Hybridization, rare alleles and adaptive radiation

Abstract

In his recent thought-provoking review in TREE [1], Ole Seehausen makes a case for a role for hybridization in adaptive speciation and radiation. Hybridization is often seen, particularly by zoologists, as an event that imposes negative endogenous selection on individuals. However, Seehausen points out that the origin of new recombinants might in fact aid the fixation of novel genotypes that are well suited to fill vacant niches in the novel environments in which adaptive radiations normally occur. We feel that Seehausen's is a theory that might prove useful in understanding adaptive radiation, and here draw attention to one aspect that might not be sufficiently appreciated.

Partial postzygotic reproductive isolation between species is usually polygenic [2] and a wide range of degrees of reproductive compatibility will exist in any hybrid population [3]. As a result, continuous purging of particularly disadvantageous combinations of alleles for reproductive isolation will occur in a hybrid swarm. In turn, this will create changed selection pressures on loci linked with these genes, leading to genome-wide shifts in allele frequencies. Recently, it was shown that the well known 'rare allele' or 'hybrizyme' effect is likely to be a manifestation of this process [4 and 5]. The hybrizyme effect is the phenomenon that rare alleles increase in frequency in hybrid populations; a very common, but previously unexplained, observation in hybrid zone studies [6 and 7].

As selection against reproductive incompatibility continues, crossing-over of chromosomes might break linkages and establish them with other alleles, continually causing shifts in selection pressure. Thus, even in the presence of moderately strong endogenous selection on hybrids, a hybrid swarm might be a population in which selection against reproductive incompatibility results in the generation of a varied and continually changing pool of recombinants. In many cases, this might aid, rather than prevent, the formation of the adaptive trait combinations that ultimately lead to an adaptively radiated species flock.