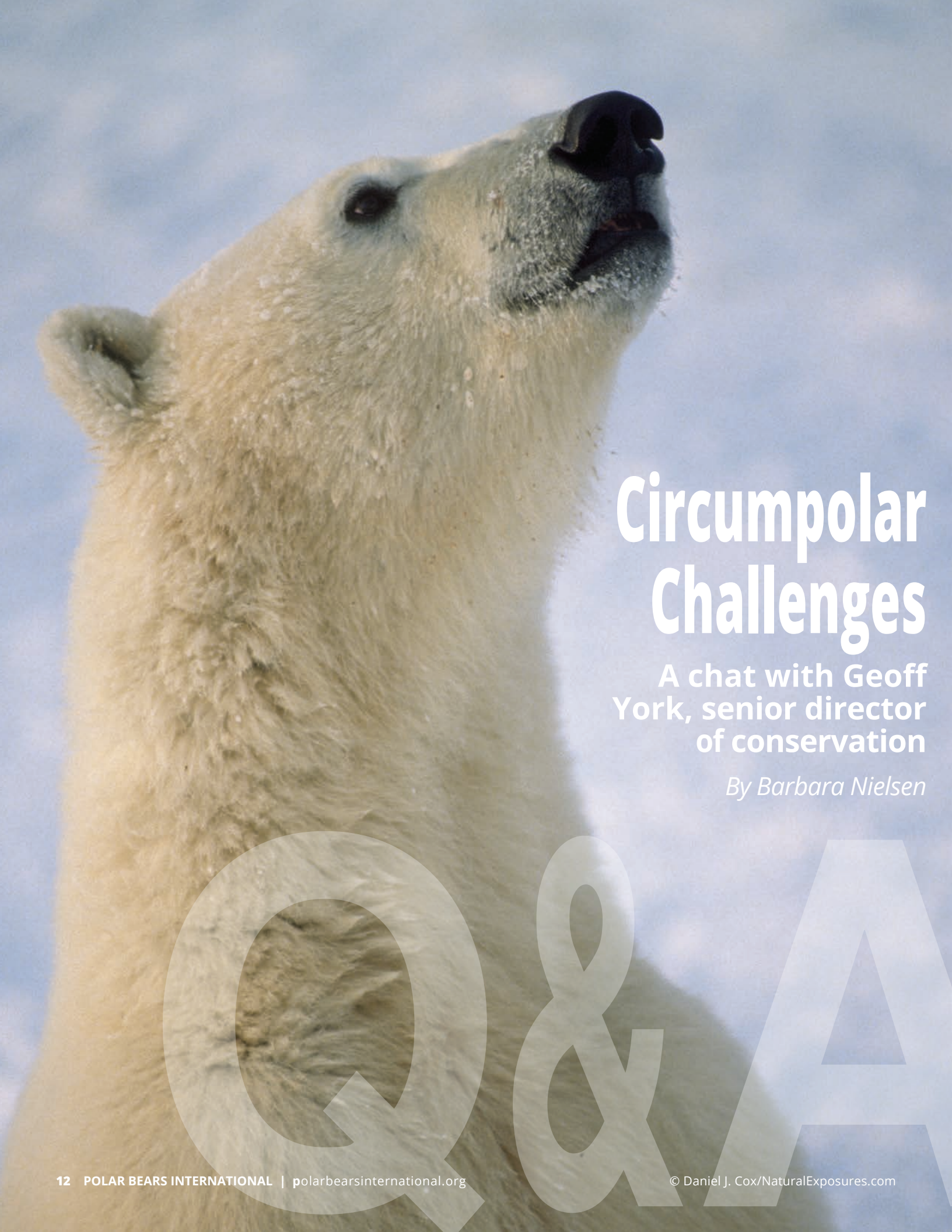

Circumpolar Challenges

A chat with Geoff York, senior director of conservation

By Barbara Nielsen

Q&A

"So this is how it ends."

