New explanation for the origin of high species diversity

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An international team of scientists have reset the agenda for future research in the highly diverse Amazon region by showing that the extraordinary diversity found there is much older than generally thought.

The findings from this study, which draws on research by the Academy of Natural Sciences' Dr. John Lundberg and other scientists, were published as a review article in this week's edition of *Science*. The study shows that Amazonian diversity has evolved as by-product of the Andean mountain uplift over millions of years, despite previous focus on the more recent history.

The vast Amazonian rainforest is arguably the most species-rich terrestrial ecosystem in the world, yet the timing of the original and evolutionary causes of this diversity are a matter of debate.

The authors compare modern diversity patterns with geological and molecular datasets and show that the highest species diversity in Amazonia today is found on a surface of Andean origin spanning more than a million square kilometers, which has been formed in the past 23 million years. This tight link between the geological history of the Andes and the development of the Amazon basin means that studies aiming to understand how the mega-diverse Amazonian forests have evolved need to look further back in time, to the past 20 million years.

Debate abounds on origin of Amazonian biodiversity

A wide range of scientific theories currently exist on the origin and complexity of the present day biodiversity in the Amazonian region. Though scientists have long suspected that the Andes influenced rainforest composition, the timing and causes have remained uncertain. In their review article, lead author Dr. Carina Hoorn of the University of Amsterdam, Lundberg, and their co-authors list the extraordinary flora and fauna that have evolved in the dynamic Amazonian landscape, which in turn has developed at a pace dictated by the reshuffling (Pacific) tectonic plates and subsequent uplift in the Andes. The paleogeographic evolution dictated by this geological reconfiguration included the formation of a vast wetland which, after the onset of the Amazon River around 10 million years ago, dried up and was open to colonization by plants and animals.

In this article, fittingly published in the International Year of Biodiversity, the authors encourage scientists to refocus when seeking explanations for the evolution of modern biodiversity. In the case of Amazonia, the pre-Quaternary flora and fauna already showed a very high level of species richness which was, in the case of reptiles and plants, even higher than found today.

"The Amazonian region, from its highest mountains to immense lowland rivers, supports a tremendous biological richness of species," said Lundberg, curator and Chaplin chair of ichthyology at the Academy of Natural Sciences in Philadelphia. "Many previously unseen species are discovered and documented every year."

More information: C. Hoorn, F.P. Wesselingh, H. ter Steege, M.A. Bermudez, A. Mora, J. Sevink, I. Sanmartín, A. Sanchez-Meseguer, C. L. Anderson, J.P. Figueiredo, C. Jaramillo, D. Riff, F.R. Negri, H. Hooghiemstra, J. Lundberg, T. Stadler, T. Sarkinen, A. Antonelli: 'Amazonia through time: Andean uplift, climate change, landscape evolution and biodiversity. *Science* (November 12, 2010).

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