



Smithsonian Tropical Research Institute
Instituto Smithsonian de Investigaciones Tropicales

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Direct link established between tropical tree- and insect diversity

Contact: Scott Miller, millers@si.edu, 202 633-5135

Higher tree species diversity leads directly to higher diversity of leaf-eating insects, researchers report in the July 13, 2006 early-online version of the journal *Science*.

“Understanding the drivers of the high diversity in tropical forests has been a major question since Darwin and Wallace visited tropical forests—and even before,” Smithsonian co-author Scott Miller writes, “We found that higher tropical tree diversity explains why there are more leaf-eating insects in tropical than in temperate forests.”

It may be obvious that forests with greater numbers of tree species should support a wider variety of leaf-eating insects than do less diverse forests, but no one had ever done the experiment to rule out the major alternative explanation: that insect species in the tropics eat the leaves of a smaller number of host trees (are more host specific), which would also result in more insect species in a given area. This study presents the best experimental evidence to date to account for the latitudinal gradient in herbivorous insect biodiversity.

The international effort involved a comparison of insects’ eating habits in temperate sites in Central Europe and lowland tropical sites near Mandang, Papua New Guinea (PNG). The team of insect ecologists, taxonomists and field assistants led by Vojtech Novotny, from the University of South Bohemia, Czech Republic, includes co-authors from the Smithsonian’s National Museum of Natural History (NMNH), National Zoological Park (NZIP) and Tropical Research Institute (STRI) and the University of Minnesota in the U.S. and Comenius University in Slovakia.

The team compared 850 species of leaf-eating insects from 14 tree species in temperate floodplain forest sites in Moravia and from 14 tree species in lowland tropical sites in Papua New Guinea (PNG). They also compared caterpillars from 8 trees in Slovakia, and 8 trees in PNG. Tree species were chosen such that they would have the same evolutionary relationships at each site, making the comparisons equivalent and eliminating another confounding factor.

After collecting the insects, researchers ran feeding trials by presenting larval and adult insects with foliage. They gathered and analyzed a total of 26,970 feeding observations.

Based on this latitudinal comparison they concluded that individual temperate and tropical tree species support similar numbers of leaf-eating insects. Host specificity did not differ

Smithsonian Institution
Smithsonian Tropical Research Institute
Apartado 2072
Balboa, Ancón
República de Panamá
Tel. 507.212.8216
FAX 507.212.8148
Email: kingb@tivoli.si.edu



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significantly between temperate and tropical communities—therefore, the greater number of tree species in the tropics is the best explanation for higher insect diversity.

Only 2 million of the estimated 5-10 million insect species on this planet have been identified. Nearly nothing is known about the behavior or environmental impact of most insect species. The conclusion that tree diversity drives insect diversity is a great step forward in the understanding of life on earth.

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Publication:

Vojtech Novotny,^{1*} Pavel Drozd,² Scott E. Miller,³ Miroslav Kulfan,⁴ Milan Janda,¹ Yves Basset,⁵ George D. Weiblen⁶ “Why Are There So Many Species of Herbivorous Insects in Tropical Rainforests?” *Science Express*, 27 April 2006; accepted 13 June 2006; Published online 13 July 2006; 10.1126/science.1129237

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The Smithsonian Tropical Research Institute (STRI), a unit of the Smithsonian Institution, headquartered in Panama City, Panama, furthers our understanding of tropical nature and its importance to human welfare, trains students to conduct research in the tropics and promotes conservation by increasing public awareness of the beauty and importance of tropical ecosystems. www.stri.org

The Smithsonian has collaborated in the long term research and training program in Papua New Guinea since 1998—contributing to our long-term interest in tropical forest biology—also represented by the STRI’s Center for Tropical Forest Science and canopy access cranes and the work of entomologist Terry Erwin at the Smithsonian’s National Museum of Natural History.

Photo: herbivory.jpg, Marcos Guerra, STRI