Functional response of *Blechnum penna marina* to desiccation in tundra environments

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The climate on the sub-Antarctic Marion Island appears to be changing, providing an important indication of climate trends in the southern Ocean. Over the past forty years, temperature and average wind speed have increased, while rainfall and the number of overcast and windy days have decreased. The impact of these changes on plant physiology has hardly been studied in these isolated floras. The aim of this study is to test how the photosynthetic activity of *Blechnum penna-marina* changes with a decrease in leaf water content, indicative of desiccation that is expected to increase with the observed climate change. *Blechnum penna-marina* is one of the key species on Marion Island as it is one of the most dominant species in terms of cover and biomass, and can be found in most of the habitats below 600m above sea level. I propose using this species as an indicator to help predict how ferns on sub Antarctic islands may respond to changing climatic conditions. *Blechnum penna-marina* samples were collected from closed fernbrake slope habitat, placed in two litre containers with saturating water levels. Samples were acclimated at either 6or 11 °C for at least 3 days. After acclimation, CO_2 response (50 to 1500 micromol CO_2 mol^{-1}) was tested with a LICOR 6400XT allowing simultaneous measurement of gas exchange and chlorophyll fluorescence. Additionally; three leaves from each sample were collected to calculate leaf water content. Samples were then desiccated over time at their respective acclimation temperature. CO_2 response curves were determined at two day intervals during desiccation. Relationships between leaf water content and various photosynthetic parameters were investigated using the following approach: The CO_2 response parameters apparent Rubisco activity (Vcmax), maximum electrontransport (Jmax), triose-phosphate utilisation (TPU), daytime respiration (Rd) and mesophyll conductance (Gm), were response variables, acclimation temperature was a categorical variable, and leaf water content was the independent variable. Factor analysis was also conducted. Plants acclimatized at 6°C had a significantly higher Vcmax, Jmax and Rd than plants acclimatized at 11°C degrees. The only value that decreased significantly with leaf water content was the mesophyll conductance of plants acclimated at 11°C. In the factor analysis, TPU, Vcmax, Jmax and Rd comprised one factor while leaf water and Gm comprised another. These results suggest that warming on the island would tend to lower fern productivity, except in areas where low temperature limits the species. The range of the species has been expanding in the past decades, but there has not been a contraction in its major habitats. Other environmental drivers are being currently tested, like wind, soil water, irradiance and temperature. I will attempt to build a mechanistic model that will help to understand how this species could react to global climate change.