© Simon Gee/polarbearsinternational.org

That was Geoff York's only thought when a female polar bear charged out of her snow den and spun towards him. As he stood up and started to back away, one leg punched through the weak spring snow, causing him to topple onto his back.

Fortunately, the mother bear was more alarmed than aggressive. A loud shout to his fellow researcher, Dr. Steven Amstrup, and an alert helicopter pilot, who started the engine, were enough to cause the bear to change direction—avoiding a tragic outcome.

The encounter took place nearly 20 years ago during fieldwork to study empty polar bear dens in Alaska. "There was every indication the den was empty," Geoff recalls, "yet there she was."

When not being charged by a polar bear, Geoff has a calm, open personality that has served him well across the circumpolar North. In my years of working with him, I've come to see Geoff as a diplomat, moving comfortably from high-level policy meetings to front-line communities in remote Arctic locations—all with a goal of working collaboratively to conserve polar bears and their sea ice home.

Q: You've had an unusual path to a career as a polar bear biologist and senior director of conservation for Polar Bears International. How did this come about?

It was a matter of the right place, at the right time, with the right attitude and the right skill set. For a lot of positions in wildlife biology you need a basic background in biology. But you also have to be open to opportunities. I'm originally from Indiana. After graduating from Notre Dame with a BA in English, I followed a girlfriend to Alaska where a BA wasn't very useful. I quickly found myself drawn to outdoor work. I ended up landing a job with a marine fisheries project in the Beaufort Sea. I met almost none of the qualifications, but they needed a quick learner who could get along with a team of four in a small research vessel.

From there, I went on to work on a master's in biology at the University of Alaska Fairbanks. Right before finishing that degree, I was offered a job at the U.S. Geological Survey. It was a project that involved working with Alaskan natives and required collaboration to be successful—the kind of project I like best. That's how I met Steve Amstrup, who was the Polar Bear Project Leader for the USGS [and is now chief scientist with Polar Bears International]. Steve asked if I'd like to work with him on polar bears—and that's how it all began.

Q: Why did you make the move from a government research position to conservation work?

By the time I left the USGS in 2007, we had a very good team of scientists doing research on polar bears. What was missing were more people on the policy and management side. I thought I could do my part to bring the science to broader policymakers and the public. After spending a decade in the polar bear's habitat, I felt I owed the bears something in return to help ensure their future.

Q: Your early work with polar bears was in Alaska. What kinds of projects were you working on then?

I joined the USGS during a period of real growth. When I first came on, the team had just two people. I was the third. We were limited by capacity and basically focused on polar bear population size and health from a management perspective. Later, as technology improved, we started researching habitat use, including den selection and behavior, and the impacts of industrial activities. Later, climate change and sea ice loss became a focus.

Q: How did sea ice loss become an issue? What changes did you see?

During my time in Alaska, I witnessed enormous changes. In the early days of my fieldwork, the sea

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Understanding Our Changing Arctic

By Zachary Labe

> “As a result of rising ocean and air temperatures, less and less sea ice has been able to last through the summer.”

© Daniel J. Cox/NaturalExposures.com

The Arctic is in transition. Ancient permafrost is beginning to thaw. Ice-covered rivers and lakes are breaking up earlier in the spring. The Greenland Ice Sheet is losing billions of tons of ice per year. Winter warming events at the North Pole are lasting longer and happening more often. And the perennial sea-ice cover is becoming younger and thinner. All of these changes are having significant impacts within the Arctic and beyond.

As a climate scientist, I've witnessed these changes first-hand—and it's likely that I also experience the impacts in my home state of California, thousands of miles away, because what happens in the Arctic doesn't stay in the Arctic.

> "The average thickness of the ice has decreased by more than two thirds in the last six decades."

