

## ABSTRACT

Freshwater amphipods are poor dispersers due to the fragmentary nature of their habitat, benthic life-style and lack of resistant propagules. Consequently, most species are narrowly endemic, and widespread morphospecies consist of numerous divergent lineages. As such, these patterns are considered relict, mainly reflecting historical rather than contemporary factors. The Carpathian Mountains underwent a dramatic geomorphological evolution during the last 20 million years, rising from the Paratethys Sea through a series of islands that eventually coalesced into one of the longest mountain chains in Europe. Moreover, these mountains and surrounding basins are inhabited by a ubiquitous and diverse amphipod fauna, providing an ideal setting for testing historical biogeographical hypotheses. Our results have shown that in the southern half of the Carpathians, montane *Gammarus* taxa display fragmented and allopatric distribution patterns while lowland species belonging to the genera *Niphargus* and *Synurella* are mostly sympatric and widespread over large distances. Subsequent molecular investigations revealed that the patchy distribution of *G. fossarum* in the western and southwestern Carpathians has likely resulted from the breakup of a formerly contiguous landmass 16 million years ago, suggesting that geological subsidence can play an important role in shaping biogeographical patterns. Moreover, the Western Carpathian lineages in eastern Czechia and Slovakia are narrowly endemic and date back to the Miocene, implying *in situ* survival of the Pleistocene climatic fluctuations closer to the northern ice-sheets than previously thought. Similarly, the phylogeography and lineage distribution of the *G. balcanicus* species complex reflect several chronologically distinct uplift episodes of the islands that once formed the Carpathian archipelago 10 to 15 million years ago, indicating that the genetic legacy of long-gone archipelagos can persist for millions of years in contemporaneous continental biotas. In contrast to montane gammarids, the two lowland species *Niphargus hrabei* and *N. valachicus* exhibit a much shallower genetic differentiation despite their substantially wider ranges. Although *Niphargus* is a groundwater genus, our analyses reveal that the focal species have independently invaded surface waters from subterranean ancestors and rapidly dispersed throughout the Danube lowlands during the second half of the Pleistocene. Although these two species are not closely related, they are remarkably similar in habitat preferences, functional morphology and zoogeographical patterns. Coupled with very rare cases of syntopy, we conclude that they are weakly differentiated ecologically. However, they do coexist with other less related amphipod taxa, as demonstrated on a case study of *N. valachicus* co-occurring with the unrelated *G. dacicus* and *Synurella ambulans*. These form an assemblage that exhibits a suite of contrasting life-history strategies which might reflect their divergent morphologies or distant evolutionary relationships.