Conserving frogs before they croak

By Clare Tayler-Henry

It might sound like a tennis ball being hit with a racket. Like a wet finger running over a balloon. Or like a cork being drawn from a wine bottle. These noises captivate Anke Maria Hoefer, the ACT and Region Frogwatch Coordinator, who uses them to identify local frogs.

The creatures can be hard to see, since many are camouflaged and grow only a few centimetres long, but each species makes a distinctive call. And when they gather, Ms Hoefer describes the result as "a full blast frog concert."

Yet the chorus is in danger of fading as some frog species succumb to a silent killer. According to the International Union for Conservation of Nature, amphibian chytrid (pronounced *kitrid*) fungus, which causes the disease chytridiomycosis, is driving dramatic declines in frogs around the globe.

The scale and speed of the pandemic took scientists by surprise, says Ben Scheele, a PhD researcher in the Fenner School of Environment and Society at the Australian National University.

"When the disease first came around and people were unaware of what it could do, a whole species would just become extinct in six months," he recalls.

"People were used to working on a species of frog and then they would come back the next year and 'Hey, where is this frog?' That was the last that was seen of many species," he says.

Chytrid fungus spreads during contact between frogs or through the water they inhabit, Mr Scheele explains. Uniquely among animals, amphibians absorb oxygen and water through their skin, and that is where the fungus attacks.

"There's no definitive answer yet," he emphasises. "But essentially it eats the keratin [protein] in the frogs' skin […] and the frogs die of symptoms similar to a heart attack."

Shrinking populations may enter "a death spiral into extinction," he remarks, as they become increasingly vulnerable to habitat destruction, drought and climate change. What's more, because tadpoles enhance water quality and frogs are a vital link in the food chain, any losses echo throughout the entire ecosystem.

For Ms Hoefer, who monitors the diversity of frogs living in and around the ACT, the tragedy is close to home. "It is awful," she reflects. "Numerous species have not been seen in years and might be lost forever."

Ms Hoefer organises the Frogwatch Census every spring when most of the area's frog species are calling. With about 200 volunteers taking part, she calls it "the largest community-powered science program in the region."

After learning about local frogs, the volunteers visit monitoring sites in daylight to photograph and describe the plant life and water level. They return after dark to measure the air and water temperatures and record the all-important frog calls.

From those recordings, Ms Hoefer identifies the species and estimates the number of frogs calling. "It's addictive," she enthuses. "It is such a great project, the team is awesome and the volunteers rock!"

But always mindful of the chytrid threat, she teaches participants to disinfect

their footwear and equipment before visiting sites and to avoid handling frogs or entering the water.

"The fungus has been very successful in spreading," she reasons. "Even into most pristine areas in the cooler south, such as our high country national parks."

That's exactly where Mr Scheele is researching ways to help frog species at risk of extinction. In the mountains of NSW and Victoria, he studies the Alpine Tree Frog and Northern Corroboree Frog which are both endangered by the disease.

Sterilising his hands or wearing single-use gloves to prevent spreading the fungus, he measures and weighs each frog and swabs its skin to test for chytrid DNA. He also collects detailed information about the climate, habitat and other amphibians at each site.

PhD researcher Ben Scheele is investigating ways to help the endangered Northern Corroboree Frog escape the deadly chytrid fungus. Photo: Elizabeth Goldrick.

Then he looks for patterns between the incidence of the disease and features of the frogs and their environment. His early results suggest that factors such as air and water temperature influence whether frogs perish or persist.

"Initially people thought, 'We have these populations that are surviving. Maybe they are resistant or maybe they have tolerance to infection,'" he recounts. "Environmental conditions probably play a more significant role than people had generally anticipated."

Species that inhabit cool, moist environments are most susceptible to the disease, he reports, because those conditions are most suitable for the fungus.

Even Far North Queensland is not beyond reach. "There are windows of opportunity for chytrid to cause problems in the region during the winter months," explains Deborah Pergolotti, founder of the Frog Decline Reversal Project. "That window increases at the higher altitudes where the temperature is lower."

But Ms Pergolotti says chytridiomycosis is only one of several diseases, including viruses and cancer, that afflict amphibians in the area. As curator of the Cairns Frog Hospital, she works seven days a week to rescue and rehabilitate ill and injured frogs.

Since opening in 1998, the hospital has cared for as many as 150 frogs at a time. Almost all of the more than 2,500 past patients have been diseased and most have suffered from multiple illnesses. And Ms Pergolotti believes this is just the tip of the iceberg.

"For every frog that makes it into our doors, we estimate that there are probably another 200 out there in the same predicament that aren't seen," she laments. "Or are seen by those who can't stop or don't care enough to

facilitate its rescue. Or who see it and don't realise it is sick."

"The fact that frogs are dying from a multitude of problems," she cautions, "is a finger pointing towards what we are doing wrong in the environment — if we have the good sense to pay attention!"

People have indeed contributed to the chytrid crisis, agrees Mr Scheele, outlining one theory that traces the fungus to African Clawed Frogs which were traded internationally for medical testing.

"Diseases and introduced species are a massive problem because humans are moving things all around the world all the time at such a rapid pace," he argues.

Chytrid fungus is now so widespread and infects so many species that "it seems very unlikely the disease could be eradicated from the wild," he admits. "There can be hundreds or thousands [of frogs] at one pond that could carry the disease."

To make matters worse, he adds, some frog species can harbour the infection without becoming sick. They act as disease reservoirs, continually infecting the susceptible species that share their habitat.

But if the fungus is here to stay, Mr Scheele plans to slow its progress. "I don't think it's that useful just to describe the disease and what it does if you can't really do anything about it," he muses.

His findings could help conservationists release disease-free, captive-bred animals into the wild and restore habitats in ways that favour the frogs rather than the fungus.

He highlights the Green and Golden Bell Frogs that were famously found during the construction of Sydney Olympic Park. As he points out, "the area where they were persisting was these really quite extreme disused brick pits that were acidic and salty, and it probably was inhibiting the disease."

The fungal disease has contributed to the vulnerable Green and Golden Bell Frog vanishing from much of its natural range in the ACT and NSW. Photo: Lance Jurd.

While research continues, our best bet for protecting frogs from infection is to stall the spread of the fungus. Mr Scheele advises pet keepers against transporting frogs from one region to another or from overseas. Ms Pergolotti warns gardeners not to move animals or plants between ponds and urges campers and bushwalkers to sterilise their shoes and tyres before and after every trip.

With precautions in place, there may still be hope for Australia's ailing amphibians. Mr Scheele observes that the Whistling Tree Frog, which declined around Canberra due to the disease, is now making a comeback. "There's been a definite trend in increasing population abundance," he declares. "So that's pretty positive."

After all, frogs are not just part of the landscape but members of the neighbourhood. "Being out on a cool night under the stars," marvels Ms Hoefer, "somewhere in town or further away from houses and street lights, listening to frogs is amazing."