

Using a Camera to Document Global Warming

‘This is a magnificent and urgent story just beginning to be told.’

By Gary Braasch

Climate change is happening. I have seen it with my own eyes. I have stood in the empty rookeries of displaced Adelie penguins and felt the chill of huge icebergs separating from a receding ice shelf on the Antarctic Peninsula. I saw the young black spruces growing higher than ever before on boreal hillsides in Alaska and witnessed subtle changes on the tundra. I can see the ablation of glaciers near my home in the Pacific Northwest and have photographed again the 150-year-old images of great Swiss glaciers to show them wasting away. In North America I’ve photographed early blooming plants and migrating birds arriving sooner than expected. Along the coasts I have seen rising tides and heavy storms erode beaches and felt the anguish of native Alaskans as their village is increasingly washed away.

These and other observations were made beginning in 1999 as part of my photographic project, “World View of Global Warming.” I wanted to move beyond the raw statistics, the charts, and the predictions that are easily dismissed. I wanted to look at the earth itself, with the eyes of a natural history photographer, and report on what changes were already underway. It seemed to me that despite the accumulating scientific evidence of the circumstances and potential consequences, awareness about this issue was largely absent from political debate, rarely written about, and seldom talked about around kitchen tables. A visual connection was needed.

In the years since then, I’ve crossed both the Antarctic and Arctic Circles, ventured above 15,000 feet in the Andes to photograph receding glaciers, dove on damaged coral reefs with scientists monitoring ocean warming, and followed scientists into the field in Europe and North America. I found that

physical systems like oceans and glaciers are being altered. Animals and plants, adapted during thousands of years to strict relationships of temperature, moisture and food availability, have no choice but to respond to changes in their habitat. In remote locations and in familiar gardens and parks, scientists are devoting their careers to measure what is happening, documenting the effects of global warming, and interpreting the results.

What I saw and learned on my photographic journeys offers strong confirmation of the global warming predictions we have been hearing since the mid-1980’s. The sources I used for guidance and documentation are hundreds of peer-reviewed studies in scientific journals and sections of the Intergovernmental Panel on Climate Change report and interviews with scientists. The scientific evidence has become a little better known in the past few years and, earlier in 2002, was acknowledged in the Environmental Protection Agency’s policy paper “Climate Action Report 2002,” even as President Bush persisted in opposing the Kyoto Protocol on limiting greenhouse gases.

Photographing and reporting on these effects presents a great challenge. These changes have been unfolding for 50 years or more. Each year, the effects are incremental, small and subtle, if not literally invisible. But after more than three years visiting scientists and their research sites my photographs have accumulated incremental effects of their own. The evidence these photographic images offer has proven compelling, even to skeptics. They have been published widely, from Time, Life and Discover to textbooks, environmental Web sites, and exhibits.

But can any photographs “prove” that global warming is a fact? The pic-

tures, like the natural science they depict, certainly don’t render courtroom proof. Rather they offer evidence of tight correlations among, and long-term observations of, physical events. Most of these photographs require captions to make their point strongly, but with this assistance, the story line they illustrate does start to clearly emerge.

Photography’s message is strengthened because the effects of global warming are frequently seen in earth’s most beautiful and sensitive landscapes, at the poles, in the mountains, and on the edges of plant and animal ranges. Treasured and threatened ecosystems and creatures can be shown in their transitions.

I have come to understand that I am documenting one of the crucial, overarching events of the 21st century. As global warming exacerbates overpopulation, food crises, and coastal degradation, its consequences might affect more people than did war in the last century. Whatever the human role, there are six billion of us on the planet now, deeply interconnected and affected by environmental changes. We are going to have to live with them and reduce activities that make them worse.

This is a magnificent and urgent story just beginning to be told. In time, each of us will see it. ■

Gary Braasch’s climate project is facilitated by 501(c)(3) tax status through the Blue Earth Alliance of concerned documentary photographers. The project has a Web site at www.worldviewofglobalwarming.org.

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✉ info@worldviewofglobalwarming.org

Antarctica

From the bridge of the National Science Foundation research ice-breaker Nathaniel B. Palmer, the scene is breathtaking, even mystical. Four searchlight beams arrow down from above me to a vanishing point over dark water. Sea smoke sweeps in along the beams and occasionally an iceberg is illuminated. We are approaching the Antarctic Circle along the west side of the Antarctic Peninsula.

