

Northern Climate ExChange

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NCE Update June 10, 2009

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Announcements

1. Alaska Native Villages: Limited Progress Has Been Made on Relocating Villages Threatened by Flooding and Erosion - Report

Government Accountability Office Report: GAO-09-551 June 3, 2009

December 2003, GAO reported that most of Alaska's more than 200 Native villages were affected to some degree by flooding and erosion (GAO-04-142). Since 2003, state officials have identified the growing impacts of climate change, increasing the urgency of federal and state efforts to identify imminently threatened villages and assess their relocation options. GAO was asked to report on (1) the flooding and erosion threats that Alaska Native villages currently face, (2) the federal programs that are available to assist villages facing potential disasters, (3) the status of village relocation efforts, and (4) how federal assistance to relocating villages is prioritized. GAO interviewed and gathered documentation from federal and state agency officials as well as regional organizations and village representatives.

[Download full report: \(pdf 53 pages\)](#)

www.gao.gov

2. Climate in Peril: A Popular Guide to the Latest IPCC Reports (UNEP, May 2009)

This resource presents the substance of the Climate Change 2007 Synthesis Report of the Intergovernmental Panel on Climate Change (IPCC) in simplified language and structure. The guide, intended for lay readers, is a joint publication of UNEP GRID-Arendal and SMI Books, supported by the Norwegian Pollution Control Authority and the Swedish Environmental Protection Agency. It includes chapters on: robust



findings and key uncertainties; present changes, causes and observed impacts; projected climate change and its impacts; adaptation and mitigation; mitigation options; adaptation options; the potential of international and regional cooperation; the limits of adaptation and mitigation; costs of impacts, mitigation and long-term stabilization targets; sustainable development, environmental protection and climate change; and long-term perspectives on key vulnerabilities, impacts and risks. [Download guide](#).

www.iisd.ca

3. In Search of Shelter: Mapping the Effects of Climate Change on Displacement and Migration - Report

In Search of Shelter: Mapping the Effects of Climate Change on Displacement and Migration, was written by researchers at CIESIN, the United Nations University, and CARE International. Drawing on empirical evidence from a new survey of every continent, with original maps created by CIESIN that pinpoint potential locations of critical displacements, the report explores how climate change is already causing people to leave their homes, and details some of the specific ways displacement may occur over the next decades.

The report calls for seeing climate-related migration and displacement as global in nature, not simply isolated local crises. It aims to inform critical policy making by presenting a comprehensive discussion of the linkages between environmental change, displacement, and migration.

[Download Climate and Migration Report](#)

www.ciesin.columbia.edu

Articles

1. Gwich'in and Alaska Natives create human aerial message

Groups call for permanent protection of Arctic refuge and urgent action to address climate change

Indian Country Today
June 8, 2009

ARCTIC VILLAGE, Alaska - The Gwich'in Steering Committee and representatives of communities of Alaska Native peoples from across the region laid their bodies on the tundra May 30 to form a giant "Message from the North" to the world, and especially to leaders at the Bonn Climate negotiations, which started June 1. The human aerial image, created with aerial artist John Quigley spelled out "SAVE THE ARCTIC" and featured people arranged into the shape of a caribou on the Arctic Village landscape.

The message was a call for permanent protection of the Arctic Refuge and urgent action to address climate change. Gathering in their homeland, in what is arguably one of the most central and charismatic landscapes in the climate change debate, the Gwich'in and their allies challenged leaders to follow science and not politics, and to push for strong carbon emissions targets.

The event was part of a weekend long "Celebration of Land and Life," marking 20 years of holding a line in the sand, protecting the Arctic National Wildlife Refuge from oil drilling. Ironically though, the threat of rising temperatures and a global climate crisis has become another critical threat to the region, and though no drilling has occurred there, the area is seeing some of the most extreme impacts of climate change and global warming.

"The people of the north are among the first to be experiencing the devastation of climate change," said Sarah James, spokeswoman for the Gwich'in Nation. "We are calling for permanent protection of the Arctic Refuge and to immediately address the impacts of climate change."

