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Biologists use deer pellet DNA to estimate population size

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Fairbanks, Alaska—University of Alaska Fairbanks scientists successfully refined a non-invasive technique that extracts DNA from deer droppings and enables wildlife managers to accurately estimate deer and other ungulate population numbers in areas where visual counting of animals isn't feasible.

Scientist Todd Brinkman, a UAF Ph.D. candidate, will present his research during the [American Society of Mammalogists 89th Annual Meeting June 24-28 at UAF](#).

"This study is ground-breaking in the sense that it finally gives managers a firm estimate of abundance for a very important game species," said Kris Hundertmark, a wildlife geneticist at the UAF Institute of Arctic Biology, who serves as one of Brinkman's academic advisors.

The technique refined by Brinkman and Hundertmark extracts DNA from skin cells attached to the outer surface of the fecal pellets and identifies the different lengths of DNA fragments in each pellet. Every deer has a unique combination of fragments and this technique can tell one deer from another, which allows Brinkman to tell how many different deer are present in a sampled landscape.

"The deer pellets Todd is working with are deposited in a relatively warm and wet environment," Hundertmark said. "Warm and wet conditions are bad for DNA." Some of the pellets are up to 10 days old and so the DNA Brinkman has been working with is often in relatively poor condition.

"Todd has been very successful at modifying the protocols to recover that DNA and has done so with large numbers of samples," said Hundertmark.

In the 1990s, hunters on Alaska's Prince of Wales Island began expressing concern that they were having trouble harvesting enough deer to meet their needs, says Brinkman. The rainforest environment of southeast Alaska makes direct visual and aerial counting impossible so wildlife management agencies have, for years, counted deer pellets to try to estimate population size.

"They were simply counting pellets. More pellets meant more deer," Brinkman said. But there was no way to know whether pellets came from one deer or a dozen, and estimates lacked precision.

The lack of reliable data prompted the United States Forest Service to create a committee to address how to improve population estimates. Brinkman, an active hunter and outdoorsman, had come to UAF to do large-game animal research at about this time. He saw the USFS call

for research as a perfect opportunity to combine his interest in hunters and game species through IAB's interdisciplinary graduate [Resilience and Adaptation Program](#).

For three years between February and May, Brinkman and assistants hired from Prince of Wales Island communities walked a systematic grid of deer trails on the island carrying backpacks filled with small plastic vials each large enough to hold 4-6 pellets. At the end of each field season the vials were shipped to UAF where Brinkman and Hundertmark conducted the DNA analysis.

With unique DNA, called genotypes, and multiple "recaptures" of the same individual deer on subsequent sampling occasions, Brinkman could estimate the number of deer in each grid. His results showed a steady decline in deer numbers during the three-year study, which he and colleagues attributed to consecutive severe winters.

Before beginning his field collections or laboratory analyses, Brinkman spent the spring and summer of 2004 and 2005 getting to know some of the Prince of Wales Island hunters whose concerns prompted the project. He interviewed 88 hunters from 11 island and two off-island communities about their perceptions of changes in deer populations, deer hunting patterns, deer habitat and hunting access.

"Sitka black-tailed deer are the most important big-game species, both culturally and nutritionally, to subsistence and sport hunters in this region," said Brinkman

The technique Brinkman and Hundertmark developed will provide insight into factors that influence deer survival and population trends such as winter weather, predation and land use.

"There's really no better place to do large game management research than Alaska," Brinkman said. The IAB Resilience and Adaptation Program at UAF was a perfect match. "I could use an interdisciplinary, integrative approach to combine the social and biological science aspects of my two areas of interest."

ADDITIONAL INFORMATION:

Brinkman received funding and in-kind support for this project from the Wildlife Resource Management Program of the U.S. Forest Service, Alaska Department of Fish and Game, UAF Institute of Arctic Biology and the UAF/IAB Resilience and Adaptation Program.

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