

Michigan coyotes: What's for dinner depends on what the neighbors are having

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Nighttime photo of a coyote at the Shiawassee National Wildlife Refuge near Saginaw. Credit: U-M Applied Wildlife Ecology Lab

Michigan coyotes in most of the Lower Peninsula are the 'top dogs' in the local food chain and can dine on a wide variety of small animals, including rabbits and rodents, along with berries and other plant foods, insects, human garbage and even outdoor pet food.

But in the Upper Peninsula, coyotes coexist with gray wolves and play a subordinate role in the food web. As a result, the diets of U.P. coyotes contain less meat than Lower Peninsula coyotes.

That's one of the findings of a University of Michigan study of the diets and gut microbiomes of three Michigan coyote populations, published in the *Journal of Animal Ecology*.

The food-web study involved the [genetic analysis](#) of more than 350 carnivore scat samples—58 of which were confirmed as coyote scat—collected at three Michigan locations, one in the Upper Peninsula and two in the Lower Peninsula: the Huron Mountain Club in the U.P.; the University of Michigan Biological Station, at the northern tip of the Lower Peninsula near Pellston; and the Shiawassee National Wildlife Refuge near Saginaw.

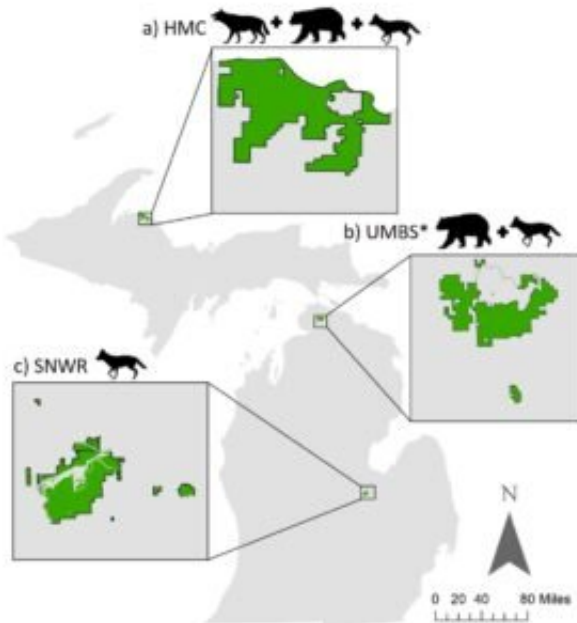
The study also used photos from hundreds of motion-triggered wildlife cameras at the three sites to document local mammal populations, which include various coyote prey species. The camera network was established over the last several years by U-M wildlife ecologist Nyeema Harris, director of the Applied Wildlife Ecology Laboratory in the Department of Ecology and Evolutionary Biology and senior author of the new study.

In the scat analysis, Harris and her graduate students used the ratios of stable carbon and nitrogen isotopes to examine variations in coyote diet at the three sites and to determine the animal's position in the local food web. They also sequenced RNA from the scat to investigate interactions

between diet and gut microbiomes.

Higher levels of the heavy nitrogen isotope N-15 in coyote scat indicates a higher position in the local food chain and generally corresponds to a diet richer in meat. In the U-M study, N-15 levels were highest at the southernmost site, the Shiawassee National Wildlife Refuge near Saginaw, where coyotes are the top predators. As so-called apex predators, they have their pick of what's for dinner, as well as where and when they roam the landscape.

N-15 levels and dietary breadth were both lowest at the Huron Mountain Club in the Upper Peninsula, where coyotes live alongside gray wolves. There, coyotes most likely play a subordinate role in the local food web and have a more limited diet.



Map shows the three locations included in the U-M scat-analysis study, the Huron Mountain Club (HMC) in the Upper Peninsula and two Lower Peninsula sites: the University of Michigan Biological Station (UMBS) near Pellston and the Shiawassee National Wildlife Refuge (SNWR) near Saginaw. Animal icons

indicate the presence of gray wolves, black bears and coyotes at HMC; black bears and coyotes at UMBS; and coyotes at SNWR. Credit: U-M Applied Wildlife Ecology Lab, from Colborn et al. in the *Journal of Animal Ecology* (2020).

"The co-occurrence of gray wolves and coyotes at the Huron Mountain Club may cause the suppression of subordinate coyotes, forcing individuals to alter their consumption patterns and switch to alternate food sources," said Harris, an assistant professor in the U-M Department of Ecology and Evolutionary Biology.

The study's findings are in accord with a phenomenon called mesopredator release, which occurs when populations of medium-sized predators are freed from top-down competition after the removal of traditional apex carnivores.

For thousands of years, North American coyotes were outcompeted by gray wolves and other apex predators. But the vast majority of gray wolves in the contiguous United States were exterminated by the mid-20th century, allowing coyotes to assume the mantle of top predator in many places.

Gray wolf populations have rebounded in recent years in parts of the West and the Upper Midwest, including Michigan's Upper Peninsula, where the gray wolf population has grown to more than 600.

But at Lower Peninsula locations such as the Shiawassee National Wildlife Refuge, coyotes remain the top predator, with no observed pressure from gray wolves. These peninsular differences are reflected in the nitrogen-isotope ratios observed in the U-M scat study, said Shawn Colborn, the first author of the *Journal of Animal Ecology* paper.

"As coyotes shifted from being a mid-level predator to being an apex predator at places like Shiawassee, they found themselves at the top of the food chain with no pressure from wolves," said Colborn, who conducted the scat analysis for his master's thesis in the U-M Department of Ecology and Evolutionary Biology, along with former EEB master's student Corbin Kuntze.

"So, they could change what they ate, where they roamed across the land, and when they were active. Those changes are reflected in their increased nitrogen level. Alternatively, N-15 values are lower in coyotes at the Huron Mountain Club in the Upper Peninsula, where they are most likely experiencing top-down pressure from [gray wolves](#)."

The researchers also found that coyotes at the three locations harbored distinct gut microbial communities. About 500 types of bacteria were identified from the [coyote](#) scat samples collected at the three Michigan sites. As expected, the diversity of gut microbes was lowest at the northernmost site, the Huron Mountain Club.

More information: A. Shawn Colborn et al, Spatial variation in diet–microbe associations across populations of a generalist North American carnivore, *Journal of Animal Ecology* (2020). [DOI: 10.1111/1365-2656.13266](#)

Provided by University of Michigan

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