To understand Arctic climate change, we need to consider the role of sea ice. During the summer months a significant amount of incoming sunlight is reflected back into space by Arctic sea ice. This is because sea ice is a relatively bright white surface. However, when sea-ice cover is reduced, this incoming sunlight is instead absorbed into the Arctic Ocean where it is stored as heat. This warming effect helps to increase air temperatures in the Arctic and is known as the "ice-albedo feedback." As a result of this positive feedback and others (such as changes in cloud cover, moisture intrusions, ocean heat transport, etc.), temperatures are rising at more than twice the rate of the average global temperature—a phenomenon known as "Arctic Amplification."

Arctic sea ice also follows a seasonal cycle. This means that during the wintertime the ice expands until it reaches a maximum extent in March. As incoming sunlight increases and temperatures begin to rise, sea ice then decreases to its minimum extent by the end of summer (September). If the sea

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BREEDING BEHAVIOR *CONT. FROM PAGE 5*

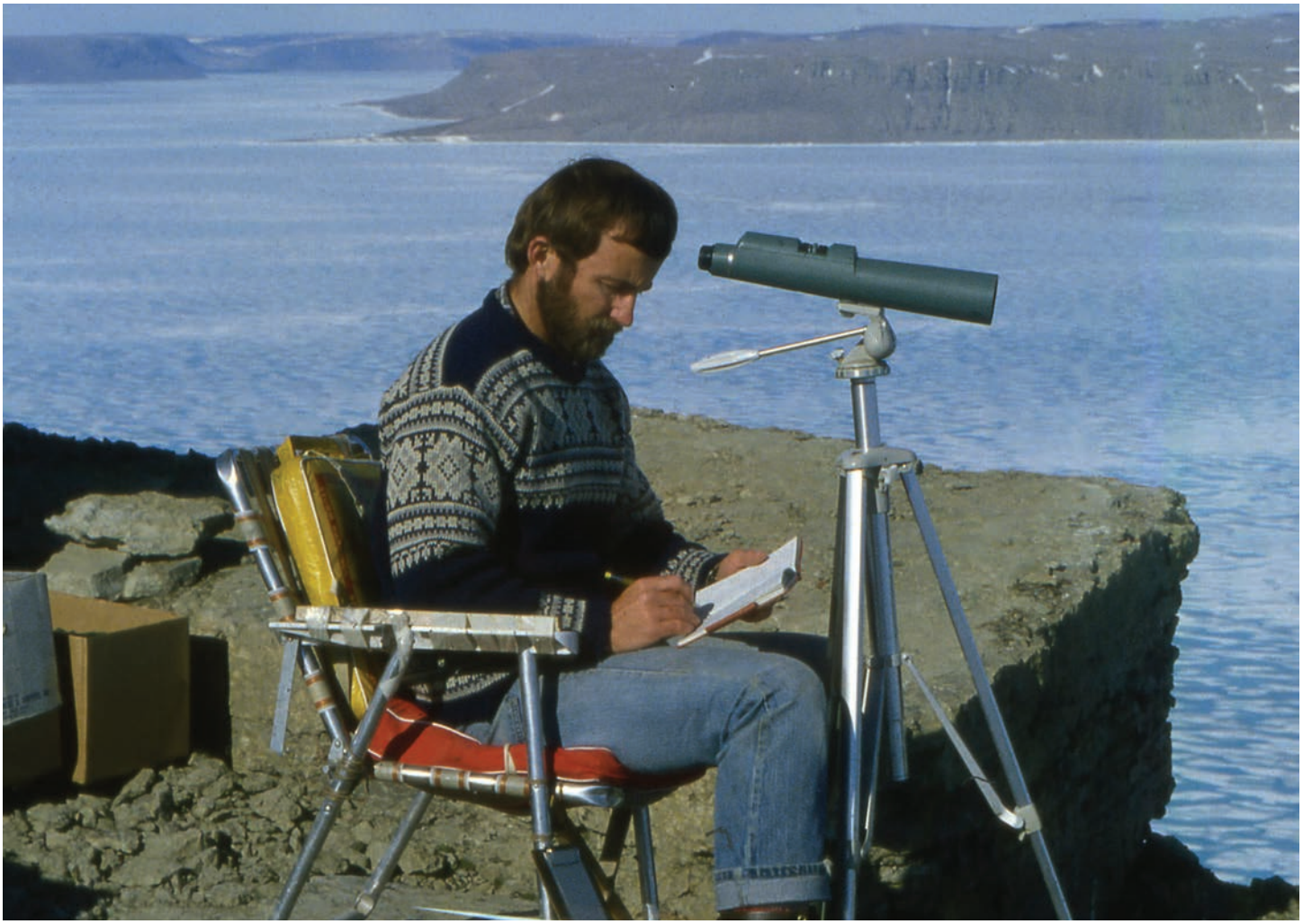
those accompanied by cubs and yearlings, flee from any adult male they meet because of the risk he will kill and eat the cubs. Sometimes an adult male will even kill and eat the female herself.

