With only the pawprints, researchers study elusive bobcat

January 9 2024, by Eric Hamilton

Credit: Unsplash/CC0 Public Domain

One Sunday morning in February of 2021, Dave Duffy's kids told him they had just seen a bobcat through the window of their home near the University of Florida's Whitney Laboratory for Marine Bioscience

outside St. Augustine, Florida. They knew their dad would want to know because they had helped him countless times take samples of animal tracks in hopes of studying the creatures that left them.

Initially skeptical—bobcats are rarely spotted during the day out in the open—Duffy eventually went to check, and there they were: six clear bobcat prints in the sandy soil. With his kids' help, he scooped up small soil samples from the footprints and tucked them away for later.

In their latest research, Duffy and his team showed that they could readily recover bobcat DNA from the serendipitous tracks. In collaboration with the Jacksonville Zoo and Gardens, they also showed that DNA recovered from bobcat pawprints can be used to determine the animals' ancestral background and even identify their unique microbial community. All from the errant DNA left behind long after the animal has left the area.

This kind of information can help scientists conserve rare or endangered species, even those, like bobcats, that are usually difficult to track.

"Bobcats, like many other species, are experiencing changes in their ranges, mostly due to humans," said Duffy, a professor at the Whitney Lab who noted that the lab itself has encroached on the native bobcats' range just as all development in the area has. "Being able to track where they are, what habitats they're using, and what areas they're in can help inform better management."

Duffy and the team of researchers from UF reported their findings in November in the journal *Biological Conservation*. It's just the latest from a team that has refined methods for studying environmental DNA, or eDNA, the genetic detritus left behind by all living things as they move through the world. Sequencing this eDNA can help protect wildlife like sea turtles or even study human populations from entire towns using

their wastewater.

Because the researchers could sequence all the DNA in the sample, they also recovered information about the microbial community associated with the bobcat. Since these microbes can directly influence an animal's health, understanding the community can give conservationists even more knowledge about the wildlife populations they study.

"As species become endangered or respond to climate change, their range can shift, and the distribution of pathogens is moving as well. If you can recover information about what microbes are associated with your species of interest, you can assess whether they are microbes with positive benefits or detrimental pathogens," Duffy said. "You might be able to tell if a wild population is healthy or not without ever seeing or interacting with individual animals."

The depth of the research was only possible thanks to a collaboration with the Jacksonville Zoo and Gardens. Zookeepers provided access to their bobcat's enclosure, which allowed Duffy's team to calibrate and confirm their techniques for the wild bobcat prints. They also showed that Abby, the zoo's bobcat, which had been confiscated as an illegal pet, likely came from a southern U.S. population, as her DNA resembled that of Texas-area bobcats.

"While you can do some interesting analysis with one set of wild samples, you need more than that to rigorously test these things. If it weren't for our collaborators at the Jacksonville Zoo, we would've had only one set of samples to trial these techniques on," Duffy said.

The researchers also demonstrated that they could distinguish between samples from bobcats and the closely related Canada lynx. Because bobcats and the lynx have overlapping ranges in the northern U.S., having methods that can tell one species from another could help

scientists analyze the species separately, which might be impossible relying on tracks alone.

In another recent study, published in *Science of The Total Environment*, the bobcat print samples helped the scientists show that eDNA persists for different durations in the environment depending on where in the cell it came from. These findings will help scientists more carefully interpret eDNA results in the future.

"Because these eDNA techniques are non-invasive, you don't have to intrude upon the species you are studying," Duffy said. "That makes them really beneficial to scientists studying endangered species and to the species themselves."

More information: Samantha A. Koda et al, A novel eDNA approach for rare species monitoring: Application of long-read shotgun sequencing to Lynx rufus soil pawprints, *Biological Conservation* (2023). DOI: 10.1016/j.biocon.2023.110315

Mark McCauley et al, Multicellular species environmental DNA (eDNA) research constrained by overfocus on mitochondrial DNA, *Science of The Total Environment* (2023). DOI: 10.1016/j.scitotenv.2023.169550

Provided by University of Florida