

# Study shows early human impacts on biodiversity

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Fogel, right, and her research colleagues search an Australian beach known as Geny Heaven for remains of Genyornis egg shells. Credit: UC Merced

Even without all the industrial and technological growth that has accelerated climate change, humans can—and do—dramatically impact ecosystems.

A new paper in *Nature Communications*, co-authored by UC Merced Professor Marilyn Fogel, indicates early humans were responsible for the fairly rapid extinction of the 10-foot-tall flightless bird *Genyornis newtoni* in Australia about 47,000 years ago, simply through hunting and the interruption of reproduction.

In "Human Predation Contributed to the Extinction of the Australian Megafaunal Bird *Genyornis newtoni*," Fogel and her colleagues—who have spent the past 20 years gathering a variety of data about the effects of humans on continental ecosystem changes—demonstrate that early aboriginal people hunted and ate *Genyornis*. Perhaps more importantly, they gathered and cooked the birds' eggs in a methodical and species-ending way.

Because *Genyornis* was a colonizing nester—unlike emus and ostriches, which can nest alone and survived though the millennia—it was easy for people to find large caches of *Genyornis* eggs, gather them up and feast.

During several visits to Australia to gather samples for [stable isotope](#) analysis, researchers found charred eggshell pieces, which they initially thought were just compromised samples.

## Understanding the pattern

"Then we realized there was a pattern to them," Fogel said. The researchers began examining middens—large piles of shells from shellfish left as refuse by humans—and found them near the burnt shells. Often both were near where *Genyornis* colonies had been. The aboriginals were nomadic, so researchers never found settlements, but they did find enough evidence of [human](#) habitation to make the connection.

"They didn't build cities, they moved around and hunted an area until the

food supply was gone," Fogel said.

People arrived in Australia from Southeast Asia about 55,000 years ago, about the same time humans began settling Europe. When they got to Australia, they likely found it filled with animals and lush plants, with a climate fairly different from what it is today. Hunting would have been plentiful.

Scientists typically date humans by the technology they develop. But the aboriginals never developed much—they used fire for many things, and their tools were simple stones.

But using different methods of sophisticated chemical dating on the burnt shells and other evidence, the researchers were able to narrow the "extinction window" to a few thousand years linked to the time period just after humans arrived on the continent.

## **"There is a lot to learn from studying ancient environments"**

"Everyone wants to know if humans are involved in large-scale ecosystem change, and the answer is yes," Fogel said. "However, it's rarely just one thing that causes extinction, so we looked at fire, hunting and climate."

The researchers found that about the time of the extinction, there were no major climate shifts. The climate everywhere cycles, sometimes warmer, sometimes cooler, and until the time of Genyornis' extinction, the climate and flora were cycling in sync. Near the time of the extinction, the cycles became disconnected, and Genyornis, in addition to being hunted and having its eggs raided regularly, lost some of its natural food supply.

Stable isotope analyses of fossil eggshells from Genyornis and emu showed that Australian ecosystems were variable and could support many different diets. Just after the extinction of Genyornis and other large animals, the isotope patterns in emu eggshells showed that major ecosystems in Australia collapsed to form more narrow niches in which fewer species could adapt and survive. Together, those factors caused the Genyornis to die off.

This isn't the only example of human predation causing extinction, of course.

"This has happened in North America with the mastodon and the mammoths," Fogel said. "Biodiversity [extinction](#) is just another aspect of human impact on the ecosystem."

Fogel, an ecology professor with the School of Natural Sciences, and her colleagues have examined myriad samples from Australia. They've looked at shells, plants, soils, termite mounds, wombat bones and teeth, insects, tree rings, feathers and many other items from around the continent. They plan to make a final journey there this summer for a last round of fieldwork before publishing a review of the two-decade project.

Biodiversity is a subject several researchers at UC Merced explore, and Fogel pointed out its relation to sustainability.

"There is a lot to learn from studying ancient environments," she said. "The loss of species today from complex changes to our environment has many parallels to what happened almost 50,000 years ago when humans had only simple tools. Understanding how an entire continent's climate and ecosystems can change as radically as Australia's reminds us that sustaining habitats and natural environments are critical for California's present and future biodiversity."

**More information:** Gifford Miller et al. Human predation contributed to the extinction of the Australian megafaunal bird *Genyornis newtoni* ~47 ka, *Nature Communications* (2016). [DOI: 10.1038/ncomms10496](https://doi.org/10.1038/ncomms10496)

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