Not surprisingly, the behavioral process necessary to allow sufficient mutual trust to develop so mating can follow is protracted. The first thing a male does after catching up with a lone female in spring is to try to herd her to a location where the chance of encountering another potential competing male is lower, such as an area of rough sea ice, a small isolated bay, the side of a hill on land, or an island. Then, he tries to keep the female in the same restricted area for about a week, while they interact with each other constantly, pausing only to sleep for seven to eight hours each day.

At first, the pair alternately run toward or away from each other, while still being careful not to become too widely separated. They do little or no feeding during this period. As the days pass, the female slowly becomes more trusting of the male and allows him to be closer to her. In return, his behavior becomes progressively less threatening until finally they start simply standing near each other, following each other back and forth, until she finally allows him to make non-threatening physical contact.

The female may reciprocate by initiating non-threatening physical contact with the male. When you remember that normally a female would not allow a male to be anywhere near her for fear of possibly being killed, the development of sufficient trust on her part to allow his intimately close presence represents an essential, but huge, physiological and behavioral adjustment, even if only for long enough to facilitate mating to

Dr. Ian Stirling observing polar bears at Cape Liddon in Canada's High Arctic.



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occur. The male also undergoes a similarly large behavioral change that allows him to behave in a sufficiently unthreatening manner to allow mating to take place.

MATING BEHAVIOR

Once sufficient trust has been established, after a week or so of interactions, the female will allow the male to mount. Mating then carries on for several periods, sometimes in excess of two hours at a time, for several days in a row. This protracted process appears to facilitate circumstances that are reliable enough physiologically to allow ovulation to occur and the egg to be fertilized.

After mating ceases, the pair remains together for an additional day or two, exhibiting tolerant, mellow behavior toward each other that is totally unlike their behavior at all other times of year. This may include slowly walking together in no particular direction, lying near each other in the snow, or separating, sometimes for as much as a kilometer or more, and then coming back together again, after which the male may again touch the female's neck or chest with his nose.

Sometimes, they will simply lie in the snow together (but not touching). Such behavior may give the impression the bears may have actually developed a longer-term attachment to each other. However, it is only a temporary behavioral and physiological adaptation, critical for reproduction to occur, but short-lived. Finally, and unceremoniously, they simply diverge and walk away in different directions.

"As the days pass, the female slowly becomes more trusting of the male and allows him to be closer to her."

REPEATING THE PROCESS

Once alone again, the male then begins to search for another female. If he finds one, the process starts all over again. Since only one complete behavioral sequence has ever been recorded in detail, we don't know if all mating events require a similar commitment of time though it appears from partial observations that they probably do. Considering how long it may take for a male to locate a potential adult female, and then behaviorally engage through the amount of interaction time required before mating may occur, the maximum number of times a male could mate in a single year is probably in the range of four to six.