Artist John Quigley created the aerial image in collaboration with the Gwich'in Steering Committee and 350

as part of the launch of the global "tck tck tck" campaign, and Human Voices Now Campaign.

"We must act to support the Gwich'in so that they don't end up the human rights casualties of climate change," Quigley said. "The Arctic Refuge and the people and animals who live here are the canaries in the coal mine of the climate crisis and it is critical that we act quickly to stem overall emissions worldwide to address the impacts of climate change and rising temperatures in their region. This is a call for people around the world to join in a visual declaration to urge leaders to immediately adopt a treaty that reduces greenhouse gas emissions and stabilizes the climate at a carbon dioxide level of 350 ppm (parts per million), and to help the Alaska Native peoples to protect their livelihoods, their way of life and the lands they call home."

Plans are underway to deliver this "Message from the North" to the world leaders gathering in Bonn for a round of preparatory talks in the lead up to the heavily anticipated UN Climate Negotiations in Copenhagen in December.

The Gwich'in have joined in an unprecedented partnership with the "tck tck tck" campaign, which brings together an unprecedented alliance of faith groups, NGOs, trade unions and individuals at this crucial time to call for a new international treaty that will save the planet from the dangerous effects caused by climate change.

As world leaders prepare to strike a climate deal in Copenhagen in December, "tck tck tck" will harness the voices of the people to demand an ambitious, fair and binding new international agreement that reflects the latest science.

Background:

Drilling in the Arctic National Wildlife Refuge has been a major debate over the last 20 years. The Arctic Refuge has been described as part of America's last great wilderness. The coastal plain of the refuge contains the most biological diversity of the entire circumpolar north. Birds from all 50 states and six continents migrate there for nesting and staging.

This area is the last portion of the North Slope of Alaska that is currently unavailable to oil and gas development. Gwich'in experts and caribou biologists have concluded that allowing drilling in the Arctic Refuge coastal plain will detrimentally impact the porcupine caribou herd. The caribou instinctually migrate up to 3,000 miles to the coastal plain safe from the predators in the foothills of the Brooks Range, where they can graze on highly nutritional vegetation and the ocean provides vital insect relief.

Protecting the calving and nursery grounds is a human rights issue for the people of the Gwich'in Nation, a right guaranteed by the International Covenant on Human Rights that states, "In no case may a people be deprived of their own means of subsistence."

www.indiancountrytoday.com

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2. Arctic set to see dangerous climate change

By Kate Ravillious
Environmental Research Web
May 28, 2009

For Inuit people dangerous climate change may already be happening. Temperatures in the Arctic are increasing at twice the global average, and recent years have seen unprecedented summer sea-ice melt and an increase in extreme weather. Hunting and fishing opportunities have become less reliable, and permafrost thaw is threatening the viability of a number of settlements.

James Ford, a geographer at McGill University, Canada, believes it is now too late to prevent dangerous climate change in the Arctic. He says that it is essential that we reduce and stabilize greenhouse gas emissions to avoid runaway climate change in the Arctic, but even our best efforts are unlikely to prevent changes that are likely to be dangerous for Inuit. As a result he argues that we now have an obligation to reduce the vulnerability of Inuit people and help them to adapt to climate change.

Around 165,000 people identify themselves as Inuit, inhabiting Arctic and sub-Arctic regions of Canada, Alaska, Greenland and Chukotka (Russia). The climate in these areas is severe, with very cold and long winters, and short, cool summers. Over many centuries these people have devised a way of living in such an extreme environment.

Sea ice is essential to this way of life; as a transportation link between communities and as a platform for hunting and fishing from. Rapid melting of sea-ice is a major threat to the Inuit lifestyle. "With climate change what we are seeing is constrained access to hunting areas, which directly affects the availability of traditional foods," Ford told environmentalresearchweb. "We are also seeing hunting becoming more dangerous as the sea ice changes."

What's more, melting of permafrost is leaving some Inuit settlements bogged down in a muddy quagmire, with inhabitants unable to use traditional sleds and skis to move around.

In his paper in Environmental Research Letters, Ford argues that it is time that the rest of the world sits up and takes notice. "The Inuit can adapt to climate change, but only if support is provided," he said. "Many barriers are financial in nature, and as such surmountable." He goes further and argues that international human rights and climate treaties establish rights for Inuit that are being compromised with climate change, establishing a legal basis for adaptation support.

