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BIOGÉOSCIENCES

# Integrative evidence for hidden species diversity and long-term divergence within *Gammarus balcanicus* Schäferna 1923 morphospecies in the northernmost part of the Carpathian Arc

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Carpathians are one of the key “biodiversity hotspots” in Europe. The mountain chain uplifted during Alpine orogenesis and is characterized by a complicated geological history. Their current biodiversity was highly influenced by Pleistocene glaciations especially in their northernmost part comprising of Western Carpathians and the northern part of Eastern Carpathians. Recent studies have already shown that cold adapted gammarids (crustaceans) probably survived the Ice Age in cryptic refugia of the Western Carpathians and that the *G. balcanicus* Schäferna 1923 morphospecies inhabiting northernmost Carpathians is in fact a complex of phylogenetic lineages.

The goal of our current study was to delimit and describe potential new species belonging to *G. balcanicus* morphospecies as well as to trace their demographic and divergence history using integrative approach. This involves morphological (e.g. Scanning Electron Microscopy - SEM) and molecular tools. Additional goal is preparation of detailed reference library of gammarids from the north of Carpathians in the Barcode of Life Data System (BOLD).

Material for the study was collected from over 50 stations in Poland, Slovakia and Czech Republic. It comprises both new and already published data. Molecular species delimitation revealed existence of 5 Molecular Operational Taxonomical Units (MOTUs) of *G. balcanicus* morphospecies with distribution limited to northern Carpathians. The morphological examination supported existence of two morphological types, previously described as “A” and “B”, the SEM analysis did not unambiguously reveal any features that could help in species delimitation. Molecular diversity showed that divergence of these MOTUs is dating back to Miocene what supports the hypothesis of their survival in local northern refugia. Delimited MOTUs show different patterns of postglacial demography. Four of them exhibit postglacial demographic expansion with two that expanded also geographically. One MOTU, restricted to the northern part of Eastern Carpathians is showing demographic decline and very limited range.

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