



Nrf2 signalling in health and disease



Article

[Evaluate](#)
[Dissent](#)

9 Mutualisms in a changing world: an evolutionary perspective.

Toby Kiers E, Palmer TM, Ives AR, Bruno JF, Bronstein JL

Ecol Lett. 2010 Dec; 13(12):1459-74

[Abstract on PubMed](#) | [Full Text](#) | [Related Articles](#) | [Citations on Google Scholar](#) [Find it @UF](#)

Relevant Sections

[Export](#) [Email](#) [Add to MyF1000](#)

Post to

Comments

[Comment on this article](#)

No comments yet.

2011 Microscopy Webinar Series

Super-Resolution Live Cell Imaging

October 14, 2011

Sign up online at
apiwebinars.webex.com



Evaluations

[Classification Key](#)

Evaluated by [Nicholas Fabina and Sebastian Schreiber](#) NEW 23 Sep 2011 | [Fabio Bulleri and Ferdinando Boero](#)

Mutualisms are increasingly recognized for their importance in various ecosystems, yet anthropogenic changes are endangering the maintenance of mutualistic interactions. Kiers, Palmer, Ives, Bruno, and Bronstein concisely summarize a good portion of the literature on mutualisms in a changing environment and outline future directions for research in this area. For those unable to read the whole article, the authors provide an excellent, one-page figure summarizing the numerous pressures on mutualistic relationships, current ecological and evolutionary responses, and critical questions for researchers.

Mutualisms – or cooperative interactions among different species – are notable because of the interdependence of the partners. Changing environmental conditions can directly and indirectly modify the parameters that promote mutualistic partnerships. Two considerations are integral to assessing whether mutualisms are maintained: are mutualisms resilient in the face of anthropogenic changes and, if not, can the partners evolve quickly enough? The authors outline the three most-common responses. First, a shift to antagonism (e.g. relaxed environmental pressures or the absence of third-party antagonists remove selection for mutualism). Second, switches to novel partners, which begs the question of whether generalists (with many potential partners) or specialists (with few tightly-coevolved partners) are better-equipped for change. Third, abandonment of the mutualism, in which one or both partners survive, but the ecological effects of the mutualism, such as nutrient fixing or carbon sequestration, are limited or gone. The authors provide a detailed summary of the literature in these areas, but also provide [counter] examples of mutualisms that may be unaffected or flourishing in the face of change, and call for further research into the evolutionary processes in mutualistic communities. Finally, Kiers et al. discuss the characteristics of a resilient mutualism and the essential ingredients for future research, including deeper explorations of the ecological and evolutionary history of systems, and examining how current trajectories compare to historical conditions.

Competing interests: None declared

[Cite this evaluation](#)

Evaluated by:
[Nicholas Fabina](#) and
[Sebastian Schreiber](#)
University of California,
USA
[Ecology](#)
23 Sep 2011

Rating 6
Recommended



This paper provides a fresh perspective on evolutionary effects of global climate changes on mutualism, a class of species interactions that has existed since the beginning of life. We sense that this paper will inspire ecologists, evolutionary biologists and conservation practitioners.

Although negative species interactions are often viewed as the main drivers of community structure, in the last two decades, positive species interactions have received growing recognition for their role in the functioning of a plethora of natural systems. This paper examines how current anthropogenic disturbances and global climate changes could alter the evolutionary trajectories of mutualisms, formulating (and providing hints to address them) two key questions: i) are mutualistic interactions resilient or flexible enough to withstand current human perturbations?; ii) if they cannot, in their current state, can rapid evolution preserve partnerships over the decadal temporal scales characterizing human perturbations?

Evaluated by:
[Fabio Bulleri](#) and
[Ferdinando Boero](#)
Universita' del Salento,
Italy
[Ecology](#)
03 Mar 2011

Rating 8
Must Read

A number of scenarios are proposed (with illuminating examples) to illustrate potential evolutionary responses to human disturbances, including switches to antagonism or alternative partners, as well as loss or reinforcement of mutualism. The authors then attempt to identify features of mutualistic interactions that are likely to promote their own persistence, such as lack of strict dependence, ability to evolve rapidly to changing conditions, partnerships that enable the exploitation of new niches or to broaden tolerance to changing conditions, control over partners, tolerance of short-term costs associated with mutualism and the intrinsic ability of partners to buffer against fluctuations in environmental conditions. Laudably, this comprehensive account is written without losing sight of the complex array of species interactions operating in real ecological systems. The authors conclude by identifying the most promising research avenues for advancing our ability to anticipate future scenarios of mutualistic-interaction breakdowns, and highlighting major hurdles to their conservation. In summary, this paper provides a modern perspective on a class of species interactions that has existed since the beginning of life and will inspire ecologists, evolutionary biologists and conservation practitioners.

Competing interests: None declared

[Cite this evaluation](#)

[Cite this page](#)



[Evaluated Articles](#) | [Rankings](#) | [F1000 Reports](#) | [F1000 Posters](#) | [Faculty](#) | [Naturally Selected](#)
[About](#) | [FAQs](#) | [Press Office](#) | [Contact](#) | [Register](#) | [Subscribe](#) | [Sponsorship](#) | [Affiliates](#) | [Science Navigation Group](#)

© 2000-2011 Faculty of 1000 Ltd. ISSN 1759-796X Legal | Partner of HINARI CrossRef

