

HYPOLITHS – UNIQUE ANTARCTIC DRY VALLEY MICROBIAL COMMUNITIES

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The bulk Dry Valley mineral soils of eastern Antarctica are populated by relatively low populations of bacteria ($>10^6$ cells g^{-1} [1]) but show a wide species diversity [2], many phylotypes belonging to so-called 'uncultured' taxa. Widely dispersed within surface soils are quartz 'hypoliths', providing suitable localized 'sub-surface' habitats for complex and active biological communities [3].

A part of a wider study investigating the driving forces responsible for the development and maintenance of microbial populations in Antarctic Dry Valley mineral soils, we have investigated the physical characteristics of the hypolithic biotope and the molecular ecology of hypolithic communities.

A survey of hypolith distribution in the Miers Valley, Eastern Antarctica, showed that hypoliths contributed up to 0.02% of the total surface area. However, hypolith distribution was not homogeneous across the valley, being dependent on suitable laminated quartz outcrops which 'seed' quartz rocks suitable for hypolith development into surrounding soils.

Spectroscopic analysis of a range of hypolithic quartz indicated that light transmission was typically 0.1 – 0.02% of incident, but that the visible spectra of the transmitted light was qualitatively similar to incident sunlight. Individual quartz hypoliths (averaging 3cm x 2cm x 1.5cm: n = 15) harboured mixed moss/cyanobacterial communities. DGGE analysis of bacterial hypolithic communities showed that species diversity was qualitatively different from nearby control sites (open soils, and soils under non-translucent rocks).

Temperature and relative humidity values were continuously monitored in hypolithic communities and control sites by insertion of micro-data loggers. Temperatures were not statistically different between the three samples was the buffering of wide humidity fluctuations caused by rapid temperature changes. We propose that key factors favouring hypolith community development are light availability coupled with stable soil humidity conditions.

References

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