

A Change in the Weather

For generations Inuit have survived by closely observing the natural world. As the Arctic environment changes, their insights are informing science.

BY SHARI GEARHEARD

Dogsled—one in a group carrying the author and her research team—skirts an unseasonable patch of open water in the sea ice off Greenland. The Arctic is warming about twice as fast as the rest of the world; Inuit and other Arctic residents report wide-ranging environmental changes, including early break-up and late freeze-up of sea ice.

Toku and I sat silently on the wooden sled, listening to the swish of snow under the runners and the panting of happy sled dogs. Whiteout conditions and blowing snow made for poor visibility. It was the end of March, and we were traveling across sea ice from the village of Qaanaaq on Greenland's northwestern shore to the most northerly community in the world, Siorapaluk, about thirty-five miles away.

We and the other members of our research team had been traveling most of the day, the fifteen of us divided among seven dogsleds. The journey was part of a project to study sea-ice changes in three Arctic communities: Qaanaaq in Greenland, Barrow in Alaska, and Clyde River in Canada. Inuit elders and hunters from each community, along with scientists from Canada, Greenland, and the United States, made up the team. The trip to Siorapaluk was a chance to see changing patterns of sea ice that the people from Qaanaaq, the Qaanaarmiut, had been describing to us.

The dogs pulled our sled in the tracks of other dog teams well ahead, moving slowly but steadily through freshly fallen snow. I was enjoying the ride and friendly conversation with Toku, a hunter and fisher from Qaanaaq, when I happened to look down at the snow. My heart skipped a beat. Mixed with the fresh imprints of dog paws, I saw dark, water-filled holes. The dogs were falling through the ice, which was only about two inches thick.

But, falling through sea ice in March? Normally the ice is much thicker at that time of year and doesn't begin to break up for at least another two months. Back in Qaanaaq, the Qaanaarmiut had told us that dur-



ANDY MAHONEY



Portraits of Baffin Island in Nunavut, Canada, near the Inuit town of Clyde River. Teenagers pass a July day fishing on sea ice in the town's protected bay, above. The ice, which lasts a few weeks longer in the bay than on the ocean, has begun to break up and flood, but is still several feet thick. In August, local waters are ice free, above right.



Near Clyde River sea ice typically persists from November into July. Cracks in it, such as the one shown above, often form in the same places from year to year. Lately, however, local Inuit report that cracks have been forming in unusual locations, perhaps as a result of shifting ocean currents and winds.

ing the last decade they've had to shift certain travel routes from sea ice onto land and stop sea-ice travel in some areas in May instead of August because of such conditions.

There on the sled it seemed we were experiencing the changes first hand. Toku encouraged her dogs to keep moving. I realized that now was not the time to ask for a pee break or jump off and run along to warm up. I had traveled sea ice enough, and with my own dogs, to keep from panicking, but it took some focus to remain calm. Toku smoked another cigarette. I busied myself with examining her dog whip and willed the dogs to keep pulling.

Finally we arrived safely at Siorapaluk. Everyone helped to unload sleds and get the dogs tied up for the night. The chatter soon turned to the thin ice, and one of the drivers said he had been pretty nervous when his dogs' legs started punching through. Most of the Inuit on our team had experienced similar thin-ice conditions before; for them, it was all part of being hunters and traveling in the Arctic. Everyone agreed, however, that it was much too early in the spring for such thin ice.



Inuit elders and hunters in Barrow, Alaska, host their counterparts from Qaanaaq, Greenland, and Clyde River for a discussion of changing environmental conditions in the three communities.

On the trip back to Qaanaaq the next day, the weather was clear and we traveled under blue skies [see photograph on preceding two pages]. With perfect visibility, we could see where we had sledged the day before. Unsettlingly close to our route lay huge gray patches of thin ice and black patches of open water. For years I'd been working with Inuit to document changes in the Arctic environment, but that was the first time I'd personally faced one of the new hazards those changes often bring.

Inuit, on the other hand, are frontline observers of the changing Arctic, confronted regularly by its new and shifting demands. The Arctic—ecologically defined, the region north of the tree line, roughly latitude 60 degrees north, about 450 miles south of the Arctic Circle—has been gradually warming since the early 1970s, and today air temperatures are, on average, about 2 degrees Fahrenheit warmer than they were three decades ago, twice the global average rise in temperature. As has been widely reported, many Arctic glaciers and the Greenland ice sheet are melting at unprecedented rates and permafrost is thawing in

some places for the first time. This past summer Arctic sea ice receded to a record minimum, covering just 61 percent of the area it covered, on average, between 1979 and 2000 [see map on page 33].

