Penguins That Weathered Past Climate Change Suffer This Time

PHOTOGRAPH BY BILL CURTSINGER, NATIONAL GEOGRAPHIC CREATIVE

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Despite their pot-bellied profile and waddling gait, Antarctic penguins have weathered the challenges of one of the harshest climates on Earth for millennia. Three of those species—the Adélie, chinstrap, and gentoo—were also able to tolerate, if not flourish under, a warming event that came as ice sheets began to shrink, says a new study.

They were climate change "winners," the authors write. About 15,000 to 20,000 years ago, the retreating ice exposed expanses of bare ground that the penguins could build nests on, allowing them to expand their populations.

This historical perspective is helping researchers to understand the penguins' current situation in western Antarctica. (See "West Antarctic Glaciers Collapsing, Adding to Sea-Level Rise.")

The warming that researchers are now measuring on the Antarctic Peninsula is approaching the limits of what these penguin species experienced in the past, says Gemma Clucas, a doctoral student at the University of Southampton in the United Kingdom and lead author of the new paper. "We're seeing a very different response [from them now.]"

Genetic analysis of 249 gentoo, 166 chinstrap, and 122 Adélie penguins showed that all three populations expanded after the last glacial maximum—when the ice sheets were at their greatest extent—the researchers report today in the journal *Scientific Reports*. But only gentoo penguins seem to be holding their own against current warming trends in the western Antarctic. The other two species are in decline.

Too Much and Not Enough

"You can have too little ice and too much ice, and both of these are bad," says Jefferson Hinke, an ecologist with the U.S. National Oceanic and Atmospheric Administration's Southwest Fisheries Science Center in La Jolla, California.

In the past, the problem was a lack of real estate. During the last glacial maximum, there was 100 percent more ice in the sea surrounding Antarctica, severely restricting access to the ocean, which penguins depend on for food. Glaciers also covered the bare ground, where they lay their eggs and raise their young. It wasn't until the ice started melting that the penguin populations began to do better.

"Now we have too little ice," says Hinke, who was not involved in the study, "and the ecological consequences of that are that species like Adélie and chinstraps aren't doing too well." However, unlike the past, the problem for penguins now is a dwindling food supply.

Adélie and chinstrap penguins rely mainly on krill, which has been declining due to retreating sea ice, which the shrimplike animals need to grow. Commercial fishing for krill, along with a resurgence of whales that prey on the tiny animals, have further reduced krill populations. Gentoo penguins are likely doing better because they have a more flexible diet, which includes fish and some squid, in addition to krill. (See also "Penguin Numbers Plummeting—Whales Partly to Blame?")

Nothing Lasts Forever

"These species are a lot more robust than we sometimes give them credit for," says Heather Lynch, a population ecologist at Stony Brook University in New York who contributed data to the study. Researchers worry when species are forced to shift their ranges, she says, but this paper shows that these penguin species can come through those changes.

However, "there have been reversals of fortune in the past," Lynch says. The Adélie and chinstrap penguins are evidence of that. Even though the gentoo penguins seem to be doing OK now, "there's no guarantee that that will last forever."

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Gentoo Penguins Thrive, While Adelies and Chinstraps Falter in a Climate-Changed World

Penguin species show there are winners and losers from global warming

ClimateWire

Jun 16, 2014 | By Elspeth Dehnert and ClimateWire |

Gentoo Penguins on Saunders Island.
Credit: Liam Quinn via Flickr

They may all waddle around in their tuxedolike feathers, but the penguins of the Antarctic Peninsula are not equal in their ability to adapt to a warming climate.

While the populations of the Adélie and chinstrap penguin species are currently declining, the gentoo species is increasing. But this hasn't always been the case, according to a recent study published in the journal *Scientific Reports*.

By tracing the genetics of the region's present-day penguins back about 12,000 years, a team of scientists from Oxford University, the U.K.'s University of Southampton and Woods Hole Oceanographic Institution (WHOI) found that the penguins' ancestors had flourished during the period of warming following the end of the last Ice Age.

"The populations of all three species of penguin during that time increased because the ice melted and provided them with more breeding space," said co-author Michael Polito, a WHOI postdoctoral investigator.

"Now, two of the three species are declining in response to current warming."

