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Multilocus analyses indicate a mosaic distribution of hybrid populations in ground squirrels (genus *Ictidomys*)

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Abstract

DNA sequence data from mitochondrial cytochrome-*b* (*Cyt*b) and Y-linked structural maintenance of chromosomes (*SmcY*) genes were combined with 478 nuclear loci obtained from amplified fragment length polymorphisms (AFLP) to assess the extent of hybridization and genetic spatial structure of populations in two hybridizing species of ground squirrel (*Ictidomys parvidens* and *Ictidomys tridecemlineatus*). Based on AFLP analyses of 134 individuals from 28 populations, 10 populations were identified that possessed hybrid individuals. Overall estimates of F_{ST} values revealed strong support for population structure in the *Cyt*b data set; however, analyses of the *SmcY* gene and the AFLP data indicated ongoing gene flow between species. Pairwise F_{ST} comparisons of populations were not significant for the *SmcY* gene; although they were significant for the *Cyt*b gene, indicating that these populations were structured and that gene flow was minimal. Therefore, gene flow between *I. parvidens* and *I. tridecemlineatus* appeared to be restricted to populations that exhibited hybridization. In addition, the fragmented nature of the geographic landscape suggested limited gene flow between populations. As a result, the distributional pattern of interspersed parental and hybrid populations were compatible with a mosaic hybrid zone model. Because ground squirrels display female philopatry and male-biased dispersal, the ecology of these species is compatible with this hypothesis.

Introduction

Hybrid zones are the result of the interaction of genetically distinct groups that produce offspring of mixed ancestry (Barton and Hewitt 1985; Arntzen 1996; Abbott et al. 2013). Hybrid zones often provide a natural laboratory for addressing major evolutionary concepts (Hewitt 1988; Baker et al. 1989; Harrison 1993). For example, studies of hybrid zones offer the opportunity to examine genetic control of speciation, mechanistic models of maintenance, premating and postmating isolation, direction of introgression, and other processes and patterns of hybridization