

# Sexual imprinting leads to speciation in locally adapted populations

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## Abstract

Sexual imprinting is widespread in birds and other species but its existence requires explanation. Here we show that sexual imprinting leads to speciation in locally-adapted populations if a neutral mating cue – e.g., novel plumage coloration – arises through mutation. Local adaptations occur when evolution results in stable genetic polymorphisms with one allele predominating in some areas while others predominate elsewhere. Here we use a deterministic two-niche population genetic model to map the set of migration and selection rates for which polymorphic evolutionary outcomes, i.e., local adaptations, can occur. Equations for the boundaries of the set of polymorphic evolutionary outcomes were derived by (Bulmer, 1972), but our results, obtained by deterministic simulation of the evolutionary process, show that one of Bulmer’s equations is inaccurate except when the level of dominance is 0.5, and fails if one of the alleles is dominant. Having an accurate map of the set of migration and selection rates for which polymorphic evolutionary outcomes can occur, we then show using the model of (Sibly et al., 2019) that local adaptation in all cases leads to speciation if a new neutral mating cue arises by mutation. We finish by considering how genome sequencing makes possible testing of our results.

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