University of Lethbridge

News Release

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University of Lethbridge PhD student leads international study of extinct Hawaiian bird

Islands are famous for producing some of the world's strangest creatures, and a new study shows that evolution on islands can push birds into even more unexpected directions than previously recognized.

University of Lethbridge PhD student Sara Citron led an international team from Canada, the United States and Australia that discovered how an extinct Hawaiian ibis evolved unusually small eyes and a dramatically reduced visual system, traits seen only in a handful of bird species alive today.

The team made the discovery while examining the skull of *Apteribis*, a flightless ibis that once inhabited the Hawaiian Islands.

"Anyone who has spent time birdwatching or visiting a zoo is familiar with ibises. These are very distinct birds: they have exceptionally long, elegant beaks and many of them have striking colors that set them apart from other shorebirds," says Citron. "Their elongated beaks are key to how they feed. By inserting the beak into mud, shallow water, or soft ground, they probe for subtle vibrations that reveal the presence of hidden prey, such as small invertebrates."

Citron's supervisor, Dr. Andrew Iwaniuk, explains that the team targeted the Hawaiian species because island evolution often produces bizarre anatomies.

"From the moment we looked at the skull, we could see that the orbits, the spaces where the eyes sit, were far smaller than they should have been," says Iwaniuk.

In an international effort, the researchers examined skulls from 25 of the 28 living ibis species, using museum specimens from all over the world. With advanced imaging technology, they created 3D reconstructions of the birds' brains and compared them with the fossil species.

“What we found was astonishing,” says Citron. “The eyes and all parts of the visual system that we can measure from the skull were dramatically reduced in *Apteribis* compared to its living relatives.”

Co-author Aubrey Keirnan, a PhD student at Australia’s Flinders University, says that such extreme reductions in vision are known only in a few birds, including the New Zealand kiwi and the world’s two nocturnal parrots, the critically endangered kākāpō and the elusive night parrot.

“What all of these species have in common is that they rely very little on sight and are active mainly at night,” says Keirnan.

The findings strongly suggest that *Apteribis* was also nocturnal, roaming the Hawaiian landscape under cover of darkness to feed and possibly breed, while resting during the heat of the day.

Dr. Vera Weisbecker from Flinders University, explains that this then brings the question “why were they nocturnal?” The answer likely lies in Hawaii’s unique ecology.

“Hawaii is the most isolated archipelago on Earth and originally had no mammalian predators. Similar to the situation in New Zealand, large birds like ibises were safe on the ground and eventually lost the ability to fly,” she says. “Highly acute vision would not have been a particular advantage.”

However, Weisbecker adds that other factors must have existed to push *Apteribis* into the dark.

That missing piece may come from their prey. Helen James, Curator of Birds at the Smithsonian National Museum of Natural History in Washington, explains that the Hawaiian Islands were once home to an extraordinary diversity of snails and flightless crickets.

“Flightless crickets and snails are nocturnal and would have been more abundant then, exactly the kind of prey that could drive a bird like *Apteribis* to adopt night-time foraging,” she says.

Why *Apteribis* became extinct remains a mystery, Citron explains.

“Possible causes of extinction are changes to the climate and vegetation on the Hawaiian Islands and the first arrival of humans. We may never know the true cause of the extinction of this wonderfully strange species.”

Iwaniuk emphasizes the broader implications of the discovery.

“The New Zealand Kiwi is often seen as a one-of-a-kind oddity among modern birds, but this extinct ibis shows that similar forms evolved elsewhere,” he says. “It reminds us how much diversity has been lost, and how many ecological roles disappeared, before we ever had the chance to study them.”

To view online: https://www.ulethbridge.ca/unews/article/university-lethbridge-phd-student-leads-international-study-extinct-hawaiian-bird

Study available here: https://doi.org/10.1093/icb/icaf159

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