Univerza *v Ljubljani* , Biotehniška Fakulteta

JAVNA AGENCIJA ZA RAZISKOVALNO DEJAVNOST REPUBLIKE SLOVENIJE

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# Project

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| **Member of University of Ljubljana** | University of Ljubljana, Biotechnical Faculty |
| **Code** | Z1-9164 |
| **Project** | Emergence of a global subterranean biodiversity hotspot – the origin of the Dinaric amphipod fauna |
| **Period** | 1.7.2018 – 06.2020 |
| **Range in 2018** | 850 FTE |
| **Head** | Teo Delić |
| **Research activity** | Natural sciences |
| **Abstract** | Mediterranean area has been recognized as one of the world's biodiversity hotspots. Region's biodiversity has been traditionally attributed to climatic oscillations during Pleistocene (2.5 MY – 11 700 years ago), and explicitly linked to mechanisms generating species richness – dispersal and extinction. The third mechanism, speciation, received far less attention and is poorly understood. Indeed, several studies suggested that most of the species richness emerged before Pleistocene, emphasizing the importance of speciation. Such discrepancies call for studies paying more attention to deviations from the general species-richness patterns, consider speciation as important generator of species richness, and search for the possible explanations of the existing patterns in a more distant past than traditionally done.<br><br>Subterranean animals offer a unique model to study speciation events, especially when executed in a global subterranean biodiversity hotspot – the Dinaric Karst. The processes and mechanisms underlying the emergence of this unique subterranean hotspot are not known. As in subterranean animals the dispersal |

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| | abilities are limited, the evidence of past speciation events should be clearer than in surface species. Question of speciation's relative importance in subterranean fauna will be specifically addressed in a subterranean amphipod genus *Niphargus*. *Niphargus* is the species richest genus of freshwater amphipods, bound almost exclusively to groundwaters, and reaching its highest species richness in the Dinaric Karst. Interestingly, some of the clades widely distibuted in Dinarides occur also in the Apennines; having a peculiar transadriatic distribution. We will employ island biogeography theory, using subterranean regions of Dinaric Karst as analogues to islands, and test how paleogeographic events affected species richness and pace of diversification in the Dinaric Karst *Niphargus*. Specifically, we will explore the role of four major paleogeographic events in diversification of the genus:<br><br>1. Collision of the Dinaric platform with the European mainland;<br><br>2. Rise and fall of the intra-lacustrine Dinaric lake system during Miocene;<br><br>3. Messinian salinity crises and;<br><br>4. Interchange of glacial and interglacial phases during Pleistocene.<br><br>We will study four *Niphargus* clades, distributed on both sides of the Adriatic Sea, as natural replicates, warranting a robust comparative analysis. Spatio-temporal analysis of diversification patterns should pinpoint which paleogeographic events most critically affected speciation processes in Dinaric region. Phylogenetic structure and speciation events within the focal clades will be scrutinized using genus-wide molecular phylogeny, time calibrated phylogeny and implementation of uni- and multilocus species delimitations. Ancestral ranges will be inferred using present species distribution. Finally, the relative importance of palogeographic events will be modelled in a joint comparative analysis.<br>A two year project will be organized in six working packages. The results are expected to establish the much needed links between paleogeographic events in Southeastern Europe and patterns and rates of speciation in Dinaric *Niphargus.* Linking the patterns with mechanisms will enable conclusions about the effect of speciation rates and patterns onto the emergence of biodiversity hotspot in the Dinaric Karst. Indirectly, we will acquire insights into present and past hydrological connections in Dinarides. In addition, regional analyses would also enable recognition of centers of diversification, which can thereafter be largely applied in nature conservation strategies. Inclusion of |

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| | the aquatic subterranean fauna into existing conservation framework is of crucial importance, due to a fact that groundwaters present the most important source of drinking water throughout the countries of the Dinaric Karst. |
| **Researchers** | https://www.sicris.si/public/jqm/search_basic.aspx?lang=slv&opdescr=search&opt=2&subopt=1&code1=cmn&code2=auto&search_term=skupina%20za%20speleobiologijo |
| **The phases of the project and their realization** | Project proposal includes six work packages (WP): data collection (WP 1), data acquisition and editing (WP 2), analysis of the phylogenetic diversity of the genus Niphargus in the Dinaric Karst and inference of time calibrated phylogeny (WP 3), taxonomic analyses of the selected trans-Adriatic clades (WP 4), joint comparative analyses of trans-Adriatic taxa (WP 5) and project dissemination (WP 6). The entire infrastructure, needed for successful execution of the proposed project, including molecular laboratory for DNA isolation and PCR amplification, will be provided at the Department of Biology, Biotechnical faculty, University of Ljubljana. Results of the project will be disseminated by attending international conferences on the research topics of subterranean biology or evolution, publishing the results in international research journals and scientific research platforms, such as Research Gate (www.researchgate.com). Additionally, since the topic of the proposal includes thematic that are of interest to wider public (ex. historical development of the Adriatic basin, Dinaric orogenesis), results will be also published as popular articles in various popular journals |
| **Citations for bibliographic records** | https://www.sicris.si/public/jqm/search_basic.aspx?lang=slv&opdescr=search&opt=2&subopt=1&code1=cmn&code2=auto&search_term=Teo%20Deli%C4%87 |