New research challenges long-held assumptions of flightless bird evolution

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Large flightless birds of the southern continents – African ostriches, Australian emus and cassowaries, South American rheas and the New Zealand kiwi – do not share a common flightless ancestor as once believed.

Instead, each species individually lost its flight after diverging from ancestors that did have the ability to fly, according to new research conducted in part by University of Florida zoology professor Edward Braun.

The new research, which appears this week in the online edition of the *Proceedings of the National Academy of Sciences*, has several important implications.

First, it means some ratites, like the emus, are much more closely related to their airborne cousins, the tinamous, than they are to other ratites, Braun said.

Second, it means the ratites are products of parallel evolution – different species in significantly different environments following the exact same evolutionary course.

Braun and his fellow researchers began closely studying this group of flightless birds, known collectively as ratites, after a discovery made while working on a larger-scale effort to better understand the evolution of birds and their genomes by analyzing corresponding genetic material

sampled from the tissue of many different bird species and determining how they relate to one another.

As they analyzed the genetic material, they noticed that the ratites did not form a natural group based on their genetic makeup. Rather, they belonged to multiple related but distinct groups that contained another group of birds, the tinamous, with the ability to fly.

Previously, the ratites were used as a textbook example of vicariance, a term that describes the geographical division of a single species, resulting in two or more very similar sub-groups that can then undergo further evolutionary change and eventually become very distinct from one another.

Scientists assumed that a single flightless common ancestor of the ratites lived on the supercontinent of Gondwana, which slowly broke up into Africa, South America, Australia and New Zealand; once divided, the ancestor species evolved slightly in each new location to produce the differences among the present-day ratites, Braun said.

But in light of this new information, he said it's more likely that the ratites' ancestors distributed themselves among the southern continents after the breakup of Gondwana, which began about 167 million years ago, in a much more obvious way.

They flew.

Although these new revelations teach evolutionary scientists a great deal, they also pose a great many new questions. For example, why did these birds evolve into such similar organisms in such different environments?

"To know for sure, we'll have to go into the lab and really study the genetics underlying the ratites' developmental pathway," Braun said.

"But nobody would have asked that question without the type of data we've collected, which raises the question in the first place."

The scientists' effort to analyze such a tremendous amount of genetic material collected from birds across the globe is in turn just a single part of a program called Assembling the Tree of Life, funded and organized by the National Science Foundation, which aims to assemble a body of similar research for every group of organisms on the planet, including animals, plants, fungi, algae and bacteria.

Source: University of Florida