Molecular Biology Fills Gaps in Knowledge of Bat Evolution

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One in five mammals living on Earth is a bat, yet their evolutionary history is largely unknown because of a limited fossil record and conflicting or incomplete theories about their origins and divergence. Now, a research team including University of California, Riverside Biology Professor Mark Springer, has published a paper in the Jan. 28 issue of the journal Science that uses molecular biology and the fossil data to fill in many of the gaps.

Springer coauthors the paper, titled A Molecular Phylogeny for Bats Illuminates Biogeography and the Fossil Record, with William Murphy, Stephen J. O'Brien and Emma. C. Teeling of the National Cancer Institute's Laboratory of Genomic Diversity, Frederick, MD; Ole Madsen in the Department of Biochemistry at the University of Nijmegen, the Netherlands; and Paul Bates of the Harrison Institute's

Centre for Systematics and Biodiversity Research, Kent, U.K.

“The present work advances our understanding of where bats originated, when they diversified and how different bat families are related to each other,” Springer said. “It also quantifies the fraction of the fossil record that is missing for bats.”

The team, using DNA sequencing, analyzed data from portions of 17 nuclear genes from representatives of all bat families.

Their results support the hypothesis that the group of large fruit-eating bats from the tropics, that fly mostly during the day – known to biologists as megabats – emerged from four major lineages of smaller and more widely dispersed, mostly insect-eating, night-flying bats, known as microbats. These microbats – also known for their highly specialized echolocation – originated about 52 to 50 million years ago during a lush period of significant global warming in a region that is now North America.

This latest research helps fill gaps in the evolutionary history of one of the most diverse group of mammals on earth and the only mammals capable of powered flight. The fossil record alone left bat evolutionary history about 61 percent incomplete, according to Springer. Bats play a major ecological role as plant pollinators and insect predators.

For Springer, this latest research is significant because it shows that molecular information can contribute to resolving and illuminating long-standing problems in evolutionary biology.

The current findings lay the groundwork for further research that, Springer hopes, will expand the coverage of classifications of bats from the family level to the genus level and probe in more detail into the bat evolutionary record. He also plans to compare the completeness of the

bat fossil record with that of other mammals.

Source: University of California, Riverside