Why it's better to be a 'generalist'

So, what changed?

According to Polito, although the melting of the Antarctic Peninsula's sea ice has provided the penguins with more open land—and, in turn, better breeding sites—it has also reduced their main food source, krill.

The reason the gentoo species of penguin is able to flourish under these conditions, when the Adélie and chinstrap penguins are not, has to do with a contrast in diet. Gentoo penguins are not as dependent on the tiny, transparent crustaceans as the other two species, which also happen to rely on fish that eat krill.

"Gentoo penguins have a much more flexible diet than the other two species," Polito said. "Therefore, they may be better able to adapt to the shortage of krill."

Moreover, he added that, unlike the others, gentoo penguins live in small colonies and forage closer to shore. And their larger size allows them to dive deeper in the water, giving them access to more kinds of fish.

"Basic ecological theory would predict that specialists are more sensitive to environmental changes than generalists," he said. "By definition, specialists are little less flexible."

Commercial fishing of krill and the rebound of the region's krill-eating humpback whale population are also contributing to the reduction of the penguins' main source of prey, Polito said.

"We are not saying that today's warming climate is good for penguins," Tom Hart, a co-author from Oxford's Department of Zoology, said in a press release. "In fact, the current decline of some penguin species suggest that the warming climate has gone too far for most penguins."

"Penguins needs two things to be successful," Polito said, "a place to breed and food to eat."

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Not so Happy Feet: Penguins go from climate winners to climate losers

12 Jun 2014, 14:00 | *Roz Pidcock*

Life for penguins is getting tougher. Retreating sea ice around the Antarctic Peninsula is taking with it valuable habitat and food. But it wasn't always that way. In the past, these charismatic birds thrived as the climate warmed, according to new research that studies the history of penguin colonies in the region.

Now their fortunes have reversed. Current rapid warming caused by human activity means sea ice in the region is retreating too far and too fast. All but one penguin population on the Antarctic Peninsula is struggling to keep up, say the authors.

There's no escaping climate change on the vast continent of Antarctica. West Antarctica and the Antarctic Peninsula are among the most rapidly warming places on earth.

Chinstrap penguins resting on an iceberg, Southern Ocean. Credit: Tom Hart.

Icy grip

Antarctica has experienced big swings in temperature throughout earth's history. When ice cover peaked during the Last Glacial Maximum about 25,000 years ago, about twice as much sea ice encircled Antarctica as it does now.

Though that might suggest more space to fish and live, life as a penguin was difficult when there was more ice, according to research just published in Nature Scientific Reports. Lead author Gemma Clucas from the University of Southampton explains:

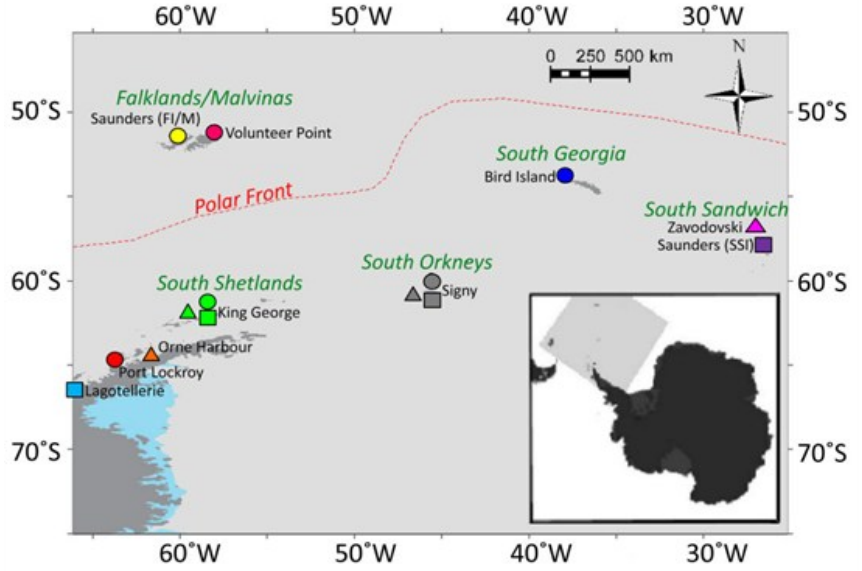
> "While we typically think of penguins as relying on ice, this research shows that during the last ice age there was probably too much ice around Antarctica … The extensive ice-sheets and sea ice around Antarctica would have made it inhospitable for them."

