Climate change promotes hybridisation between deeply divergent species

Daniele Canestrelli[1], Roberta Bisconti[1], Andrea Chiocchio[1], Luigi Maiorano[2,3], Mauro Zampiglia[1] and Giuseppe Nascetti[1]

[1] Department of Ecological and Biological Science, Università degli Studi della Tuscia, Viterbo, Italy
[2] Department of Biology and Biotechnology 'Charles Darwin', University of Roma 'La Sapienza', Rome, Italy
[3] Department of Integrative Marine Ecology, Stazione Zoologica Anton Dohrn, Naples, Italy

ABSTRACT

Rare hybridisations between deeply divergent animal species have been reported for decades in a wide range of taxa, but have often remained unexplained, mainly considered chance events and reported as anecdotal. Here, we combine field observations with long-term data concerning natural hybridisations, climate, land-use, and field-validated species distribution models for two deeply divergent and naturally sympatric toad species in Europe (*Bufo bufo* and *Bufotes viridis* species groups). We show that climate warming and seasonal extreme temperatures are conspiring to set the scene for these maladaptive hybridisations, by differentially affecting life-history traits of both species. Our results identify and provide evidence of an ultimate cause for such events, and reveal that the potential influence of climate change on interspecific hybridisations goes far beyond closely related species. Furthermore, climate projections suggest that the chances for these events will steadily increase in the near future.

Subjects Ecology, Evolutionary Studies, Zoology
Keywords Climate change, Hybridisation, Pre-mating reproductive barriers, Life-history traits

INTRODUCTION

Hybridisation is a widespread phenomenon in nature (*Mallet, 2005*). However, its frequency, diversity of outcomes, underlying mechanisms, its role in the evolutionary process, and how to deal with it in conservation biology have been controversial topics for more than a century (*Arnold, 2006*; *Schwenk, Brede & Streit, 2008*). Much of our knowledge about the link between hybridisation dynamics in animals and climate changes, comes from studies of hybrid zones (*Hewitt, 2011*), where the reshuffling of species' ranges in response to changing climates brought into contact closely related and previously allopatric species. Pre-mating reproductive barriers could be incomplete between these species, and their genomes could still be porous to introgression, with several far reaching implications (*Mallet, 2005*; *Arnold, 2006*; *Schwenk, Brede & Streit, 2008*; *Hewitt, 2011*). Not surprisingly, species of ancient divergence and with a long-lasting history of sympatry have contributed the least to this body of knowledge (*Mallet, 2005*; *Schwenk, Brede & Streit, 2008*). These species have had ample opportunity to evolve strong pre-mating reproductive barriers, either as a by-product of a longer allopatric divergence

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Corresponding author
Roberta Bisconti, bisconti@unitus.it

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