Interspecific interactions and evolution of reproductive isolation in two species of nightingales

Radka Reifová (Storchová)
Department of Zoology, Charles University in Prague, Czech Republic

Co-authors: Jiří Reif, Institute for Environmental Studies, Charles University in Prague, Czech Republic, Jana Vokurková, Department of Ecology, Charles University in Prague, Czech Republic, Jitka Fischerová, Department of Zoology, Charles University in Prague, Czech Republic, Tereza Petrusková, Department of Ecology, Charles University in Prague, Czech Republic, Adam Petrusek, Department of Ecology, Charles University in Prague, Czech Republic, Silke Kipper, Institute of Biology, Freie Universität Berlin, Germany, and Michael W. Nachman, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, USA

Evolution of reproductive barriers is a complex process that can be facilitated by some interspecific interactions, while others lead to the barriers weakening and species fusion. We studied how interactions between two incipient bird species, the Thrush Nightingale (*Luscinia luscinia*) and the Common Nightingale (*Luscinia megarhynchos*), affect the speciation process. These species show parapatric distributions, however, they occasionally interbreed in the narrow region of sympathy. According to Haldane’s rule, hybrid females are sterile, while hybrid males are fertile. We explored patterns of genetic variation at multiple nuclear loci as well as mitochondrial DNA together with morphological and song characteristics in sympatric and allopatric populations of both species. Our results show that hybridization results in gene flow between the two species in most autosomal loci. In contrast, interspecific gene flow was absent or very low along the whole Z chromosome, in spite of detected recombination on this chromosome. This suggests that multiple speciation genes exist on the Z chromosome and supports its large role in speciation. Despite the significant interspecific gene flow, we found that nightingales diverged in relative bill size in sympathy. This divergence is better explained by interspecific interactions than by a geographical gradient, and most likely reflects segregation of feeding niches between the species in sympathy. In contrast to ecological requirements and bill morphology, the song patterns converged in sympathy. The convergence is asymmetrical: Thrush Nightingale males incorporate songs of the other species in their repertoires but Common Nightingale singing does not seem to be affected. We demonstrated that this convergence is caused by heterospecific copying of songs rather than by interspecific introgression and could be an adaptive response to the
presence of heterospecific males or females in the neighboring territories. Unexpectedly, the Thrush Nightingale males show lower rate of heterospecific crossing than the Common Nightingale males in sympatry, suggesting that song convergence in sympatry does not increase hybridization. Our results suggest that despite an ongoing hybridization and song convergence, competition for food resources resulting in character displacement in bill morphology facilitates species divergence and may therefore contribute to speciation.