

update

A finer focus on glacial refugia in the Mediterranean region

The importance of glacial refugia in structuring biodiversity has long been recognised. By allowing local persistence during past glacial periods, these areas were instrumental in retaining diversity at global to local scales, from the genetic variation within species to the diversity of species themselves.

Based on a combined analysis of phylogeographical studies conducted on 82 plant species occurring in the Mediterranean region and beyond, Frédéric Médail and Katia Diadema present evidence of 52 putative refugia throughout the region. Their work represents a step-change in the resolution of refugia in the Mediterranean, offering a fine scale localisation, where individual studies have often resolved their location no further than the major peninsulas.

Médail and Diadema consider the characteristics of refugia, highlighting the great importance of the Mediterranean mountain regions. From a thoughtful commentary of how multiple episodes of past climatic and other environmental changes have impacted diversity and the distribution of species, they suggest that the title of 'glacial refugium' might be seen as rather a simplification, with 'cumulative refugia' perhaps being more appropriate for the areas they define. The great evolutionary importance of refugia is discussed, with refugia acting both as storehouses of evolutionary history and reservoirs of genetic diversity for the future.

In the Mediterranean, refugia occur predominantly at the rear or 'hot and dry' edge of the distribution of many of their component species. Thus in a period where rapidly rising global temperatures dominate much of our thinking, it is tempting to dismiss the biodiversity of these regions as condemned and attempts at their conservation as futile. However, as the authors remark, the high environmental complexity of refugia that has facilitated the persistence of species throughout environmental changes experienced over past millennia, clearly demonstrates that the fate of these rear edge populations is far from sealed.

When we combine the possibility that populations might survive future changes in climate in these refugial areas with their exceptional evolutionary importance, we gain a clear understanding of why their conservation is so important. The observation by the authors that a high proportion of Mediterranean refugia are located in regions of high population and human land use pressure should then give us significant cause for concern. However, it is the finer geographical resolution of refugial areas that this paper provides that also paves the way for developing more effective strategies for their conservation.

Individual species have been impacted by individual climatic and biogeographic events in different ways, as the authors acknowledge. Further study in this region will uncover yet greater complexity and might modify the described patterns to some extent, as the difference between this paper and some of its predecessors demonstrates. However, the refugial areas that the authors define represent a significant advance in our understanding of both the historical and contemporary biogeography of plants in the Mediterranean, and confirm the great importance of the region for the biodiversity of the future.

Médail, F. & Diadema, K. (2009) Glacial refugia influence plant biodiversity patterns in the Mediterranean Basin. *Journal of Biogeography*, 36, 1333–1345.

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