The Arctic climate has always fluctuated, according to studies of ice cores that date back some 400,000 years, from which past temperature and atmospheric conditions can be deduced. But the overwhelming majority of climate scientists agree that the recent changes are almost certainly attributable to global warming. Inuit, too, recognize the Arctic's inherent variability—which they've observed keenly and adapted to over the centuries—and they say that something is indeed very different today. Changes in snow and sea-ice conditions, shifts in the seasonal calendar, unusual animal behavior—all exceed the familiar range of variability, they say. As a result of their intensive use of the environment, Inuit and other Arctic residents pick up on many subtle changes and intricate connections that scientific instruments cannot detect, and that scientists are just beginning to appreciate and understand.

Inuit, a broad term—Inuk being the singular—includes many Arctic groups, from the Yup'ik in western Alaska and Russia to the Kalaallit in Greenland. All were once known as Eskimos, a term no longer used in most regions, and they speak related languages or dialects in the Eskimo-Aleut language family. In total, approximately 155,000 Inuit live in the Arctic, mainly in northern Alaska, Canada, Greenland, and northeastern Russia [see map on page 33].

(Other indigenous groups inhabit the Arctic, too, including the Dene and Athabaskans in North America, the Sami in northern Scandinavia, and a dozen or so other ethnic groups in northern Russia.)

I live and base most of my studies in Clyde River, or Kangiqtugaapik, a small Inuit community of about 850 on the northeastern shore of Baffin Island in the Canadian territory of Nunavut. Nunavut—which means “our land” in Inuktitut, the language of the region's Inuit—split from the Northwest Territories to become Canada's newest territory in 1999. Nunavut is huge, encompassing 770,000 square miles—about three times the size of Texas. Some 29,500 people, 85 percent of them Inuit, live there, spread between twenty-six communities. The territory boasts a diverse landscape, from flat tundra and lakes to dramatic mountains, fjords, and cliffs. Ten months out of the year, from October through July, snow, ice, and cold weather prevail in most places.

In the 1950s and 1960s, Inuit in the region moved—some willingly, some under compulsion—into settled communities created by the Canadian government. But before that they were nomadic, following the rhythms of the seasons and the migrations of animals as they moved between summer and winter camps. Today, many Inuit still spend a great deal of time out on the land and at camps and cabins, but most live primarily in settlements. As with many northern indigenous groups, elders belong to the last generation to have lived most of their lives in the traditional way and to retain the specialized knowledge, language,

and skills needed to live on the land.

My work has focused on the Nunavut communities of Baker Lake, Clyde River, and Igloodik, but has recently taken me to Alaska and Greenland as well. Working closely with resident researchers and interpreters, I meet with elders and other local experts to discuss environmental changes. Often we use maps to chronicle travel routes and the locations of various changes, such as thinning ice, dried-up ponds, and receding glaciers. I also spend a great deal of time accompanying Inuit as they travel, hunt, and fish, to learn about what they observe and how they make decisions within their environment.

Years ago, it was often difficult to get scientists to take traditional knowledge seriously. But increasingly, climate scientists and other researchers have been incorporating indigenous knowledge and observations into their research. A notable example is the prominent role of Arctic indigenous communities in the International Polar Year of 2007 to 2008, in which thousands of scientists are engaged in more than 200 research projects in the Arctic and Antarctic. Indigenous communities are contributing to studies on biological diversity, birds, caribou and reindeer, and human health, among other topics.

Several of the projects I help lead bring Inuit and scientists together. One example is the sea-ice study in Clyde River, Barrow, and Qaanaaq—called the Siku-Inuit-Hila Project, for “sea-ice people weather” in a mix of Inuit dialects—which contributes to several international studies. In another project, I work with Inuit hunters and my colleagues at the National Snow and Ice Data Center at the University of Colorado at Boulder to document changing sea-ice off the east coast of Baffin Island, using both remote



Inuksuk (the plural is inuksuit) near Clyde River: such humanlike figures of rock mark travel routes, indicate important resources, or aid in hunting.

sensing data and Inuit knowledge. Remote sensing via satellites provides an overview of sea-ice extent and some data on its characteristics going back to the 1970s. Inuit knowledge goes back further, to the early 1900s, and provides insight into finer-scale changes, including sea-ice texture and stabil-

ity, and into changes in the environmental processes that drive sea ice, such as currents, snowfall, and winds. Such work is driven by the belief that linking multiple methods, scales, and ways of knowing increases confidence in individual observations, broadens the information base, and helps explain the various changes.

