

## Prized Poop:

### Using fecal hormone analysis to monitor reintroduced Canada lynx

By Kerry Fanson

*Jen struggled through the snow. It was a sunny Colorado day, but at 11,000 feet, the temperature was about 10° below, and the snow was deep. There was no time to rest, though. She was on a mission. She followed the fuzzy round tracks through a dense young spruce stand that scratched her face and knocked her hat off. Unlike Jen, the owner of the tracks had apparently floated across the snow and gracefully maneuvered through the spruce branches. Jen trudged on, and then she saw it – lynx scat!*



*Meanwhile, halfway across the country, Lynn Culver was making her daily rounds. It was a cold day by Arkansas standards, and Lynn was bundled up as she took care of her cats. But her 3 lynx looked perfectly comfortable. As she approached their enclosure she checked the usual spots – sure enough, the red one, the green one, and the plain one were all in the same spots as they were yesterday! (The scat, that is.) The food dye that Lynn was feeding her lynx revealed that they had apparently claimed their own personal pooping spots.*

You may be wondering why Jen and Lynn are so excited about lynx scat when the cats themselves are so much more alluring. Truth be told, they may not be as excited about it as I make them out to be. But I'm thrilled about all the lynx poop they are finding, because there is a wealth of information contained within each piece of feces. Fecal matter absorbs things from the body as it passes through. Therefore, it provides a window into what is actually going on *inside* the body without ever needing to capture, anaesthetize, or surgically alter the animal. We can find out what the animal is eating, if it has parasites, if it is pregnant, and whether or not it might be stressed. As a graduate student at Purdue University, I am hoping to capitalize on the data stored in these little “nuggets” to learn about the physiology of these beautiful, elusive felines.

#### MY OBSESSION WITH SCAT

I have always loved animals, and have known that I wanted to work with them. As a young kid, I plagued my parents with the injured turtles, abandoned baby birds, and other animals I brought home to add to our menagerie of pets. In high school and college I worked at a vet clinic, and after college I spent

several years working as a field biologist. Working with vets helped me appreciate the value of physiology and fueled my passion for understanding how the body works. If you can figure out what is causing an animal's problem, then you can actually treat the source of the problem and not just the symptom. However, my field jobs gave me a chance to work with exotic, wild animals and learn about how they behave in their natural habitat. As a field biologist, I was able to obtain valuable information that could help protect these species. I just needed to find a way to combine these two interests. Scat, oddly enough, seemed to hold the key.

Two years after we graduated from college, my husband and I worked for a snowshoe hare project in Colorado. The project was connected to the current Canada lynx reintroduction effort in Colorado. In addition to learning about snowshoe hares that winter, I also became intimately involved with the lynx reintroduction.

## LETTING THE CAT OUT OF THE BAG

In 1999, the state of Colorado released the first Canada lynx as part of a large-scale reintroduction effort. [See the January 2006 issue of National Geographic for more details about the lynx reintroduction.] It had been 26 years since lynx disappeared from these mountains, and now they were on their way back. But the exhilaration felt by the biologists after those first few releases faded as the death count rose and biologists failed to find any sign of kittens. Even when survival began to improve, kittens remained absent. Critics of the project cited the mortality rate and lack of reproduction as a sign of failure.

However, it is not unusual to have low survival and reproduction during the early stages of a reintroduction effort. Consider it: an animal is moved from the wild to captivity, anaesthetized for exams, transported thousands of miles, held in pens with "strangers," and then released in a foreign environment. It's not a big surprise that reintroduced animals don't exhibit typical biological patterns. Biologists have proposed several explanations for what might cause this "reintroduction effect," but very few studies have actually investigated these theories. Part of the difficulty with answering the question "Why does this occur?" is that many reintroduction programs fail to monitor the animals after they are released.

The Colorado Division of Wildlife has implemented an impressive post-release monitoring program under the direction of biologist Tanya Shenk. All of the released lynx are fitted with radio-collars so biologists can monitor them. Nearly every week for the last 7 years, a pilot has flown over the study area to find each lynx and make sure the collar was not emitting a mortality signal. In the winter months, biologists (such as Jen) track the lynx on foot to get more detailed information about lynx behavior. They follow an individual's tracks through the snow, recording information about the habitat

the lynx moves through, where it rests, what it kills, which other lynx it crosses paths with, etc. And they also collect any lynx feces that they find.

