

# Study finds Amazonian rainforests gave birth to the world's most diverse tropical region

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Uncontacted indigenous tribe in the Brazilian state of Acre. Credit: Gleilson Miranda / Governo do Acre / Wikipedia

A new study is suggesting many of the plants and animals that call Latin America home may actually have their roots in the Amazon.

The study, co-authored by Harvard Visiting Scholar Alexandre Antonelli and an international team of researchers, found that a dynamic process of colonization and speciation led to the formation of the American tropics, which is today the most [species-rich region](#) on the planet. The study is described in a May 14 paper published in the *Proceedings of the National Academy of Sciences*.

"We were astonished to detect so much movement across such different environments and over such large distances," said Antonelli, the study's lead author. "Up until now, these natural dispersal events were assumed to be quite rare. Our results show how crucial these events have been in the formation of tropical America's unique and outstandingly rich biodiversity."

Over tens of millions of years, thousands of species have naturally made their way to new regions, where some of them survived and adapted to new conditions. These adaptations added up, and when the offspring were sufficiently different from earlier generations, [new species](#) were formed.

Over time, this dynamic process occurred so many times in the American tropics that the area became the exceptionally diverse region we see today.

To understand that process, Antonelli and colleagues used information on the evolutionary relationships, distribution, and timing of the origin of thousands of tropical species to calculate how often species dispersed into new regions or new environments. Much of this information comes from natural history collections, including specimens at Harvard University Herbaria and the Museum of Comparative Zoology, where

Antonelli is currently working.

What they found, he said, is that while all regions in the American tropics have exchanged species with one another, Amazonia stood out as the main source.

"Two main factors seem to explain the key role of Amazonia in exporting so much diversity: its huge area, and the large amount of time that species have existed there. Together, these have increased the chances of species dispersing into new habitats and regions", says Antonelli.

For all the groups researchers examined—from plants to birds to frogs to mammals, and even frogs, snakes and lizards—Antonelli said that pattern remained essentially the same, suggesting that biotic movements are important for generating diversity among all life forms.

"Most evolutionary research focuses on how new species form. But we want to understand how whole ecosystems evolve, and what makes some regions much more species-rich than others. This is important because it shows us how plants and animals deal with new environments and what factors determine biodiversity", Antonelli concludes.

This study highlights the far-reaching importance of tropical regions - comprising rainforests, savannas and mountain ecosystems, among others - in sustaining the world's biodiversity. Most tropical ecosystems are now threatened due to human activities, and many species are on the edge of extinction, further highlighting the need for immediate and widespread protection.

"This study brings together a truly massive amount of data and distills it down in a way that gives crucial insights into the history of biodiversity in the tropics," said Kyle Dexter, Senior Lecturer in the School of

GeoSciences at the University of Edinburgh and Research Associate at Royal Botanic Garden Edinburgh." The previous paradigm in the tropics focused on local evolution when explaining high tropical diversity, but clearly there is a shift happening to acknowledge the importance of dispersal, and this study contributes decisively to this shift."

Going forward, Antonelli hopes to continue to examine the dynamic processes that drive the distribution and evolution of species, especially in [tropical regions](#). To this end, his group is combining data and techniques from several disciplines, from fossils to genomes and from fieldwork to software development.

"Biodiversity is the dark matter of our planet: we know there must be millions of species that we haven't found yet. Finding, understanding, and protecting this diversity is probably humanity's toughest but most important challenge".

**More information:** Alexandre Antonelli et al., "Amazonia is the primary source of Neotropical biodiversity," *PNAS* (2018).

[www.pnas.org/cgi/doi/10.1073/pnas.1713819115](http://www.pnas.org/cgi/doi/10.1073/pnas.1713819115)

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