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Mysterious Bat Die-off Triggers Alarm Robert Locke

Hibernating bats are dying by the tens of thousands in the northeastern United States, and a growing circle of top scientists is anxiously trying to figure out why. The mystery affliction, reported in New York, Vermont and Massachusetts, is dubbed “white-nose syndrome” because many affected bats have visible halos of white fungus around their faces.

Researchers increasingly suspect the fungus is not a primary cause of the die-offs, but a symptom of a larger, unidentified problem. The syndrome clearly is a major and imminent threat to North American bats, and until the cause is identified, we can do little to counter it.

So far, scientists are focusing on three hypotheses “alone or in some combination” to explain the cause:

- an as-yet-undetected pathogen, such as a virus, bacterium or fungus;
- climate change that is affecting either food supply or the ability to hibernate;
- toxicants, such as pesticides that either impair bats’ ability to hibernate or deprive them of food needed to build sufficient fat reserves to last for an entire winter of hibernation.

White-nose syndrome (WNS) was first reported during the winter of 2006-07 in a few hibernation caves near Albany, New York, where more than 8,000 bats died, reports the U.S. Fish & Wildlife Service, which is helping to coordinate the broad-based research effort. This past winter, it was reported in at least 18 caves and mines in the three affected states.

The syndrome is hitting little brown myotis (*Myotis lucifugus*) hardest, but deaths are also reported among other species, including endangered Indiana myotis (*M. sodalis*), northern myotis (*M. septentrionalis*), eastern small-footed myotis (*M. leibii*) and eastern pipistrelles (*Perimyotis subflavus*). The ubiquitous big brown bat (*Eptesicus fuscus*) appears so far to be unaffected.

The most consistent finding from initial studies of recovered dead bats is that they are emaciated: their bodies contain little or none of the stored fat that bats must have to survive months of winter hibernation.

On-site reports note that where WNS is present, bats sometimes cluster near cave or mine entrances or other areas where hibernating bats are not normally found. Many affected bats have also been seen flying outside their hibernacula during winter, and members of the public are reporting unusually high numbers of dead or dying bats outside hibernation caves and mines.

Leading pathologists from several major laboratories have examined living and dead bats from affected sites and have failed so far to find any consistent pathogens likely to have



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caused these deaths. Many now seem somewhat skeptical that the bat die-offs are caused by a disease.

Some researchers say the evidence of emaciation and the unprecedented numbers that are emerging early from hibernation, apparently in a desperate search for food, could be suggestive of chemical interference with hibernation metabolism or of an insufficient availability of food for the bats to store enough fat to last until spring. Extensive spraying of some pesticides might be capable of altering metabolism. Or such spraying could severely diminish the size of insect populations that bats require before entering hibernation. Northeastern states have experienced a major increase in pesticide use to combat West Nile Virus during the past few years.

Wildlife biologist Al Hicks of New York's State Department of Environmental Conservation is leading efforts to uncover the cause of WNS. He notes that the syndrome appears to have begun in just a small cluster of hibernation caves in New York a year ago, but has since spread across a rapidly expanding zone. This geographic spread might support the pathogen (disease) hypothesis. However, a wildlife rehabilitator in the region reports that the application of warmth and food allowed at least one WNS bat to recover "which might argue against it.

New York State Wildlife Pathologist Ward Stone says the bat die-offs could well be the end result of a combination of factors, and all possibilities must be examined. But he has also noted that temperatures were unusually warm and erratic during the past two winters, which could arouse bats from hibernation much too soon, causing them to burn fat that's needed to meet hibernation needs. Hungry bats could be flying out of the hibernation site looking for food that simply is not available in midwinter; if so, when their energy stores are expended, they would die. So far, Hicks says, he has not noticed higher internal temperatures in hibernation caves, but the hypothesis will receive careful scrutiny.

Several biologists have noted similarities between the bat die-offs and the "colony collapse disorder" that has devastated honeybee colonies in the United States and elsewhere over the past few years.

Carole Copeyon, an endangered species supervisor at the U.S. Fish and Wildlife Service's Pennsylvania Field Office, noted in an interagency email that, although most of the missing bees are never located, dead bees found at the hives are typically in poor body condition. She said various bacteria and viruses have been found, but none is clearly identified as a causative agent. Fungus was reported on some dead bees, which was interpreted as evidence of stress or a compromised immune system.

She said the most striking thing reported by beekeepers is that the bees seem to have been affected neurologically, since they exhibit abnormal behavior. Bees leave their hives during the winter (when they should stay home), then do not return. She also cites a report of bees "clinging to the outside of hives [during freezing weather] in February." That, Copeyon suggests, sounds very similar to the behavior reported for stressed bats leaving their hibernation caves in winter in the Northeast. Among hypotheses that attempt to explain the bee die-offs is a relatively new class of neurotoxic pesticides known as neonicotinoids, which has been used intensively in the past few years.

"There may be no association with what we are seeing in bats," Copeyon wrote, "but some of the similarities" including the timing of the bee and bat colony collapses and the incidence of highly unusual, maladaptive behavior "raise questions."

Some suspected causes of white-nose syndrome likely will prove very difficult to confirm and, as noted, the deaths could very well be a culmination of several factors. This obviously is an exceedingly complex problem that could require a major investment of resources to unravel. And time is short. Most experts agree with Hicks that, whatever the cause, this is a crisis that requires immediate and focused attention.

Major contributors to this effort include USGS's National Wildlife Health Center, the New York State Department of Environmental Conservation, the New York State Department of Health, Boston University, Cornell University and Disney's Animal Kingdom.

Bat Conservation International has offered financial assistance to help underwrite a much-needed meeting where experts can share research findings, assess what we know about WNS and recommend the priorities and budgets needed to ensure rapid, cost-effective progress.

This is a critical first step. Without rapid success, many of America's largest remaining bat populations and the ecosystems they protect may be at extreme risk. When ecologically and economically essential creatures as diverse as bees and bats begin to die off in large numbers, there may well be a "canary-in-the-coal-mine" message that we cannot afford to ignore.

ROBERT LOCKE is Director of Publications at Bat Conservation International.

Help Bat Conservation International support scientists from many agencies and organizations who are working to identify and deal with the cause of this major threat to North American bats. To contribute to BCI's Fund for White-nose Syndrome Research, please contact development@batcon.org or visit us online at www.batcon.org/whitenose.

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