Abstract

Sympatric speciation has received much attention both empirically and theoretically. However, the contribution of sympatric speciation to biodiversity remains unclear. One piece missing from the speciation puzzle is the plausibility of sympatric ecological divergence of species through adaptation in polygenic traits. I consider an environment consisting of two niches, where one value of the trait is advantageous in only one niche, and vice versa. The selection regime is described by a trade-off in viabilities between the niches. These polygenic traits can, and often do, involve epistatic interactions among and between loci, so that the contribution of the alleles to viability deviates from additivity. Epistasis then also affects the curvature of the trade-offs: predominant less-than-additive epistasis turns the curve towards concavity and predominant more-than-additive towards convexity. The curvature of the trade-off plays a crucial role in the evolution of populations. With a convex trade-off, extreme values of the trait are favored and the population tends to diverge, but relatively stringent symmetry in strength of selection within the niches and the niche proportions is necessary to maintain polymorphism. In this study I use two and three-locus haploid versions of Levene's model to investigate various epistasis-selection regimes and explain characteristics of the trade-off curve affecting divergence and maintenance of polymorphism. I compare the results of a multi-locus model with predictions based on the infinitesimal model and identify the limits of both approaches.