カナダ高緯度北極　エルズミア島氷河後退域における菌類の多様性

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Fungal diversity on a retreating glacier area on Ellesmere Island in the Canadian High Arctic

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Cold environments cover a large part of the Earth, and many ecosystems are continuously exposed to temperatures below 5 °C (Feller and Gerday 2003). Fungi in cold environments can grow and decompose organic compounds even at sub-zero temperatures, and can therefore, play an important role in the biogeochemical cycles of polar ecosystems (Welander 2005; Margesin et al. 2007).

The Walker Glacier (unofficial name) (lat. 83° 00.601'N; long. 72° 12.387'W) is located on the northern coast of Ellesmere Island in the Canadian High Arctic. This region is at the northern limit of Quttinirpaaq National Park, Nunavut, where climate-related effects on the cryosphere have been observed over the last 20 years. GPS measurements on 20 July 2013 from a datum pole that had been installed at this site by Paul T. Walker on 10 July 1959 showed that the glacier had retreated by 71 m, at an average rate of 1.3 m/year over this 54-year period. Repeat GPS measurements at this site during the present study (21 July 2016) showed a further retreat of 10 m, giving an average rate of 3.3 m/year. This 2.5-times faster rate of glacial melting and retreat would indicate a recent acceleration of climate warming at this far northern site.

As part of a microbial survey in the region, soils were scraped from the surface of the melting glacier face and additional samples were taken of surface soil that had been deposited and exposed by the receding glacier. The soils were transferred aseptically to sterile 5-mL sample tubes. Within one hour of sampling, the tubes were transferred to a –20°C freezer at field laboratory and then stored at that temperature until subsequent analysis.

Subsamples (0.1 g) of the glacial sediment or soil were directly placed on potato dextrose agar (PDA; Difco, Becton Dickinson Japan, Tokyo, Japan) containing 50 μg/mL chloramphenicol and incubated at 10°C for a period of up to 3 weeks. Fungal samples were chosen for isolation based on colony morphology, and each colony with a different morphology was purified by repeated streaking on fresh PDA. DNA was extracted from fungal colonies, using an ISOPLANT II kit (Wako Pure Chemical Industries, Osaka, Japan) according to the manufacturer's protocols. The extracted DNA was amplified by polymerase chain reaction (PCR), using KOD–plus DNA polymerase (Toyobo, Osaka, Japan). After that, the DNA was purified using Sephacryl S–400HR (Sigma-Aldrich Japan, Tokyo). Sequences were determined using an ABI prism 3130xl Sequencer (Applied Biosystems, Life Technologies Japan, Tokyo). The species were identified by BLAST analysis based on a sequence homology of > 99%.

A total of 117 fungal strains were isolated from the ice island mat samples that were collected on Walker glacier, Ellesmere Island, Canada. Based on the internal transcribed spacer (ITS) region and 26S rDNA D1/D2 domain sequence similarity, these strains were classified into 19 genera and 24 species. The dominant fungi belonged to the genera *Mrakia* (34.2%) and *Vishniacozyma* (12.8%). At the species level, the most frequently isolated yeasts were *M. gelida* (18.8%), *V. victoriae* (12.8%). Among 24 fungal species, two species were classified as new cold adapted basidiomycetous yeasts and we propose them to *Mrakia hoshinoi* and *Vishniacozyma ellesemerensis*.

References

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