Until recently, the polar bear's breeding season was generally thought to take place between early April and mid-May. Probably, a significant contributing factor to determining the mating period was that little hunting by Inuit, or field research by scientists, takes place between late May and the open water season in summer, so observations were limited. However, with the advent of ecotourism in Arctic marine areas, particularly in Svalbard, ecotourism ships now regularly enter polar bear habitat from early April through the break-up of the sea ice in early summer. As a result, some of the natural history guides have reliably documented breeding behavior of polar bears through the end of June. Although it is likely that the frequency of mating behavior is significantly reduced by that time, the confirmation of breeding behavior over such a long period is an important revelation.

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BEAR SPRAY *CONT. FROM PAGE 7*

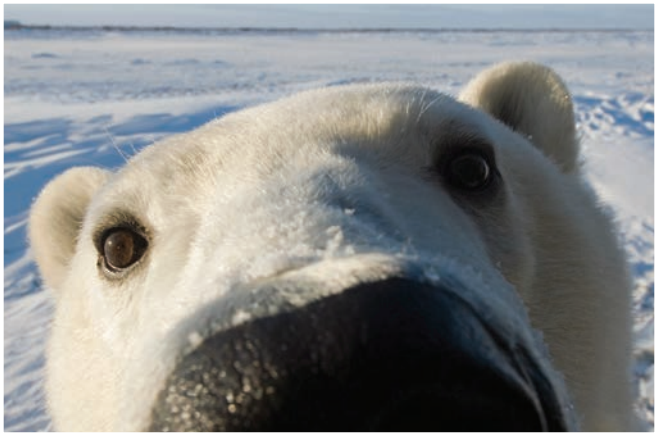
To address concerns about bear spray's effectiveness for deterring polar bears, we collected and analyzed existing human-polar bear conflicts that involved bear spray and set up lab and field experiments to collect data regarding the effects of temperature and wind on spray performance.

We analyzed 17 incidents where persons used bear spray on aggressive polar bears. We found that bear spray was successful in 94% of the incidents (16 of 17) when used on polar bears. Wind was cited as the main reason for failure in the one case. The average distance from person to bear was two meters when they fired the spray. One can only imagine the outcome had spray not been used.

To determine how cold temperatures affect bear spray performance, we tested head pressure in bear spray canisters from −20°C to +30°C and found a strong positive linear relationship. However, when cans of bear spray were chilled to −30°C, sprays still reached four meters, more than adequate to spray an attacking bear in the face. We did note, however, that as temperature declines the spray increasingly becomes a stream rather than an atomized cloud. Still, the spray exited the container with force, would coat a bear's eyes, and be inhaled—both with debilitating effect.

To explore how wind may influence spray effectiveness, we first reviewed the 17 incidents when bear spray was used to deter polar bears. In 50% (6 of 12) of bear spray incidents, users reported spray causing minor irritation side effects upon themselves. That is, some of the spray was blown back to the user. Importantly, however, the spray stopped the aggressive bear and did not incapacitate the user. Another six persons (35%) reported no effect at all due to wind, and five (30%) did not report anything regarding wind effects. In short, no one was impacted by sprays and bears were deterred, except for one case.

In contrast, 14% (10 of 71) of bear spray incidents involving grizzly or black bears, users reported spray having negative side effects which ranged from minor irritation (11%, 8 of 71) to near incapacitation (3%, 2 of 71). Wind in your face (a 25% chance since



the other 75% of the time the wind could be coming from behind you or as a cross wind), could push spray your way. But bear spray exits the canister at nearly 95 kilometers per hour (60 miles per hour) and that force pushes it away from you and into the bear's face. In the worst-case scenario, you would get some blowback … but at least the bear would get a faceful of debilitating spray, buying you critical time.

We used computer simulations to see how bear spray performs in headwinds, cross winds, and wind from behind. While the data are not all in, we learned that even in the strongest headwinds, a bear will eventually get a blast of spray in the face. Clearly, no one wants to have to deter a bear at one to two meters. But the alternative (no protection at all) is untenable.