This is my first trip to this southern continent, for which I have waited 40 years since I first read about it as a kid. I've come now because in those years the average temperature along the Peninsula has risen about 2.5 degrees C (~5 degrees F), by actual measurement at British science stations. The Antarctic Peninsula, which stretches 900 miles north toward South America, has a more moderate climate than the rest of the continent. Its great seasonal changes provide many benchmarks against which to measure climate shifts. Scientists are studying the effect on ice shelves, penguins, tiny plants, and the all-important plankton and krill of the Southern Ocean.

On my 1999 journey south, I accompanied Hamilton College geologist Eugene Domack to the disintegrating Müller Ice Shelf—a scene that was repeated in much larger scale in 2002 when a huge part of the Larsen Ice Shelf broke apart. This part is thought to have been intact since the end of the last ice age 10,000 to 12,000 years ago.

In papers by Domack and others, the recent regional warming is viewed as unusually rapid, though it is not the only time warmth has diminished these ice shelves. A concern of scientists is that continued warming and ice shelf destruction will lead to increased flow and melting of tidewater glaciers and continental ice streams. Unlike the melting of ice shelves that are already floating, this will add to sea level rise. My images help us visualize the scale of these events and provide a sense of proportionality to the amount of ice involved in even a tiny section of a small ice sheet in the vastness of Antarctica.

For Adelie penguins, the effect of warming is due to a changing relationship between the winter sea ice, the preferred rookery sites on rocky points that melt free in summer, and the krill on which they feed. Montana State University professor and ornithologist Bill Fraser has studied the Adelies near the United States Palmer Station for more than 25 years. He has seen some rookeries diminish to forlorn pebbly flats while others continue to teem. Penguins seek dry nesting sites within a short foraging range of the edge of the pack ice, beneath which the shrimp-like krill are found. Warming winter temperatures along the Peninsula reduces the pack ice, which then melts farther out in summer, too far from some rookeries. Also, according to Fraser's correlations, the warming air combined with more open water leads to increased snowfall on some nesting sites, causing breeding failure. Adelies, numbering in the millions, are not endangered as a species, but they are sensitive monitors of climate changes as their population decreases in Fraser's study area, but increases farther south. ■ —G.B.



Photo © 2002 Gary Braasch

A male Adelie penguin disgorges krill for its chick.



Photo © 2002 Gary Braasch

The disintegrating Müller Ice Shelf, Lallemand Fjord.



Photo © 2002 Gary Braasch

Ornithologist Fraser at a diminished Adelie colony on Torgersen Island.

Photos by © Gary Braasch 2002.

The Arctic

At earth's opposite pole, the Arctic is experiencing a similar heat wave. Unlike the Antarctic land mass with its two-mile thick ice cap that holds 90 percent of the world's fresh water, the northern pole is an ice-covered ocean surrounded by land. Antarctica is home to ocean mammals and penguins, but no land mammals and only two plants. The Arctic lands have vast boreal forests and tundra, which serve as habitat for many land mammals, including bears, caribou—and human beings, since seven nations claim Arctic territories, which are a source of petroleum, timber, minerals and fish.

The summer thaw across this ocean and landscape is a huge biologic and climatic event whose timing and scale scientists are studying intensively. Using Greenland ice cores, pollen layers in lakes, permafrost probes and tree ring coring, scientists estimate that temperature is the highest it has been in 400 years. Since 1974, warmer temperatures have contributed to a thinning of the permanent Arctic sea ice pack from nine feet to six feet and shrinkage of its overall breadth by 14 percent.

To document changes in Arctic ice, I flew on a NASA laser mapping plane that found that Greenland's outlet glaciers appear to be moving faster and creating more icebergs in the north Atlantic. I can photograph the melting Arctic ice, but its crucial influences on earth's weather cycles are subtle—so far. However, a theory that increasing meltwater from the Arctic will eventually disrupt the Gulf Stream might be tested sooner than expected, according to new research by the Woods Hole Oceanographic Institution. This year its research ships found the most Arctic water ever in the Labrador Sea.