Autumn and late spring are likely to be the most difficult times of year for the Inuit - when the sea ice is freezing and breaking up respectively. To help Inuit through these difficult seasons Ford recommends developing new hunting trail networks, which access different areas, and changing the nature of hunting at these key times of year (using boats more, for example). He also suggests that new technology, such as GPS and satellite phones, could help to make hunting and travel safer.

Other changes need to happen at a government level, for example managing the wildlife population in ways that assist Inuit harvesting in a changing climate, investing in infrastructure that can withstand climate change impacts, and supporting the training of young Inuit with the new skills they need to survive in a changing climate.

Some communities may need to relocate due to sea level rise and permafrost thaw, and for others traditional lifestyle is likely to be severely curtailed. Nonetheless Ford says that a new and sustainable way of life for the Inuit is possible, but only if help is provided now.

In particular Ford stresses that international climate change funds should not be limited to developing countries, but should be accessible to all vulnerable people who need to devise ways of adapting. "The Inuit did not cause climate change, but they are experiencing the worst effects," he said.

www.environmentalresearchweb.org

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3. Strange sights under northern lights

Fish change colour, new birds are seen as climate change impacts Canada's far north

By Alexander Panetta
The Canadian Press
The Record.com
June 6, 2009

PANGNIRTUNG, Nunavut - The fish changed colour. New bird species were spotted. Two bridges were wiped out by a once-in-a-lifetime flood that forced villagers to dump sewage into their pristine waters.

The locals say strange things happened last year in this snow-peaked, sapphire-watered hamlet by the Arctic circle.

And they have a message for city-dwellers who might normally be indifferent to the bizarre weather in an

Inuit village 1,000 kilometres north of Labrador: This is what climate change looks like.

"Climate change is real," says Ron Mongeau, the town manager of Pangnirtung, a postcard-pretty spot girded by mountains and glacial fjords.

"It's not happening tomorrow or next week. It's happening here and it's affecting the life of everybody in the Arctic - every day."

Climate scientists describe the Arctic as Ground Zero for rising global temperatures, with climate change being felt earlier and more dramatically here than most of the planet.

The most severe example came a year ago, on June 8. Floods knocked out two bridges that separated the community from its garbage dump, sewage-treatment plant, and water station.

Locals were forced to pump their waste into the sea for several days as they jury-rigged a dirt-and-rock replacement bridge.

The town declared a 30-day state of emergency and the federal government later covered the lion's share of an \$8 million project that built a replacement bridge last October.

Mongeau says a torrent of meltwater cascaded off the surrounding mountains in an unusually mild spring. He says it eroded the permafrost base of the bridges and destroyed them both.

"We literally had a wall of water - between 12 to 15 feet high - coming down that river," Mongeau said.

"It's unprecedented in the history of this community. The first thing we did is talk to the elders. Nobody has any experience with any event anywhere close to the (water) level that we saw."

Local leaders described similar phenomena last week to the visiting Gov. Gen. Michaëlle Jean: robins and bluejays spotted for the first time in the area; an unprecedented abundance of smelt in Cumberland Sound; less ice cover; char, caribou and polar bears migrating at different times, to different places.

The town's cherished char also look strange, Mongeau said. The prized fish is comparable to salmon or trout in taste, but with darker flesh.

"Pang is known for really, really red char - the best char in the Arctic," Mongeau said.

"The char is really red because the char eat shrimp. Last summer, the char began to eat capelin and we were getting pale-fleshed char - white, pink, and not red."

Climate scientists say the occurrences up on Baffin Island are unsurprising.

The UN's Intergovernmental Panel on Climate Change projects temperature changes of 5 degrees or more in the Arctic this century - roughly double the expected rate in the rest of North America.

It says sea levels had already risen by an average rate of 3.1 millimetres a year from 1993 to 2003. Records from Environment Canada already indicate a warming trend in Pangnirtung.

