

Climate change and the biodiversity of alpine ponds: challenges and perspectives

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Abstract

1. Inland waters are among the most threatened biodiversity hotspots. Ponds located in alpine areas are experiencing more rapid and dramatic water temperature increases than any other biome. Despite their prevalence, alpine ponds and their biodiversity responses to climate change have been poorly explored, reflecting their small size and difficult access. 2. To understand the effects of climate change on alpine pond biodiversity, we performed a comprehensive literature review for papers published since 1955. 3. Through analysis of their geographic distribution, environmental features, and biodiversity values, we identified which environmental factors related to climate change would have direct or indirect effects on alpine pond biodiversity. We then synthesized this information to produce a conceptual model of the effects of climate change on alpine pond biodiversity. 4. Increased water temperature, reduced hydroperiod, and loss of connectivity between alpine ponds were the main drivers of biodiversity geographic distribution, leading to predictable changes in spatial patterns of biodiversity. 5. We identified three major research gaps that, if addressed, can guide conservation and restoration strategies for alpine ponds biodiversity in an uncertain future.

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