



Media only: English-language media: Beth King (703) 487-3770, x8216;
+507-212-8016 (direct, Panama); kingb@si.edu
Spanish-language media: Monica Alvarado (703) 487-3770, x8023;
+507-212-8023; alvaradom@si.edu

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Eating Like a Bird Helps Forests Grow

Lions, tigers and bears top the ecological pyramid—the diagram of the food chain that every school child knows. They eat smaller animals, feeding on energy that flows up from the base where plants convert sunlight into carbohydrates. A new Smithsonian study examines complex interactions in the middle of the pyramid, where birds, bats and lizards consume insects. These predators eat enough insects to indirectly benefit plants and increase their growth.

“Our findings are relevant to natural communities like grasslands and forests, but also to human food production, as these insect-eating animals also reduce insect pests on crop plants,” said Sunshine Van Bael, biologist at the Smithsonian Tropical Research Institute in Panama.

Previous theory on food webs suggested that the impact of insect-eaters on plants would be minimal because animals like birds feed not only on insects that eat plants (benefitting the plants), but also on predatory insects such as spiders who prey on herbivorous insects (which would not benefit plant communities). The theory suggested, for example, that if birds eat a lot of spiders, caterpillars would be “released” from spider predation and more would survive to consume more plant material. The authors found that this theory did not hold true; in fact, the birds simply ate the spiders *and* the caterpillars.

The authors reviewed more than 100 studies of insect predation by birds, bats or lizards from four continents. They found that the species of the predator didn’t make much of a difference. By consuming both herbivores and their insect predators, insect eaters collectively reduced damage to plant communities by 40 percent, which resulted in a 14 percent increase in plant biomass.

“It’s no longer apt to say that one ‘eats like a bird,’” Van Bael said. “Our study shows that birds, bats and lizards act as one big vacuum cleaner up in the treetops. Everything’s on the menu.”

“Our study shows that birds, bats and lizards protect plants, underscoring the importance of conservation of these species in the face of global change,” summed up lead author Kailen Mooney, professor of ecology and evolutionary biology at the University of California-Irvine.

Co-authors of this study, published online by the prestigious journal, *Proceedings of the National Academy of Sciences*, also include researchers from the University of Maryland, the University of Missouri—St. Louis, the University of Toledo, and the Smithsonian’s Migratory Bird Center at the National Zoological Park.

The Smithsonian Tropical Research Institute, headquartered in Panama City, Panama, is a unit of the Smithsonian Institution. The institute furthers the 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 beauty and importance of tropical ecosystems. Web site: www.stri.org.

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Mooney, Kailen, and Daniel Gruner, Nicholas Barber, Sunshine Van Bael, Stacy Philpott and Russell Greenberg. “Interactions among predators and the cascading effects of vertebrate insectivores on arthropod communities and plants” *Proceedings of the National Academy of Sciences* (2010) www.pnas.org/doi/10.1073/pnas.1001934107