Statistics from the government weather office say the average annual temperature has been 1.4 degrees warmer this decade than in the late 1990s. In five consecutive recorded years, summer temperatures passed 22 degrees - which never happened between 1996 and 2000.

The department was asked to provide statistics for the last decade but, lacking data for Pangnirtung in 2004, 2005, 2007, and 2008, it offered figures for nine of 11 years starting in 1996.

This winter, though, was a typical cold one, residents say.

One climate scientist says warming will be two or three times greater in the Arctic than elsewhere on the planet because of a phenomenon called, "feedback."

"It's really straightforward physics," said John Stone, a professor at the University of Ottawa.

"The ice melts. The ice is a white, reflective surface. As it melts, you get open sea water. And open sea water is a dark, absorbent surface. As it gets warmer, the ice melts more, and it goes around in circles."

In southern Canada, he says the impact will be felt in a variety of ways: longer growing seasons; less snow in the Rockies; less fresh water spilling down to the Prairies; lower water levels in the Great Lakes; rising sea levels; more extreme floods and heat waves.

Forests are already being stripped by pine beetles, tree-eating parasites that thrive in warmer conditions. Not all changes will be bad. A longer growing season, for instance, could actually be a good thing for the wine-makers of southern Ontario.

The problem, Stone says, is the unpredictability and the potential for it to play havoc with people's lives. "We might see new crops in Canada. But is there going to be enough water for them?" Stone says.

"Will insects be pollinating the fruit trees? And if you're running a ski slope, you're not too happy. Same thing if you're in a cottage vulnerable to mud slides.

"Your heating bill might go down in the winter - but your cooling bill would go up in the summer. "

One Inuit leader says he's managing to adapt so far. Peter Kilabuk, a former member of the territorial legislature, says he's hunting and fishing as successfully as always.

He's just doing it differently.

The char follow the shoreline once the ice breaks up - which used to happen in July, but has been occurring as early as May in recent years. Kilabuk follows the char.

Seal pups are being forced to leave their dens earlier in the year - raising fears among hunters that they may end up stunted.

Caribou arrive near town later in the year, their traditional migration patterns disrupted by reduced ice cover. The polar bears are doing the same, because they follow the caribou.

Kilabuk's hunting skills had helped him deal with those changes. But the collapsed bridges came as a shock. "Nobody had seen nothing of this magnitude," said Kilabuk, who sat in the legislature for a decade.

"People were surprised. But at the same time, it confirmed what they had started seeing in the last 20 years."

Climate scientists say there are plenty of reasons to pay close attention to the Arctic - and not just because it serves as an early-warning system for climate change.

It's also because the more the permafrost melts, the more tonnes of trapped methane gases will be released into the atmosphere, with further consequences for the rest of the planet.

Stone says the Arctic is already warning us.

"We are running out of time," he says.

"The changes we had anticipated are occurring faster and faster than we anticipated. The longer we delay (action), the more expensive and difficult it's going to become to address this."

www.news.therecord.com

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4. Yacht Silent Sound sets off to transit the North-West Passage

By BW Media

Sail World
June 4, 2009

Today is the day that yacht Silent Sound is to depart from Victoria in British Columbia, Canada, to transit the North West Passage and bear witness to the signs of climate change. Under the name of the Open Passage Expedition, they want to reach the Beaufort Sea as the ice opens, which normally occurs in mid- to late-July.

The expedition team, Canadian Cameron Dueck, German Hanns Bergmann, Tobias Neuberger who lives in both Germany and Turkey and Anna Woch originally from Poland, had gathered in Victoria, BC in preparation for their departure. In the last preparations they were adding new electronic equipment - voice communications and GPS mapping technology - kindly provided by Iridium Satellite and Blue Sky Network. They had also been doing research and setting up contacts in the North, as well as buying provisions for the summer.

The goal of this carbon-neutral voyage through the Northwest Passage is to use written word, video and photos to tell the story of how climate change is affecting Arctic communities. Scientific research provides us with facts on how the earth is changing, but their goal is to tell this story in a more creative and emotional way to reach a wider audience.

The journey over the top of Canada is about 7,000 nautical miles long and will take some four months to complete. In each port they will hear the stories of the Inuit and others living in the Canadian Arctic who are most impacted by the changes, and they will then retell these stories to the world.

