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Unmasking the delusive appearance of negative frequency-dependent selection

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A recommendation of

Brisson D. 2017. Negative frequency-dependent selection is frequently confounding. *bioRxiv* 113324, ver. 3 of 20th June 2017; doi: [10.1101/113324](https://doi.org/10.1101/113324)

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Explaining the processes that maintain polymorphisms in a population has been a fundamental line of research in evolutionary biology. One of the main mechanisms identified that preserves genetic diversity is negative frequency-dependent selection (NFDS), which constitutes a powerful framework for interpreting the presence of persistent polymorphisms. Nevertheless, a number of patterns that are often explained by invoking NFDS may also be compatible with, and possibly more easily explained by, different processes.

In the present manuscript [1], Brisson acknowledges first that genuine NFDS has been instrumental for our understanding on the dynamics that perpetuate polymorphisms, and that the power and importance of NFDS cannot be disregarded. Second, the author aims at identifying certain of the processes that may result in maintenance of genetic diversity, and whose outcome may be mistaken for NFDS, namely directional selection in changing environments, density-dependent fitness, multiple niche selection and community diversity. The author claims that systematic resort to NFDS as explanatory device may have lead to its application to systems where it does not apply or that do not fulfil the basic assumptions of NFDS. The author struggles in the text to provide with a precise, verbal definition of NFDS, and the exchanges with the reviewers during the recommendation process show that agreeing on such a verbal definition of NFDS is not trivial. Probably a profound mathematical formulation of the varying value of a genotype's fitness relative to other competing ones as a function of their frequency (developing further the synthesis by Heino [2]) may still be wanting.

Indeed, the text is intended for a broad audience of evolutionary biologists with operational mathematical knowledge and interest in models, rather than for modellers or biomathematicians. Nevertheless, the manuscript is rich in references to original literature, elaborates on interesting lines of thought and discussion and will hopefully trigger novel experimental and formal research to clarify the role of NFDS and to discern between alternative mechanisms that may render similar patterns of maintenance of genetic diversity.

References

- [1] Brisson D. 2017. Negative frequency-dependent selection is frequently confounding. *bioRxiv* 113324, ver. 3 of 20th June 2017. doi: [10.1101/113324](https://doi.org/10.1101/113324)
- [2] Heino M, Metz JAJ and Kaitala V. 1998. The enigma of frequency-dependent selection. *Trends in Ecology & Evolution* 13: 367-370. doi: [1016/S0169-5347\(98\)01380-9](https://doi.org/10.1016/S0169-5347(98)01380-9)

Appendix

Reviews by David Baltrus and two anonymous reviewers, authors' replies and recommender's decisions:
<http://dx.doi.org/10.24072/pci.evolbiol.100024>