LOST TOADS OF THE CLOUD FOREST LIVE LESSON - PRE-READ ARTICLE

‘Extinct’ toad rediscovery offers hope amid amphibian apocalypse

From National Geographic

If the Mindo harlequin toad has developed resistance to chytrid disease, that may be a sign that the global epidemic is abating.

Melissa Costales stood in the dark, listening to the sounds of insects chittering in the cloud forests of northern Ecuador.

It was August 2019 and Costales, a conservation biologist at University of New Brunswick, had traveled with colleagues to a private reserve in search of rainfrogs—small, brown amphibians that look like fallen leaves. As the cool of the night set in, the team had already found nearly a dozen rainfrog specimens, a good haul by any standards. Then one of the scientists noticed a bright fleck of green on a low-hanging leaf, and everyone crouched down in awe.

“There it was,” says Costales, “the legendary *Atelopus mindoensis*!”

Before that night, *A. mindoensis*—commonly known as the Mindo harlequin toad—hadn’t been seen alive in 30 years. Most believed the species to be extinct, a victim of the fungal disease called chytrid. Over the past three decades, chytrid has ravaged amphibian populations worldwide. The disease disrupts the animals’ ability to absorb oxygen and water through their skin, and it has hit species within the *Atelopus* genus harder than most. (Read more about the debate over the “amphibian apocalypse.”)

But the rediscovery of the Mindo harlequin toad could mean there’s hope yet for this family of amphibians, experts say.

“The fact that it has reappeared after 30 years is possibly because they have become resistant to [chytrid],” says Costales, who recently published a study on the discovery in the journal *Herpetological Notes*.

Scientists have documented a handful of amphibians that have developed a resistance to chytrid. Among them: Sierra Nevada yellow-legged frogs, variable harlequin frogs, and common rocket frogs.

But as has been the case with coronavirus in humans, there hasn’t been enough testing to know the true scope of the recovery, says Jamie Voyles, a disease ecologist at the University of Nevada in Reno. “We know from lots of diseases, including the current pandemic, that infectious diseases and outbreaks tend to subside,” says Voyles, who wasn’t involved in the new discovery. “There’s an

outbreak stage, but then frequently, there's a drop-off in terms of the severity of disease within a population. And so we have experienced a similar thing with amphibians."

Outbreak survivors?

There are 25 species of *Atelopus* in Ecuador, and all of them are currently classified as either threatened, critically endangered, or presumed extinct. More than half of the species haven't been seen since the 1980s. The reappearance of the Mindo harlequin toad makes it the ninth species in the *Atelopus* genus to come back from the dead, so to speak, since 2003. (Read more about the starry night toad's rediscovery.)

Like many of its kin, the half-inch-long toad is striking. It's the color of a fresh lime with a few brown spots. Its eyes are jet black, with irises that look like they've been wrapped in gold foil.

After Costales and colleagues made the discovery last August, they saw toads five more times when they returned to the same reserve, whose name they're keeping confidential. Three of the sightings were of juvenile toads, which means the species is reproducing—a good sign, Costales says.

Though chytrid is know to be present in the vicinity, two of the toads that the team captured did not test positive for it. This could be because the toads never come into contact with the fungi—but it also might that these amphibians have evolved a way to fend off chytrid spores. "It's certainly possible that this is what would be called a relic population," says Voyles, "meaning that it had gone through a bottleneck of some sort, and what we're seeing are the survivors after the outbreak."

Hold your harlequins

"I think this is super-exciting," says Cori Richards-Zawacki, a herpetologist at the University of Pittsburgh and Voyles' collaborator. "Every *Atelopus* species that is 'rediscovered' highlights the importance of continued surveillance, and the opportunity we have to learn from these resilient creatures about the mechanisms of recovery after epidemics," she said by email. (Learn about "ground zero" of the amphibian apocalypse.)

The rediscovery of the Mindo harlequin toad could also serve as a reminder to exercise caution before declaring a species extinct, says Richards-Zawacki: "It's hard to get funding to survey for endangered species, but near impossible to get funding to survey for extinct species."

That's why Costales is working to make sure the Mindo harlequin toad doesn't slip through the cracks again. She and the Zoology Museum of the University

San Francisco de Quito have already begun to assemble a monitoring program for the species. In the future, Costales hopes to raise enough money to buy and protect some land near where the healthy *A. mindoensis* was found. “Although the newly found toads are not infected with the chytrid fungus,” she says, “their survival is not guaranteed.”