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Jurassic fossils reveal varied life of early mammals

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The two specimens lived 165 to 160 million years ago and were part of a group that died out before the dinosaurs, leaving no living descendants. But the lifestyles they were adapted for shows that they evolved similarly to modern mammals, and were not severely constrained by the presence of the dinosaurs, says [Zhe-Xi Luo](#) of the University of Chicago.

This finding puts the final nail in the coffin of the long-standing view that early mammals were primitive, shrew-like insectivores, overshadowed by the dinosaurs. This idea was based on many specimens of tiny teeth and a few jaw fragments.

[Discoveries](#) in more recent years of more complete skeletons in rare fossil beds that preserve exceptional details first challenged this idea about 10 years ago. The finding of a [predator of baby dinosaurs](#), about the size of a honey badger, in 2005, and of an aquatic, [beaver-like fish-eater called \*Castorocauda\*](#) in 2006, revealed that early mammals did more than just live under the feet of their reptilian co-inhabitants.

### **Tree houses**

Now Luo and his colleagues have found two small but highly specialised relatives of *Castorocauda*. One is the earliest digging mammal ever to have been discovered; the other is both the earliest herbivorous mammal and the earliest tree-dwelling mammal

Together, they show how mammals might have evolved in a world they shared with dinosaurs.

Luo thinks that dinosaurs only had a strong influence on limiting mammal diversity at larger sizes. Mammals did not evolve to be large or fast-running herbivores like elephants or deer until the dinosaurs were gone, he says.

As the first mammal able to eat plants, Luo says *Agilodocodon scansorius* broke "a very important barrier", because plants were more abundant than the insects eaten by other early mammals. Its spade-shaped front teeth would have enabled it to gnaw into bark to feed on tree gums or saps, much like a modern marmoset monkey, while the curved, horny claws on its hand and feet, a bit like those of some squirrels, suggests that it lived in trees or shrubs.

With shovel-like fingers for digging, a sprawling posture for crawling through tunnels, and short wide upper molars for foraging underground, *Docofossor* resembles the modern African golden mole. Just like this mole, it had lost one bone segment in its fingers, which would have strengthened its fingers for digging, Luo says.

### **Extreme lifestyle**

"We wouldn't be able to interpret those fossils if nothing like them lived today," says [Anne Weil](#) of Oklahoma State University in Stillwater. Burrowers have such an extreme lifestyle that they develop very distinctive skeletons, which have characteristics like longer arm bones and probing fingers, she says.

But although these animals occupied similar niches to modern-day mammals, these species were members of the Docodonta group, which is outside what we consider to be true mammals. "If we could go back to the Jurassic, we probably would think of these animals as furry mammals, but we might notice that they had funny heads or moved awkwardly," says Weil.

These Docodonts shared a common ancestor with extant mammals, but have no descendants living today. "If you went back and looked at the mid-Jurassic, our ancestors didn't look special. They were just one of many groups. Maybe we just got lucky," says Weil.

"It continually surprises me how new discoveries expose more and more structural and palaeoecologic diversity," says [Rich Cifelli](#) of the University of Oklahoma in Norman. He speculates that docodonts may have had a head start in diversifying compared with other early mammal relatives because they had complex molar teeth that are easily adapted for special roles.

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