

ANIMALS

# How a deadly fungus could decimate North America's salamanders

An insidious disease has eliminated dozens of the world's frog species. Scientists fear a similar plague could be coming for North America's salamanders.



A northern spring salamander lounges on a tree's branch in Ohio. Amphibians like these are at risk of succumbing to invasive fungi.

Story and photographs by Ryan Wagner  
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When Sal Cincotta stumbled upon a little, warty salamander emerging from a Massachusetts pond, it struck them as out of place. The little creature was about six inches long with granular, pinkish skin and a wide head. "I've lived in Massachusetts my whole life, and I've never seen anything like it before," says Cincotta.

Puzzled, they posted the sighting on Reddit: *r/herpetology*. Even experienced amphibian hobbyists were stumped.

A few days later, Cincotta received an urgent call from Evan Grant, an amphibian disease biologist and researcher with the U.S. Geological Survey. Grant identified the salamander as an Iberian ribbed newt (*Pleurodeles waltl*), a species native to Spain and Portugal, and he needed to know where it had been found. Likely a released pet, Grant was worried the newt could be infected with the fungus *Batrachochytrium salamandrivorans*, the cause of a deadly amphibian disease scientists have long

...and many others, the cause of a deadly amphibian disease outbreak have long  
feared.

Bsal for short, the pathogen hasn't yet been detected in North America, but laboratory trials suggest many North American salamanders are highly vulnerable to the disease. If it arrives, the consequences could be catastrophic, says Grant.

## The salamander capital of the world

Bsal has been devastating European salamanders since it was first discovered in the Netherlands in 2013. Some fire salamander populations infected with Bsal there and in Germany have declined by over 90 percent. "It can emerge and cause mortality very quickly," says Grant.

Bsal is closely related to another infamous fungus called *Batrachochytrium dendrobatidis* or Bd, which has already driven hundreds of amphibian species—mainly frogs—towards extinction.



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"When salamanders began dying in Europe from a similar disease, we realized it wasn't Bd but something new," says Deanna Olson, an amphibian disease biologist and emeritus researcher with the U.S. Forest Service.

For most amphibians and reptiles, the tropics are home to the largest number of species—not so for salamanders. The eastern U.S. is the epicenter of salamander biodiversity, home to over 100 different species. Other salamander hotspots include the Pacific Northwest and the central highlands of Mexico.



North American salamanders aren't just diverse; they are also superabundant. Red-backed salamanders in Virginia forests can reach densities of four individuals per square meter. "Their biomass is higher than that of white-tailed deer, mice, coyotes, or red-tailed hawks," says Grant.

Salamanders also play an outsized role in ecosystems. They transfer energy through the food web as both predators and prey, and by consuming invertebrates that break down leaf litter and release carbon dioxide, they even help sequester carbon. One California salamander species prevents **an estimated 72 metric tons of carbon** from entering the atmosphere each year.

To prepare for Bsal's potential arrival in North America, Grant and his fellow amphibian biologists formed the Bsal Taskforce, an international collaboration of

scientists dedicated to studying the disease. “Unlike Bd, this time we know it’s coming,” says Grant. “We have the opportunity to prepare.”



The two dead frogs seen here are Cascade frogs found in northern California. Scientists suspect they died from an infection caused by the chytrid fungus. The blue dots around their bodies are the eggs they produced from mating.

## A disease-free pet trade

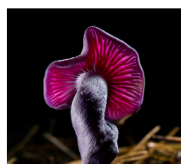
One likely pathway for Bsal’s introduction to North America is the pet trade.

In 2016, the U.S. federal government banned the import of 201 salamander species susceptible to Bsal. Another 164 species were added to the ban in early 2025. That ban includes the Iberian ribbed newt, the same species *Cincotta* found in Massachusetts. While these proactive measures by the U.S. government may delay Bsal’s arrival in North America, “It’s not a question of if Bsal arrives, but when,” says Olson.

Despite the salamander restrictions, the U.S. still imports around four million amphibians every year as pets or—in the case of bullfrogs—to be sold in food markets. Many of these imported amphibians come from the wild and could be infected with diseases like Bsal. “There’s no required disease monitoring for amphibians,” says Susanna Masecar, a veterinarian and doctoral candidate at Washington State University.

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She studies how Bsal affects amphibians commonly kept as pets. Small, plastic enclosures line the walls of her laboratory, each containing an Iberian-ribbed newt.

“We take biosecurity very seriously,” says Masecar as she washes her gloved hands with ethanol, trades shoes for sterile booties, and slips into a hazmat suit. “We look like we’re in *Breaking Bad*.”

Unlike Cincotta’s pink-colored salamander, which may have been leucistic (partial lack of pigment), these newts are mottled brown and gold. Masecar plucks one from its enclosure and gently swabs its feet, tail, and chin with a cotton swab. By measuring the amount of Bsal DNA present on its skin, Masecar can track how the disease progresses. An otherwise healthy salamander can succumb to Bsal in fewer than two weeks.

Next, she examines the salamander for characteristic black-ringed lesions, a telltale sign of Bsal infection. But even healthy-looking salamanders can pose a risk. Asymptomatic carriers can slip undetected into collections and further spread the pathogen. “Those are the ones we’re really worried about,” says Masecar.

To reduce that risk, Masecar is working with other disease researchers and amphibian breeders to create a pathogen-free certification program for salamanders bred within the U.S. Research suggests customers are willing to pay more for disease-free pets. “It’s not only good for amphibians, but it’s good for businesses,” she says.

## A rapid response

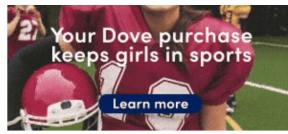
If Bsal does reach North America, detecting it quickly will be critical, says Grant. He monitors amphibians across the northeastern U.S. from Virginia to Maine.

“We have sampled 10,000 individual salamanders and haven’t detected Bsal in any of them,” he says. But biologists’ capacity to monitor diseases is limited. “If there is a disease outbreak, somebody from the public is probably going to be the first one to see it,” says Grant.

Thanks to a friend of a friend who saw Cincotta’s social media post, Grant was able to respond rapidly. “It was really kind of miraculous,” he says. Most of the time, released pets go undetected by researchers.

Grant urges the public to report observations of dead or sick amphibians to the Partners in Amphibian and Reptile Conservation (PARC). “They can disseminate the information to a network of amphibian biologists across the country who can intervene,” he says.





With Cincotta’s help, Grant found the Massachusetts pond, a popular fishing spot among locals, where the newt was photographed. While Grant was unable to relocate the Iberian ribbed newt, he found a large population of eastern newts (*Notophthalmus viridescens*), a native species highly susceptible to Bsal.

That population tested negative for Bsal, according to a study published last year in the journal *Herpetological Review*. “It’s very unlikely that Bsal was introduced,” he says with relief. Still, the false alarm was a chance for Grant to sharpen his response protocols for the next time the Bsal alarm is raised—false or otherwise.

“I’m so grateful to have been part of the scientific process, even as a non-scientist,” says Cincotta, who appeared as a study co-author.

Collaborations among the public, industry, resource managers, and scientists are critical, says Olson. “That’s what it’s going to take to address emerging threats and prevent the next biodiversity crisis.”

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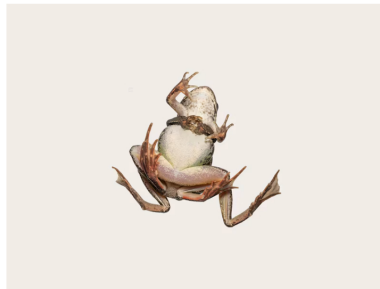
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