Gentoo penguins nesting at Neko Harbour, Antarctic Peninsula. Credit: Gemma Clucas.

As the world emerged from the glacial maximum, temperatures rose, ice shelves retreated and penguins prospered. That's because the flightless birds need ice-free ground, explains co author Dr Tom Hart from Oxford University:

> "As ice retreated, these penguins had access to more breeding sites and more open ocean to feed."

The researchers suggest the gradual warming and retreat of ice shelves as the world emerged from the LGM allowed penguin populations to expand as more habitat became available to the south.



The team studied penguin colonies across the Antarctic Peninsula and Scotia Arc. Circles are places where they sampled Gentoo penguins, triangles are Chinstrap penguins and squares are Adélie penguins. Colours are different populations. Source: Clucas et al. (2014)

A reversal of fortune

They may have coped with climate change in the past, but current warming isn't proving so positive for the plucky penguins, say the authors.

Only Gentoo penguins seem to still be managing reasonably well as temperatures rise, by opportunistically taking advantage of new suitable habitat for breeding, say the authors.

The less adventurous Chinstrap and Adélie penguins are diminishing in number around the Antarctic Peninsula, most likely due to the decline of their major food source, Antarctic krill.

Another theory is that more meltwater runoff is making the early life of Chinstrap and Adélie penguin chicks more perilous, and fewer are surviving into adulthood.

An Adélie penguin incubating newly hatched chicks in the rookery on Petermann Island, Antarctic Peninsula. Credit: Tom Hart

Too far, too fast

The warming we're seeing now is outside the natural range of variation that has occurred in the past, which is why we're seeing penguins respond very differently to how they did at the end of the LGM, the paper explains.

That's why it's important not to jump to the conclusion that a warming climate is good news for penguins, explains Hart:

> "We are not saying that today's current warming is good for penguins, in fact the current decline of some penguin species suggests that the warming climate has gone too far for most penguins."

Clucas adds that many species are losing out to climate change too, so it's important to take a broad view:

> "Despite historic warming clearly opening up new opportunities for penguins, we should not assume that current rapid warming caused by human activity is good for penguins as a whole. Evidence from other studies shows that climate change today is creating lots of losers and few winners".

Sometimes when it comes to predicting how species will respond to future warming, peering back into earth's recent past can help. The new study suggests penguin fortunes are perhaps one instance where to looking backwards to look forwards doesn't pay.

Clucas, G. V., et al., (2014) A reversal of fortunes: climate change 'winners' and 'losers' in Antarctic Peninsula penguins. Nature Scientific Reports. Doi: 10.1038/srep05024

Penguins Thrived in Warmer Temps, But Now Face Climate Crisis

Since the last ice age, penguins have basked in warmer Antarctic climates because less ice makes it easier for the birds to breed and hunt for food, a new study reveals. But there's a key caveat: Current climate change is happening too fast for their food supply to keep up with demand.

Declines in some species of penguins have been happening for the past 1,000 years, but are getting worse as climate change accelerates, the study found.

Researchers examined how populations of penguins changed since the end of the last ice age, some 11,000 years ago. The scientists looked specifically at three current Antarctic penguin species: gentoo, Adelie, and chinstrap. All three

of these species prefer ice-free waters to look for food, and ice-free land to nest and raise youngsters.

"We typically think of penguins as relying on ice, but this research shows that during the last ice age, there was probably too much ice around Antarctica to support large populations," study lead author Gemma Clucas, a postdoctoral marine biologist and ecologist at the University of Southampton in the United Kingdom, said in a statement.

Adelie penguins in Antarctica.

But too little ice is hurting some penguin populations now, the study found. One of the penguins' main sources of food — krill, or shrimp-like crustaceans — prefer to eat algae that clings to the bottom of sea ice.

"We are not saying that today's warming climate is good for penguins; in fact, the current decline of some penguin species suggests that the warming climate has

gone too far for most penguins," study co-author Tom Hart, a researcher in the department of zoology at the University of Oxford in the U.K., said in a statement.

- Elizabeth Howell, Live Science

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