Abstract

Microinvertebrate consumers are important players in carbon and nitrogen cycling on glacier surfaces (the supraglacial). They constitute the highest level of the supraglacial trophic network, and their grazing significantly affects resident microbial communities and the allochthonous organic matter (OM) pool. However, the food preferences and trophic strategies of supraglacial consumers have not been investigated to date which limits the understanding of the feedback mechanisms between carbon and nitrogen uptake and utilization on glacier surfaces. This thesis aims to reveal the mechanisms behind the supraglacial OM composition to consumers' community structure and abundance through the investigation of their trophic position and potential food preferences. A reliable methodological approach to measure carbon and nitrogen contents and their stable isotopes in supraglacial consumers was established and subsequently combined with taxonomical identification and biomass estimation. The results revealed that the different groups of supraglacial consumers (tardigrades, rotifers, and springtails) differ in their food preferences and/or in their macronutrient requirements. Differences in OM sources were reflected in the $\delta^{13}C$ signature of the OM as well as that of the consumers themselves and indicated differences in the contribution of allochthonous and autochthonous OM between glaciers and supraglacial habitats (e.g., cryoconite vs supraglacial debris). For example, on the Forni Glacier in the Italian Alps, tardigrades were found to feed on and control the biomass of green algae. The high dynamics of the glacier surface, including meltwater pulses and precipitation events, was found to significantly affect supraglacial biota. This thesis provides the first insight into carbon and nitrogen content and stable isotopic composition in glacier-dwelling, cold-adapted microinvertebrates and so contributes to the understanding of the consumers' role in supraglacial trophic food webs.