Extinction risk factors for New Zealand birds today differ from those of the past

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What makes some species more prone to extinction? A new study of nearly 300 species of New Zealand birds — from pre-human times to the present — reveals that the keys to survival today differ from those of the past.

The results are important in light of the growing number of studies that try to predict which species could be lost in the future based on what kinds of species are considered most threatened today, said lead author Lindell Bromham of Australian National University.

In the roughly 700 years since humans arrived in the remote islands that make up New Zealand, more than one out of four of New Zealand's native bird species have been wiped out.

Gone are birds such as the massive Haast's eagle, which weighed up to 33 pounds (15kg), and the giant moa, a flightless bird that stood up to ten feet (3m) tall.

Many species were hunted to extinction. Others were eaten by the animals humans brought with them — such as cats, rats and weasels — or pushed off their land as humans cleared and burned forests to make way for farms and pastures.

In a new study, a team of researchers examined whether biological traits such as body size might help scientists predict which species were likely to perish, and whether those risk factors held up over time.

To find out, they analyzed extinction patterns for New Zealand's native birds across four time periods in New Zealand's history, from pre-human times to the present. The data set included 274 species of living and extinct birds, such as ducks, penguins, geese, gulls, pigeons, parakeets and wrens.

The researchers looked for the biological traits that best predicted extinction risk in each time period. After accounting for similarities among closely related species, the researchers found that the traits that make some species more vulnerable today differ from what made species more prone to extinction in the past.

When the researchers compared the last 700 years of human occupation to pre-human times, for example, they found that flightless species such as moa and rails have been consistently hard-hit — presumably because species that can't fly make easy snacks.

"There was no difference in extinction risk between flightless and flighted species until humans arrived," said co-author Robert Lanfear, currently a visiting researcher at the U.S. National Evolutionary Synthesis Center.

Other risk factors for extinction changed with each new wave of human settlement.

In the period after Polynesians appeared until Europeans arrived in the 1820s, for example, bigger species were more likely to die out. According to one study the extinct giant moa — a group of ostrich-like birds that weighed up to 600 pounds (270 kg) — was hunted to extinction within less than one hundred years.

The researchers were surprised to find that after Europeans arrived, size was no longer a factor. Instead, species having males and females of

different color were the hardest hit —possibly because those species were prized for museum collections.

Today, species that nest on the ground and lay only a few eggs at a time are considered most threatened, including the iconic kiwi, and a giant flightless parrot called the kakapo — two birds found only in New Zealand.

Why do the extinction risk factors for New Zealand birds living today differ from those of the past? Size, for example, was only associated with extinction risk in the period after Polynesians arrived but before European settlement.

"It could be that that's when birds were most heavily hunted for food," Bromham said. "Or it might be that all the largest birds went extinct soon after human arrival, so now there are no longer enough large species to spot the raised extinction risk!"

"If extinction has already caused the loss of a susceptible trait, then this trait may no longer be relevant to surviving species even though it is still the original cause of past extinctions. This is known as an 'extinction-filter'," explained co-author Phillip Cassey of the University of Adelaide in Australia.

For studies of extinction risk, the results mean we should proceed with caution when analyzing different time periods. "We can't guarantee that the patterns we detect in contemporary extinction risk are the same as those that have caused extinctions in the past, or will be the ones that are most important in the future," Bromham said.

More information: Bromham, L., R. Lanfear, et al. (2012). "Reconstructing past species assemblages reveals the changing patterns and drivers of extinction through time." *Proceedings of the Royal Society*

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