

Tardigrades living on a sub-arctic glacier in Alaska

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Tardigrades are small invertebrates, commonly called water bears. They are typically 0.1 – 1.5 mm in body length, and walk slowly with four pairs of legs. Tardigrades can shrink their body like a tun and become cryptobiosis, which enables to survive in extreme environments, such as low or high temperature, high pressure, or under strong radiation. Their physiological mechanism of cryptobiosis is expected to be applied to medical and industry technologies, such as dry preservation of animal cells. They live in various environments worldwide including the tropics, high mountains and deep sea. They are also commonly found on glaciers in Arctic regions. They actively live in cryoconite holes and spend their entire lives on glaciers. They eat algae growing on snow and ice. Although tardigrades have been reported to live on Arctic glaciers in Svalbard and Greenland, the presence of tardigrades in North America is still unknown. The geographical distribution of tardigrades is important to know and their life cycle and dispersion process in Arctic regions. In this study, we identified species of tardigrades collected from cryoconite holes in a glacier in Alaska using microscopic observation and DNA analysis and compare the results with tardigrades reported from other glaciers in Arctic.

The fieldworks were carried out in July 2019 on Gulkana Glacier in Alaska, located in the Alaska Range. Cryoconite samples were collected from cryoconite holes at different elevations (1,470 m, 1,585 m, 1,680 m). Microscopic observation and DNA analysis identified that tardigrades living on the glacier were species belonging to the genus *Hypsibius* (Fig.1). Their body color was brown or dark brown. Body size was an average 344 μm (n=133). Eyes were absent in all specimens. The claws were asymmetrical and closer to those of *Hypsibius*-type tardigrades. They were not found at the sites below 1600 m, but only at the site at 1680 m, suggesting that their presence requires special conditions on the glacier. As compared with tardigrades found on the other arctic glaciers, this species is more closely related to tardigrades reported from alpine glacier like Alps and Himalaya rather than Arctic species.