

Assessing the influence of life form and life cycle on the response of desert plants to past climate change : genetic diversity patterns of an herbaceous lineage of *Nolana* along western South America

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Abstract:

Premise of the study: Plant responses to past climate change could have been shaped by life-history traits. Here we explore the influence of life form on the response of xerophytic plants to Quaternary climate fluctuations, through a comparison of genetic patterns of codistributed herbaceous and shrubby lineages of the genus *Nolana*.

Methods: We reconstructed the phylogeographic history of a herbaceous lineage of three species of *Nolana* distributed from a northern arid zone (30°S) to a southern wet-temperate (42°S) zone, by sequencing two cpDNA regions. Results were compared with similar data published earlier for a congeneric, codistributed shrubby lineage.

Key results: We detected significant genetic differentiation among populations. Divergence of all haplotypes occurred during the Pleistocene, between 245 and 62 kyr ago. For both the shrubby and herbaceous lineages, the greatest haplotype diversity was found in their northern range. However, herbs also retained some diversity at higher latitude. Herbaceous populations were less genetically structured and less differentiated than shrubby ones.

Conclusion: Genetic evidence revealed that both lineages of *Nolana* survived climate change through the Quaternary, experiencing population collapses and recoveries. Phylogeographic histories present similarities between the two lineages, but also marked differences that can be explained by their differences in life form and life cycle. While the shrubby lineage followed the classical pattern of postglacial expansion toward higher latitudes, species in the herbaceous lineage showed evidence of long-lasting persistence at the southern edge of their current range, suggesting for the first time multiple glacial refugia for a xerophytic plant in southern South America.

Keywords: Coastal Atacama Desert | *Nolana* | Quaternary climate oscillations | Solanaceae | Comparative phylogeography | Life cycle | Life form | Multiple refugia | Phylogeography of desert plants.

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