

Smithsonian scientists rearrange Hawaii's bird family tree

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Smithsonian researcher Helen James studies a specimen of the now-extinct Kioea at the National Museum of Natural History in Washington, D.C. Credit: John Gibbons / Smithsonian Institution

A group of five endemic and recently extinct Hawaiian songbird species were historically classified as "honeyeaters" due to striking similarities to birds of the same name in Australia and neighboring islands in the South Pacific. Scientists at the Smithsonian Institution, however, have recently discovered that the Hawaiian birds, commonly known as the oo's and the kioea, share no close relationship with the other honeyeaters and in fact represent a new and distinct family of birds—unfortunately, all of the species in the new family are extinct, with the last species of the group disappearing about 20 years ago.

The findings of the study, conducted by Robert Fleischer, a molecular geneticist at Smithsonian's National Zoo and National Museum of Natural History and Storrs Olson and Helen James, both curators of birds at the National Museum of Natural History, were published in the international science journal *Current Biology* today, Dec. 11.

"The similarities between these two groups of nectar-feeding birds in bill and tongue structure, plumage and behavior result not from relatedness, but from the process of convergent evolution—the evolution of similar traits in distantly related taxa because of common selective pressures," said Fleischer, lead author of the study.

These five Hawaiian species of birds in the genera *Moho* and *Chaetoptila*, looked and behaved like Australasian honeyeaters of the family *Meliphagidae*, and no taxonomist since their discovery on Captain James Cook's third voyage to Hawaii in 1779 has ever classified them as anything else. However, there has been no rigorous assessment of their relationships using molecular data—until now.

Smithsonian scientists obtained DNA sequences from museum specimens of *Moho* and *Chaetoptila* that had been collected in Hawaii 115-158 years ago. Analyses show that these two Hawaiian genera descended from a common ancestor. Surprisingly, however, the analyses also revealed that neither genus is a meliphagid honeyeater, nor even in the same part of the evolutionary path of songbirds as meliphagids. Instead, these Hawaiian birds are divergent members of a group that includes deceptively dissimilar families of songbirds (waxwings, neotropical silky flycatchers and palm chats). The researchers have placed these birds in their own new family, the *Mohoidae*.

"This was something that we were not expecting at all," said Fleischer. "It's a great example of how much we can learn about systematics and evolution by applying new technologies like ancient DNA analysis to old

museum specimens."

A DNA rate calibration suggests that these Hawaiian taxa diverged from their closest living ancestor 14-17 million years ago, coincident with the estimated earliest arrival of a bird-pollinated plant lineage in Hawaii. Convergent evolution is illustrated well by nectar-feeding birds, but the morphological, behavioral and ecological similarity of *Moho* and *Chaetoptila* to the Australasian honeyeaters makes these groups a particularly striking example of the phenomenon.

All five members of the family *Mohoidae* were medium-sized songbirds with slender, slightly downward curved bills with unique scroll-edged and fringed tongues, making them very specialized nectar-feeding birds. They inhabited undisturbed forests on most of the main Hawaiian islands.

Although the cause for the extinction of the *Mohoidae* species is not definitely known, disease, human development and introduced species like mosquitoes, mongooses and rats are thought to play a significant role. The last member of the family Mohoidae to be positively identified was a Kauai o'o (*Moho braccatus*) in the Alakai Swamp on Kauai in 1987.

Source: Smithsonian

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