

Shortening tails gave early birds a leg up

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This image shows fossil birds from the time of dinosaurs [left image: *Eoenatiornis*, right image: *Hongshanornis*] showing they had diverse types of legs. Credit: Roger Close

A radical shortening of their bony tails over 100 million years ago enabled the earliest birds to develop versatile legs that gave them an evolutionary edge, a new study shows.

A team led by Oxford University scientists examined fossils of the

earliest birds from the Cretaceous Period, 145-66 million years ago, when early birds, such as *Confuciusornis*, *Eoenantiornis*, and *Hongshanornis*, lived alongside their dinosaur kin. At this point birds had already evolved powered flight, necessitating changes to their [forelimbs](#), and the team investigated how this new lifestyle related to changes in their hind limbs (legs).

The team made detailed measurements of early bird fossils from all over the world including China, North America, and South America. An analysis of this data showed that the loss of their long bony tails, which occurred after flight had evolved, led to an explosion of diversity in the hind limbs of early birds, prefiguring the amazing variety of talons, stilts, and other specialised hind limbs that have helped to make modern birds so successful.

A report of the research is published this week in *Proceedings of the Royal Society B*.

'These early birds were not as sophisticated as the birds we know today—if modern birds have evolved to be like stealth bombers then these were more like biplanes,' said Dr Roger Benson of Oxford University's Department of Earth Sciences, who led the research. 'Yet what surprised us was that despite some still having primitive traits, such as teeth, these early birds display an incredibly diverse array of versatile legs.'

By comparing measurements of the main parts of the legs of early birds—upper leg, shin, and foot—to those of their dinosaur relatives Dr Benson and co-author Dr Jonah Choiniere of the University of the Witwatersrand, South Africa, were able to determine whether bird leg evolution was exceptional compared to leg evolution in dinosaurs.

'Our work shows that, whilst they may have started off as just another

type of dinosaur, birds quickly made a rather special evolutionary breakthrough that gave them abilities and advantages that their dinosaur cousins didn't have,' said Dr Rogers. 'Key to this special 'birdness' was losing the long bony dinosaur tail – as soon as this happened it freed up their legs to evolve to become highly versatile and adaptable tools that opened up new ecological niches.'

It was developing these highly versatile legs, rather than powered flight, that saw the evolutionary diversification of [early birds](#) proceed faster than was generally true of other dinosaurs.

More information: Rates of dinosaur limb evolution provide evidence for exceptional radiation in Mesozoic birds,
[rsos.royalsocietypublishing.org1098/rsos.2013.1780](https://rsos.royalsocietypublishing.org/doi/10.1098/rsos.2013.1780)

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