Biodiversity loss and emerging infectious diseases
Emerging infectious diseases, 1940-2004
(335 total)

Jones et al. Nature 2008
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**Zoonotic 75%**
White-footed mouse: an important disease reservoir
Borrelia burgdorferi

Babesia microti

Anaplasma phagocytophilum
United States. Data from the CDC.

Lyme disease cases over the years from 1982 to 2012, with the number of cases Multiply by 10.

Babesiosis, New York State (data from NYSDOH)

Human babesiosis cases from 1999 to 2013.

Granulocytic anaplasmosis cases from 1994 to 2010.

Blacklegged tick image.
Regulation of disease risk by predator diversity?

Ye olde catfood can method
87 sites in two consecutive years

Predator assemblages and tick infection
Eat rodents

Deflect tick meals from rodents

Eat few rodents
Displace other mesopredators
HYPOTHESIS:
Diverse predator assemblages will reduce tick-feeding on small rodents and therefore reduce disease risk.
Unpublished data, not shown
Severe mammal declines coincide with proliferation of invasive Burmese pythons in Everglades National Park


*Department of Biology, Davidson College, Davidson, NC 28035; †Department of Fish and Wildlife Conservation, Virginia Tech, Blacksburg, VA 24061; ‡Fort Collins Science Center, US Geological Survey, Fort Collins, CO 80525; §Homestead, FL 33034; ††Fort Lauderdale Research and Education Center, University of Florida, Davie, FL 33324; ‡‡University of Florida, Gainesville, FL 32611; §§State Museum of Pennsylvania, Harrisburg, PA 17120; ¶¶Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC 27606; and ‖‖Southeast Ecological Science Center, Charleston, SC 29407

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A

ENP temporal variation
- 1996 – 1997 (6,599 km)
- 2008 – 2011 (56,971 km)

Number observed per 100 km

B

Current spatial variation
- Core (ENP; 56,971 km)
- Peripheral (4 sites; 4,794 km)
- Extralimit (2 sites; 817 km)

Peripheral - Core
- +0.01
- +0.06
- +0.49
- +0.30
- +0.03
- +0.04
- +0.01
- -0.01
- -0.03

Extralimit - Core
- +0.09
- 0
- +1.64
- +2.83
- +0.09
- -0.01
- -0.01
- -0.01
- +0.05

Rodents
Rabbits
Opossum
Raccoon
Frogs
Coyote
Bobcat
Panther
Deer
Mammal decline, linked to invasive Burmese python, shifts host use of vector mosquito towards reservoir hosts of a zoonotic disease

Isahak J. Hoyer¹, Erik M. Blosser¹, Carolina Acevedo¹, Anna Carols Thompson¹, Lawrence E. Reeves² and Nathan D. Burkett-Cadena³

Figure 2. Shifts in host use by Cx. cedecei in the Everglades before [18] after (current study) invasion by Burmese python. Animals appearing on the right increased in relative host use between 1979 and 2016, while those on the left decreased in relative host use between 1979 and 2016, while those on the right increased over the same period.

Everglades virus
Biodiversity inhibits parasites: Broad evidence for the dilution effect

David J. Civitello¹, Jeremy Cohen², Hiba Fatima², Neal T. Halstead², Josue Liriano², Taegan A. McMahon², C. Nicole Ortega², Erin Louise Sauer², Tanya Sehgal², Suzanne Young², and Jason R. Rohr

Department of Integrative Biology, University of South Florida, Tampa, FL 33620

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Does biodiversity generally reduce disease risk?

We addressed the generality of the dilution effect hypothesis with a formal meta-analysis. We searched the published literature for all available data sources, including experimental and observational studies of human and wildlife diseases, to rigorously assess the generality of this phenomenon. We estimated the effect of biodiversity on parasite abundance using the Hedges’ g effect size (thus negative values indicate dilution effects) and used a multilevel model to include nonindependence among effect sizes that arise from the same parasite species or experiments. Last, we compared the evidence for dilution effects with the evidence for associational resistance, an analogous hypothesis that posits that plant diversity inhibits the abundance of herbivores via mechanisms similar to those hypothesized to drive dilution effects (20). If both of these natural enemies are
Meta-analysis on 202 studies, 61 parasite species
D. Civitello, J. Rohr, and colleagues (PNAS 2015)
Does biodiversity generally reduce disease risk?

Yes.