



Ecosphere Ecology Ecological Monographs Ecological Applications Frontiers Bulletin Ecological Archives

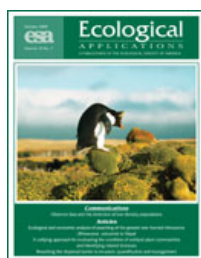
ESA Publications Home Online Journals Home EcoTrack Subscriptions

Quick Search

All Publications > Ecological Applications > October 2009 > Functional richness and ecosystem services: bird predation on arthropo... [Advanced Search](#)

Volume 19, Issue 7 (October)

[< Previous](#) [Next >](#)



[Current Issue](#)
[Available Issues](#)
[Preprints](#)

Share this Article

[Share](#) |

Journal Information

ISSN: 1051-0761
Frequency: 8 times per year

[Mission and Scope](#)

[Types of contributions](#)

[Editorial Board](#)

[Staff](#)

[Instructions for Authors](#)

[Reviewer Guidelines](#)

[Permissions](#)

[< Previous Article](#)

Volume 19, Issue 7 (October 2009)

[Next Article >](#)

[Add to Favorites](#)

| [Email](#)

| [Download to Citation Manager](#)

| [Track Citations](#)

| [Permissions](#)

[Full-text](#)

[PDF](#)

Philpott, Stacy M., Oliver Soong, Jacob H. Lowenstein, Astrid Luz Pulido, Diego Tobar Lopez, Dan F. B. Flynn, and Fabrice DeClerck. 2009. Functional richness and ecosystem services: bird predation on arthropods in tropical agroecosystems. *Ecological Applications* 19:1858–1867. <http://dx.doi.org/10.1890/08-1928.1>

Articles

Functional richness and ecosystem services: bird predation on arthropods in tropical agroecosystems

Stacy M. Philpott^{1,6}, Oliver Soong², Jacob H. Lowenstein^{3,4}, Astrid Luz Pulido⁵, Diego Tobar Lopez⁵, Dan F. B. Flynn³, and Fabrice DeClerck⁵

¹Department of Environmental Sciences, University of Toledo, Toledo, Ohio 43606 USA

²Donald Bren School of Environmental Science and Management, University of California, Santa Barbara, California 93106 USA

³Department of Ecology, Evolution, and Environmental Biology, Columbia University, New York, New York 10027 USA

⁴Department of Ichthyology, American Museum of Natural History, New York, New York 10024 USA

⁵Department of Agriculture and Agroforestry, Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), Turrialba, Costa Rica

In agroecosystems, biodiversity correlates with ecosystem function, yet mechanisms driving these relationships are often unknown. Examining traits and functional classifications of organisms providing ecosystem functions may provide insight into the mechanisms. Birds are important predators of insects, including pests. However, biological simplification of agroforests may decrease provisioning of this pest removal service by reducing bird taxonomic and functional diversity. A recent meta-analysis of bird exclusion studies from a range of agroecosystems in Central America concluded that higher bird richness is associated with significantly greater arthropod removal, yet the mechanism remains unclear. We conducted a meta-analysis of the same data to examine whether birds demonstrate functional complementarity in tropical agroforests. We classified birds according to relevant traits (body mass, foraging strategy, foraging strata, and diet) and then examined how design of functional classification, including trait selection, classification methods, and the functional diversity metric used affect the suitability of different classifications as predictors of ecosystem services. We determined that vegetation characteristics are not likely drivers of arthropod removal by birds. For some functional classifications, functional richness positively correlated with arthropod removal, indicating that species complementarity may be an important mechanism behind this ecosystem function. The predictive ability of functional classifications increased with the number of traits included in the classification. For the two best classifications examined, functional group richness was a better predictor of arthropod reduction than other metrics of functional diversity (FD and Rao's *Q*). However, no functional classification predicted arthropod removal better than simple species richness; thus other factors may be important. Our analysis indicates that the sampling effect may also play a role, as one species and two functional groups were responsible for disproportionate effects of arthropod removal.

Keywords: [agroforest](#), [biodiversity](#), [birds](#), [Central America](#), [ecosystem function](#), [exclusion experiment](#), [functional richness](#), [insects](#), [meta-analysis](#), [predation](#), [species complementarity](#), [species trait](#)

Received: October 16, 2008; Revised: February 9, 2009; Accepted: February 17, 2009

⁶ E-mail: stacy.philpott@utoledo.edu

Cited by

Stefan W. Ferger, Katrin Böhning-Gaese, Wolfgang Wilcke, Yvonne Oelmann, Matthias Schleuning. (2013) Distinct carbon sources indicate strong differentiation between tropical forest and farmland bird communities. *Oecologia* 171:2, 473-486
Online publication date: 1-Feb-2013.
[CrossRef](#)

Valerie E. Peters, Russell Greenberg. (2013) Fruit Supplementation Affects Birds but not Arthropod Predation by Birds in Costa Rican Agroforestry Systems. *Biotropica* 45:1, 102-110
Online publication date: 1-Jan-2013.
[CrossRef](#)

Stacy M. Philpott. 2013. Biodiversity and Pest Control Services. , 373-385.
[CrossRef](#)

Sandra Quijas, Patricia Balvanera. 2013. Biodiversity and Ecosystem Services. , 341-356.

