

Factors behind past lemur species extinctions put surviving species in 'ecological retreat'

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This is a young ring-tailed lemur in densely forested area of Madagascar. Credit: Brooke Crowley, University of Cincinnati

New research out today on the long-term impact of species extinctions suggests that the disappearance of one species does not necessarily allow remaining competitor species to thrive by filling now-empty niches.

Instead, in University of Cincinnati-led research on lemur extinctions over the past 2,000 years, findings suggest that one likely result of changes that lead to species' extinctions is that remaining [species](#) go into "ecological retreat." And that retreat can result in new selective and ecological pressures that then increase the [extinction risk](#) of surviving species, potentially creating an "extinction cascade."

These conclusions are found in today's online [Proceedings of the Royal Society B](#), the British Royal Society's flagship [biological research](#) journal, in an article titled "Extinction and Ecological Retreat in a Community of [Primates](#)" by lead author Brooke Crowley, assistant professor of anthropology and geology at UC.

Co-authors are Laurie Godfrey, professor of anthropology at the University of Massachusetts at Amherst; Thomas Guilderson, research scientist, and Paula Zermeno, scientific associate, both of the Lawrence Livermore National Laboratory; Paul Koch, professor of earth & planetary sciences at the University of California at Santa Cruz, and Nathaniel Dominy, associate professor of anthropology at Dartmouth College.



In the region surrounding a protected forest on Madagascar, little native vegetation is left outside the protected reserves. Credit: Brooke Crowley

Using radiocarbon and isotope analysis from fossils of eight large-bodied

lemur species that have died out in Madagascar since the arrival of humans to the island 2,000 years ago, the research team was able to determine the type of habitat in which lemurs in the past lived, their diets, when they died out and whether other still-extant species filled vacated environmental niches.

Findings show that prior to extensive human disturbance, lemurs were very common in open habitats of wooded savannah and spiny thicket on Madagascar, which constitutes the majority of southwestern Madagascar today.

But after the larger-sized lemurs that once inhabited those regions went extinct, related species – that existed then and are still extant today – could not fill the empty niches. Instead, still-extant lemur species have shown, over time, an increasing reliance on habitats with dense forest cover.

Said UC's Crowley, "The reasons behind the increased reliance on densely forested habitats are uncertain, but it's likely that low hunting and logging pressures in forest reserves are contributing factors."

She added that while [forested areas](#) have experienced human disturbance, even greater disturbance has been documented in the unprotected open, drier areas where lemur species once flourished but have gone extinct.



Pictured is UC researcher Brooke Crowley, left, with a companion on Madagascar. Credit: Brooke Crowley, University of Cincinnati

According to UMass' Godfrey, it's not that lemur species of the past two millennia did not live in forested areas at all nor that today's species live only in forested areas. Rather, lemur species were once very common in other, drier and more open habitats in Madagascar and so, species were not so heavily reliant on forest habitat as they are today.

Added UC's Crowley, "It's been assumed that lemurs were in the forests because that's where the resources that best suited them were. Our fossil analysis shows that lemur species once preferred a much wider, more distinctive habitat range, which may mean that modern lemurs prefer the densely forested areas simply because these areas offer greater protection. The forest is more of a refuge."

If so, this could help explain other researchers' previously reported findings regarding "mismatches" between [lemur](#) anatomy and observed behavior of modern lemurs in the dense forest environments.

And such mismatches could be indications that today's lemurs are in ecological retreat and at risk if conservation and environmental

management efforts don't take into account what were once, and may likely still be, their preferred habitats.

"In other words," explained Crowley, "We now have long-term historical data, a broadened historical perspective indicating that what lemurs are doing today – preferring densely forested areas – is not representative of their ecological niche over past millennia. That's an indication that we need to rethink our assumptions on their current habitat choices and on our own conservation efforts. And this form of historically informed research can also be applied to other locales and animals to benefit threatened species."

Provided by University of Cincinnati

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