

Inbred wolves struggle, moose proliferate at Isle Royale National Park

May 5 2014



Wolves trek across the snow at Isle Royale National Park. Credit: John Vucetich

During their annual Winter Study at Isle Royale National Park, scientists from Michigan Technological University counted nine wolves organized into one breeding pack and a second small group that is a remnant of a formerly breeding pack.

In the Isle Royale Wolf-Moose Study's annual report released today, the

researchers say that over the past three years, they have tallied the lowest numbers of wolves ever: nine in 2011–12, eight in 2012–13 and nine in 2013–14. During the same period, predation rates—the proportion of the [moose population](#) killed by wolves—also dropped to the lowest ever recorded, while the number of moose doubled, to approximately 1,050 moose.

Wolves are the only predators of moose on the remote island national park in northwestern Lake Superior. The moose population has been increasing because wolf predation has been so low.

"The poor condition of wolf predation on Isle Royale appears to be caused by inbreeding," said John Vucetich, director of Michigan Tech's study of the wolves and moose of Isle Royale. In its 56th year, the research project is the longest continuous predator-prey study in the world.

In the annual report, Vucetich and Rolf Peterson, research professor in Michigan Tech's School of Forest Resources and Environmental Science and a codirector of the wolf-moose study, document analysis of the DNA of more than 1,000 fecal samples collected from wolves over the past 15 years. Doing so allowed them to construct a family tree from 1999 to 2013.

That pedigree enabled them to monitor the rate of inbreeding among the wolves. They found that an immigrant wolf, who eventually came to be known as the Old Gray Guy, came to the island across an ice bridge from Canada in 1997. He brought a fresh infusion of genes that so dominated the Isle Royale wolves' weakened gene pool that, by 2008, most of the wolves on the island were descended from the Old Gray Guy.

"This represents a very high standard of evidence that Isle Royale wolves

had been suffering from inbreeding prior to the immigrant's arrival," says Vucetich.

In the 1960s, ice bridges between Isle Royale and the mainland formed seven out of every 10 winters, the scientists note. In the past 17 years since the immigrant's arrival, only two ice bridges have occurred, so the Old Gray Guy's descendants soon became highly inbred as well. In particular, a large portion of the Old Gray Guy's descendants were the result of two consecutive generations of close inbreeding. Of those wolves, all lived short lives, all were dead by 2011, and only one reproduced in this case, a single pup.

"Their short, unproductive lives appear to mark the waning benefits of the genetic rescue event that occurred with the immigrant's arrival in 1997," the scientists say in the annual report.

The wolves of Isle Royale were not there when the [national park](#) was established in 1940. They are believed to have crossed an ice bridge from Canada in the late 1940s.

Vucetich and Peterson have analyzed data from decades of scientists' field notes, trying to determine whether the Isle Royale wolves might have benefited from infusions of new genetic material from wolves crossing ice bridges on other occasions in the past. They found, for example, that a pack of seven or eight wolves, including four black ones, crossed an ice bridge to the island in 1967. Many of these wolves were still present a year later and may have rejuvenated the population, genetically speaking, about two decades after its founding.

In a paper just published in the journal *Conservation Genetics*, Peterson, Vucetich, Philip Hedrick of Arizona State University, Jennifer Adams of the University of Idaho and Michigan Tech's Leah Vucetich report on their study of the effects of this new genetic input. The Isle Royale study

is significant, they write, because "few documented instances of genetic rescue have been observed long enough or in sufficient detail to understand how long one can expect the beneficial effects of genetic rescue to persist."

But ice bridges are two-way streets. In 1977, researchers observed a pack of wolves chase a pack mate half way to the mainland across an ice bridge. In 2008, the last time an ice bridge formed before this winter, two radio-collared wolves disappeared shortly after the ice bridge formed. And in late January 2014, an Isle Royale wolf crossed to the mainland on an [ice bridge](#) and was found dead as a result of an air pellet wound near Grand Portage, Minn.

Not limited by predation, moose are thriving on Isle Royale. In the past three years, their numbers have doubled; the vegetation that they eat is still plentiful, and the primary factor limiting their growth has probably been the severity of the past two winters, the researchers report.

Unless the next five winters are especially harsh, the moose population is likely to increase dramatically, the researchers say. Their concern is that, "the likely result would be significant and long-lasting harm to Isle Royale's forest."

No Genetic Rescue for Now

The scientists have recommended genetic rescue: bringing a few new wolves to Isle Royale to mitigate the effects of inbreeding. In their new *Conservation Genetics* paper, the researchers say, "Past gene flow also suggests that human-assisted gene flow is necessary to conserve the ecosystem services associated with predation, since climate warming has reduced the frequency of ice bridges and with it the only opportunity for unassisted gene flow."

Isle Royale National Park recently affirmed that as long as a breeding population of wolves exists on the island there would be no intervention in the near term.

However, the Park Service will begin an expanded planning effort and environmental impact analysis for ecosystem management, focusing on moose and their impacts to the forest, as well as the dynamics between predator and prey.

"There is time to fully explore all the consequences of such an action," said Isle Royale National Park Superintendent Phyllis Green. "Bringing [wolves](#) to the island remains an option, however the final decision will be based on the best available sound science, accurate fidelity to the law and long-term public interest.

More information: The annual report is available at isleroyalewolf.org/wolfhome/ann_rep.html

Provided by Michigan Technological University

Citation: Inbred wolves struggle, moose proliferate at Isle Royale National Park (2014, May 5) retrieved 27 April 2024 from <https://phys.org/news/2014-05-inbred-wolves-struggle-moose-proliferate.html>

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