With only four crew and limited time before the winter ice returns, the Open Passage Expedition will be a gruelling voyage of modern day adventure and discovery.

For full information about Open Passage Expedition, go to the [expedition website](#).

About the North-West Passage:

Since the discovery of the New World, the fabled Northwest Passage had been an elusive dream for explorers and mariners alike. Throughout the grand age of exploration, it remained the ocean's one unattainable prize, luring young men who were seeking wealth and fame to sail north in search of this frozen passage.

Wealthy patrons poured their fortunes into the quest but the only thing they gained was their name on a distant, frozen spot on the map, which few would ever see. Instead, the potential Arctic shortcut from Europe to Asia became an icy graveyard for the hundreds of sailors who, helplessly trapped in the shifting sea ice, died miserable deaths from starvation, scurvy and the bitter cold. Their wooden sailing ships were crushed in the ice and many sank without leaving any clues to the suffering of their men.

In 1906, Roald Amundsen became the first man to sail through the passage. This "shortcut" took him over three years to complete. Despite his success, the ice-choked passage never became the commercial shipping route that early explorers hoped for, and few men could boast of sailing its entire length.

Until now.

Climate change is causing temperatures in the Arctic to rise twice as fast as elsewhere on the globe. The sea ice has melted so rapidly that the Northwest Passage has been open water during the past two summers. The warming climate is forcing Arctic communities and wildlife to adjust their lifestyles to survive.

These changes will enable Silent Sound to embark on a voyage that five years ago was nearly impossible for amateur sailors.

www.sail-world.com

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5. New record Arctic sea ice cover minimum?

Climate researchers from Bremerhaven and Hamburg present new prognoses.

Alfred Wegener Intstitute
June 10, 2009

Bremerhaven/Hamburg, June 10th 2009. Climate researchers from the Alfred Wegener Institute for Polar and Marine Research and KlimaCampus of the University of Hamburg participate for the second time in an international scientific competition. Some of the most renowned climate research institutes worldwide fathom possibilities for seasonal prognoses of Arctic sea ice cover by means of different methods and climate models. The declared aim of all participants is to find the best method for reliable prognoses. The German researchers agree upon a continuing negative trend. Another critical minimum of Arctic sea ice is to be expected in the late summer of 2009.

"We have computed in this year's first prognosis that the ice cover of the Arctic Ocean will lie at the end of the summer with at least 28 % probability under that of 2007 - the year with the lowest-ever measured ice extension", explains Prof. Dr. Rüdiger Gerdes from the Alfred Wegener Institute. "The new prognosis is to be repeated each month. It was developed in cooperation with staff from the scientific companies OASys and FastOpt (Hamburg) within the framework of the EU project DAMOCLES. The uncertainty of the prognosis is still very great because the Arctic melting period has just started. We expect increasing accuracy when the start date of the prognosis comes nearer to the target time period in September", continues Gerdes.

The prognosis of the team from KlimaCampus of the University of Hamburg is slightly more positive: "We estimate a probability of 7 % that this year will fall below the negative record of 2007 - with an increasing tendency", reports Prof. Dr. Lars Kaleschke from the Institute of Oceanography. There is no doubt regarding the long-term trend for him, too. "The Arctic sea ice will also melt extremely in this year - with far-reaching consequences for the global thermal and radiation balance."

The researchers expect a long-term decrease of sea ice cover in the North Pole region in the summer of the coming decades. An exact prognosis for the respective next late summer is not possible, however. This is based on two factors: ice thickness at the end of the winter in its spatial distribution is unknown - in contrast to the degree of ice cover. "The knowledge of it, however, is of decisive importance for a good prognosis", explains Gerdes from the Alfred Wegener Institute. In addition, a prognosis over the summer is made more difficult by the fact that the short-term development of sea ice is dependent on the actual weather over the Arctic Ocean. This is not predictable over many months, however.

