



Conference Abstract

The value of DNA barcoding in a hotspot area: an example of *Rhyacophila tristis* (Trichoptera) in the Western Carpathians

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Abstract

DNA barcoding has proven to be an essential tool in providing molecular tags for animal species. In addition, the value of DNA barcoding undoubtedly consists in giving information about intraspecific genetic diversity, which is of great importance for biodiversity monitoring and conservation assessments. Such data are especially valuable in case of biodiversity hot-spots. Therefore, the aim of our study was to expand the knowledge of the genetic patterns and distribution of the caddisfly *Rhyacophila tristis* (Trichoptera, Rhyacophilidae) population in one such biodiversity hotspot - The Western Carpathians.

The W Carpathians include rich freshwater systems of springs and streams, where molecular diversity and phylogeographic patterns of aquatic fauna are yet to be fully explored. Based on the mitochondrial DNA barcoding fragment (COI-5P) of 161 sequences, two BINs representing distinct lineages within *R. tristis* were identified. BIN BOLD:AAD5574 occurred in 16 localities to the west and BIN BOLD:ADL4166 in 44 localities more to the east, with contact zone in the middle of the mountain system (Fig. 1). BIN BOLD:AAD5574 occurred at a significantly narrower altitudinal interval compared to BIN BOLD:ADL4166, but we did not record significant differences in molecular diversity

between BINs. Likewise, past population growth was found in both lineages. Both BINs started to expand demographically at the beginning of the Last Glacial Maximum, however BIN BOLD: ADL4166 increased its demography more sharply compared to BIN BOLD:AAD5574, moreover the effective population size of BIN BOLD:ADL4166 was much higher. BIN BOLD:ADL4166, showing a significantly wider range of altitude, has probably found higher potential for dispersal to various mountain units in the area of the W Carpathians. Our results showed also that BIN BOLD:ADL4166 is more closely related to the separate *R. tristis* BIN BOLD: ADL4367 recognized in Bulgaria than to the BIN BOLD:AAD5574 occurring geographically in the same mountain system. Additionally, different patterns of population expansion of BIN BOLD:ADL4166 between springs and streams were found. These differences may have occurred due to specific environmental conditions of the karstic springs, which are considered as relatively isolated aquatic habitats.

Our initial study of *R. tristis* phylogeography in W Carpathians opens several new important questions: Is it possible that BIN BOLD:ADL4166 is expanding from the eastern part of Europe (Bulgaria) to the colder streams in the W Carpathians during the LGM? What role do the W Carpathian springs play in maintaining the genetic diversity and sustainability of *R. tristis*? Could these relatively isolated aquatic habitats serve as postglacial refugia for *R. tristis* species? And, maybe also, are they two separate species? This contribution was partially supported by the project VEGA 2/0084/21 and VEGA 1/0127/20.

Keywords

DNA barcoding, Karst springs, Western Carpathians, COI, mtDNA, genetic diversity, *Rhyacophila tristis*

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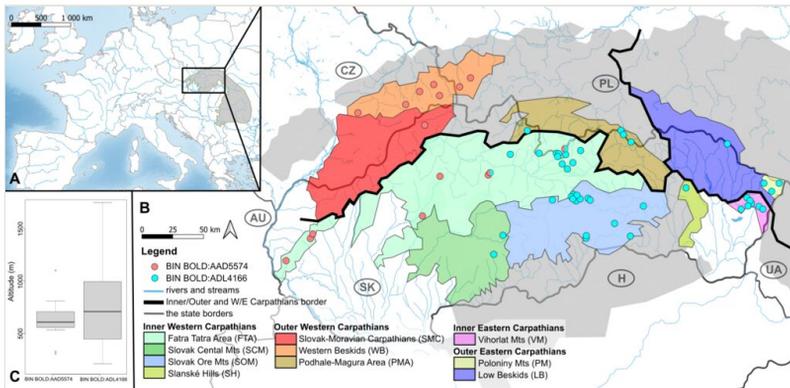


Figure 1. [doi](#)

Spatial patterns in the distribution of two BINs of *R. tristis* in the W Carpathians. (A) Map of the studied area within the Carpathian Arc and (B) the 58 sampling sites (BIN BOLD:AAD5574 - 16, BIN BOLD:ADL4166 - 44) divided into eight geomorphological units represented by different fill colors. (C) The altitude range of both BINs. The boxplots show the distribution of the altitude above sea level for BIN BOLD:AAD5574 and BIN BOLD:ADL4166. The boxes represent the interquartile distances (IQD), while the central lines through each box show the medians. The dot indicates outliers and the whiskers extend to the extreme values of the data, calculated as $\pm 1.5 \times \text{IQD}$ from the median. Wilcoxon signed-rank test supported the significant differences of altitude range between two BINs of *R. tristis* ($P < 0.05$). Abbreviations: Slovakia (SK), Hungary (H), Ukraine (UA), Poland (PL), Czech Republic (CZ) and Austria (AU).