A Northern Michigan Bat Doctor Fights for the Hibernacula's Future

By **SUZANNE VAN DAM** *on October 2, 2012*
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Photo by Dr. Allen Kurta, Eastern Michigan University

Northern Michigan: The Great Lakes have buffered Michigan's bats against a disastrous disease that's decimated populations up and down the East Coast. Writer Suzanne Van Dam ventures underground with Dr. Allen Kurta and his bat squad to learn what the future holds for our mysterious and misunderstood friends of the night.

Shivering, I ease myself onto a rock deep inside an abandoned iron mine in Vulcan, Michigan. The mine is a damp 45 degrees, as it has been all day, indeed all year, here underground. Water droplets seep through fissures in the earth, breaking the silence as they plop onto a puddle. My headlamp creates a halo of light that reveals a little brown bat above me. He's tucked himself into a nook of the ceiling where a man's chisel once searched for metal. Dangling there precariously from what looks like an impossibly slim toehold, his soft, furry body looks vulnerable against the backdrop—jagged stones below him and nothing but dark passages ahead.

I'm tagging along with the Michigan "bat squad," which consists of a university biologist, a DNR officer, and a local caver who knows these subterranean tunnels nearly as well as the bats who make this mine their winter home. As the men's footsteps approach and their voices grow louder, the bat's tiny body starts to quiver, like the swaying of a chrysalis before it cracks open. He peels one eyelid back and peeks at me, his body too sluggish from winter torpor to fly away. I give him a silent nod and move on to join my group.

After finishing the tour of the iron mine in Vulcan, we drive the back roads of Michigan's western Upper Peninsula searching for copper mines and more hibernacula, as the hideouts

where bats spend winter are called. As we enter the mines and trudge along these subterranean passages, my light flickers first on one bat, and then another, until I've passed dozens, hundreds, possibly thousands of bats over the course of the day. Sometimes they perch alone, sometimes they nestle against a neighbor for warmth and companionship, their bodies hanging from the ceiling like little upside-down question marks.

And there are a lot of question marks. Their survival as a species, for starters. A devastating disease called White Nose Syndrome (WNS) has swept across much of North America, killing an estimated 6.7 million bats since it first appeared in a tourist cave in New York in 2006. Scientists are calling the illness the most significant wildlife calamity ever in North America, worse than the extinction of passenger pigeons or the decline in American bison, as the disease wreaks havoc not just on one species, but on an entire ecological niche: predators of night-flying insects. In less than six years, the disease has spread as far north as Quebec and as far south as Alabama, but it hasn't reached Michigan—yet.

Or has it? That is what Dr. Allen Kurta, a wildlife biologist from Eastern Michigan University, is trying to find out. Week after week, mine after mine, professor Kurta and caver Steve Smith have scrambled down ladders, shimmied up ropes, trudged through icy water in hip waders and otherwise surveyed every possible bat hibernaculum in Michigan. Some sites, such as Tippy Dam, 40 miles south of Traverse City, provide a home for 20,000 bats; others have fewer than a hundred. Nevertheless, the bat team catalogs them all. These men, along with a team of scientists and volunteers, have monitored air temperatures and humidity, physically examined bats, banded them for later tracking, and glued tiny temperature-sensitive data loggers onto their backs. With White Nose Syndrome waiting in the wings, they are collecting every bit of information they can about bats "before they are all gone," as Kurta says.

In one of the passageways, Kurta plucks a Northern Long-Eared bat off the ceiling with the gentle and practiced familiarity of a farmer picking an apple off a tree. With one deft movement, he cradles the animal's back in his palm, holding its head firmly but gently between his thumb and forefinger, taking care to avoid its mouth. "The little browns won't do any damage, but you got to watch these guys. Their teeth need to be sharp and their jaws are more powerful because they need to chew through the shells of beetles and other insects with hard exoskeletons," Kurta says.

As if on cue, the bat bares its teeth at us in a vain attempt to ward off the man-sized monster that is holding him. His expression, accompanied by a little hiss, might look intimidating except that this four-inch ball of helpless fur is smaller than Kurta's palm. "Bad PR, little guy," Kurta chuckles. "That's not the face you want to give to the camera." He's joking, but makes sure I know he's serious that the bat is the underdog here, the one acting in self-defense. Kurta is protective of his bats, as he thinks of them, and doesn't want to reinforce people's negative stereotypes of bats as monsters of lore. I put my camera down.