[CrossRef](#)

Luc Barbaro, Eckehard G. Brockerhoff, Brice Giffard, Inge Halder. (2012) Edge and area effects on avian assemblages and insectivory in fragmented native forests. *Landscape Ecology* 27:10, 1451-1463

Online publication date: 1-Dec-2012.

[CrossRef](#)

Gregorio I. Gavier-Pizarro, Noelia C. Calamari, Jeffrey J. Thompson, Sonia B. Canavelli, Laura M. Solari, Julieta Decarre, Andrea P. Gojman, Romina P. Suarez, Jaime N. Bernardos, María Elena Zaccagnini. (2012) Expansion and intensification of row crop agriculture in the Pampas and Espinal of Argentina can reduce ecosystem service provision by changing avian density. *Agriculture, Ecosystems & Environment* 154, 44-55

Online publication date: 1-Jul-2012.

[CrossRef](#)

MATIAS E. MASTRANGELO, MICHAEL C. GAVIN. (2012) Trade-Offs between Cattle Production and Bird Conservation in an Agricultural Frontier of the Gran Chaco of Argentina. *Conservation Biology* no

Online publication date: 1-Jul-2012.

[CrossRef](#)

Brice Giffard, Emmanuel Corcket, Luc Barbaro, Hervé Jactel. (2011) Bird predation enhances tree seedling resistance to insect herbivores in contrasting forest habitats. *Oecologia*

Online publication date: 3-Aug-2011.

[CrossRef](#)

Palatty Alleesh Sinu. (2011) Avian pest control in tea plantations of sub-Himalayan plains of Northeast India: mixed-species foraging flock matters. *Biological Control*

Online publication date: 1-Jun-2011.

[CrossRef](#)

Y. Clough, J. Barkmann, J. Jührbandt, M. Kessler, T. C. Wanger, A. Anshary, D. Buchori, D. Cicuzza, K. Darras, D. D. Putra, S. Erasmí, R. Pitopang, C. Schmidt, C. H. Schulze, D. Seidel, I. Steffan-Dewenter, K. Stenchly, S. Vidal, M. Weist, A. C. Wielgoss, T. Tschardtke.

(2011) Combining high biodiversity with high yields in tropical agroforests. *Proceedings of the National Academy of Sciences*

Online publication date: 2-May-2011.

[CrossRef](#)

Stacy M. Philpott, Peter Bichier. (2011) Effects of shade tree removal on birds in coffee agroecosystems in Chiapas, Mexico. *Agriculture, Ecosystems & Environment*

Online publication date: 5-Mar-2011.

[CrossRef](#)

Niels Blaum, Eva Mosner, Monika Schwager, Florian Jeltsch. (2011) How functional is functional? Ecological groupings in terrestrial animal ecology: towards an animal functional type approach. *Biodiversity and Conservation*

Online publication date: 30-Jan-2011.

[CrossRef](#)

Mark Sagoff. (2011) The quantification and valuation of ecosystem services. *Ecological Economics* 70:3, 497-502

Online publication date: 15-Jan-2011.

[CrossRef](#)

Erik Heyman, Bengt Gunnarsson. (2011) Management effect on bird and arthropod interaction in suburban woodlands. *BMC Ecology* 11:1, 8

Online publication date: 1-Jan-2011.

[CrossRef](#)

R. I. Smith, J. McP. Dick, E. M. Scott. (2011) The role of statistics in the analysis of ecosystem services. *Environmetrics* n/a-n/a

Online publication date: 1-Jan-2011.

[CrossRef](#)

Rena Borkhataria, Jaime A. Collazo, Martha J. Groom, Adrian Jordan-Garcia. (2011) Shade-grown coffee in Puerto Rico: Opportunities to preserve biodiversity while reinvigorating a struggling agricultural commodity. *Agriculture, Ecosystems & Environment*

Online publication date: 1-Jan-2011.

[CrossRef](#)

JOSEP PIÑOL, XAVIER ESPADALER, NÚRIA CAÑELLAS, JORDI MARTÍNEZ-VILALTA, JOSÉ A. BARRIENTOS, DANIEL SOL.

(2010) Ant versus bird exclusion effects on the arthropod assemblage of an organic citrus grove. *Ecological Entomology* 35:3, 367-376

Online publication date: 1-Jun-2010.

[CrossRef](#)

K. A. Mooney, D. S. Gruner, N. A. Barber, S. A. Van Bael, S. M. Philpott, R. Greenberg. (2010) Interactions among predators and the cascading effects of vertebrate insectivores on arthropod communities and plants. *Proceedings of the National Academy of Sciences*

107:16, 7335-7340

Online publication date: 20-Apr-2010.

[CrossRef](#)

ESA Publications Office | 127 W. State Street | Suite 301 | Ithaca, NY 14850-5427 | phone 607-255-3221 | email esa_journals@cornell.edu

Frontiers Editorial Office | 1990 M Street, NW | Suite 700 | Washington, DC 20036 | phone 202-833-8773 | email frontiers@esa.org

ESA Headquarters | 1990 M Street, NW | Suite 700 | Washington, DC 20036 | phone 202-833-8773 | email esahq@esa.org

Copyright Ecological Society of America. All rights reserved.

