

What Do We Know about the Future of Biodiversity in Glacier and Adjacent Ecosystems?

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1. INTRODUCTION

Glacier retreat has consequences for diverse ecological functions, from nutrient cycling, energy flow to species interactions and likely decline of glacier related psychrophiles. The vanishing of glaciers also determines a change in the diversity and distribution of organisms, including potential extinction of glacier specialists (i.e. supraglacial organisms). Global biodiversity is declining at rates faster than at any other time in human history. While much research has focused on documenting the spatio-temporal changes in biodiversity following glacier retreat, better understanding of the biodiversity of glacial habitats, and the response to elevated temperatures of glacial specialist is crucial for anticipating future actions protecting biodiversity in situ or ex situ, and to identify refugia.

2. AIMS

(i) catalogue the diversity of eukaryotes and prokaryotes in glacial habitats, (ii) test their physiological capability to tolerate higher than on glacier surface temperatures, and (iii) investigate their potential refugia during future warming.

3. PRELIMINARY RESULTS

We identified by morphology and DNA-based approaches some invertebrates, bacteria and algae taxa from glacier and glacier adjacent habitats in mountains and polar regions. Tardigrades are glacier-specific species while rotifers include both glacial-obligate species and other inhabiting both glacial and non-glacial habitats. Representatives of both taxa survive higher temperatures than those on the ice surface but die at specific thresholds. Preliminary studies on eukaryotic green algae and cyanobacteria indicate the presence of both specialists and opportunistic species on glaciers. Heterotrophic bacteria from cryoconite grow in low and high temperatures and show physiological versatility. Finally, the historical vanishing of some glaciers indicates that a number of glacial taxa survived previous warm periods in cold refugia. Snowfields, debris-covered glaciers and glacierets are candidates as long-term refugia. Preliminary data indicates that invertebrates found on the snow could be divided into wind-blown (accidental) faunal elements and specialists inhabiting both glacial and snow ecosystems and that the later environment could seasonally support psychrophiles.

Acknowledgments. Studies are supported by: National Science Center BiodivERsA+ Call COFUND call, under the European Biodiversity Partnership programme (no. 101052342), with the funding organisation: MUR and National Science Centre no 2022/04/Y/NZ8/00092 on ecophysiology of organisms in glacial and adjacent systems, Lithuanian Research Council Snowlife “Microfauna emerging in seasonal snow patch ecosystems – losers or winners?” (no. S-MIP-23-25) on invertebrates on snow patches and IDUB UAM “Biodiversity of icy Carpathian arks” no. 173/02/UAM/0033 on biodiversity of European glacierets.

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Received 3 September 2025

Accepted 20 October 2025