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Preliminary results on spatial distribution of apex consumers within cryoconite holes on an Arctic valley glacier

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The biology and ecology of cryosphere has been the subject of intensive studies in recent years. Cryoconite holes (CH) are the most biologically active reservoirs on glaciers. However, the spatial distribution of microorganisms on the cryoconite holes sediment remains unexplored. This knowledge gap poses a problem in terms of an optimal collection of samples from the floor, followed by a proper estimation of organisms densities. Tardigrades and rotifers are the most frequent and abundant invertebrates in cryoconites. Little attention has been devoted to their diversity and ecology in glacial ecosystems where they play an important role of grazers and secondary consumers, and where they may influence on microalgae and bacteria densities.
In this study, we investigated pattern of distribution of micro-fauna within the sediment of cryoconite holes. We collected up to nine subsamples within CH on an Arctic valley glacier in three rows along a longer axis of the holes (Longyearbreen, Svalbard). We found no differences in tardigrades ($\chi 2$ = 4.06, d.f. = 2, p = 0.13) and rotifers ($\chi 2$ = 1.85, d.f. = 2, p = 0.39) density between the rows within the holes. The density of tardigrades differed among the holes ($\chi 2$ = 76.41, d.f. = 3, p < 0.001). In contrast, we found no difference in the density of rotifers between the holes ($\chi 2$ = 1.82, d.f. = 3, p = 0.61). However, the density of both tardigrades and rotifers varied considerably among the samples taken within the holes. The biggest difference in rotifers and tardigrades densities between two subsamples taken within the same hole equalled to 374 and 150 individuals, respectively. Our results indicate heterogenous distribution of Tardigrada as well as Rotifera within cryoconite holes on High Arctic valley glacier. Typical random factors on glaciers such as melting, flushing and rain result in heterogeneous meiofauna distribution on the cryoconite holes floor. Multisampling appears to give us a more accurate view of the organisms densities and functioning of cryoconite holes.