

Can barnacle geese predict the climate?

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Each spring, barnacle geese have to fly a long way to their breeding grounds. It's a couple of thousand kilometres to Arctic Russia, where they have to arrive just as the snow has melted. Are they able to predict the vastly changing climate there from their wintering grounds? Credit: Jasper Koster

The breeding grounds of Arctic migratory birds such as the barnacle goose are changing rapidly due to accelerated warming in the polar regions. They won't be able to keep up with this climate change unless they can somehow anticipate it. A research team from the Netherlands Institute of Ecology (NIOO-KNAW) employed computer models to assess the future of the geese and their young. Results are being published online by the scientific journal *Global Change Biology*.

It's the time of year when [barnacle geese](#) and many other migratory [birds](#) prepare to depart for their [breeding grounds](#) above the Arctic Circle. From their wintering grounds in the Netherlands, the [geese](#) fly all the way up to the Barentsz Sea in northern Russia, where they should arrive just as the snow has melted. But in the polar regions, the climate is warming much more rapidly than in more temperate areas like the Netherlands - a phenomenon known as 'Arctic amplification'.

It's hard enough for humans to get to grips with the accelerated warming, let alone for barnacle geese, as an earlier NIOO-led study showed. After all, how can they tell from their wintering grounds if the snow has begun to melt thousands of kilometres away? So is it possible for the barnacle geese to advance their spring migration nonetheless, to predict [climate change](#)?

First study, fewer young

Ecologist Thomas Lameris and his fellow researchers from NIOO, and also the Swiss Ornithological Institute among other institutions, have tried to find the answer. "This is the first study that tests if migratory birds are in any way able to adjust their timing to the accelerated warming in the [polar regions](#). We used a model to show that the availability of enough edible grass to build up reserves for their journey is not a problem for the barnacle geese. It's the unpredictability of the climatic changes in their breeding grounds that spells trouble for them."



Are barnacle geese capable of predicting climate change? They need to arrive at their breeding grounds just as the snow has melted. But the climate in the Arctic is changing rapidly nowadays. Credit: Thomas Lameris/NIOO-KNAW

If the geese continue to mistime their arrival, their reproductive success will be reduced. Lameris: "They miss their optimal breeding window and the peak in local food abundance, so fewer goslings will survive." Some compensation for this comes from the fact that as well as starting earlier, the breeding season is becoming longer. This gives the goslings more time to grow. But that's not enough.

To establish the barnacle geese's potential for anticipating climate change, the researchers built a model that tracks individual geese as they fly to their breeding grounds in northern Russia and make stopovers along the route. "In the model, the geese have to make a choice each day: stay in their present location and continue to feed, or fly to the next stopover." The researchers tested the model for various gradations of climatic warming.

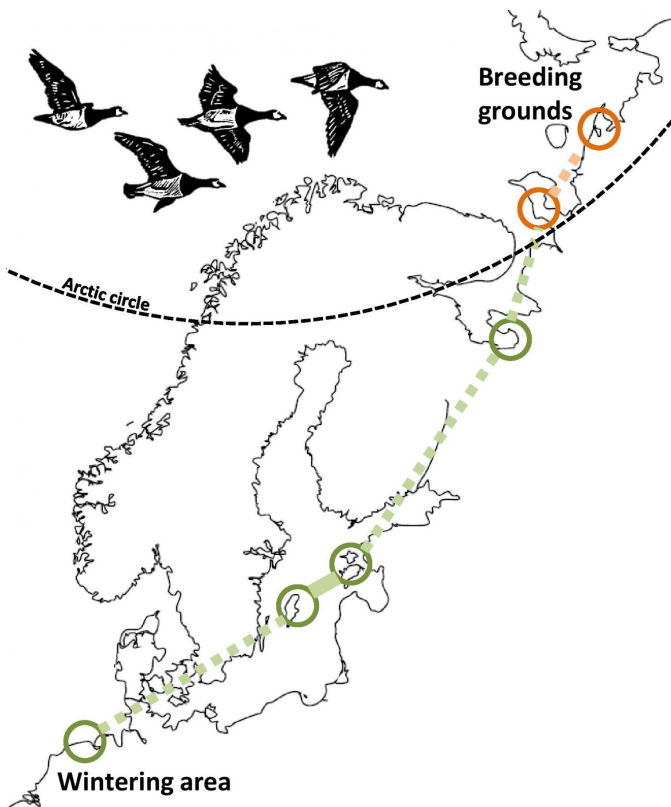
Smarter migration strategy?

The barnacle goose is an ideal 'model species' for studying the effects of climate changes, because researchers have been able to study this animal for decades. But it's not just about a single species. Lameris: "Our results are probably valid for many more species of Arctic-breeding migratory birds, and certainly for other geese such as the white-fronted and the brent goose."

On the whole, geese are clever birds. Goslings learn the migration route from their parents, including the best places to stop over and build up fat reserves. "So if they do change the timing of their arrival, it would be easy to pass that on to the next generation", Lameris argues hopefully. "The main question is whether geese and other [migratory birds](#) can adapt as fast as the [climate](#) changes, to keep up."

More information: Thomas K. Lameris et al, Potential for an Arctic-breeding migratory bird to adjust spring migration phenology to Arctic amplification, *Global Change Biology* (2017). DOI: [10.1111/gcb.13684](https://doi.org/10.1111/gcb.13684)

Provided by Netherlands Institute of Ecology



It's a long trip each spring for the barnacle goose. It has to fly thousands of kilometres from temperate Europe to its breeding grounds in the Arctic, with only a few stopovers along the route. Credit: Thomas Lameris/NIOO-KNAW

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