Although firearms are the deterrent of choice in much of polar bear country and are a good tool for experienced people to carry when in bear country, there are situations where carrying a firearm is difficult, if not unwise. In communities or work camps, one can easily carry bear spray when going from building to building. Bear spray is very handy in close quarters whereas a firearm may be difficult to deploy. For these reasons, we encourage persons working, recreating, and living in polar bear country to consider this effective deterrent. It may well save a life.

The authors, representing, in order, Brigham Young University, the U.S. Fish and Wildlife Service, Polar Bears International, and the Ontario Ministry of Natural Resources, are part of the Polar Bear Range States Conflict Working Group.

RUSSIAN ENCOUNTERS CONT. FROM PAGE 11

wolves, their lives extending across vistas and generations, without human influence. One time traveling at night a snowy owl took off in front of my ATV, not five meters away, silent and otherworldly in the headlights.

On the day we encountered the curious bear, we were taking a break after several days of travel. The Russian rangers with us—the guys who make everything on the island work—spent the morning fixing vehicles, smoking cigarettes, and drinking tea. The researchers typed at their keyboards or hauled water and chopped wood for the banya (sauna), a much welcome and all-day affair. Later in the day, when the fog cleared, we put on rubber boots and set out across the tundra. In the distance we watched an adult female polar bear nurse her three cubs, a rare sight for a species that usually has twins.

On our way home, it turned out that the bear following us, a young male, had done the calculations correctly, arriving at the cabin a few minutes before we got there. So, we did what people in bear country have always done: we bunched into a group, which made us look big, and made noise (I used a "bear shaker" consisting of several large steel washers on a rod with a handle). As the bear ambled off, our adrenaline dissipated, and we took out our binoculars. We watched an hour later as he tried his luck with a herd of muskoxen, again to no avail. I felt very lucky to be there. Lucky to have a window into this timeless and distant world and, hopefully, be part of something that may help preserve it.

Dr. Eric Regehr is a principal research scientist at the University of Washington and the principal investigator on collaborative American-Russian polar bear studies on Wrangel Island. Polar Bears International is one of several partners supporting the research, which is helping to fill knowledge gaps on Russia's polar bears.

Q&A with **GEOFF YORK** *CONT. FROM PAGE 13*

ice was three to four miles offshore during the summer—you could typically see it from the beach. In areas like Barrow and Kaktovik, it didn't leave the shore in some years. Today if you go to the same places, the sea ice is 400 miles or more offshore. Not only did we witness the sea ice retreating, we went from seeing large pans of flat stable ice to endless piles of ice broken up in all directions. We also encountered huge areas of open water. All of this made our work on the sea ice difficult.

We also started to sense changes in the polar bears we were studying. One- and two-year-old bears sort of disappeared from our capture samples. It took several years of research and analysis to understand that, *Oh, yeah, something is definitely going on.* The USGS ultimately documented a 40% drop in the Southern Beaufort Sea polar bear population. We had sensed something was amiss, but our long-term monitoring and some careful analysis finally quantified it.

Q: Although you spent years as a field researcher, some of your current focus is on reducing conflict between polar bears and people. Can you tell us about that?

Reducing conflict ties in well with my personal interest in bringing people together: people who live with polar bears, work with polar bears, or recreate with polar bears. It's one of the few areas in the polar bear world where people have shared values and outcomes. It's a safe topic for governments and communities to talk about with nonprofits, a place where relationships can start over shared concerns. At the end of the day we all want to keep polar bears and people safe.

Front-line managers and researchers have been concerned that, with sea ice loss, more polar bears would spend more time on shore for longer periods, leading to more interactions with people. As part of my work with the Polar Bear Range States Conflict Working Group, we've tried to anticipate problems and get ahead of the curve. We began by documenting known encounters and their causes. We also discovered a lot of solutions already on the shelf from efforts to reduce brown and black bear conflict—simple things like better waste management and following safety tips when in bear country. But a lot remains to be done to help northern communities mitigate risks.

