



Peer Community In Evolutionary Biology

The spread of chromosomal inversions as a mechanism for reinforcement

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Dagilis AJ, Kirkpatrick M (2016) Prezygotic isolation, mating preferences, and the evolution of chromosomal inversions. bioRxiv, ver. 1, peer-reviewed and recommended by Peer Community in Evolutionary Biology. <https://doi.org/10.1111/evo.12954>

Submitted: 13 December 2016, Recommended: 13 December 2016

Cite this recommendation as:

Roze, D. and Broquet, T. (2017) The spread of chromosomal inversions as a mechanism for reinforcement. *Peer Community in Evolutionary Biology*, 100005. [10.24072/pci.evolbiol.100005](https://doi.org/10.24072/pci.evolbiol.100005)

Published: 13 December 2016

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Several examples of chromosomal inversions carrying genes affecting mate choice have been reported from various organisms. Furthermore, inversions are also frequently involved in genetic isolation between populations or species. Past work has shown that inversions can spread when they capture not only some loci involved in mate choice but also loci involved in incompatibilities between hybridizing populations [1]. In this new paper [2], the authors derive analytical approximations for the selection coefficient associated with an inversion suppressing recombination between a locus involved in mate choice and one (or several) locus involved in Dobzhansky-Muller incompatibilities. Two mechanisms for mate choice are considered: assortative mating based on the allele present at a single locus, or a trait-preference model where one locus codes for the trait and another for the preference. The results show that such an inversion is generally favoured, the selective advantage associated with the inversion being strongest when hybridization is sufficiently frequent. Assuming pairwise epistatic interactions between loci involved in incompatibilities, selection for the inversion increases approximately linearly with the number of such loci captured by the inversion. This paper is a good read for several reasons. First, it presents the problem clearly (e.g. the introduction provides a clear and concise presentation of the issue and past work) and its crystal-clear writing facilitates the reader's understanding of theoretical approaches and results. Second, the analysis is competently done and adds to previous work by showing that very general conditions are expected to be favourable to the spread of the type of inversion considered here. And third, it provides food for thought about the role of inversions in the origin or the reinforcement of divergence between nascent species. One result of this work is that an inversion linked to pre-zygotic isolation "is favoured so long as there is viability selection against recombinant genotypes", suggesting that genetic incompatibilities must have evolved first and that inversions capturing mating preference loci may then enhance pre-existing reproductive isolation. However, the results also show that inversions are more likely to be favoured in hybridizing populations among which gene flow is still high,

rather than in more strongly isolated populations. This matches the observation that inversions are more frequently observed between sympatric species than between allopatric ones.

References:

[1] Trickett AJ, Butlin RK. 1994. Recombination Suppressors and the Evolution of New Species. *Heredity* 73:339-345. doi: [10.1038/hdy.1994.180](<https://doi.org/10.1038/hdy.1994.180>)

[2] Dagilis AJ, Kirkpatrick M. 2016. Prezygotic isolation, mating preferences, and the evolution of chromosomal inversions. *Evolution* 70: 1465–1472. doi: [10.1111/evo.12954](<https://doi.org/10.1111/evo.12954>)

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