Diversity, Distribution and Species Specificity in Antarctic Lecideoid Lichens Correlated to Newly Generated Climate Zones

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FWF Der Wissenschaftsfonds.

Subject and Aims

Lichens are the most successful vegetation forming organisms of the Antarctic continent. We defined climate zones of Antarctica to analyze the distribution and environmental specification of lecideoid lichens (myco- and photobiont separately).

Climate Data

Climate data was obtained from the AMPS (Antarctic Mesoscale Prediction System; http://polarmet.osu.edu/AMPS/). We downloaded gridded data at 3 hourly temporal resolution and averaged over the years 2009-2015.

Temperature & Precipitation Zones

For the temperature zones (Fig. 3) first the values were clustered into three regions (using k-means clustering in R). The 'warmest' third then was evenly divided in ten.

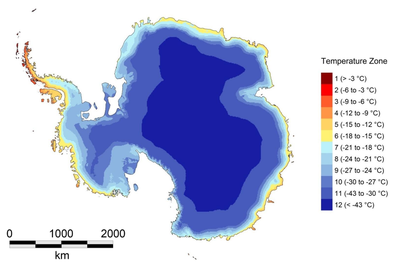

Fig. 3) Temperature zones of Antarctica.

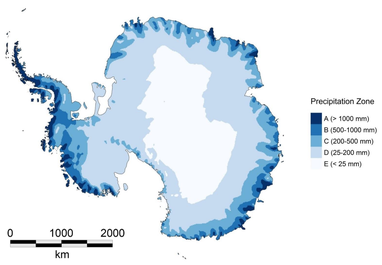

Fig. 4) Precipitation zones of Antarctica.

The precipitation zones (Fig. 4) were defined following the concept of Peveril Meigs (Meigs, 1953) who established the classification of hyperarid (E), arid (D) and semiarid (C) deserts. Precipitation values above semiarid were evenly divided in two as a fourth (B) and fifth (A) category.

Antarctic Climate Zones

Two zonings of Antarctica were defined, one based on temperature and one on precipitation (see box on the left). By combining the twelve temperature zones and the five precipitation zones we defined climate zones (Fig. 2).

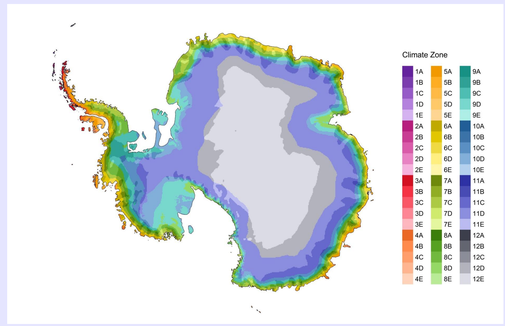

Fig. 2) Climate zones of Antarctica. Colors refer to temperate zones (with 1 as the warmest) and brightness refers to precipitation zones (with A as the wettest).

Specification Mycobiont ↔ Photobiont

Molecular investigations show a wide range of species specificity from the mycobionts to their photobionts. It varies from highly specific as *Lecidella greenii* which is restricted to only one *Trebouxia* species to very low as the widespread *Lecidea cancriformis* with the ability to choose different *Trebouxia* species (Fig. 5).

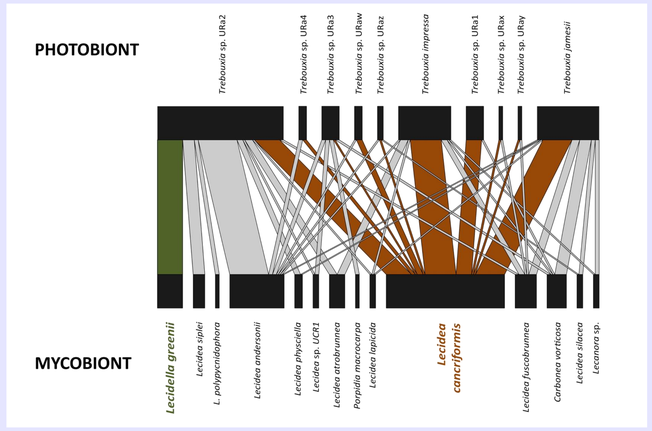

Fig. 5) Species specificity of mycobionts to photobionts (and vice versa) of 157 lichen samples.

Lecideoid Lichens

Antarctic lecideoid lichens (Hertel, 1984) include several genera (*Carbonea, Lecanora, Lecidea, Lecidella, Rhizoplaca*) which are mainly characterized by a crustose thallus with green-algal photobionts, apothecia without algae in the exciple and eight colorless aseptate ascospores (Fig. 1).

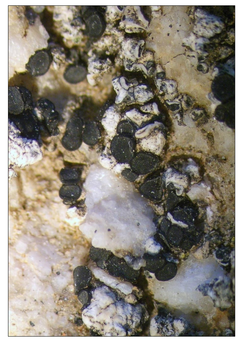

Fig. 1) *Lecidea andersonii*; photo: U. Ruprecht

Lichen Samples & Climate Zones

The following example classifies sample sites of *Lecidella greenii* and *Lecidea cancriformis* according to the climate zones; it shows that the former occurs only in a small range of habitats while the latter is rather wide-spread (Fig. 6).

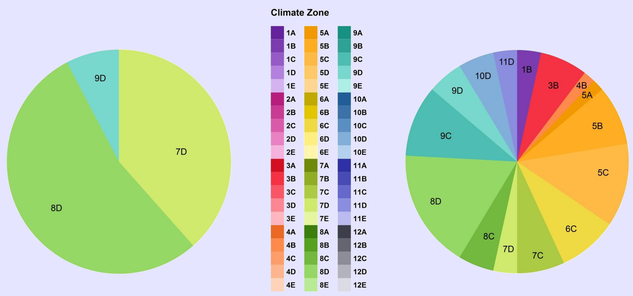

Fig. 6) Classification of sample sites of *Lecidella greenii* (13 samples) and *Lecidea cancriformis* (58 samples) to the climate zones defined before.

Literature & Acknowledgements

Hertel, H. (1984): Über saxicole, lecideoide Flechten der Subantarktis. Beih. Nova Hedwigia 79: 399–499.
Meigs, P. (1953): World Distribution of Arid and Semi-arid Homoclimates. In, UNESCO, Reviews of Research on Arid Zone Hydrology, Paris: United Nations.

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