Do positive interactions expand the upper distributional limits of vascular plant species on Marion Island?

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Biotic interactions may strongly shape ecological communities [1] and an understanding of the community-level consequences of these interactions is important for examining current species dynamics and distributions. Therefore, an understanding of the impact of biotic interactions may be especially valuable for predicting species responses to future climate change [2; 3]. While the impact of the abiotic environment on species distributions has been well-established [4], the importance of biotic interactions, particularly positive (facilitative) interactions has largely been overlooked [1]. This study examines whether fine-scale facilitative interactions scale up to shape plant species distributions, and uses *Azorella selago* Hook., a widespread cushion plant and ecosystem engineer, and the rest of the vascular flora of Marion Island as a model system.

We assess if the elevational distribution of vascular plant species differs when growing in association or away from *A. selago*. Many studies have examined the occurrence of plant species on and off cushion plants at different altitudes [5; 6; 7]; however, they were unable to test if the distributional limits of species were affected by the cushion plants. The upper altitudinal limits of all vascular plant species in the presence and absence of *A. selago* were determined along altitudinal transects, running from approximately 900 m a.s.l. (since the current vascular plant record is at 840 m a.s.l.) down to sea level.

The upper distributional limits of most species did not differ significantly in the presence and absence of *A. selago*. However, *A. selago* had negative impacts on the upper range limits of two species, *Cotula plumosa* (mean difference = -9.21 m) and *Blechnum penna-marina* (-23.34 m) and a strong positive effect on another, *Colobanthus kerguelensis* (+185.96 m). Therefore, even though *A. selago* strongly impacts some fine-scale species patterns, these local impacts only scale up to shape the distribution of certain vascular plant species. Thus, plant-plant interactions may affect species broad-scale distributions, but the strength of these interactions is species-specific.

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