## THE POWER OF POOP

Biologists initially collected the fecal samples for diet analysis. However, there was much more information stored inside these packets. There are thousands of hormones that circulate through an animal's body in the course of a day, helping to ensure that the body continues to function normally. Steroids are one class of hormones that play a critical role in physiological processes (just ask athletes how powerful these hormones can be!). This class includes several hormones that are important for reproduction (testosterone, estrogen, and progesterone) and also hormones that help the body respond to stress (glucocorticoids). While the body "recycles" most hormones, it disposes of steroid hormones in urine and feces. Fecal hormone monitoring is rapidly becoming a popular tool for monitoring an animal's reproductive status or stress level. This unique approach to post-release monitoring could provide a new perspective on how the reintroduction process impacts lynx.

Together with Dr. Nadja Wielebnowski (a behavioral endocrinologist at Chicago's Brookfield Zoo) and Dr. Tanya Shenk (the head researcher for the lynx reintroduction), I developed a project that would help us understand what caused poor reproduction and survival during the early stages of the reintroduction. By combining the behavioral and ecological data collected by field biologists with the hormonal information that I could obtain from the fecal samples, we could begin to answer a lot of questions about the "reintroduction effect." Does the reintroduction process trigger a chronic stress response in released lynx? If so, does this stress response suppress reproductive hormones and inhibit mating? Or, are stress levels normal but lynx need time to adjust to their new surroundings? Or, are the lynx ready and willing – physiologically speaking – to breed, but they can't find a mate because the population is too small and dispersed? Or some combination of these factors? If we could figure out what caused poor survival and reproduction, then maybe we could do something about it.

Unfortunately, the power of lynx poop lies not only in the information it contains, but also in its smell. Astrid Bellem, the lab manager at Brookfield Zoo, has declared that lynx poop is one of the most potent varieties of poop out there. And she has worked with samples from more than 35 different species!

## THE CATCH

There was one problem with using fecal hormone analysis to monitor the physiology of reintroduced lynx. No one had ever studied lynx endocrinology (hormone expression), using either blood or feces. Without knowing what "normal" patterns of hormone expression are for Canada lynx, it would be very difficult to tell if the reintroduced lynx were *not* "normal." In order to overcome this problem, I

set out to find people that owned lynx and wouldn't mind collecting poop for me (like Lynn!). By collecting fecal samples from lynx that are successful breeders, unsuccessful breeders, singly-housed, juveniles, and moved between institutions, we are beginning to put together a much more complete picture of lynx endocrinology.

Several FCF members have played a critical role in the life of this project. Tracy Wilson was one of the pioneering poop collectors. Even with several trips to Playa de Oro, intense downpours that washed the samples away, a sprained wrist, and two comical males that preferred to play with their food rather than eat the dye that was in it, she still collected a load of samples. These samples provide several key pieces that will help us complete the puzzle of lynx physiology.

#### WHERE IS THE PROJECT HEADED NOW?

Things are looking much more positive for the reintroduced lynx. Although it took 5 years, they have started to reproduce. Biologists found 16 kittens in 2003, 39 kittens in 2004, and 46 kittens in 2005! This is exciting, because it allows us to compare patterns of behavior and hormone expression before and after the lynx started breeding successfully.

Fecal samples from captive lynx are still being collected and analyzed. Once we establish a basic understanding of hormone expression in lynx, we will be able to start asking more refined questions about lynx physiology.

Throughout this project, I have been astonished at how willing people are to help some stranger asking for poop! As an animal lover, I will admit that it is hard to only be able to see the feces and not the actual lynx. Therefore, I am incredibly grateful to all of my collaborators who have sent me pictures and stories of their lynx. Then it is not just a piece of poop that I am working with; it is *Kenobi's* poop. A fellow grad student has a poster asking "Have you hugged your organism today?" Sadly, my answer is almost always no, but I know that many lynx lovers around the country are hugging their lynx for me!

*If you have questions or comments about this article, please contact Kerry at [kerrypettersen@yahoo.com](mailto:kerrypettersen@yahoo.com).*

