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Conference Abstract

Comparative phylogeography of two cavernicolous springtails (Collembola) codistributed across a geologically complex karst landscape

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Abstract

Genetic isolation and biological diversification in caves is generally attributed to physical barriers to gene flow, but few studies have evaluated the influence ecology has on patterns of divergence and molecular variation in cave organisms. Collembola (springtails)—a class of tiny, insect-like arthropods—constitute an under-utilized and information-rich source of data for inferring evolutionary processes in cave environments. They are among the most abundant and diverse animals in caves with species that are often codistributed and have varying levels of ecological specificity to, or dependence upon, cave habitats—differences that may affect dispersal capacity and genetic connectivity. This is the first study to characterize and compare patterns of molecular diversity and genetic structure among ecologically distinct and codistributed species of cavernicolous springtails. Twenty-five caves were sampled throughout the Salem Plateau in Illinois and Missouri—a once continuous karst region, now bisected by the Mississippi River Valley. Multilocus datasets generated for morphospecies in the genera *Pygmarrhopalites* and *Pogonognathellus* were used to delimit species, identify genetic barriers, and evaluate and compare phylogeographical patterns between troglobiotic and eutroglophilic species to assess whether two codistributed cave-dwelling species have congruent phylogeographical

patterns across a complex geological landscape, despite having distinct ecologies. Populations of troglobiotic *Pygmarrhopalites* sp. were strongly structured among karst areas and across the Mississippi River valley, but these patterns were not recovered for eutroglophilic *Pogonognathellus* sp., which displayed little to no genetic structure, except among caves. Results indicate that cave-dependence is associated with deep phylogeographic divisions across geographical barriers—supporting the hypothesis that ecological specialization to cave habitats is correlated with low dispersal capacity. The recovery of highly divergent and cryptic lineages, genetically isolated at fine geographic scales (microendemism), also highlights how little we understand microarthropod diversity in caves and presents major concerns for cave conservation biology.

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