

Mass lizard extinction looms as climate change continues



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by James Morgan

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Experts from the [University of Lincoln](#) and the [University of Exeter](#) have warned that climate change could cause dozens of lizard species to become extinct within the next 50 years. The researchers, whose results have been published in the journal *Global Ecology and Biogeography*, found evidence to suggest that global temperature increases are threatening the survival of viviparous lizards – those whose embryos are retained within the mothers' bodies.

Liolaemus lizards comprise one of the most diverse vertebrate groups on Earth. By evolving to become viviparous, the formerly oviparous, or egg-laying, lizards successfully adapted to life in cooler climates. However, the evolutionary move from oviparity to viviparity is irreversible, meaning that these lizards are unable to return to warmer environments. Consequently, increasing temperatures brought about by global warming could prove devastating for such species.

During the course of their research, the academics analysed the evolutionary transition of the lizards' reproductive modes and made projections concerning the potential impact of climate change. They discovered that rising temperatures in historically cold habitats are likely to significantly reduce the organisms' areas of distribution. In turn, viviparous lizards could face extinction within the next few decades.

To find out more about the predicted plight of *Liolaemus* species, I spoke to the study's lead author Dr Daniel Pincheira-Donoso, Lecturer in Evolution at Lincoln's [School of Life Sciences](#). I began by asking why viviparous reproduction has proven so evolutionarily advantageous in the past.

"Without viviparity, it is really difficult for cold-blooded organisms such as reptiles to survive in cold environments," Dr Pincheira-Donoso explained. "By evolving viviparity, *Liolaemus* lizards were able to disperse across regions that would have been off limits to them otherwise. As the Andes Mountains have uplifted over the last 25 million years, these organisms have had to adapt in order to colonise very cold, elevated environments. Without the evolution of viviparity, they would not have survived."

Unfortunately, global climate change has turned viviparity into a double-edged sword for the South American lizards. Whilst this mode of reproduction facilitated the species' survival in the past, it could prove disastrous as temperatures continue to rise. I asked Dr Pincheira-Donoso why viviparous organisms find it so difficult to thrive in warm climates.

"Firstly, viviparity limits the frequency at which an organism can reproduce," he replied. "Because the offspring of these lizards are retained inside the mother, reproduction can only take place every year or two. If they were oviparous, they could reproduce six or seven times within the same period. Secondly, because the mothers have to retain their infants, they become really heavy. This added heft diminishes their ability to evade predators. The main problem is that if an environment becomes really warm, viviparous organisms cannot re-evolve oviparity. Dollo's law of irreversibility suggests that once an oviparous species evolves to become viviparous, it cannot go back. Viviparity allowed these lizards to survive in colder climates, but if temperatures rise, they will be unable to readapt."

“ Dollo’s law of irreversibility suggests that once an oviparous species evolves to become viviparous, it cannot go back. Viviparity allowed these lizards to survive in colder climates, but if temperatures rise, they will be unable to readapt. Viviparous lizards in warm environments are disadvantaged both ecologically and reproductively. Consequently, we predict that they will become extinct. **Dr Daniel Pincheira-Donoso** ”

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Of course, the impacts of extinction are never limited to any one species. If the scientists' predictions prove to be accurate, the lizards' habitats will also be significantly affected. I went on to ask about the ways in which the mass extinction of *Liolaemus* would impact upon connected ecosystems.

"The extinction of these lizards would have a substantial effect on biodiversity," Dr Pincheira-Donoso replied. "The reptile populations of these high-elevation ecosystems in the Andes consist primarily of viviparous *Liolaemus* lizards. If they were to go extinct, these communities would be almost entirely eradicated; there would be no reptiles left. We expect these lizards to become extinct within the next few decades. After the extinctions have taken place, we are likely to witness a cascade effect on other components of the ecosystems."

Finally, I asked Dr Pincheira-Donoso whether or not we might be able to prevent this mass lizard extinction from occurring. As he explained, it is probably too late in the day for us to reverse the plight of these lizards. However, there are certainly lessons that we can take away from this situation.

"My research is focused on the ability of organisms to respond to climate change," Dr Pincheira-Donoso concluded. "Personally, I don't think that there is really anything that we can do to save these lizards. Even if the transition from oviparity to viviparity *could be* genetically reversed, climate change is occurring at an incredibly rapid pace. Temperatures are rising far too quickly for the lizards to successfully adapt. Despite the bleak outlook for these species, we can learn from their extinction. We must do our best to prevent further extinctions from taking place within the coming centuries. Sadly though, I don't think that there is any way back for some *Liolaemus* lizards."

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