In general, we're trying to better document and quantify what's happening. Secondarily, we're trying to make sure northern communities have access to better deterrents. In some cases, laws need to be changed. In others, there are difficulties related to shipping hazardous materials. We are also working on consistent bear safety messaging, so we're all saying the same things about how to stay safe.

Q: What are some other interesting projects that you're working on?

The most interesting right now is the "Burr on Fur" project with 3M, where we're investigating adhesives and other non-permanent attachment methods that would allow us to put small tracking tags on bears rather than collars. If we're successful, it will be extremely helpful in tracking not only males and young bears but also address a lot of concerns about tagging wildlife. It's a great example of partnering with a big tech or industry partner—in this case, one with considerable expertise in adhesives. And the implications won't stop with polar bears—there's already interest in using the tags on other wildlife.

Q: The overarching threat to polar bears from the climate crisis can feel overwhelming at times. What keeps you going?

To me there is no alternative. We have to keep working to mitigate the worst aspects of the climate crisis and to actively plan for the impacts already baked into the system. I think of myself as a reality-based optimist.

I also know that we have tremendous capacity to solve large problems, both in adaption to and mitigation from a warming world. I just hope it is not too little and too late.

Barbara Nielsen is Polar Bears International's director of communications.

Polar Bear Cam

Every fall, Polar Bears International, Frontiers North Adventures, explore.org, and Parks Canada team up to stream the annual gathering of polar bears from the shores of Hudson Bay to people around the world. Watch the live cam at **explore.org/polarbears** or **polarbearsinternational.org/#polar-bear-cam.**

explore.org

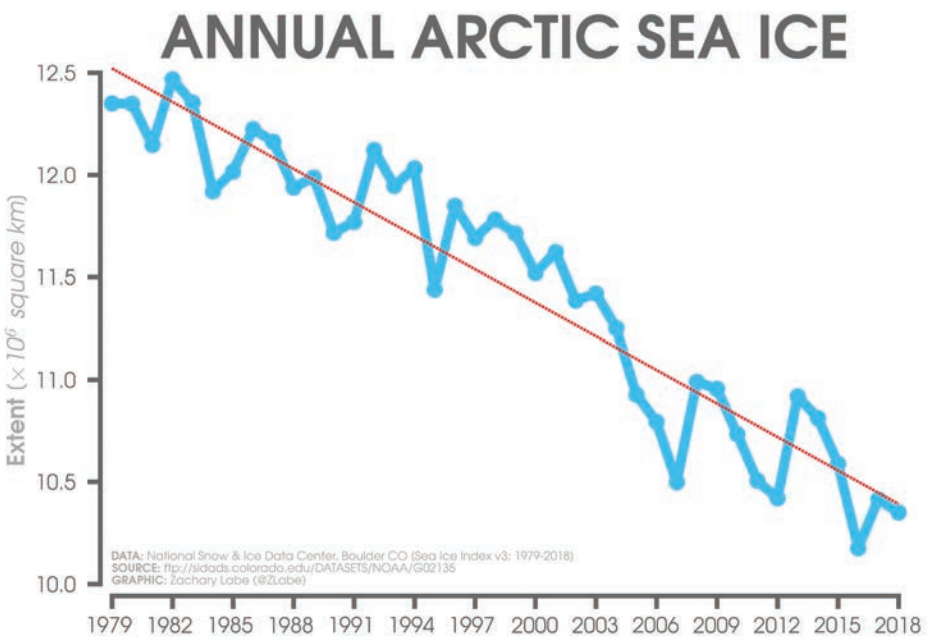
BREEDING BEHAVIOR *CONT. FROM PAGE 17*

Because actual mating constitutes such a small part of the total behavioral breeding sequence (≤ 2% of the total time), most casual observers seeing two bears together at a distance, behaving as described above, simply did not realize they were observing some part of the sequence of normal mating behavior. Many likely assumed that two polar bears of different size walking about or interacting together were a mother and cub. However, now that we understand more about the duration, variability, and the overall pattern of the behavioral sequences of "mating pairs," it has been possible to confirm the full period over which breeding of polar bears in the wild may occur.

