Poop reveals an immigrant in Isle Royale wolves' gene pool

March 30 2011, By Jennifer Donovan

The large, lighter colored wolf in the center is the immigrant from Canada dubbed The Old Gray Guy. The wolf to the left is his daughter and mate, who died during 2010. Credit: John Vucetich

The wolves and moose of Isle Royale have done it again. They've surprised the scientists who have spent more than half a century studying them.

In a journal article published online today in the *Proceedings of the Royal Society* and in their 2010-2011 annual report, Michigan Technological University researchers John A. Vucetich and Rolf O. Peterson tell an unexpected tale of genetic immigration. In 1997, a virile male wolf crossed an ice bridge from Canada to the remote island national park in northern Lake Superior. He was physically larger than most Isle Royale wolves, and soon after his arrival he became the alpha male of Middle Pack, one of the island's three packs. As he aged, his fur turned very light, a trait that had not been seen previously on Isle Royale, but has

since become common. Before knowing his genetic history, the researchers called this wolf “The Old Gray Guy.”

How did Vucetich and Peterson learn so much about The Old Gray Guy? For the past 12 years, they had been systematically collecting scat (poop or droppings) deposited by the wolves. The immigrant wolf was discovered after Vucetich and Peterson collaborated with geneticists Jennifer Adams and Leah Vucetich from Michigan Tech and Phil Hedrick of Arizona State University, to examine the DNA contained within the scat. The geneticists found a scat that carried several alleles—alternative forms of a gene—that had not previously been seen in Isle Royale wolves. Through field observations, Peterson and Vucetich confirmed that this scat belonged to The Old Gray Guy.

“Before this discovery, the Isle Royale wolf population had been considered completely isolated since it was founded in the late 1940s,” Vucetich says.

According to the researchers, the discovery is also an important opportunity to better understand genetic rescue, a potentially important conservation tool for populations that suffer from inbreeding. Genetic rescue involves introducing one or more unrelated individuals into an inbred population. The effectiveness of genetic rescue is not well understood because the opportunities are limited to closely monitor an isolated population before and after a known immigration event. For this reason, the Isle Royale immigrant represents a special opportunity.

Genetic rescue is supposed to result in increased survival or reproduction. However, evidence for increased birth or longevity rates in the Isle Royale population is equivocal. Coincident with the immigrant’s arrival, though, moose on Isle Royale declined dramatically in response to food shortage, severe winters and tick outbreaks. A clear response to the immigration event may well have been disguised by lack of food for

the wolves, the scientists suggest. If so, it may be important to recognize that deteriorating ecological conditions can mask the beneficial effects of infusing new genetic material, they point out.

The Old Gray Guy died in 2006. But he left his mark. He sired 34 offspring and 22 grand-offspring, "and counting," the scientists say. Today, 56 percent of all the genes now found in the Isle Royale wolf population trace back to him. Within a couple of generations of the Old Gray Guy's arrival, inbreeding plummeted, but then rose quickly again. This Isle Royale case shows how the effect of genetic rescue can be substantial and manifest quickly, but also be short-lived.

Wolf Population Declining

The wolf-moose researchers' latest report also brings discouraging news about the wolves of Isle Royale. This year's Winter Study, conducted between Jan. 12 and Feb. 28, 2011, found that the Isle Royale wolf population had been reduced to just 16 wolves. Among these wolves are no more than two adult females. If the few remaining females were to die before raising female pups, the wolf population would almost certainly be committed to extinction. "The situation is kind of precarious," says Vucetich. "But it's always been precarious," Peterson notes.

The wolf population has also been reduced from the four packs seen a couple of years ago to perhaps just a single pack. East Pack and Paduka Pack went extinct in late 2009. In late February 2011, Chippewa Harbor Pack traveled deep into Middle Pack's territory, where they killed Middle Pack's alpha male (a son of the Old Gray Guy). "With his death, the survival of Middle Pack is doubtful," Vucetich and Peterson say. It has been 40 years since the wolf population was comprised of just a single pack.

The scientists acknowledge that National Park Service (NPS) policy promotes natural processes, and that, in this instance, local application of NPS policy could mean natural extinction. However, they advocate for an evaluation of the full range of management options, including the introduction of new wolves into the inbred population on Isle Royale.

Moose are Thriving

During the 2011 Winter Study, the scientists estimated a population of 515 moose, approximately the same as it has been for the past three years.

With the number of moose remaining low for so long now, the vegetation on Isle Royale also has become more abundant. Balsam firs, a favorite meal for moose, are growing taller than ever before, and deciduous shrubs have been flourishing. The calves were larger this winter, and the fat content of bone marrow indicates that adult moose are better nourished now. The scientists have spotted three sets of twins in the past two years, the first twins since 2005. Winter ticks, which posed a severe threat to the Isle Royale moose in 2007, have declined significantly since then.

“The moose are poised for increase,” says Peterson. The last large increase in the moose population was seen on Isle Royale in the 1990s.

Provided by Michigan Technological University