
Living in windy environments: new insights on mechanisms supporting the invasion success of alien plant species at the Kerguelen Islands

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Abstract

Invasions of native communities by alien plant species constitute a major driver of biodiversity changes, inducing modifications of ecological networks and ecosystem functioning. Due to their geographic isolation and simplified native communities, insular ecosystems are particularly vulnerable to invasions, and are often strongly relevant for investigating mechanisms supporting the establishment and spread of introduced plants. In addition to cool thermal conditions, terrestrial flora of subantarctic islands, including at the Kerguelen Islands, must often thrive in moderate to highly windy habitats, thus imposing strong mechanical constraints to individuals. While native subantarctic plants have evolved in these supposedly harsh abiotic conditions, many alien plants at the subantarctic islands are of tropical or temperate origins, where they were exposed to less stringent wind conditions. As wind likely represents a strong environmental filter for the successful establishment and further geographic spread of the plants, they may have then developed adaptive or phenotypic responses to resist and successfully colonize the Kerguelen Islands.

To test this assumption, we studied the ecological responses to wind exposure in three alien plants that are particularly invasive at the Kerguelen Islands: *Taraxacum ruderales*, *Poa pratensis*, and *Dactylis glomerata*. We sampled plant individuals of these three plants at three different locations, under wind exposed and sheltered conditions. Traits related to avoidance (height), resistance (stem density, flexibility), and performance (individual, and flower biomasses) to windy conditions were measured.

We demonstrated similar patterns of responses in the three studied species. Plant individuals were overall smaller, and displayed stems with a higher flexibility when they are thriving in

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windy habitats, regardless of the sampling location. This abiotic resistance to wind exposure may have help alien plants to efficiently colonize habitats of the Kerguelen Islands. Further investigations are nevertheless needed to determine whether these responses are heritable (adaptation) or not (phenotypic plasticity).