

Chemical fingerprinting tracks the travels of little brown bats

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Little brown bats are aptly named.

They're tiny creatures with glossy, chocolate-brown hair, out-sized ears and wings. They gobble mosquitoes and other insect pests during the summer and hibernate in caves and mines when the weather turns cold. They are little brown bats, and a deadly disease called white-nose syndrome is threatening their very existence.

A [novel technique](#) using stable hydrogen isotopes—a kind of chemical fingerprint found in tissues such as hair—has enabled researchers at Michigan Technological University to determine where hibernating bats originated. Knowing that could help predict and ultimately manage the spread of white-nose syndrome.

In the July issue of the journal *Ecological Applications*, Joseph Bump, an assistant professor at Michigan Tech's School of Forest Resources and Environmental Science, and a former undergraduate student in his lab,

Alexis Sullivan, report on their use of stable hydrogen isotopes to identify the likely origins of the little brown bats that hibernate in three mines of Michigan's western Upper Peninsula.

Sullivan, who is first author on the paper, is now working on dual Master of Science degrees in Forest Molecular Genetics and Biotechnology at Michigan Tech and the Swedish University of Agricultural Science. She will receive degrees from both universities as part of the ATLANTIS Program, a transatlantic educational project jointly funded by the US Department of Education and the European Union.

Sullivan, Bump and colleagues Rolf Peterson and Laura Kruger studied the little brown bats that winter in the Quincy Mine in Hancock, Mich., the Caledonia Mine near Ontonagon, Mich., and the Norway Mine in Norway, Mich. They collected bat hair and tested it to identify the hydrogen fingerprint of the water where the bat grew the hair. Ecologists have developed maps of the distinctive hydrogen fingerprints of water from different locations, so the chemical fingerprints from the bat hair can be matched to the flying mammals' probable origins.

Up to now, stable hydrogen isotopes have been used mostly to track migratory birds.

"Relatively little is known about bat-to-bat interactions or how far bats travel between seasonal habitats," Sullivan explains. Earlier attempts to use hydrogen isotopes with bats stalled because most hibernating bats don't make dramatic seasonal migrations, and they have unclear molt patterns, making it difficult to connect their hair to a given habitat, she adds.

In their latest study, Sullivan, Bump and colleagues were able to estimate with 95 percent certainty the summer origins of the tens of thousands of bats that hibernate in the Quincy Mine, the 23,000 bats in the Norway

Mine and the estimated quarter of a million bats that call the Caledonia Mine their winter home. Using the hydrogen "fingerprints" from hair samples, they located the geographic areas from which the bats migrate—some as far as 565 kilometers (351 miles) from their hibernation mine.

"This novel application of stable [hydrogen isotopes](#) can help predict which hibernation sites are likely to exchange bats," says Bump. Bat-to-bat contact is believed to be the way white-nose syndrome is spread, so understanding the bats' movements can help us know which hibernation sites are connected and how disease could potentially be transmitted among locations."

Although white-nose syndrome has not been seen among bats in the Upper Peninsula of Michigan yet, it is decimating bat populations in the northeastern US.

And why should anyone care what happens to these reclusive winged creatures that weigh less than half an ounce and average 3.4 inches long?

"First, they are amazing mammals. Second, we should care about little [brown bats](#) because they eat millions of things for which we care much less, like mosquitos," says Bump.

More information: The preprint of the journal article is accessible at www.esajournals.org/doi/abs/10.1890/11-1438.1

Provided by Michigan Technological University

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