

# Recreating LOST FROGS

**Kelly Body** set out to recreate extinct Aurora and Waitomo frogs using their bones, DNA analysis, and a series of illustrations in a fascinating science-art project.



Vanished forever: Aotearoa's Waitomo frog pictured right with the smaller Aurora frog on the left.

The last of the evening light breaks through a canopy of ancient, moss-covered trees. The shrill cries of kiwi and lonely sounds of ruru and laughing owls replace the chattering of birds that fill the forest during the day. A quiet rustling of dead leaves in the darkness is the only sign that the frogs have emerged.

In contrast to the noise surrounding them, these amphibians sit silently, unmoving, waiting for their next meal to cross their path. Many of them are at home among the leaf litter on the forest floor, while others spend their lives next to bubbling streams, all flourishing in a pristine environment.

This is the story of our long extinct, endemic frogs. Before the arrival of humans, Aotearoa's forests were home not only to countless unique birds but also to at least seven different species of pepeketua – endemic *Leiopelma* frogs. Found nowhere else in the world, three species became extinct soon after the first introduction of kiore rats about 800 years ago: Markham's frog (*L. markhami*), the Aurora frog (*L. auroraensis*), and the Waitomo frog (*L. waitomoensis*).

Since then, it seems as though these animals have been relegated to the footnotes of history – rarely mentioned when any of us talk about Aotearoa's extinct species.

For me, it wasn't until I started looking into Aotearoa's pre-human biodiversity for a Master of Science in Society project at Victoria University that I discovered we even had extinct frogs. There are no historical illustrations of them to be found, no alcohol-preserved specimens, no photographs, and no mention of them in kōrero from iwi around the country.

The only information we have is in a handful of scientific articles and several images of their recovered bones.

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I began to wonder how we were meant to feel a sense of loss for these species if there were no stories or visual illustrations about them for us to connect to and how this might affect our feelings about protecting the *Leiopelma* species that remain on the mainland – Archey's frog (*L. archeyi*) and Hochstetter's frog (*L. hochstetteri*). They are in serious trouble and extremely vulnerable to predators and habitat loss.

To start conversations about our lost frogs, I decided to recreate two species, the Waitomo and Aurora frog, through a series of artworks. Although there is a lack of available visual information about these animals, there have been comprehensive studies carried out on the bones and DNA of these species from scientists around the country. By reading through their descriptions of the bones in the scientific literature, I could slowly



Aurora skeleton. Kelly painstakingly recreated the frogs using their bones before bringing them to life through her illustrations.

piece together what the skeletons of these animals would have looked like.

We know the Waitomo frog was the largest of all *Leiopelma* species, measuring 100mm in length, with long, slender hindlimbs but very short forearms. Combined with its long digits and the caves where its bones were found, this suggests it was a stream-dwelling animal capable of hopping, similar to our surviving Hochstetter's frog. Waitomo frog bones have been found throughout the North Island.

In contrast, the much stockier Aurora frog was only about 50mm long, with long strong forearms and short hindlimbs built for walking about on the forest floor rather than hopping. All the information on the Aurora frog comes from just one incomplete skeleton found in the Aurora Cave, in Fiordland.

This information, as well as guidance from Dr Luke Easton, who was the lead author on the main academic article I used for this project, was vital for the project's completion and helped me to create accurate reconstructions of these species.

Once I had them drawn out, it was easy to understand their vulnerability to introduced predators and the cause of their extinction. Being ground-dwelling, sedentary, and, in the case of the Aurora and Markham's frog, unable to hop very well meant these animals were an easy meal for kiore.

This, combined with widespread habitat loss, put huge pressure on the frogs' ability to survive, although we don't know exactly why they became extinct. The four *Leiopelma* species that did make it through this initial wave of environmental change were exposed to new threats when European settlers arrived, such as rapid habitat modification and the introduction of a swathe of new predators.

"Our remaining endemic frog species have fortuitously clung onto survival but are still at great risk of extinction. Predation by rats and potentially other introduced mammals on the mainland, continued habitat loss, and novel disease risks are ever present," says Dr Luke Easton.



