

# Large ancient flightless birds from Australia, Europe and North America found to be related

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An artist's rendition of a Haast's eagle attacking moa. Credit: John Megahan - Ancient DNA Tells Story of Giant Eagle Evolution. PLoS Biol 3(1): e20. doi:10.1371/journal.pbio.0030020.g001

(Phys.org)—A small team of researchers from Flinders University, Centro de Investigaciones en Ciencias de la Tierra and the South Australian Museum has found evidence that suggests large flightless birds that once lived in Australia, Europe and North America were related to one another. In their paper published in *Royal Society Open Science*, the group describes using a variety of techniques to study the ancient birds and offers a theory on how birds that were unable to fly were related to other birds that could not fly such a great distance.

Dromornithidae were a type of very large flightless bird (much bigger than today's ostriches) that lived in what is now Australia approximately 50,000 years ago. Gastornithidae were similar to [birds](#) that once lived in parts of North America and Europe. The researchers with this new effort have found that the two bird types were related and that both were also related to modern fowl, rather than ratite, which include ostriches, emu and the extinct moa. The birds and their modern cousins all belong to the group known as galloanseres, which includes ducks, geese and chickens. Fossil remains of Dromornithidae suggest they did not resemble modern fowl—they could not fly, stood taller than modern humans and weighed on average 650 kilograms.

Prior research has shown that ancestors of Dromornithidae first appeared approximately 50 million years ago. The researchers with this new effort used both heuristic guides and tip-dated Bayesian approaches in their analysis of the birds and their possible relatives to link them together. They noted also that both bird types evolved to gigantism while existing on a purely vegetarian diet, as do modern fowl. They suggest that they evolved from a common bird that was able to fly, which explains how they could have evolved so far apart. This theory is similar to that proposed for ratites to explain their distant evolutionary history.

The researchers also concluded that *vegavis*, an extinct bird that once lived in what is now Antarctica was not related to modern fowl and

neither was Brontornis, an extinct flightless bird that lived in what is now South America.

**More information:** Trevor H. Worthy et al. The evolution of giant flightless birds and novel phylogenetic relationships for extinct fowl (Aves, Galloanseres), *Royal Society Open Science* (2017). [DOI: 10.1098/rsos.170975](https://doi.org/10.1098/rsos.170975)

### **Abstract**

The extinct dromornithids, gastornithids and phorusrhacids are among the most spectacular birds to have ever lived, with some giants exceeding 500 kg. The affinities and evolution of these and other related extinct birds remain contentious, with previous phylogenetic analyses being affected by widespread convergence and limited taxon sampling. We address these problems using both parsimony and tip-dated Bayesian approaches on an expansive taxon set that includes all key extinct flightless and flighted (e.g. Vegavis and lithornithids) forms, an extensive array of extant fowl (Galloanseres), representative Neoaves and palaeognaths. The Paleogene volant Lithornithidae are recovered as stem palaeognaths in the Bayesian analyses. The Galloanseres comprise four clades inferred to have diverged in the Late Cretaceous on Gondwana. In addition to Anseriformes and Galliformes, we recognize a robust new clade (Gastornithiformes) for the giant flightless Dromornithidae (Australia) and Gastornithidae (Eurasia, North America). This clade exhibits parallels to ratite palaeognaths in that flight presumably was lost and giant size attained multiple times. A fourth clade is represented by the Cretaceous Vegavis (Antarctica), which was strongly excluded from Anseriformes; thus, a crucial molecular calibration point needs to be reconsidered. The presbyornithids Wilaru (Australia) and Presbyornis (Northern Hemisphere) are robustly found to be the sister group to Anatoidea (Anseranatidae + Anatidae), a relatively more basal position than hitherto recognized. South America's largest bird, Brontornis, is not a

galloansere, but a member of Neoaves related to Cariamiformes; therefore, giant Galloanseres remain unknown from this continent. Trait analyses showed that while gigantism and flightlessness evolved repeatedly in groups, diet is constrained by phylogeny: all giant Galloanseres and palaeognaths are herbivores or mainly herbivorous, and giant neoavians are zoophagous or omnivorous.

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