After almost thirteen years, my work in Nunavut tells a story repeated by many communities around the North: the Arctic is changing, and changing fast, on a number of fronts. Among the most striking changes, observed by locals from Alaska to Finland, is that the weather is increasingly unpredictable. Since weather determines the day's activities for most hunters, it is a critical part of everyday life, and closely watched. Skilled Inuit forecasters observe cloud patterns and wind conditions to predict weather through the next day.

Since around the mid-1990s, however, those techniques haven't been working so well [see sidebar on opposite page]. Winds kick up and die down unexpectedly, they come from unusual directions, and they shift direction several times a day. Although conditions may indicate a clear day ahead, an unexpected storm might arrive. As Norman Attungala, an elder from Baker Lake, explained to me in 2001, “Inuit have a traditional juggling game. The weather is sort of like that now. The weather is being juggled; it is changing so quickly and drastically.”

The increased risk of running into bad weather has pushed Inuit hunters and travelers to change their travel habits. Some pack extra supplies, just in case. As for the traditional forecasters, many have lost confidence in their prediction skills and have stopped advising hunting parties about when and where to travel. That has wrought an emotional change for some, who miss having an advisory role in their families and communities.

Inuit have been observing many other environmental changes, too. During the past decade, for instance, Inuit in Nunavut have noted strengthening winds, which can pack snow much harder than usual. The hard snow can prevent people from building igloos for temporary or emergency shelter, leaving them vulnerable to that



Puppies of the breed known as the Canadian Inuit dog, or qimmiq, explore the world around their doghouse, behind them. They will join the author's sled team when they mature.

Uqarumajakka “What I have to say”

By Ilkoo Angutikjuak

Translated from Inuktitut by Nellie Iqalukjuak and Geela Tigullaraq

I am sixty-five years old and I have been living in Clyde River, Nunavut, almost my entire life. When I was young, we hunted by dog team for seal, fish, fox, rabbit, and sometimes caribou in the winter, and we hunted narwhal and fished for halibut in the summer. I hunt by Ski-Doo these days, and I enjoy going out on the land when it's not too windy.

In the past, we would watch the dogs to learn about the wind. If it was windy and the dogs started walking around instead of lying curled in one spot, we'd know it was going to calm down. I don't have dogs anymore, but I use ravens today. Like dogs, they try to get into a sheltered spot if it's going to get windy. When you're always outside, you notice little things like that. In the old days, even as children, we had to go outside first thing in the morning to look at the weather, to learn. It's still the same for me today, even though I sometimes look through a window. But it's more difficult to predict the weather now, especially the wind. It seems to get windy suddenly these days. And there are many other changes, too.

For example, the sea ice isn't the same anymore. It seems like it's forming only from water, meaning it's much less salty now. You

can even see through the sea ice. In the past it wasn't clear, it was whitish. It also breaks up sooner in the spring than it used to, and the winters don't feel as cold. Narwhals seem to come sooner than before. When the sea ice was here longer, they didn't come as early; they would pass us by, swimming north.

The snow has changed, too. It used to be really white but now it seems yellowish, as if it has some fine sand or dirt on it. The sky used to be clear blue on a nice day but now it seems reddish. It's just a guess, but I think it's redder for the same reason the snow is yellow: there is a smoky or dirty substance in the air. That might explain why the nights seem darker, too—the snow is dirty, not as reflective of light, and the sky is hazy.

I know that before our time the world was very warm, even around here. When the glaciers started to recede people found woolly mammoth tusks, so we know things were different long ago. Many years from now, it might be like those old days. Inuit used to say that one day the Arctic would melt, that things would reverse and there would be snow down south, but none up here. We see weird weather in many places on the television these days,

and it is warmer here, so maybe that's what is happening.

If the changes continue, I will learn to live with them. The seals and other animals that depend on the sea ice will move to the shores; the animals will adapt. I've heard that because they depend on sea ice, polar bears will go extinct, but I don't believe it. They are very adaptable. As the sea ice changes, polar bears might get skinnier and some might die, but I don't think they will go extinct.

The only way to react to the changes we are seeing is to be positive. The people and animals will adapt. At the same time, it is very important to get the information out there about what is changing, so others can understand what is happening.



unpredictable bad weather. Some Baker Lake residents told me they blamed the extra-hard snow for the deaths of several travelers out on the land.

Weather and wind changes, in turn, have affected sea ice—and not just its thickness. In Nunavut, all but one of the twenty-six communities lie on the coast. Their inhabitants rely intensively on sea ice for hunting and traveling, so their understanding of it is quite complex. How does the sea ice feel when you walk on it? How does it respond to being kicked or struck with a harpoon? How does it taste at different times of the year: too salty? Not as salty as it should?

