Spatial genetic structure of Dinaric cave-dwelling spiders

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Abstract

Caves put strong constraints on organisms living there, which results in acquisition of variety of troglomorphic traits, most obvious ones being depigmentation and degradation of visual system (Christiansen 2012). Cave habitats are considered fragmented, and the animals living there face limited connectivity between potential habitats (Barr 1967, Bregović and Zagmajster 2016, Trontelj 2018). Additionally, once adapted to underground conditions, cave-dwellers are thought to be unable to use the surface for dispersal, thus demonstrating population dynamics similar to those of the species found in islands (Barr and Holsinger 1985). We compared the population genetic structure of several cave spider species with different biology and ecology from different caves in the Dinarides. Namely, depigmented and anophthalmic Dysderidae species which were never collected outside caves, and several species from the genus *Troglohyphantes*, which exhibit different levels of troglomorphisms and dependency on cave habitat (some, like *T. excavatus* and *T. kordunlikanus*, can be occasionally found in surface habitats). Additionally, Dysderidae are wandering active hunters, while all *Troglohyphantes* species spin webs. In our study, we applied a hybridization-capture approach, i.e., HyRAD (Suchan et al. 2016) to extract and capture DNA from historical samples. We compared the population genetic structures among the species, and studied isolation by distance, and identified contrasted genetic structures related to the biology and ecology of each species. We identified a deeper population structuring and more pronounced patterns of isolation by distance in the highly troglomorphic species compared to the less troglomorphic ones. Species that can occasionally be found in surface habitats showed less structured populations compatible with higher dispersal ability. Additionally, we detected several common breaks in gene flow for most studied species, some of which can be explained by geographic and geologic features.

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Keywords

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Conflicts of interest

References

- Barr TC (1967) Observations on the ecology of caves. Am. Nat 101: 475-491.
- Barr TC, Holsinger JR (1985) Speciation in cave faunas. Annu Rev Ecol Syst 16: 313-337.
- Bregović P, Zagmajster M (2016) Understanding hotspots within a global hotspot - identifying the drivers of regional species richness patterns in terrestrial subterranean habitats. Insect Conserv. Divers 9: 268-281. https://doi.org/10.1111/icad.12164.
- Christiansen K (2012) Morphological adaptations. In: White W, Culver D (Eds) *Encyclopedia of Caves*. https://doi.org/10.1016/B978-0-12-383832-2.00075-X.
- Suchan T, Pitteloud C, Gerasimova NS, Kostikova A, Schmid S, Arrigo N, Pajkovic M, Ronikier M, Alvarez N (2016) Hybridization Capture Using RAD Probes (hyRAD), a New Tool for Performing Genomic Analyses on Collection Specimens. PLoS One 11: 22. https://doi.org/10.1371/journal.pone.0151651.
- Trontelj P (2018) Structure and Genetics of Cave Populations. In: Moldovan OT, Kováč Ľ, Halse S (Eds) Cave Ecology. https://doi.org/10.1201/9781351070232-2.