Hybrid speciation, reproductive isolation and adaptive radiation along an elevational gradient in an alpine butterfly

Laurence Despres*[1], Thibaut Capblancq , Gabriel Nève , Jesus Mavarez , and Laurent Dormont

[1]Laboratoire dÉcologie Alpine (LECA) – Université Joseph Fourier - Grenoble 1, Université Savoie Mont Blanc, Centre National de la Recherche Scientifique : UMR5553 – bat. D - Biologie 2233 Rue de la piscine - BP 53 38041 GRENOBLE CEDEX 9, France

Abstract

Speciation with gene flow is more common than previously thought, but the mechanisms by which phenotypic divergence and reproductive isolation arise are poorly understood. Furthermore, the role of hybridization in species diversification and adaptive radiation is debated. Approximate Bayesian Computation procedures based on a large SNP dataset suggest that the Darwin's Heath (*C. darwiniana*) is a hybrid species between the Pearly Heath (*C. arcania*) and the Alpine Heath (*C. gardetta*) with different parental contributions, dating back ~ 10,000 years ago. The hybrid lineage presents an intermediate morphology between the parental species, while its climatic niche is more similar to the alpine species *C. gardetta*. Unexpectedly, although the hybrid genome is mostly constituted of the lowland species genome (70% *C. arcania* and 30% *C. gardetta*), introgression rates in contact zones were much higher between the hybrid lineage and the high altitude species *C. gardetta* than with the lowland parental species *C. arcania*. Interestingly, the alpine species emit volatile compounds (Octadecanal, Octadecanol and Eicosanal) that are also present in the hybrid lineage, but absent in the lowland species, suggesting pre-mating isolation mechanisms between the alpine and lowland species through olfactory cues. Evidence for local adaptation to cold temperature was found by measuring higher warming-up rate (thorax temperature in controlled conditions) with increasing elevation in the lowland and hybrid species. The alpine species *C. gardetta* had the highest warming-up rate, suggesting that temperature is a main driver of adaptive radiation along elevational gradient in this butterfly alpine species complex.

*Speaker