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Range-wide phylogeography of the common wall lizard *Podarcis muralis* reveals persistence across Pleistocene Ice Ages in Mediterranean and extra-Mediterranean refugia

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We investigated the phylogeographic pattern of the widespread Western Palearctic lizard *Podarcis muralis*, using a range-wide multilocus approach, to evaluate whether it is concordant with a recent expansion from southern glacial refugia or alternatively from a combination of Mediterranean and northern refugia. We analyzed DNA sequences of two mitochondrial (cytb and nd4) and three nuclear (acm4, mc1r, and pdc) gene fragments in individuals from 52 localities across the species range using phylogenetic and phylogeographic methods. The complex phylogeographic pattern observed, with multiple reciprocally monophyletic allo- parapatric lineages having a Pleistocene divergence, suggests a scenario of long-term isolation in multiple ice-age refugia across the species distribution range. Multiple lineages were identified within the three Mediterranean peninsulas but also outside southern peninsulas, suggesting that additional refugia in France, Northern Italy, Eastern Alps and Central Balkans allowed the long-term persistence of this species throughout the Pleistocene glaciations. This finding provides a paradigm of temperate species survival in Mediterranean and extra-Mediterranean glacial refugia, suggesting the need for a reappraisal of the role of northern refugia for glacial persistence and post-glacial assembly of temperate ecoregions.

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