

Abstract

Understanding why land snails are distributed the way there are and how dynamic their distribution ranges are requires first knowing the diversity of and phylogenetic relationships among the species and intraspecific lineages, and then examining evidence documenting past distributions and changes in range extents. The present work focuses on a few selected representatives of terrestrial land snails from the superfamily Helicoidea Rafinesque, 1815, especially the genus *Monachoides* Gude & Woodward, 1921 of the family Hygromiidae Tryon, 1866, but also on several helicids. We examined their taxonomy, and diversity of mitochondrial lineages, and, where applicable, used fossil data to document their postglacial spread.

The main model species of this dissertation is *Monachoides incarnatus* (O. F. Müller, 1774). It is an abundant euryvalent land snail limited from west and east to central Europe, used as one of the important indicators of woodland in Quaternary palaeoecology. In the Holocene, however, *M. incarnatus* adapted very well to human-impacted habitats and can survive in semi-ruderal sites of urban and suburban zones. Our main objective was to determine the location of the glacial refugia of *M. incarnatus* and the directions of its postglacial colonization. First, it was necessary to revise the existing genus *Monachoides*. We were able, based on sampling a large part of the genus' range, analyses of mitochondrial and nuclear gene sequences, and conchological observations, to reverse the genus *Monachoides*. Three species from the Balkans (*M. fallax* (Wagner, 1914); *M. taraensis* De Winter & Maassen, 1992; *M. kosovoensis* De Winter & Maassen, 1992) were newly placed in the genus *Xerocampylaea* Kobelt, 1871, one species from the Banat (*M. bacescui* Grossu, 1979) was synonymized with *M. incarnatus*, and the remaining two species (*M. incarnatus* and *M. vicinus* (Rossmässler, 1842)) were moved to the genus *Perforatella* Schlüter, 1838. In addition, we discovered a new genetic lineage in Croatia, which had already been described. We redefine it as the neotype of *Perforatella welebitana* (Pfeiffer, 1847). We also provide determinate characters based on which the two syntopic species *P. incarnata* (O. F. Müller, 1774) and *P. welebitana* can be clearly distinguished.

To understand the dynamic nature of biodiversity, it is crucial to determine how species ranges change over the Quaternary climate cycle. The Western Balkan region is considered a refugium with uninterrupted diversification, whereas central and northern Europe was recolonized following climate fluctuations that led to extinctions. We radiocarbon-dated the earliest fossil records of *P. incarnata* and *P. vicina* (Rossmässler, 1842) on the territory of Czechia and Slovakia and found that *P. incarnata* responded relatively quickly to climate change and spread to Central Europe at the turn of the Late Glacial and Holocene, thus surprisingly soon. We linked the fossil data with molecular phylogeographic data and pointed out an exception to the general paradigm, where the Balkan region is assumed to be a refugium with unbroken diversification. The results of phylogenetic analyses point to the origin and glacial refugia of *P. incarnata* south of the Alps, in northern Croatia and Slovenia. Another refugium was discovered in northwestern Italy. Remarkably, we found that *P. incarnata* colonized the western Balkans from the north during the postglacial period. A similar direction of postglacial colonization is shared by *Caucasotachea vindobonensis* (Pfeiffer, 1828). In Central European land snails, this type of colonization, from north to south was observed for the first time. Two lineages colonized the Czech territory, from the west and the southeast, creating a broad overlap between divergent intraspecific lineages that would otherwise remain geographically isolated. In contrast to these large changes in range size, species from southern Balkans, even though some of their lineages might have expanded considerably in the Holocene, show old phylogeographic divisions indicating undisturbed diversification *in situ*.

Keywords: shell morphology, land snail, postglacial colonization, refugium, shell, taxonomy.