

## Getting to grips with grasshoppers: syncopated speciation in central South Island *Sigaus*

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Species concepts are hard to apply when individuals that look similar share genetic material. Species concepts and our understanding of speciation is becoming more complex as we move further away from typological approaches and allopatric models. New speciation models show there is not justification for assuming physical isolation as a prerequisite, and sympatry models now recognize locus specific gene flow and selection. Speciation with gene-flow requires that some traits of two entities (groups of individuals) be maintained through strong selection despite extensive genetic exchange. In South Island NZ, *Sigaus* alpine grasshoppers form a complex of species that appear to show several interesting evolutionary phenomenon in this regard. One is formed in Central Otago around the township of Alexandra, with the species *Sigaus australis* ranging over much of the lower/middle South Island, and completely encompassing the very localized and rare species, *Sigaus childi*. These species share some identical mitochondrial haplotypes, and microsatellite data reveal no population structure between them. In contrast morphological analysis shows little evidence of hybridization between the two species with individuals having one or other parental form regardless of their degree of genetic mixing. These observations are consistent with a model involving selection on distinct physical characteristics despite exchange of neutral genetic. Previous work on species complexes such as this have typically been data limited. Using a new technique called double-digest RAD-sequencing we have generated extensive SNP data that is allowing us to further test among alternative explanations (hybridization, incomplete lineage sorting, and speciation with gene flow) for the pattern we have seen in *Sigaus*.