



Northeast Greenland. Filling in the Gaps...

By Jeffrey Kerby

A self portrait with research engineer Ebbe Poulsen as we gaze over the 1200m cliff that falls from Bastionen, a high point on Ella Island. Far below, a small gravel runway and the red buildings of a research station sit next to a natural harbor. These few buildings and landing area make Ella Island a hub for scientific research in the Northeast Fjord Region of Greenland.

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Left: The research station Ørnereden (The Eagle's Nest) on Ella Island hearkens to an earlier era of scientific exploration. Built in 1931 by the Three Year Expedition led by Lauge Koch, this main station building on Ella Ø has variously been a hub for research, the Sirius Dog Sled Patrol, and other activity for almost a century.

Top Right: Inside Ørnereden, the past and present of Arctic research exist in parallel. Here, researcher Signe Høgslund prepares to head outside while carrying polar bear deterrents.

Centre Right: Relics from past scientific investigations on Ella Ø are mingled with modern day scientific monitoring gear. The strange fossilized crystals on these rocks from the island relate to a period of complete global glaciation approximately 700 million years ago known as 'snowball earth'.

Bottom Right: Research buildings and the summertime base for the Sirius Dogsled Patrol are all nestled into a small harbor below the looming cliffs of Bastionen. Inside a small shipping container sitting near the shore, solar- and wind-powered data loggers and communication links connect to cameras and environmental sensors that continuously monitor nearby land, sea, and atmospheric conditions. Other containers like this one are being deployed throughout NE Greenland National Park as part of the Greenland Integrated Observation System (GIOS) network.

The world's largest National Park sprawls across Northeast Greenland, spanning nearly 1 million km². Within its borders are no hotels, no public airports or roads, and no commercial harbors. Only a few dozen people live here, nearly all of them short-term residents at weather and research stations or military outposts.

Yet the park's inaccessibility belies its global relevance. Water and organic carbon are locked up in its ice-sheets and permafrost respectively. As the planet heats up, the Arctic warms faster, and this frozen region is thawing. As some of this water and carbon re-enters ecosystems, the science and policy communities ask: 'when', 'how much', and 'what next?'



Research engineer Wieter Boone works to install a connection to one of the underwater sensors linked up to a GIOS container, itself pictured with the small windmills in the background. Various sensors monitoring environmental change on land, sea, and in the atmosphere are linked to the container, which can transmit data live to a server based in Denmark year round.

While there are no roads connecting locations in NE Greenland, the icy fjords are a highway for boats used to deploy sensors and take water measurements throughout the summer.



Not all activities are automated in NE Greenland. Here a Sirius Patrol sled dog takes some time off to play while researchers take water samples from a small lake on Ella Island.



Photos: Jeffrey Kerby

The answers to these questions affect both Greenlanders and everyone else on the planet. 'We're all doomed!' or 'The risks are overblown!' are news-friendly narratives that depart from the reality on the ground. The situation is indeed an urgent and complex crisis, but it's also one where there is still space for informed decision making and action. For hope.

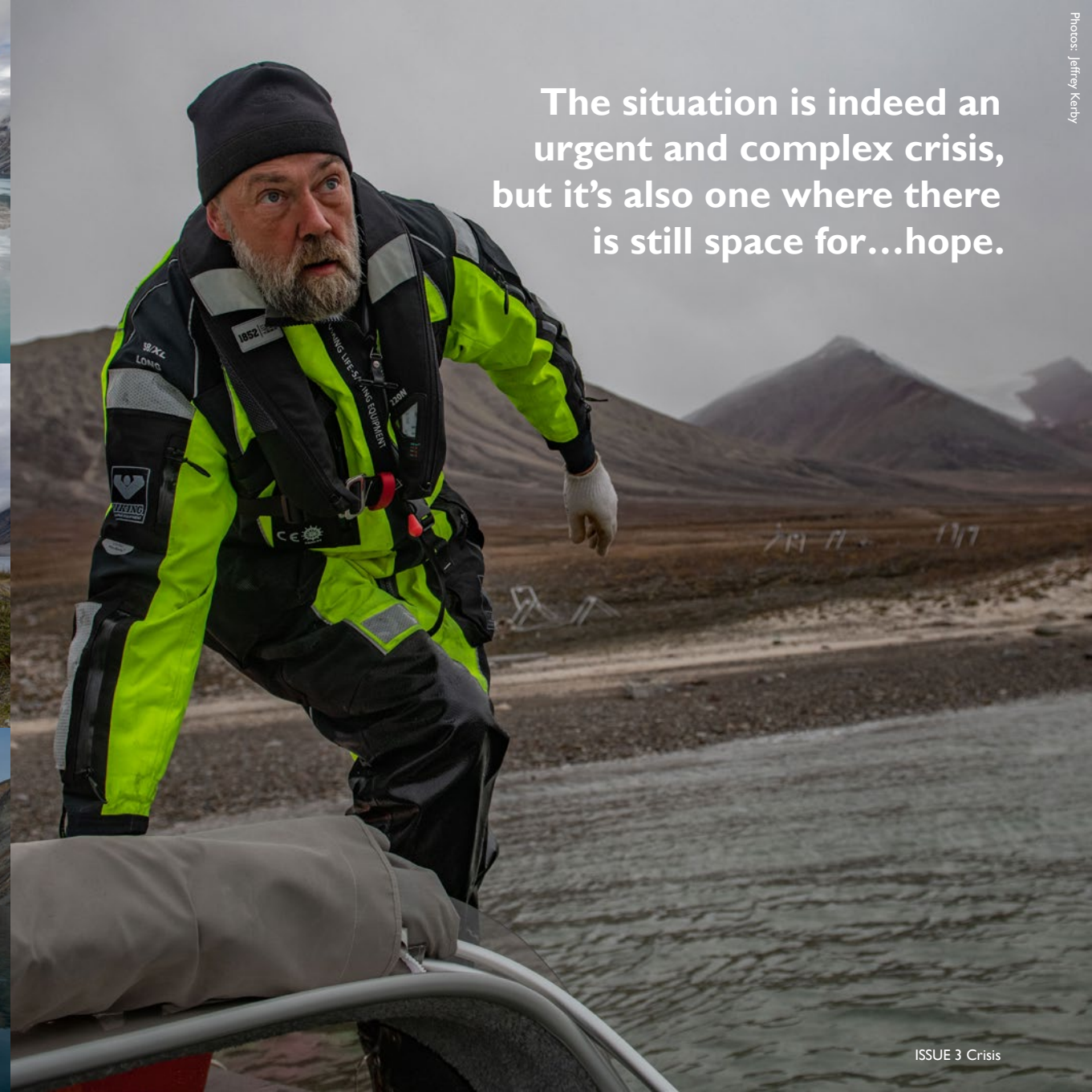
Environmental monitoring in the Northeast Greenland National Park, by Pinngortitaleriffik and other government, academic institutions, informs action. We are entering a new era where uncrewed monitoring systems - like the Greenland Integrated Observing System (<https://gios.org/>) - can run year-round in regions with minimal logistical support.

