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## The cuddly cause behind Nunavut's boom in foxes and owls

### Many Arctic predators depend on the humble lemming

JOHN THOMPSON



Lemmings, such as this one seen on Bylot Island in Nunavut, are important prey for a number of Arctic predators, including snowy owls and Arctic foxes. (© GUILLAUME SLEVAN-TREMBLAY)

There's a reason why snowy owls have descended from Canada's eastern Arctic to parts of the northeastern United States in such great numbers this winter.

It also happens to be a reason why Arctic foxes have been spotted near many Nunavut communities this winter, prompting the territory's Health Department to remind residents to keep children and dogs away from the animals, for fear of transmission of rabies.

That reason is small enough to hold in your hand, furry, and has an unjustified reputation for committing mass suicide by jumping off cliffs.

It's the Arctic lemming. The small, plant-nibbling rodent is famous for its dramatic, four-year population cycles. These population swings, in turn, help drive the number of foxes and owls, which view lemmings as a food staple.

Researchers have puzzled over what drives the lemming's population booms and busts. At a certain point, does their population swell to such a point that they end up eating all the edible plants in their surroundings and starve? Or do predators eventually swarm in such numbers that lemming populations plummet?

In Canada's High Arctic, it looks like the answer is likely the latter, says Dominique Fauteux. He's a research scientist at the Canadian Museum of Nature, who recently completed his PhD at Laval University while studying lemming ecology on Nunavut's Bylot Island for Laval's Centre for Northern Studies.

"There are too many predators, and they just empty the lunch box of the tundra," said Fauteux, who recently published some of his findings on lemmings in the journal Arctic Science.

During an ongoing experiment on Nunavut's Bylot Island, Fauteux and his colleagues fenced off nine hectares of tundra and topped the structure with netting, in order to protect lemmings inside the area from predators.



Lemmings are famous for their dramatic, four-year population explosions. (© GUILLAUME SLEVAN-TREMBLAY)

Then, over three years, they captured, tagged and attempted to recapture lemmings, both inside and outside the protected area. Researchers caught the lemmings with the help of live traps baited with peanut butter, oats and apple.

Researchers were eight times as likely to recapture a lemming from year to year within the netted area.

This outcome "suggests that predation is a major factor affecting overwinter survival of brown lemmings," the study states. "This is in good agreement with studies showing that predation is the main factor affecting summer survival of lemmings in the High Arctic and that it may be the main driver of their population dynamics over multiple seasons."

Fauteux cautions, however, against generalizing this finding for all lemmings across the Arctic. In northern Norway, for instance, [research shows](#) that lemming population collapses are caused by the animals devouring all the moss they depend upon for food.

On Bylot Island, Fauteux said they never observed the lemmings exhausting their food supply, which includes a lot of willow flowers and roots.

Perhaps this difference is explained by how Norwegian lemmings reach much higher population densities than their Canadian counterparts—in some cases, 10 times as high, said Fauteux.

Some researchers believe this is the result of Fenno-Scandinavia having far fewer predators, due to human disturbances: snowy owls are endangered there, and Arctic foxes populations are also "at critically low numbers," said Fauteux.

Researchers have studied lemmings on Bylot Island for 13 years now, and Fauteux has been involved with this work for about half that time. That's allowed him to observe first-hand how the boom-and-bust cycles of lemmings affect other species.

"When there are lots of lemmings, the tundra becomes alive," said Fauteux.

During the summer months, "every time the lemming population builds up, there is a massive migration of all the raptors," said Fauteux. "So the snowy owls, the jaegers, the hawks, they all come in massive numbers and they start eating the lemmings that build during the winter."

Foxes behave a bit differently. Rather than migrate in search of lemmings, their number of offspring depends on how much food they're able to find.

"For years that there are going to be lots of lemmings, you can expect during the next winter or summer there will be lots of new, young foxes wandering around," said Fauteux.

The foxes on Bylot Island have another food supply, when the number of lemmings dwindle: the island is home to a large snow goose nesting site. In fact, that's what first brought wildlife biologists there in the 1980s. To some surprise, they found that lemmings impacted the goose population as well.

That's because the island's foxes will feast on lemmings when they can, but, if lemming numbers are low, they resort to trying to eat goose eggs and chicks—a more risky strategy, as it could involve "a big adult chasing you away from the nest," said Fauteux.

"There was a clear relationship between the lemmings and the snow geese, by sharing the predator. This is what we call apparent competition in ecology. It's when two prey share the same predator."

Climate change may be disrupting the boom-bust cycles of lemmings in parts of the Arctic, and this, in turn, could be bad news for the predators that depend on the critters.

"There are populations of lemmings in Fenno-Scandinavia and Greenland where there is evidence of their [cycles collapsing](#). That means they were doing these high amplitudes, and then all the sudden, boom, it's a straight line of low abundances," said Fauteux.

Researchers suspect that warmer winters are creating more challenging conditions for lemmings.

"In years when the winter is relatively warm, the basal layer of the snow becomes harder, and it becomes harder for the lemmings to dig. There's some evidence there may even be ice crusts that prevent the lemmings from digging through it," said Fauteux.

"The lemmings are really having a bad time trying to feed during these warm winters. We're worried that these collapses might happen in the Canadian Arctic, because of the warming of the Arctic."

The only way to know if these changes are beginning to affect lemmings in the Canadian Arctic, of course, is to conduct more painstaking field work. And that's what Fauteux plans to do, with the planned creation of a new lemming monitoring program in Salluit on Nunavik's Hudson Strait.

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