Both research teams have approached this problem with different methods. Prof. Gerdes and his team have included additional measurement data into their model in this year. They utilized a variational data assimilation system developed by OASys and FastOpt within the framework of DAMOCLES. The simulation with their model (NAOSIM) orients itself on measurement data gained in the Arctic during the last months as closely as possible. Included are oceanic measurement data from drift buoys, such as brought out in the ice by the Alfred Wegener Institute, and also data on ice cover and ice movement measured from satellites. It is intended to take ice thickness measurements gained by the Alfred Wegener Institute and the Canadian University of Alberta with the research aircraft Polar 5 in later prognoses into account.

The prognosis of the Hamburg researchers around Prof. Lars Kaleschke is based upon an extrapolation of satellite data from the last 36 years. This is the longest global climate time series among all satellite measurements. "Our latest studies show that there is no conclusive interrelation between the frozen surface measured in the winter and in spring and the expected minimum for the late summer", reports Kaleschke. Different statistical prediction methods were tested. The most precise methodology is currently the analysis of the respective minima, this means the data from September regarding the whole time span. This shows the highest correspondence compared to real data measured later.

"Even if we do not wish a new record minimum of ice extent - we nevertheless hope that our prognosis will be near to the actual data in September, just like last year", says Rüdiger Gerdes.

Contacts:

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www.awi.de

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6. Melting Ice Could Lead to Massive Waves of Climate Refugees

Earth Policy Institute
Environmental News Network
June 3, 2009

"As the earth warms, the melting of the earth's two massive ice sheets-Antarctica and Greenland-could raise sea level enormously. If the Greenland ice sheet were to melt, it would raise sea level 7 meters. Melting of the West Antarctic Ice Sheet would raise sea level 5 meters," says Lester R. Brown, President of the Earth Policy Institute, in a recent release. "But even just partial melting of these ice sheets will have a dramatic effect on sea level rise. Senior scientists are noting that the Intergovernmental Panel on Climate Change (IPCC) projections of sea level rise during this century of 18 to 59 centimeters are already obsolete and that a rise of 2 meters during this time is within range."

Assessing the prospects for the Greenland ice sheet begins with looking at the warming of the Arctic region. A 2005 study, conducted by the Arctic Climate Impact Assessment (ACIA) team, an international group of 300 scientists, concluded that the Arctic is warming almost twice as fast as the rest of the planet. It found that in the regions surrounding the Arctic, including Alaska, western Canada, and eastern Russia, winter temperatures have already climbed by 3-4 degrees Celsius (4-7 degrees Fahrenheit) over the last half-century. In testimony before the U.S. Senate Commerce Committee, Sheila Watt-Cloutier, an Inuit speaking on behalf of the 155,000 Inuits who live in Alaska, Canada, Greenland, and the Russian Federation, described their struggle to survive in the fast-changing Arctic climate as "a snapshot of what is happening to the planet." She called the warming of the Arctic "a defining event in the history of this planet."

The ACIA report described how the retreat of the sea ice has devastating consequences for polar bears, whose very survival may be at stake. A subsequent report indicated that polar bears, struggling to survive, are turning to cannibalism. Also threatened are ice-dwelling seals, a basic food source for the Inuit.

Since this 2005 report, there is new evidence that the problem is worse than previously thought. A team of scientists from the National Snow and Ice Data Center and the National Center for Atmospheric Research concluded that the ice is melting much faster than climate models had predicted. They found that from 1979 to 2006 the summer sea ice shrinkage accelerated to 9.1 percent a decade. In 2007, Arctic sea ice shrank some 20 percent below the previous record set in 2005. This suggests that the sea could be ice-free well before 2050, the earliest date projected by the IPCC in its 2007 report. Some scientists now think that the Arctic Ocean could be ice-free in the summer by 2030, if not earlier. Arctic scientist Julienne Stroeve observed that shrinking Arctic sea ice may have reached "a tipping point that could trigger a cascade of climate change reaching into Earth's temperate regions."

Scientists are concerned that "positive feedback loops" may be starting to kick in. This term refers to a situation where a trend already under way begins to reinforce itself. One of the feedback mechanisms in the Arctic is the albedo effect. When incoming sunlight strikes the ice in the Arctic Ocean, up to 70 percent of it is reflected back into space. Only 30 percent is absorbed as heat. As the Arctic sea ice melts, however, and the incoming sunlight hits the much darker open water, only 6 percent is reflected back into space and 94 percent is converted into heat. This may account for the accelerating shrinkage of the Arctic sea ice and the rising regional temperature that directly affects the Greenland ice sheet.