As with the Qaanaarmiut in Greenland, many Nunavummiut, or people from Nunavut, report that the ice is thinner in places, forms later, and breaks up earlier—observations that mirror findings from numerous scientific studies. Clyde River Inuit note that familiar cracks in the sea ice are not appearing even as new ones open in unusual locations; they say the sea ice seems to be softer, not as solid as it used to be; and they say the

currents have shifted in certain areas, combining with wind changes to affect ice movements. In response, Inuit in northern Quebec and parts of Nunavut are reviving the traditional practice of dogsledding. Dog teams are more reliable than snowmobiles in the changing environment, because they can help navigate dangerous sea-ice conditions and can find their way home during storms—not to mention that they don't run out of gas or need new spark plugs.

Dogsledders have helped to identify seasonal changes. The month of June, according to Clyde River Inuit, no longer lives up to its name, Qiqsuqqaqtuut, which refers to the top layer of snow melting during the day and re-freezing at night. During the spring dogsledders usually prefer to travel at night, when the refrozen surface lets sleds' runners glide quickly over the snow and the temperature is cooler than during the day for the dogs. Now the crust no longer forms at night. Moreover, many Inuit communities report that fall freeze-up of sea ice comes between two and three weeks late and spring break-up is



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Naqsaq is a year-round hunting and fishing camp about forty-five miles southwest of Clyde River. Beyond the cabins, a retreating glacier leaves a cascade of gravel in its wake. Many local glaciers have been receding recently; the meltwater has eroded riverbanks and destroyed some campsites.

between two and three weeks early, making for an extra month or more of the open-water summer season.

Changes in the environment are bound to affect other organisms, and indigenous people throughout the Arctic have reported changes that range from subtle to striking in a variety of species, including birds, caribou, fish, insects, polar bears, walrus, and whales, as well as plants and lichen. In many cases, species are turning up in unexpected places or at unexpected times of the year, often following the shifts in seasonal timing. But many of the observed changes are even more complex.

At Clyde River, for instance, the most important animal for Inuit is the ringed seal, which provides food and skins for clothing. Seals normally molt in spring, and they scrape off old fur as they lounge and move around on sea ice, basking in the spring sunshine. But hunters and women who work with skins note that seals caught in summer sometimes appear still to be molting. With earlier sea-ice break-up, seals are forced into the water before their molt is complete. Inuit still use the seals' meat for food, but the skins are too uneven to be useful.

Notably, not all Arctic communities are experiencing the same changes. Parts of western North America are warming dramatically; some communities there are experiencing severe coastal erosion and thawing permafrost is damaging or destroying infrastructure. Temperatures elsewhere in the Arctic remain stable. Yet wherever environmental changes occur, they intersect with social, cultural, economic, and political changes, often brought

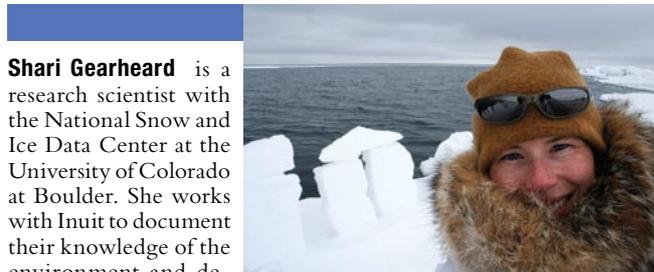
about by the forces of modernization and globalization.

Apak Qaqqasiq, a Clyde River elder, told me a few years ago that the changes are “not that scary, yet.” Indeed, it’s often not the changes per se that are unusual: the sea ice has occasionally broken up early, the weather has gone wonky at times. *At times*. But the sea ice never used to break up early six years in a row, and the weather has never changed as frequently or as unpredictably as it does today.

And more change is yet to come. The Intergovernmental Panel on Climate Change projects that by the year 2100 the Arctic will have warmed by between 5 and 12 degrees above current average temperatures, already 2 degrees higher than they were in the 1970s. What will happen to

the Inuit? Undoubtedly, they will face serious challenges. Like many hunters I work with, I have concerns for the future; but like them I also have hope and a strong faith in the ingenuity and resiliency that have enabled Inuit to thrive in one of the harshest and most unpredictable environments on Earth.

In spite of the changing sea ice, Toku continues to be a successful hunter, combining the knowledge her father and brother have passed on to her with her own observations of new conditions. And the community of Clyde River is tackling climate change head on, partnering with scientists and the Canadian government to develop an adaptation plan. Many Inuit have told me that regardless of how their environment changes, they will always remain Inuit—connected to their land by love and respect, no matter what the weather may bring.



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