

Species richness of Orthoptera declines with elevation while elevational range of individual species peaks at mid elevation

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Abstract

Species richness has been shown to decrease, and elevational range increase (the Rapoport effect), with elevation as a consequence of biotic and abiotic factors, but patterns are inconsistent across taxonomic groups. Despite being an important indicator taxon and component of local communities, Orthoptera distributions at higher elevations in Europe remain unclear. We investigated the relationship of Orthoptera species richness and elevational range with elevation by conducting field studies at 28 sites across three study areas in the Pyrenees mountains, Europe. We found that species richness declined with elevation. Study area and the site-specific factors of sampling effort, topography (slope) and vegetation structure (density and cover) were also important predictors of species richness. We did not observe a Rapoport effect, with elevational range peaking at mid-elevation instead. Smaller elevational ranges found at high elevations may be due to a combination of sampling over a restricted elevational range and the presence of specialist high-elevation species. We also explored the composition of Orthoptera assemblages using multivariate methods, finding no clear effect of elevation, slope or vegetation structure on these communities, although study area somewhat influenced assemblages. To our knowledge, this is the first study of the Rapoport effect along an elevational gradient using insects as a study system in Europe. We argue that our findings are useful for understanding species distributions with elevation at the interface between local and regional scales. Clarifying the biotic and abiotic predictors of species distribution is important for informing conservation efforts and predicting consequences of climate change.

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