Global gene flow releases invasive plants from environmental constraints on genetic diversity

Annabel L. Smith^{a,b,1,2}, Trevor R. Hodkinson^c, Jesus Villellas^d, Jane A. Catford^e



(8), t u t utt t t t t g g

μµ v ŀ (9, 10)^g ^g ġ ۲ ۲ v u u ŀ ŀ ŀ 1). ŀ u u ŀ ۲ (11). 11 v v v (12)u ۲ (13). u 1 u μv u ŀ w u ŀ ŀ (14),^gu _k u ŀ v μv (15, 16) ġ g 11 ġ (. w ŀ g_u (18<mark>9</mark>, (17)^g g u (19),) uμ (20). u u ŀ ġ (21) u ŀ ŀ ₽^gv . D (22)v ŀ (23)^g, w v v ŀ g (24). y ŀ w٢ ŀ v yı

it, g g t t v



Results and Discussion

Hypothesis 1: Dispersal between Populations Will Dilute Demographic												
Effects on	Genetic	Diversity.	μw	u	I J		u	ŀ	u -			
ł		, W L		r	1	Ľ	v	u	$\mathbf{v}\mathbf{v}$			
$(\sigma = 0.1)$	0.2)		u	F ((μ, Φ	$F_{F} = 1$			
₽ 100),	g e v	u vv		1	g		g l	. V	, h			

V V	V	1-14	L W	v r	. wv,w
	1 V 1 1	W	1 1	E	$(IA_{I}, \dots, x,$
	1), r	, u		ŀ	rr u
- 18^g 1W 1	$F^{\mathbf{g}} = 0 (\mathbf{\hat{g}})$	L L U U L (F	F) w = 1 = 0.16)	(gr gr	
g F	F,w	u r gr	r + + V	ġ ġ	μV g,

u u ŀ (6, 44). u ₹v u u W u u W ŀ L g I IN u WJ ŀ g u WL v u w W WĻ (42). u ŀ W ŀ ŀ ŀ ġ v ۴. ų g r (45). Ľ. W ġ W u V ŀ w (46), W u ŀ ŀ ġ u υĻ u P u L g u į l n u (36). wĻ u u u u V L V ŀ ŀ g u v μ **1**0 . E u Ļν ŀ W ŀ u į

W

v

ŀ

(BayeScan) and two individual-level methods (PCAdapt and LFMM). BayeScan uses a Markov chain Monte Carlo algorithm to examine outlier loci against background values of population differentiation (F_{ST}) among predefined populations (65). PCAdapt and LFMM both define background population structure as K

three variables that can influence genetic diversity (Table 1): population density (rosettes per meter²), fecundity, and empirical population growth rate. For fecundity, we used reproductive effort estimated as the rosette-level inflorescence length \times number of flowering stems per meter²

- A. T. Pahl, J. Kollmann, A. Mayer, S. Haider, No evidence for local adaptation in an invasive alien plant: Field and greenhouse experiments tracing a colonization sequence. Ann. Bot. 112, 1921–1930 (2013).
- 34. A. Raj, M. Stephens, J. K. Pritchard, fastSTRUCTURE: Variational inference of population structure in large SNP data sets. Genetics **197**, 573–589 (2014).
- L. H. Rieseberg, A. Widmer, A. M. Arntz, J. M. Burke, The genetic architecture necessary for transgressive segregation is common in both natural and domesticated populations. Philos. Trans. R. Soc. Lond. B Biol. Sci. 358, 1141–1147 (2003).
- E. Fenollosa, D. A. Roach, S. Munné-Bosch, Death and plasticity in clones influence invasion success. Trends Plant Sci. 21, 551–553 (2016).
- O. François, M. G. B. Blum, M. Jakobsson, N. A. Rosenberg, Demographic history of european populations of Arabidopsis thaliana. PLoS Genet. 4, e1000075 (2008).
- R. Pinhasi, J. Fort, A. J. Ammerman, Tracing the origin and spread of agriculture in Europe. PLoS Biol. 3, e410 (2005).
- M. J. Grosvenor et al., Human activity was a major driver of the mid-Holocene vegetation change in southern Cumbria: Implications for the elm decline in the British Isles. J. Quaternary Sci. 32, 934–945 (2017).
- Ł. Kajtoch et al., Phylogeographic patterns of steppe species in Eastern Central Europe: A review and the implications for conservation. Biodivers. Conserv. 25, 2309–2339 (2016).
- J. Villellas, D. F. Doak, M. B. García, W. F. Morris, Demographic compensation among populations: What is it, how does it arise and what are its implications? Ecol. Lett. 18, 1139–1152 (2015).
- D. A. Roach, Age-specific demography in Plantago: Variation among cohorts in a natural plant population. Ecology 84, 749–756 (2003).
 J. Villellas, R. Berjano, A. Terrab, M. B. García, Escasa correspondencia entre diversidad
- J. Villellas, R. Berjano, A. Terrab, M. B. García, Escasa correspondencia entre diversidad genética y demografía en una planta a escala continental. Ecosistemas (Madr.) 28, 4– 14 (2019).
- 44. C. I. Fraser, I. D. Davies, D. Bryant, J. M. Waters, How disturbance and dispersal influence intraspecific structure. J. Ecol.