Top Left: Land, sea, ice, and atmosphere all interact in NE Greenland to determine environmental feedbacks on climate. The GIOS team places instruments along natural gradients in these environments to capture these interactions. Here, three small boats are visible at the natural harbor - two modern MOPAs built specially for Arctic expedition work, and one abandoned wooden boat - a relic of the fox trapper era that spanned the early 1900s to 1960.

Centre Left: Near the shore, the remnants of a hut used by fox trappers over 70 years ago sits in disrepair. Hundreds of these small structures dot the shores of NE Greenland, and several have been restored to serve as emergency shelters and living museums by the Northeast Greenland Kompagni NANOK, and they can also serve as infrastructure for mounting scientific sensors. Here, Egon Frandsen walks past the remains of an abandoned boat from the trapping era.

Bottom Left: The MOPA boats used by the research team offer a means of transport, but also act as scientific workbench and emergency shelter if the weather turns.

Right: Researcher Søren Rysgaard pushes the boat back from shore after helping set up time-lapse camera infrastructure on shore. These cameras take photos every minute throughout the summer to capture when plants begin to grow and pull carbon out of the atmosphere and to create a record of the timing and identity of different insect pollinators that visit them.



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Top: Scientific monitoring gear, like these components of a time-lapse camera installation, go through repeated rounds of testing in Denmark and in Greenland. Despite this, they face a variety of challenges to function properly when left alone to gather data for long periods of time. The weather takes its toll, but so does wildlife. Arctic Foxes are extremely curious animals, and will 'taste' nearly any foreign material they find out on tundra. Unfortunately, it seems they particularly enjoy the taste of rubber coated wires...

Bottom Left: Foxes are not the only curious creatures on the tundra. Here Simon Kortegaard inspects fresh polar bear tracks near a stopover point. These are important reminders to stay vigilant while installing infrastructure.

Bottom Right: Like foxes, polar bears are curious about nearly any novel object they find on the Arctic tundra and will rigorously investigate what it might taste like! This can be a problem when designing and setting up environmental monitoring gear, as it must be able to withstand all sorts of bumps and exploratory bites. Curiosity is a critical trait for animals living in landscapes where food can be hard to come by. Here curiosity is often a means to survival.



In parallel with existing monitoring strategies, this new infrastructure will fill knowledge gaps beyond a scope that any human based monitoring system could ever fill. For example, how do you discover exactly when and which insects pollinate a flower across its entire lifetime? Or when does a pulse of fresh water emerge from underneath the snout of a fjord-terminating glacier? These seemingly esoteric questions are small but important missing pieces to the much larger puzzle that is understanding ecosystem function, and ultimately, large-scale climate feedbacks.

This photo essay shows some of the infrastructure that will help solve these ecological puzzles, but also glimpses of the people, places, and processes involved in deploying and maintaining it in this globally unique region.

Top Left: Sometimes curiosity can lead to human-wildlife conflict. Here a flare illuminates the nighttime sky in an effort to scare away a polar bear. Moments earlier the bear had broken open a window to the room where Toke Høye (another former AIAS fellow) and I were sleeping. Fortunately neither the bear nor any researchers were harmed in the encounter.

Top Right: Night disappears during the peak summer months at these latitudes, but it begins to creep back in as August fades into September. This adds a new dimension to long boat journeys home after installing sensors many kilometers away from camp on Ella Island.

Bottom Left: Researcher Torben Christiansen secures a small boat to shore while it is being helmed by Peter Schmidt Mikkelsen, director of NANOK and a former Sirius Patrol member. This location is at the mouth of a rich, vegetated valley with many muskoxen, hares, foxes, and other wildlife.

Bottom Right: At this point in history, people are only visitors in this part of Greenland. The information we gather from the park feeds into broader management and policy initiatives, but researcher presence here is fleeting. It is home to numerous plants and animals that have to adapt to its changing conditions. Scenes like this were uncommon in decades past, but polar bears are now more commonly seen on land by researchers during spring and summer, as their preferred sea ice habitat has diminished with rapid Arctic warming. What sights will we see another two decades from now?



Photos: Jeffrey Kerby



About the author

Jeff Kerby, a former AIAS fellow, is an ecologist and photographer whose work focuses on polar and alpine regions. He is currently based at Arctic Research Centre and the Section for Ecoinformatics and Biodiversity in the Department of Biology at Aarhus University.