For a full report, see http://www.earthpolicy.org/Books/Seg/PB3ch03_ss5.htm.

www.enn.com

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7. Ancient Creatures Survived Arctic Winters

By Andrea Thompson

Live Science
June 5, 2009

Flowering plants and hippo-like creatures once thrived in the Arctic, where the tundra and polar bears now prevail.

New research, detailed in the June issue of the journal *Geology*, is shedding light on the lives of prehistoric mammals on Canada's Ellesmere Island 53 million years ago, including how they survived the six months of darkness during the Arctic winter.

Today, Ellesmere Island, located in the high Arctic (about 80 degrees north latitude), is a polar desert that features permafrost, ice sheets, sparse vegetation and a few mammals. Temperatures there range from minus 37 degrees Fahrenheit (-38 Celsius) in winter to plus 48 degrees F (9 Celsius) in summer. It is one of the coldest and driest places on Earth.

But 53 million years ago, the Arctic had a completely different look.

The findings have implications for understanding how ancient animals dispersed across North America and what might lie in store for modern mammals that are moving northward because of climate change.

Arctic then and now

In 1975, researchers discovered that a surprising menagerie of Arctic creatures lived on Ellesmere during the early Eocene epoch (55 million to 50 million years ago). A team led by Mary Dawson of the Carnegie Museum of Natural History in Pittsburgh discovered fossil alligator jaw bones. Since then, fossils of aquatic turtles, giant tortoises, snakes and even flying lemurs - one of the earliest forms of primates - have also turned up.

The new research team analyzed the signatures of carbon and oxygen in the fossil teeth of three types of mammals that once dwelled in the Arctic - a hippo-like, semi-aquatic creature known as *Coryphodon*; a second, smaller ancestor of today's tapirs (pig-like animals found in South America and Southeast Asia); and a third rhino-like mammal known as *brontothere* - to find out what the Arctic environment was like in the past.

The results point to warm, humid summers and mild winters with temperatures probably ranging from just above freezing to near 70 degrees F, said study team member Jaelyn Eberle of the University of Colorado at Boulder.

The region was probably similar to swampy cypress forests in the Southeast United States today, Eberle said. Fossils of tree stumps as large as washing machines can still be found there.

Changing diet

In the winter, the prehistoric mammals would have experienced the same perpetual night that Arctic denizens do now. Come summer, they would have lived in constant sunlight.

The analysis of the fossil teeth also told researchers what the animals munched on during their lifetimes, and answered the question of whether or not they hibernated or migrated during the winter darkness. (The same questions exist for Arctic dinosaurs, Eberle said.)

Coryphodon and its contemporaries were similar to those living in Wyoming and Colorado at the time. "They do not appear to be a unique, 'specialized' group of beasts adapted to High Arctic conditions," Eberle told LiveScience in an email.

So many scientists thought these creatures might go on long migrations, like today's barren ground caribou, which travel more than 600 miles (1,000 kilometers) to over-winter in subarctic forests, Eberle said.

The new study found that this was not the case.

The teeth records indicated that the creatures dined on a summer diet of flowering plants, deciduous leaves and aquatic vegetation. But in winter's twilight they apparently switched over to foods like twigs, leaf litter,

evergreen needles and fungi, Eberle said.

"We were able to use carbon signatures preserved in the tooth enamel to show that these mammals did not migrate or hibernate," Eberle said. "Instead, they lived in the high Arctic all year long, munching on some unusual things during the dark winter months."

Fossils of babies and juveniles of the mammal species, as well as their sturdy builds, also make it likely that these animals stayed put during the winter, Eberle added.

Migration, past and future

The year-round residence of mammals such as *Coryphodon* was a "behavioral prerequisite" for their eventual dispersal across high-latitude land bridges that geologists believe linked Asia and Europe with North America, Eberle said.

"In order for mammals to have covered the great distances across land bridges that once connected the continents, they would have required the ability to inhabit the High Arctic year-round in proximity to these land bridges," Eberle said.