There are likely many more almost unbelievable adaptations of polar bears to their polar environment that have yet to be understood. Some will require largely opportunistic extended observations of undisturbed polar bears in wild situations before their significance can be appreciated. However, the more we are able to observe the behavior of undisturbed wild polar bears, the more we will come to understand their incredible adaptations to life in one of the most difficult environments in the world.

Dr. Ian Stirling is a member of the Scientific Advisory Council for Polar Bears International. He is also a research scientist emeritus for Environment and Climate Change Canada and an adjunct professor in the Department of Biological Sciences, University of Alberta.

ARCTIC CHANGE CONT. FROM PAGE 15



Despite natural variation from year to year, the long-term decline in Arctic sea ice is abundantly clear.

ice is thick enough, it may survive the summer melt season. As a result of rising ocean and air temperatures, less and less sea ice has been able to last through the summer. Reconstructions of past Arctic sea ice show that the average thickness of the ice has decreased by more than two thirds in the last six decades. In addition to thinning, the extent of Arctic sea ice at its annual minimum has decreased at a rate of 82,300 square kilometers (32,000 square miles) per year. Satellite and on-site observations confirm that decreases in Arctic sea ice extent and thickness are now occurring in all months of the year.

The effects of shrinking sea ice are not limited to Earth science. Reductions in sea ice are already impacting polar bears, along with indigenous communities and coastal towns that rely on the sea ice for hunting, fishing, transportation, and their cultural identity. Future loss of sea ice will open the Arctic to an increase in shipping, tourism, and exploration for natural resources.

And the effects of sea ice are also not restricted to the Arctic. My research group at the University of California, Irvine is trying to understand how changes in Arctic sea ice, snow cover, and ocean temperatures are linked to weather patterns in lower latitudes, such as in North America, Europe, and Asia. By comparing climate models using historical vs. future levels of Arctic sea ice, we can test how the atmosphere might respond to sea-ice melt. Although some scientists have found evidence of linkages between Arctic sea ice and the jet stream (storm track), the connections are still uncertain in our weather observations and climate models. There is a lot of exciting work to be done in order to understand how/if Arctic sea-ice loss is related to extreme weather events that impact lower latitudes.

Although there is year-to-year variability (weather) and natural climate components, the long-term decline in Arctic sea ice is overwhelmingly clear. Without a reduction in greenhouse gas emissions, global climate models project further declines of Arctic sea-ice extent and thickness in the 21st century. Nevertheless, the Arctic is a resilient place. The amount of future climate warming will have a big impact on the amount of sea ice lost. Even the difference between the Paris Climate Agreement targets of 1.5°C vs. 2°C of warming will significantly affect the chance that the Arctic has an ice-free summer within the next several decades. Our choices today will determine the next chapter for Arctic sea ice and climate change.

Zachary Labe is a PhD candidate in the Department of Earth System Science at the University of California, Irvine. Follow him on Twitter at @Zlabe.

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SAVE THE DATE
Toronto Polar Bear Affair Gala: February 22, 2020

PBI Calendar of Events

POLAR BEAR CAM
Late October-late November

PBI HOUSE OPENING
November 2019

POLAR BEAR WEEK
First full week of November

NORTHERN LIGHTS CAM
November-March

TORONTO POLAR BEAR AFFAIR
February 22, 2020

INTERNATIONAL POLAR BEAR DAY
February 27, 2020

ARCTIC SEA ICE DAY
July 15, 2020

BELUGA CAM
Mid July-mid September 2020

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