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JURASSIC PERIOD MAMMAL TEETH FOUND; PREVAILING THEORIES CHALLENGED

Paleontologists have discovered three tiny teeth embedded in a piece of lower jawbone from a small Jurassic period mammal on the island of Madagascar, evidence that some of our mammalian ancestors roamed the Earth at exactly the same time as the dinosaurs, according to an article in the Sept. 2 Nature.

The finding more than doubles the age of the oldest known mammal from Madagascar. Until now, terrestrial fossils were all but unknown from Madagascar for this time interval.

These small, furry creatures, the size of a house mouse, lived in Madagascar during the Middle Jurassic period -- about 165 million years ago -- scampering under the feet of allosaurs and brachiosaurs, much earlier than scientists had previously thought. The findings also show that an advanced subgroup of mammals evolved in the Southern hemisphere, challenging the prevailing notion that it came from the north.

"Smack in the middle of the dinosaurs' heyday, our ancestors were living as well -- it's just that they were small and inconspicuous," said Andre R. Wyss, associate professor of geology at the University of California, Santa Barbara, and one of the authors of the article.

The National Geographic Society funded the research, a collaboration that included John J. Flynn and William F. Simpson, of the department of geology, the Field Museum of Natural History in Chicago; J. Michael Parrish of the department of biology, Northern Illinois University, DeKalb; Berthe Rakotosamimanana of the department of Paleontology, University d'Antananarivo, Madagascar; and, Andre R. Wyss, of the department of geology, UC, Santa Barbara.

"The most conspicuous and hence the most famous land animals of the Mesozoic Era were of course the dinosaurs," explained Wyss. "Less widely appreciated is the fact that furry animals -- mammals -- and dinosaurs sprang on an evolutionary scene at about the same time; the two groups lived side by side for more than 100 million years."

According to Wyss, two factors account for the popular misconception that mammals arose only after dinosaurs became extinct.

"First, early mammals were all quite small, chipmunk-sized or smaller, so they don't grab the popular imagination the way their giant Mesozoic contemporaries do," said Wyss.

"Second, apart from very late in the Mesozoic, the fossil record of mammals has been extremely sparse," he said. These fossils are unlikely to be spotted in the field by the naked eye, one reason for the dearth of information.

The finding of the teeth contradicts the widely-held idea that the subgroup of mammals encompassing most living forms (marsupials and placentals) came from the North. The teeth offer the first clear glimpse of mammalian evolution on the Southern continents during the mid-late Jurassic period, indicating a Gondwanan rather than a Northern origin for this mammal subgroup, as long assumed, said Wyss.

"This is the first mammal from this interval of time from Southern continents," he said, "earlier than anything in the North."

Most paleontologists live and work in the Northern Hemisphere, said

Wyss, another factor that introduces bias in the fossil record. "We are only beginning to fill in the fossil record of Madagascar. Much younger and much older fossils of land animals were known from there previously; now we are starting to fill in the middle."

The fossil teeth were not easy to find. Aside from the fact that they were located in a remote area, the three molars (see photograph) are each smaller than the head of a pin. They were sifted out of bags of sediment and identified during microscopic inventory at the Field Museum of Natural History. "We didn't realize that we'd found this until long after it had been collected," said Wyss. "We put bags of dirt on a truck, and then on a boat. That was three years ago. We were incredibly lucky."

The scientists chose to search for fossils on the island of Madagascar because it separated as an island so long ago. It hasn't been connected to Africa since the Jurassic period, and is therefore an excellent place to study evolution.

The teeth document the earliest occurrence of this dentally advanced group of mammals called Tribosphenida, a group encompassing the vast majority of living mammals -- marsupials plus placentals, said the scientists.

The fossils also contradict the estimates of scientists who study DNA to arrive at molecularly-based estimates of a Middle Jurassic divergence between the major groups of extant tribosphenidans, also called therians, said Wyss. "They try to predict how long ago they shared an ancestor. The fossil record indicates that the divergences between many kinds of living mammals are not nearly as ancient as molecular work suggests."

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Editors: An enlarged black and white jpeg photograph of the teeth is available.

WHAT OTHER PALEONTOLOGISTS ARE SAYING ABOUT THE FINDING:

"This is a remarkable discovery that provides new insights into the timing of particular early branching events in the family tree of mammals. It underscores how important fossils are for providing the temporal dimension necessary to test hypotheses based on molecular evidence and, at the same time, how extremely little we still know about early mammalian evolution, particularly from the Southern supercontinent of Gondwana." -- David W. Krause

(Krause has led five fossil-collecting expeditions to Madagascar in the 90s.)

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"The discovery of this new mammal is highly significant because it is an indication that this group of animals was present in the Southern Hemisphere, and that early radiation of mammals was not restricted to the Northern Hemisphere. It shows that scientists have underestimated the time of the beginning of radiation that led to modern groups of

mammals, and that radiation occurred in the Southern Hemisphere."

-- William A. Clemens

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