A rise in summer temperatures might sound like good news, but its effects are ominous and beginning to show. I've witnessed insect attacks that have killed four million acres of white spruce in Kenai, Alaska. Changes correlated with temperature rise threaten all the boreal forests that ring the Arctic and comprise one-third of the world's forests. At the same time, the boreal forest and its associated shrub population are starting to migrate north, overtaking the native tundra. Geophysicist Tom Osterkamp's research shows Alaska permafrost temperature has increased up to 1.50 degrees centigrade since 1980. At his temperature site near Denali National Park, Osterkamp can show how far the once-frozen tundra has subsided. The damage from collapsing permafrost extends from the Fairbanks area north to the Arctic Ocean coast.

The native village of Shishmaref on the Bering Sea is losing houses rapidly to permafrost thaw and rising sea level. Such scenes are repeated around the entire Arctic shore. Some native prey animals—walrus, seabirds, caribou—are beginning to be affected. In some areas, polar bears cannot reach their prey due to diminished sea ice. Perhaps most threatening, dying forests, thawing permafrost, and drying tundra are beginning to pump a huge flux of carbon dioxide and methane into the atmosphere in a region that once served only as a carbon absorber. This feedback loop could combine with increased absorption of solar heat by open tundra and ocean to escalate the rate of change. ■ —G.B.



Photo © 2002 Gary Braasch
Icebergs issue from Jakobshavn Glacier into Disko Bay, West Greenland.



Photo © 2002 Gary Braasch
Geophysicist Osterkamp shows permafrost thaw-down near Healy, Alaska.



Photo © 2002 Gary Braasch
Native village of Shishmaref, Alaska, undergoing attack by Bering Sea erosion.

Photos by © Gary Braasch 2002.

Glaciers and Sea Level Change

When I began my project, "World View of Global Warming," glaciers presented another very visible indication of climate change. Throughout the 20th century, glaciers in the temperate and tropical zones have been shrinking. Because scientists and photographers have been attracted to glaciers since the 19th century, there is informal documentation of what this ice has looked like through the years.

Finding usable "before" images can be tough given the many gaps in the record of dates and circumstances of historic pictures. Locating the previous photographers' viewpoints can be very difficult: Many were not recorded or were on trails long since blasted away for highways. I first tried this in Peru in 1999. With directions from Andean glaciologist Alcides Ames of Huaraz and clutching a copy of the previous photograph in my gloved hand for constant comparison, it took long days of scrambling on rugged ridges above 15,000 feet to reach the points where other photographers apparently once stood. The change in the glaciers is very obvious even before one finds the matching view to create a set of convincing images.

Perhaps the most dramatic glacier withdrawal that can be seen in my comparative photographs is based on an 1859 photo and etching of the Rhone glacier in the Bernese Oberland, Switzerland. Back then, ice filled the valley right to the tiny crossroads of Gletsch. By 2001, modern highways replaced the trail, and the glacier was nearly out of sight, 2.5 km distant and 450 meters higher. I've since found images from the 1930's that provide more details about the glacier's retreat.

University of Colorado glaciologist Mark Meier has published frequent reports of worldwide glacier recession and its effect on sea level rise. In 2002, he calculated that glacier melting could contribute 0.65 feet or more to the sea level during this century, and sea level is already about six inches higher than it was 100 years ago. The rate of rise is increasing as warming seawater expands. Early in this century the estimated rate of increase might be enough to inundate low-lying areas in the Pacific Islands, Bangladesh, the Everglades, and coastal zones in Florida and along the Atlantic coast. My photograph of a normal high tide on Delaware Bay shows the tiny area that remains for migrating shorebirds to forage for horseshoe crab eggs before being forced up against storm sewer outfalls near Cape May, New Jersey. This feeding situation now is added to other environmental obstacles confronting roughly one million sandpipers, red knots, and turnstones on their migratory flight from South America to the Arctic.

In California, marine biologist Rafe Sagarin of the University of California at Santa Cruz found that some tide pool habitat had changed when he revisited a 60-year-old study at Hopkins Marine Laboratory at Monterey, California. Summer sea temperatures have risen more than one degree during that time, and his new survey showed many warm-water tide pool animals had increased while those favoring colder water had decreased. These changes in small animals are harbingers of shifts that are likely to affect coastal life, including that of humans. ■—G.B.



The shrinking Rhone glacier, in 1859 and in 2001.



High tide on Delaware Bay near Cape May.



Sagarin at Monterey tide pools.

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