**TRAIT AND COMMUNITY VARIATION ACROSS A FOG GRADIENT IN DESERT LICHENS**

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The relationships between environment, functional traits and community composition are a central focus of plant ecology. However, the associations between particular traits and environmental stressors is much less well understood in other terrestrial photosynthetic organisms such as lichens. While responding to similar pressures, these organisms also differ in their stoichiometry and stress tolerance, leading to potentially quite different trade-offs between traits. The lichen-dominated ecosystems found in some coastal deserts provide an ideal space for evaluating and testing trait-environment relationships in lichenized fungi. We evaluated lichen communities across an altitudinal gradient in the hyper-arid Atacama desert of Chile, representing a moisture gradient from near-daily wetting by fog to the arid limit of complex multicellular autotrophs. We also measured qualitative and quantitative functional traits associated with water relations, photosynthetic activity and reproduction. Increased moisture availability was strongly correlated with species richness, phylogenetic diversity and functional diversity. The most arid-adapted communities at the edge of the gradient represented a small (5 spp) subset of the much more diverse communities in frequently foggy sites. Variation in functional diversity was evident in both increasing diversity of growth forms and reproductive strategies, but also surface properties (hydrophobicity) and stable isotopes. These community scale changes in traits were also seen intra-specifically for some, but not all, of the species found across the entire gradient, reflecting species-specific variation in phenotypic plasticity. The strong environmental response of novel, easily measured quantitative functional traits in lichens argues for the need to develop a broader functional trait framework for lichen ecology than the current emphasis on categorical traits.