In his hard hat, Tyvek suit and blue latex gloves, Kurta looks like a cross between a miner and a surgeon, but when he asks me to distinguish between two bat species by the shape of their

ears, I realize he's the quintessential professor, quizzing me, making sure I'm getting it right. He points out the healthy brown face and the blackish ears no bigger than my pinky fingernail, explaining that White Nose syndrome is caused by a cold-loving fungus called Geomyces destructans that grows on the live skin of bats while they hibernate. If our bat had been infected, he would likely be sporting a white muzzle or a white powdery growth on his ears and tail membrane.

Kurta tips the bat over, spreading its wings out and scanning them with a black light, searching for the telltale pinholes associated with the disease. If positive, the tiny tears in the wing will light up "like the Milky Way," says Smith, and I wince at the caver's glum irony.

The fungus does not strike outright, but instead kills the bats in a particularly cruel way—indirectly, as an irritant that rouses them frequently from their normal state of torpor. When bats awaken, their heartbeat and metabolism surges, and they raise their body temperature 40 to 50 degrees in a matter of minutes. Though all mammals that hibernate stir periodically (some researchers believe that the arousal helps preserve brain functions, such as memory), bats can rarely survive repeated, prolonged arousals because they greatly deplete the fat upon which the bats depend for energy during hibernation.

Furthermore, new research by DeeAnn Reeder from Bucknell University suggests that the fungus strikes when the animals are particularly vulnerable—when their immune system, (normally dormant during hibernation), has little capacity to respond. The bat is caught in a terrible Catch-22: the immune system may work better at a higher temperature, but the effort required to reach that temperature depletes its needed energy stores.

Many infected bats exhibit strange behavior, such as flying around outside during winter, even during the daytime, for they are literally starving and in search of insects to eat—insects that in our northern climes won't hatch for weeks or months. "It's heart wrenching," says Al Hicks, a biologist from New York who was at "ground zero" of the epidemic and is currently working with Kurta on bat banding surveys in Michigan. "Hearing them squeaking on the walls, flying around outside in the sun to almost certain death, we asked ourselves what we could've done differently, but there was nothing."

With bat populations crippled in the Eastern United States, researchers are looking closely at Michigan, collecting healthy bats here in the hope that they will offer some pieces to solving the White Nose puzzle. Why so much effort here? Because Michigan may be crucial to the bats' survival. The state offers everything bats need: a robust insect population for food, vast forest cover for summer roosting, and miles of underground mine networks for winter hibernation. As Hicks explains, "There's hostile habitat out West pushing from one side and the disease pushing from the other, so Michigan is it. It's their last stand."

The U.P. is especially critical because there are very few suitable hibernacula downstate. Most of the naturally occurring caves are too shallow and therefore too cold to protect the

bats, which require temperatures just above freezing during hibernation. Also, though some bats in the Lower Peninsula will minimize their energy loss by overwintering inside the spillway at Tippy Dam (instead of migrating farther distances), it is not ideal habitat—too cold in winter and too warm in the autumn—so scientists speculate that some of the underground hibernators that summer in Lower Michigan may actually head north for the winter. According to Kurta's 2012 study, 91 percent of all hibernating bats in Michigan are found in only 79 mines, most of which are in the U.P.—which is why Kurta and Smith continue to traipse through mines and collect data.

Just what are they looking for? Two types of information—evidence of White Nose (or, more hopefully, lack of it), and any information about bat behavior and their genetic make-up that might help scientists find a cure, or at least stave off, this coming plague.

And it is coming. With depressing regularity, Kurta sends me updates to the official White Nose map that charts the spread of the disease by year and by county from the epicenter, marked with a red bull's eye on Schoharie County, New York. I've heard that where White Nose has shown up, the mortality rates have been staggering—as high as 96 percent in many sites, but I just can't wrap my head around these statistics. When I ask if the survivors are somehow immune, the DNR biologist gives a sobering answer: "When we talk about a 96 percent die-off rate and a survivor's population of 4 percent, we have to ask if it's 4 percent because they're resistant, or just because they got lucky."

Kurta points to the ceiling of the mineshaft to help me understand the numbers. Above us, the remnant of a drill hole originally intended to hold sticks of dynamite now cradles at least 18 little brown bodies. "Bats are highly social animals. If you don't have your buddies to cuddle up with, there are going to be other impacts. We aren't even sure if the surviving population would be genetically viable."

And so I go back to the map, watching the mottled, dotted pink of "suspected" sites turn crimson as scientists complete their analysis of the winter counts and confirm the presence of White Nose in places that had previously been safe havens. Since 2006, the splotches of gray, violet, aqua, bright green and red have radiated outward from ground zero, moving logically to adjacent sites, but also to sites more than a thousand miles away. As Kurta explains, this seemingly random distribution shows two things: one, bats can transmit the disease to each other during hibernating, mating, or while swarming, and two, humans can carry the fungal spores on their clothing or boots, acting as the unwitting vector of the disease. Kurta also quickly points out that though humans can transport the fungus, and indeed probably did carry it from Europe where it originated, we can't be affected by it, for our bodies are much too warm for the cold-loving G. destructans.

