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Saving frogs, and revealing new extinction threats

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Author: Niall Byrne – Prime Minister's Prizes for Science

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Dr Lee Berger received the \$50,000 Frank Fenner Prize for Life Scientist of the Year for solving the mystery of frog extinction. Berger is based in Townsville and holds Adjunct Research Fellowships at James Cook University and the University of Melbourne.

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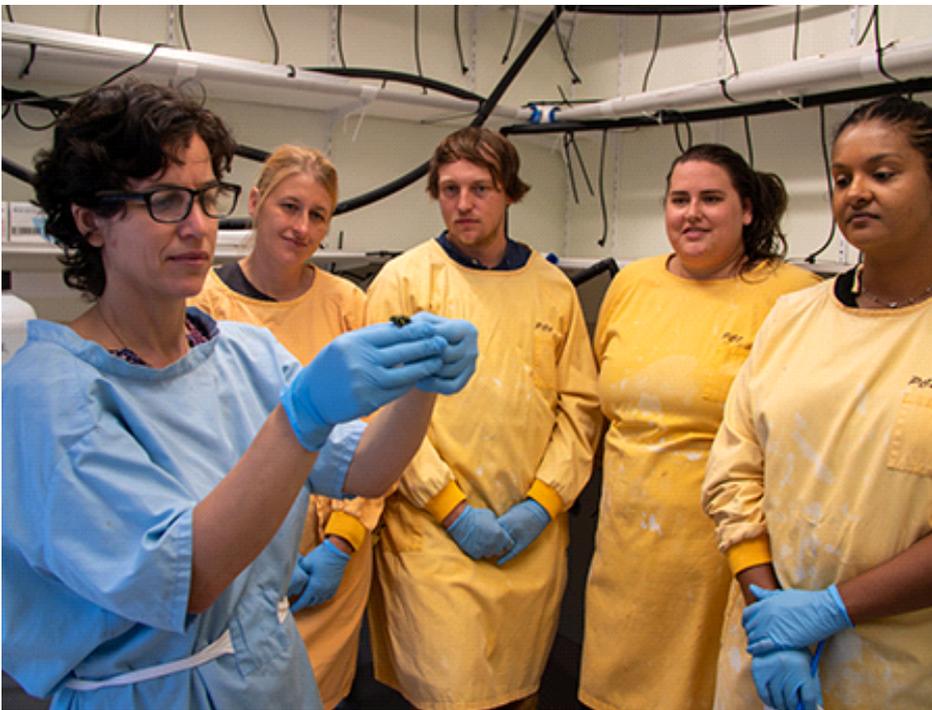
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Dr Lee Berger solved the global mystery of disappearing frogs and challenged paradigms about wildlife health, all in the course of her PhD.

Starting in the 1970s frogs disappeared in pristine habitats in Queensland and in Central America. Whole species vanished; there was worldwide concern. Was it pollution or UV from the hole in the ozone layer? Were frogs the 'canary in the coal mine'? Would we be next?

Berger and her mentors thought that an introduced infection such as a virus could explain the pattern of declines. The dogma of the time was that infectious diseases don't cause extinctions. Now, thanks to Lee, we know they do. She didn't find a virus, but she did find a fungus growing on the skin of sick frogs. This chytrid fungus is now known to be the cause of a global mass extinction of frogs. Hundreds of species have declined, and at least six species have disappeared entirely in Australia.

It took over a decade of research and debate to persuade the sceptics. Today, quarantine protocols recognise the threat of disease to biodiversity, recovery programs are designed to reduce the risk of

infection, and wildlife health experts are alert to the spread of diseases such as those found in bats and salamanders in recent years.

The gastric brooding frog raised her babies in her stomach. The frog was last seen in the wild in 1981, and it is now listed as extinct. It's one of six Australian species that disappeared between the 1970s and 1990s. Around the world hundreds of species of frog declined over the same period, and today iconic frogs such as the southern corroboree frog are also threatened. Thanks to Berger and her colleagues we now know what's happening, but we're still struggling to save the frogs that remain.

When the first reports of disappearing frogs emerged from high altitude rainforests in Central America and Queensland there was global concern. Wildlife conservation experts focussed on environmental factors. But a Townsville medical doctor and vet, Dr Rick Speare, thought they were looking for the wrong culprit. He suspected that an infectious disease was responsible, predicted where it would turn up next, and persuaded Berger to join the hunt. Together, they found sick and dead frogs and took samples.

She took the samples to the CSIRO Australian Animal Health Laboratory in Geelong, the biosecurity fortress tasked with detecting emergency disease threats such as foot-and-mouth disease, rabies, and Hendra virus. Her mission: to find the virus responsible for the frog deaths. She couldn't find a virus. Instead she found a fungus new to science on the skin of the sick frogs. In 1997 she showed that this chytrid fungus was killing the frogs.

Her discovery was greeted with scepticism. The scientific dogma of the time was that infectious diseases didn't cause extinctions, and that some animals would have resistance and the species would recover. So, over the course of the next decade, Berger gathered more evidence with a team co-led by her husband Lee Skerratt and Rick Speare. They showed for example why frogs die from this skin infection and that the fungus thrives in colder habitats such as those found at high altitudes. Other researchers then confirmed that the fungus was present in sick frogs around the world.

Today, her original paper has been cited more than 1,800 times and has sparked hundreds of papers and research careers devoted to the problem. She has generously shared methods and fungal cultures worldwide to ensure rapid progress.

Now, thanks to her persistence, we know that wildlife diseases pose a threat not just to individual animals, but to whole species. That knowledge has changed conservation practices globally. In recent years declines of salamanders and bats have both been attributed to infectious agents.

Berger's discovery came too late for many species of frog around the world that are now thought to be extinct, but she and her team are now working on ways to protect frogs into the future. This includes providing recommendations for biosecurity and disinfection, and for improving success of reintroduction programs.