The fossils also suggest that creatures such as tapirs originated in the Arctic, as that is where the earliest known fossils of these groups are found, and later migrated southward.

"Until geologically older fossils of tapirs and brontotheres are found elsewhere in the world, the Arctic is very much in the running as a place of origin," Eberle said.

The animals likely made their way south from the Arctic in minute increments over millions of years as the climate shifted and cooled, the researchers suggest.

"This study may provide the behavioral smoking gun for how modern groups of mammals like ungulates - ancestors of today's horses and cattle - and true primates arrived in North America," Eberle said. The new study, funded by the National Science Foundation, also foreshadows the impacts of continuing global warming on Arctic plants and animals, Eberle said.

Temperatures in the Arctic are rising twice as fast as those at mid-latitudes with global warming. Air temperatures over Greenland have risen by more than 7 degrees F since 1991, according to climate scientists.

"We are hypothesizing that lower-latitude mammals will migrate north as the temperatures warm in the coming centuries and millennia," Eberle said. "If temperatures ever warm enough in the future to rival the Eocene, there is the possibility of new intercontinental migrations by mammals."

"Let's face it - when the climate changes, an organism has three choices - adapt, move/disperse, or go extinct," she added.

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8. NOAA Unmanned Aircraft Helping Scientists Learn About Alaskan Ice Seals

NOAA
June 2, 2009

NOAA's Fisheries Service scientists and their partners have launched an unmanned aircraft to mount the vehicle's first search for ice seals at the southern edge of the Bering Sea pack ice during the Arctic spring, in an effort to learn more about these remotely located species.

On May 13, the NOAA research vessel *McArthur II* departed Kodiak, Alaska, and headed for the Bering Sea to launch the *ScanEagle*, an unmanned aircraft that is being used to collect images and video along the ice edge.

NOAA's Fisheries Service scientists from the Alaska Science Center's National Marine Mammal Laboratory, in cooperation with the University of Alaska's Cooperative Institute for Arctic Research, will use the images, taken during the month-long expedition, to evaluate whether unmanned aircraft could be useful for estimating the abundance and distribution of ice seals. In 2008, NOAA determined that ribbon seals should not be listed under the Endangered Species Act. NOAA was also petitioned to list spotted, bearded and ringed seals, and is gathering information and preparing status reviews for those species.

"The distributions of ice seals are broad and include areas very far from shore," said Michael Cameron, NOAA's Fisheries Service's lead scientist on the expedition. "Using traditional, manned aircraft to survey all of the sea ice habitat in Alaskan waters would be challenging, expensive and potentially dangerous. We hope that the ScanEagle will provide a safe and efficient way to collect information in this remote environment."

The ScanEagle, owned and operated by the University of Alaska Fairbanks, weighs less than 27 pounds. When loaded with fuel and survey equipment it can fly for about 20 hours at a cruising speed between 48 and 75 knots.

The small aircraft is recovered through a modified "skyhook" system—a catch line, hung out over the water using a large deck crane, caught by airframe-mounted hooks on the ends of the ScanEagle wings.

"We tested the ScanEagle from two NOAA vessels, the Dyson and the McArthur II, in Puget Sound near Seattle," said Robyn Angliss, deputy director of NOAA's National Marine Mammal Laboratory. "It performed well and we expect the same in the far north."

There are many potential applications of this technology in the North Pacific. In addition to surveys for ice seals and other easily visible marine mammals such as walrus, the system could potentially be used to study near surface oceanography, sea ice conditions and movements, and to collect information on atmospheric and weather conditions.

Collecting data on seals and sea ice will improve the agency's understanding of seal habitat preferences and sensitivity to climate change.

Greg Walker and Don Hampton from the University of Alaska Fairbanks will be piloting their ScanEagle system from the McArthur II. Other key partners who have been pivotal in making this project successful are Insitu, the aircraft's manufacturer, their subcontractor Evergreen, and the U.S. Navy.

NOAA understands and predicts changes in the Earth's environment, from the depths of the ocean to the surface of the sun, and conserves and manages our coastal and marine resources.

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