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# Glacier animals and their importance in Glacial Ecosystems

Krzysztof Zawierucha (1,2), Jakub Buda (1), Karel Janko (2), Daniel Shain (3), and Nozomu Takeuchi (4)

(1) Adam Mickiewicz University, Poznań, Institute of Environmental Biology, Department of Animal Taxonomy and Ecology, Poznań, Poland (k.p.zawierucha@gmail.com), (2) Academy of Sciences of the Czech Republic, Institute of Animal Physiology and Genetics, Laboratory of Fish Genetics, Libechov, Czech Republic, (3) Rutgers The State University of New Jersey, Department of Biology, Camden, USA, (4) Chiba University, Graduate School of Science, Department of Earth Sciences, Chiba, Japan

Invertebrates dominate all ecozones and environments including extreme polar deserts, high mountains and even hostile ice. Both supraglacial and englacial zones support unique, cold-adapted, glacier-obligate fauna. In supraglacial environments, invertebrates inhabit weathering crust, cryoconite holes and sophisticated plants on the icy surface. Weathering crusts are mainly inhabited by springtails with some reports on black tardigrades, while abundant groups in cryoconite holes are tardigrades and rotifers. However, insects (stoneflies in Patagonia and midges larvae in Himalaya), springtails, copepods, ice worms, and mites were also found in cryoconite holes. Tardigrades and rotifers along with springtails were detected on Icelandic glacier in moss balls called glacier mice. Moss gemmae aggregations on Ugandan glacier are inhabited by rotifers and tardigrades. Englacial zones on the west coast of North America and east Asia are inhabited by black oligochaetes called ice worms, which are nocturnal and appear on surface primarily during the night. Englacial micro-water channels are also inhabited by enigmatic bdelloid rotifers. Micro-animals seem to be forgotten in studies on the diversity and ecology of glacier organisms including bioalbedo, biomass or carbon budget.
Two widespread and abundant faunal groups on glaciers are tardigrades and rotifers. Their diversity on glaciers is lower than in terrestrial ecosystems, but it is certainly underestimated. Recently, a new genera and species of tardigrades have been described from central Asian and African glaciers. The taxonomic status of some Arctic rotifers and tardigrades remains unresolved. The density of tardigrades in High Arctic glaciers reached up to 168 ind./ml, with frequency of up to 90% of samples. The densities of rotifers may constituted 118 ind./ml of cryoconite sediment. The important role of tardigrades (the herbivorous genus, Hypsibius, or the grazer genus, Pilatobius) and rotifers (Bdelloid rotifers - mostly filter-feeders) in a trophic web, is their influence on chemical cycling by limiting nutrients to microalgae and bacteria, and competing with or suppressing bacterivorous and grazing ciliates. High mountain glaciers in temperate zones are projected to lose 80% of their volume by the end of 2100, and tropical glaciers will completely disappear within the next decades. For any organism living exclusively in glacial habitats on tropical or temperate glaciers, their extinction and loss of biological information in the near future is inevitable. Taking into account that glaciers and ice sheets constitute a disappearing biome, studies on micro-animals diversity and ecology in these habitats is an urgent task.