

Research Article
SPECIAL ISSUE:

Introduction

The capacity for clonal growth is often given as an explanation for the invasive character of many introduced species (Thompson *et al.* 1995). Clonal growth affords species a capacity for reproduction despite small initial population sizes. It also offers competitive advantages such as the ability to nurse new ramets (sprouts), share resources between ramets and avoid the costly risks involved in sexual reproduction. However, the fitness costs of reproduction by clonal growth can include a limited ability to adapt to environmental and temporal heterogeneity (Alpert and Simms 2002). Recombination of genetic material

Introduced *A. trichocarpus* produces biomass more quickly, metabolizes carbon and nitrogen more quickly, and it is suspected that the introduced lineage has a photosynthetic advantage over its native conspecific (Mozdzer [et al. 2013](#)). Using previously identified clonal genotypes (

interactions in the complete data set, though we did find weak but statistically significant interactions when several highly variable clones were excluded from the data. We inferred the significant effects using the complete data set, employing a Type II procedure to ensure full power to determine effects ([Langsrud 2003](#))

11.5 (6.7–18.1) mol m⁻² s⁻¹). This substantial difference between the lineages was relatively consistent across the three sites (16–31 % increase on log_e scale depending on site; Fig.

contributed to differences in w_{\max} between native and invasive lineages. We found that at three marsh sites separated by as much as 43 km, introduced lineages have consistently greater w_{\max} than their native congeners. Thus, w_{\max} can be added to an already extensive list of functional traits that distinguish these genetic variants (stem densities, heights, above ground biomass, leaf area, leaf nitrogen and chlorophyll content, rates of photosynthesis, relative growth rates (RGR) and carbon fixation; reviewed in [Mozdzer et al. 2013](#)). Our analysis also indicates that plasticity of the introduced lineage, determined as within-genotype variation in w_{\max} , is similar to or exceeds that shown by the native lineage. These results provide insights that scale up from stomatal morphometrics to community dynamics.

Phenotypic variation in stomatal morphometrics

We observed inverse relationships between stomatal size and density, as have been commonly reported in the literature for multiple taxa ([Kawamitsu et al. 1996](#); [Hetherington and Woodward 2003](#); [Franks et al. 2009](#)). The derivation of w_{\max} based on the work of [Brown and Escombe \(1900\)](#)

suggests that a trade-off between stomate size and density will be broadly linked with conservation of w_{\max} ; decreases in stomatal size without a compensatory increase in density should result in decreases in w_{\max} (the relative effect of decreased stomatal size on w_{\max} is smaller when stomata are large because while pore resistance is increased by declines in pore area, parallel decreases in pore depth act to decrease pore resistance; see discussion by

case of $\sigma_y \sigma^*$, improvements in stomatal feedback could allow introduced lineage access to more exposed ground with less reliable water supply, contributing to their observed capacity to reduce soil moisture levels (by accretion, [Rooth \$\sigma\$. 2003](#); by transpiration $2954E0u;irbsapcre9.9(0$

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