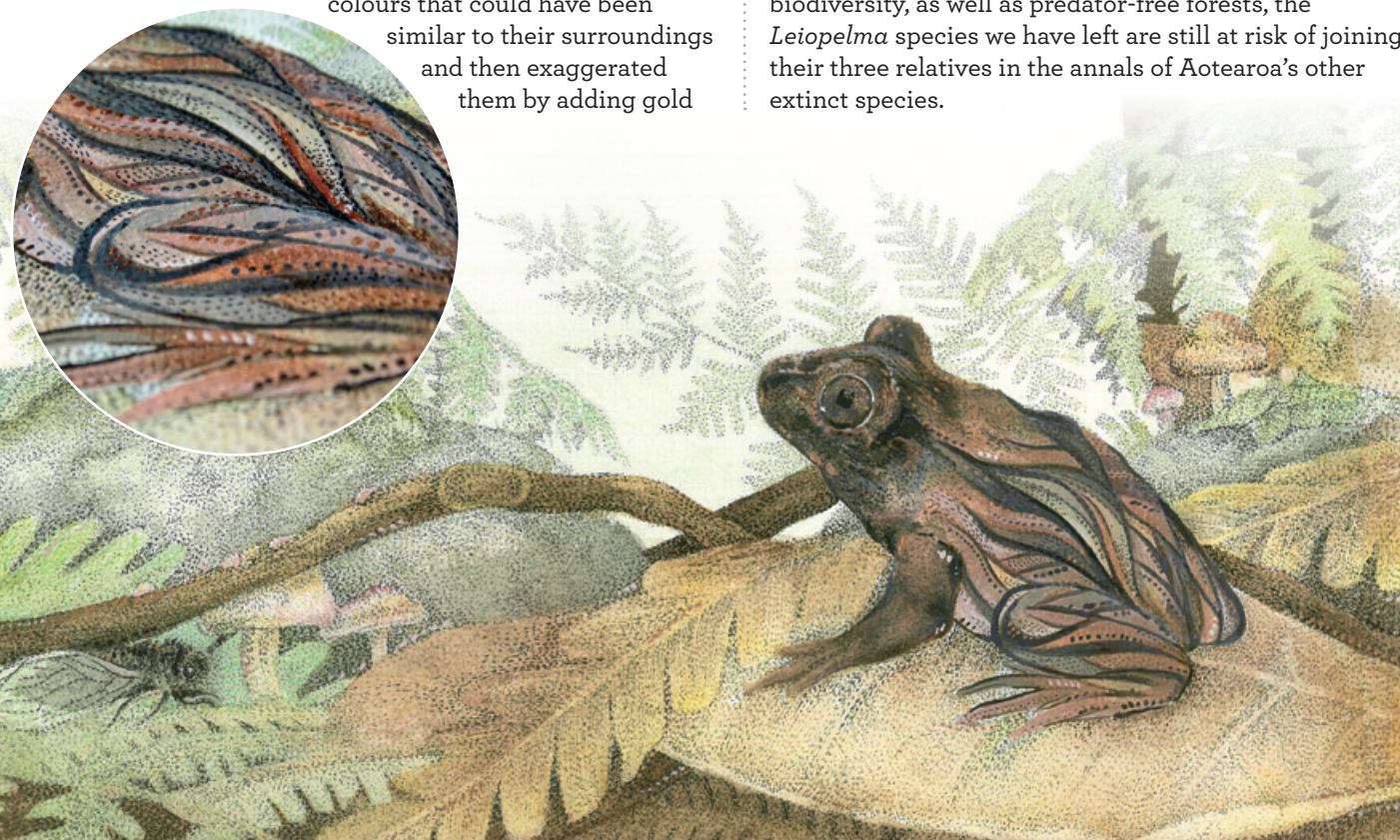


→ “In some areas, frogs are doing just about okay, but this status can change rapidly.”

The one thing I couldn’t recreate from the scientific literature were the colours and textures of the extinct Waitomo and Aurora frogs. This isn’t something we can establish by analysing their bones. Instead, I chose colours that could have been similar to their surroundings and then exaggerated them by adding gold

and bronze. I also added a unique, stylised element to each frog, to remind us all that this part of the process is entirely up to the artist.

Without serious conservation efforts from organisations like Forest & Bird, who want to see landscape-scale restoration of native flora and biodiversity, as well as predator-free forests, the *Leiopelma* species we have left are still at risk of joining their three relatives in the annals of Aotearoa’s other extinct species.



## FROGGIE FUNDRAISING

Kelly is selling her incredibly beautiful recreations of Aotearoa’s extinct frogs to help raise funds for Forest & Bird.

Last year, she organised a froggie fundraising event with Dr Luke Easton that raised \$700.

Kelly has created some limited-edition A4 prints that are available to purchase for \$45 on the Forest & Bird online shop – see [www.shop.forestandbird.org.nz](http://www.shop.forestandbird.org.nz). Be in quick as stocks are selling fast!

## ANCIENT ANCESTRY

All four of New Zealand’s remaining frog species are in big trouble and face multiple pressures in the wild – just like their extinct ancestors, they are threatened by introduced predators, especially rats, as well as habitat loss and human impacts.

For example, the fragile and critically endangered Archey’s frog population in the Coromandel is facing additional stress from the continued impact of gold mining developments.

“These weird and wonderful frogs need our help,” says Rebecca Stirnemann, Forest & Bird’s central North Island regional manager. “We need to stop threats like pigs and rats, and also say no to mining development in the last places they live in Aotearoa.”

New Zealand’s primitive *Leiopelma* species – Archey’s, Hamilton’s, Hochstetter’s, and Maud Island – are incredibly special. They have no eardrums, which suggests they may be deaf, and don’t croak like other frogs. The species that walk are terrible jumpers.

There is only one other genus of frogs in the world that is as old and as unique as our *Leiopelma* – the *Ascaphus* frogs from North America. Together, these two ancient groups of amphibians have changed very little in about 70 million years – near the end of the time of the dinosaurs.

Archey’s, Hamilton’s, and Maud Island species are unique in that they don’t have a tadpole stage. Instead, the eggs hatch as almost fully formed froglets with tails. Parental care is variable. In Archey’s frogs, the female lays the eggs and then the male takes over for a few weeks. He lovingly cleans each egg, polishing them with his secretions. It is thought this stops fungal growths.

Hochstetter’s frogs do have a tadpole stage, but even this is unlike other species of frogs – the tadpoles don’t feed! They simply don’t need to, as they have a large yolk sac that they absorb over several months and that provides them with all the nutrients they need.

Despite conservationists’ best efforts, nature continues to vanish at an alarming rate, with 80% of native birds, 88% of lizards, and 100% of frogs threatened with extinction in New Zealand. Habitat loss, predators, weeds, and climate change threaten many ecosystems.

The proposed NPS for Indigenous Biodiversity strikes a fair balance where farming and other existing activities can continue, but new activities that would destroy certain habitats or plants generally can’t.



Archey's frog. © Euan Brook



Maud Island frog. © Zealandia



Hochstetter's frog. © Grant Capill



Hamilton's frog. © Andrew MacDonald