In the first few years after the disease was discovered, die off rates were 50 percent the first year, and nearly another 50 percent of the remaining bats the second year. Before White Nose hit, Vermont and New York would log populations of approximately 200,000 bats; several years after the calamity, a mere 2,000. After six years of rapid and continuing decline,

however, surveys conducted during the winter of 2012 showed a small increase in population at some sites. Good news? Kurta and Hicks both caution that it is too soon to tell. The survivors may be resistant or somehow resilient to the fungus, but the increase could be due to bats migrating from other sites. In layman's terms, some bat hibernacula offer better bedrooms than others. If the best underground sites are suddenly vacant, it's possible that other bats will move in—like a younger sister taking an older sister's room after she goes off to college.

Human researchers may count a mine as all one place, one hibernaculum, but the bats might not see it that way. "There are still so many basic facts about bats that we just don't know," Hicks explains. "When you study something like deer, you've got grad students who can predict whether the deer is going to turn its head to the left or to the right. But bats? They are still a frontier, and we're losing that frontier."

Back in the iron mine, Kurta and Smith lead me down a long tunnel that opens into an enormous chamber. I gasp, awed not only by what looks like a stone cathedral in front of me, but also by the sheer magnitude of their challenge. On the other side of a low wooden fence is an intimidating plunge where the rock has collapsed or been mined to dizzying depths. Above us, a crack in the earth allows sunlight to filter though, illuminating the vaulted ceiling some 50 or 60 feet high. When my eyes adjust, Kurta points out little black patches dotting the rock: bats. On the walls across the divide, more bats. And in the honeycomb of passages and shafts and adits that we can't readily see, the possibility of yet more bats. I understand now what they are up against in their effort to study these small, secretive creatures that take refuge in vast, cavernous places.

But the effort is worth it, they reassure me, for their data will help state agencies decide which habitats to prioritize for conservation and for choosing which mine entrances to gate. Since Kurta and Smith began their surveys some 15 years ago, Michigan has erected 25 bat-friendly gates that allow the tiny animals to come and go as they please while keeping curious people out—both for human safety and for the bats, who cannot survive frequent awakenings, whether they are caused by cavers tromping through their winter bedrooms or a debilitating fungus.

The scientists and volunteers who are allowed to enter these sensitive sites in Michigan are guided by people like Steve Smith who is trained in DECON—that's field jargon for the decontamination procedures designed to prevent humans from spreading the fungus to new sites. Though people can't be affected by Geomyces destructans, humans can carry the spores on clothing and gear, and could introduce the lethal disease to a healthy colony of bats. Smith shows visitors, including me, how to protect the bats by tucking our clothing under Tyvek suits, sterilizing our boots with a bleach solution, and even wiping off the pages of my notebook with Lysol.

Smith's other key role is to serve as a "walking compass," as Kurta says, able to navigate the serpentine mine tunnels. "We've harnessed Steve for conservation work," explains the DNR

officer, Bill Scullon. “Local knowledge, local connections, both are critical to finding our way underground.”

Though some bat research is funded by small grants from the DNR, a significant portion of data is collected by volunteers. As Paul White, a biologist from Wisconsin here on the U.P. bat banding survey explains, “When we tell our citizen scientists that the bats they’re counting, the information they’re collecting, is something no one has tabulated before, they feel empowered.”

That’s a good thing, say researchers, because both bats and humans need more people to take up the bat cause. The nine species of bats in Michigan are all insectivores, consuming tons of moths, beetles, flies, and other insects each year, including those harmful to farmers and foresters. According to a 2011 Science article by Justin G. Boyles and colleagues, “the loss of bats in North America could lead to agricultural losses estimated at more than $3.7 billion/year.” The authors add, “Urgent efforts are needed to educate the public and policymakers about the ecological and economic importance of insectivorous bats and to provide practical conservation solutions.” To that end, Professor Kurta walks down one mine passage after another each winter and casts one mist net after another in the summer, hoping his bats will hold out against White Nose another year.

Outside the mine, as we wriggle out of Tyvek coveralls and peel off plastic gloves, I realize that these remarkable animals may go extinct during our lifetime because of our unnatural relationship with the natural world, our ability to cross oceans in hours, bringing with us a tidal wave of consequences. I hope, along with Kurta, that the stories we tell will help others appreciate these tiny creatures now, while they are still with us. I don’t know what caring does scientifically, if empathy has any ecological value, but it’s a place to start on our long, rocky passage to bringing these vulnerable animals back from the brink.

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