Fire-bellied toads *Bombina bombina* benefit from distant gene introgression – genetic rescue or rapid temperature adaptation?

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Abstract

We evaluate two hypotheses on the impact of introgression on rapid adaptation, (1) genetic rescue, i.e., maladapted populations gain adaptive genetic variation from an introgression, and (2) temperature adaptation, i.e., introgression accelerates adaptation to a changing environment (here, to higher temperature). Our study organism is the Fire-bellied toad. At the northern edge of its range, this toad lives in small genetically isolated populations. Some of these populations have been introgressed by toads from a southern evolutionary lineage, presumably due to recent (illegal) release. With full mitochondrial sequencing, a transcriptome-wide SNP search, and a candidate gene approach, we were able to quantify the locus- and population-specific impact of this introgression. We found that (1) allochthonous genotypes/alleles have spread in introgressed populations at many loci (mtDNA, microsatellites, SNPs, 8 MHC II loci, the Heat Shock Protein gene HSP70kDa), (2) these populations exhibit a positive population trend and have invaded nearby populations, and (3) genetically admixed populations/specimens are superior in their body condition, a trait putatively related to reproductive fitness. Now we aim at understanding the underlying evolutionary mechanisms of this fitness benefit.