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富山県立山における雪氷藻類の色素の時間的空間的多様性
Temporal and spatial variations in pigment compositions of snow algae in Mt. Tateyama in Toyama prefecture, Japan

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Snow algae are photosynthetic microorganisms inhabiting on alpine and polar snow fields. When they bloom, they can change color of snow to red or green since they have various pigments in their cells. Variation in snow color may be associated with environmental conditions and/or taxa of the algae. However, detailed information is not known. In this study, we analyzed pigment compositions, microscopic cell morphology and abundance, and 18S rRNA gene of algal snow collected in the melting season of 2014 on Mt. Tateyama in Toyama prefecture, Japan. We aim to understand the relationship among taxa, life cycles, and pigments of algae.

Absorption spectrums of extracts from the colored snow showed that there were four absorption maximums in absorption spectrums. Each absorption maximums may correspond to pigments contained in the algae, including Chlorophyll *a*, Astaxanthin and unknown Carotenoid. Absorption spectrums varied among the samples, and that could be classified into 4 types: Type A (with maximums of Chlorophyll *a* and Astaxanthin), B (with maximums of Chlorophyll *a* and unknown Carotenoid), C (with maximums of Chlorophyll *a* only), and D (without any maximum). Microscopy of the samples revealed that the samples of A and B types contained snow algae of different color and structure: red sphere cells in Type A, and orange sphere, yellow sphere, green oblong cells in Type B. Analyses of the 18S rRNA gene identified 15 OTUs of algal gene in the samples. The samples of Type A and B contained distinctive OTUs of the algae, respectively, suggesting that the difference of algal pigments between Type A and B is not due to pigment compositions in same algal taxon, but to those of different algal taxa. Analysis of seasonal changes revealed that pigment compositions changed from Type A to Type B at the same location during the study period, suggesting that algal species composition on the snow surface change with time. The results also showed that the colored snow of Type A, B, and C appeared on several locations in Tateyama mountains from June to August. Variations in algal species and pigment compositions among time and locations may be attributed to life cycles and the dispersal of algae.

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