Beyond the Guidelines: Designing resilient persistent plant translocations
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Climate niche models to inform site selection

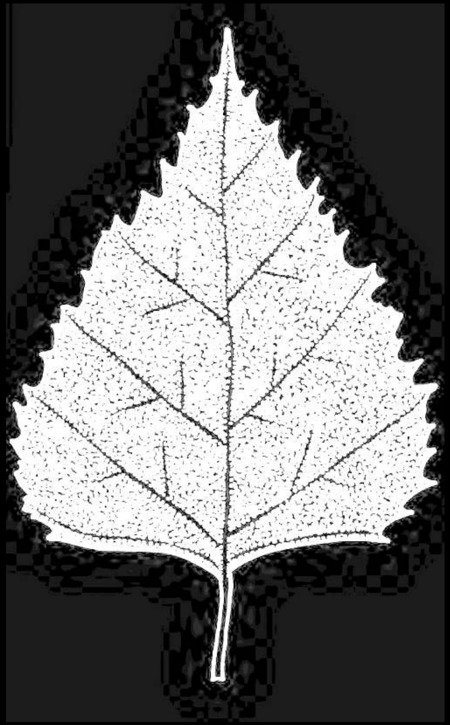
Sarah E. Dalrymple & Joe M. Bellis

s.e.dalrymple@ljmu.ac.uk
sarahedalrymple.github.io
@sarahedalrymple

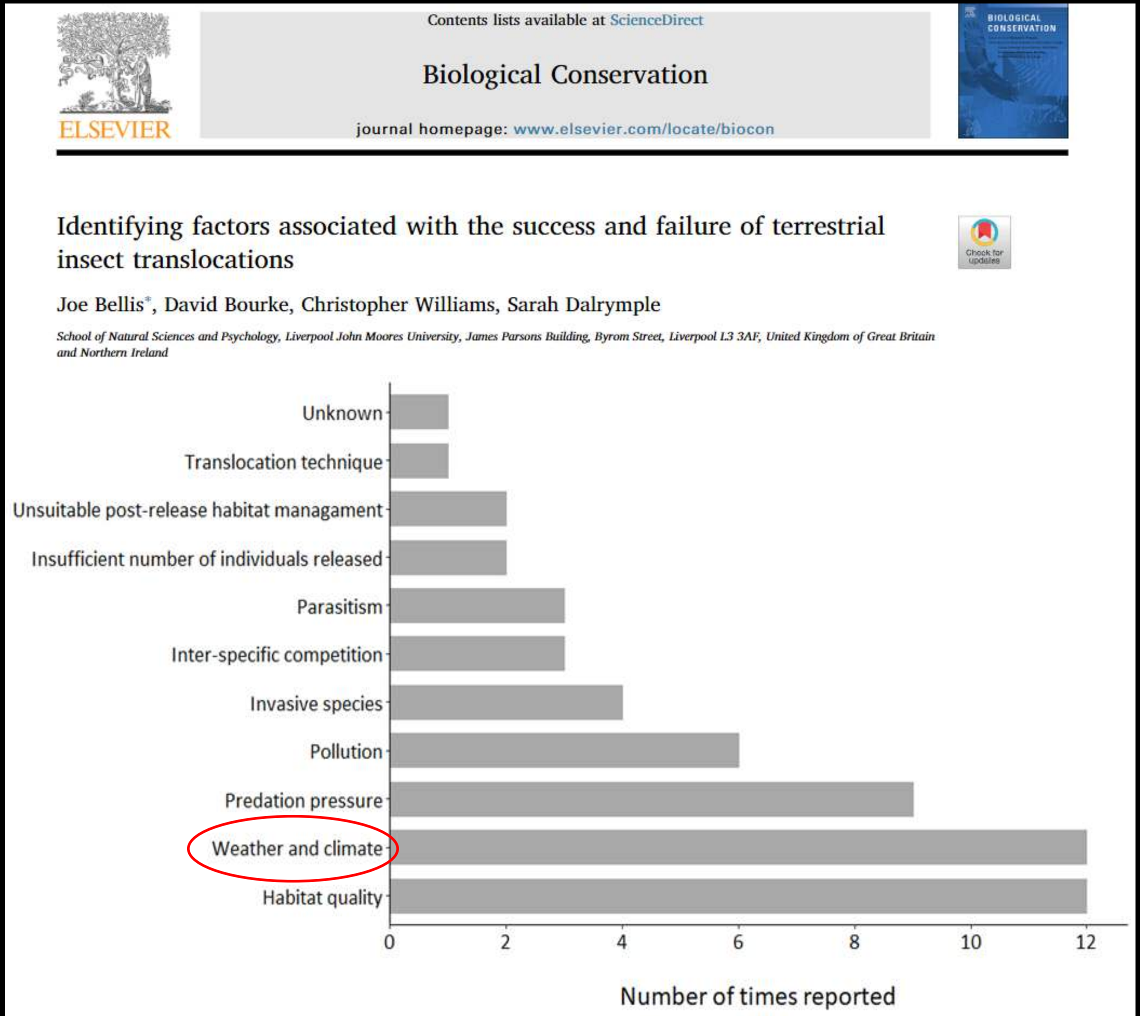
Reader in Conservation Ecology
Programme Leader BSc Wildlife Conservation

LIVERPOOL JOHN MOORES UNIVERSITY

IUCN SSC Species Survival Commission
Conservation Translocation Specialist Group



Translocations and weather/climate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ELSEVIER

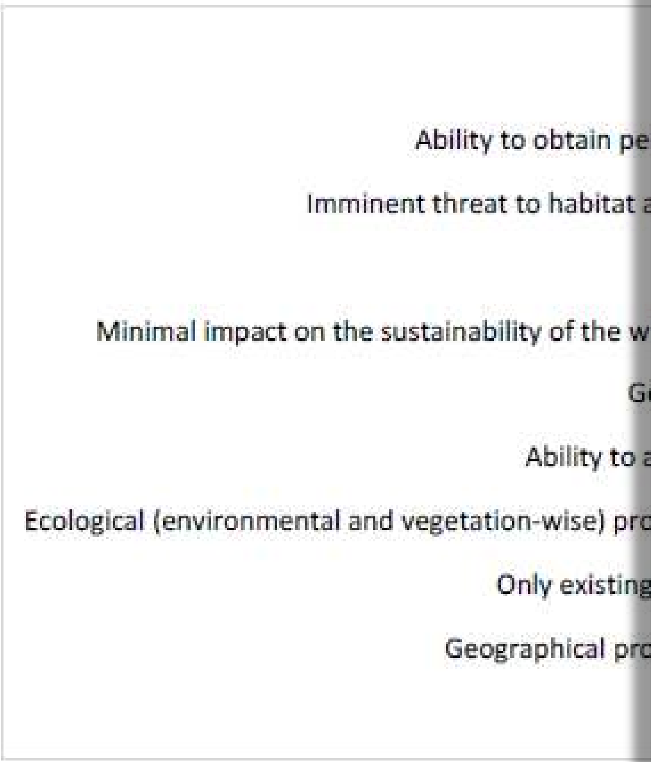
Identifying factors associated with the success and failure of terrestrial insect translocations

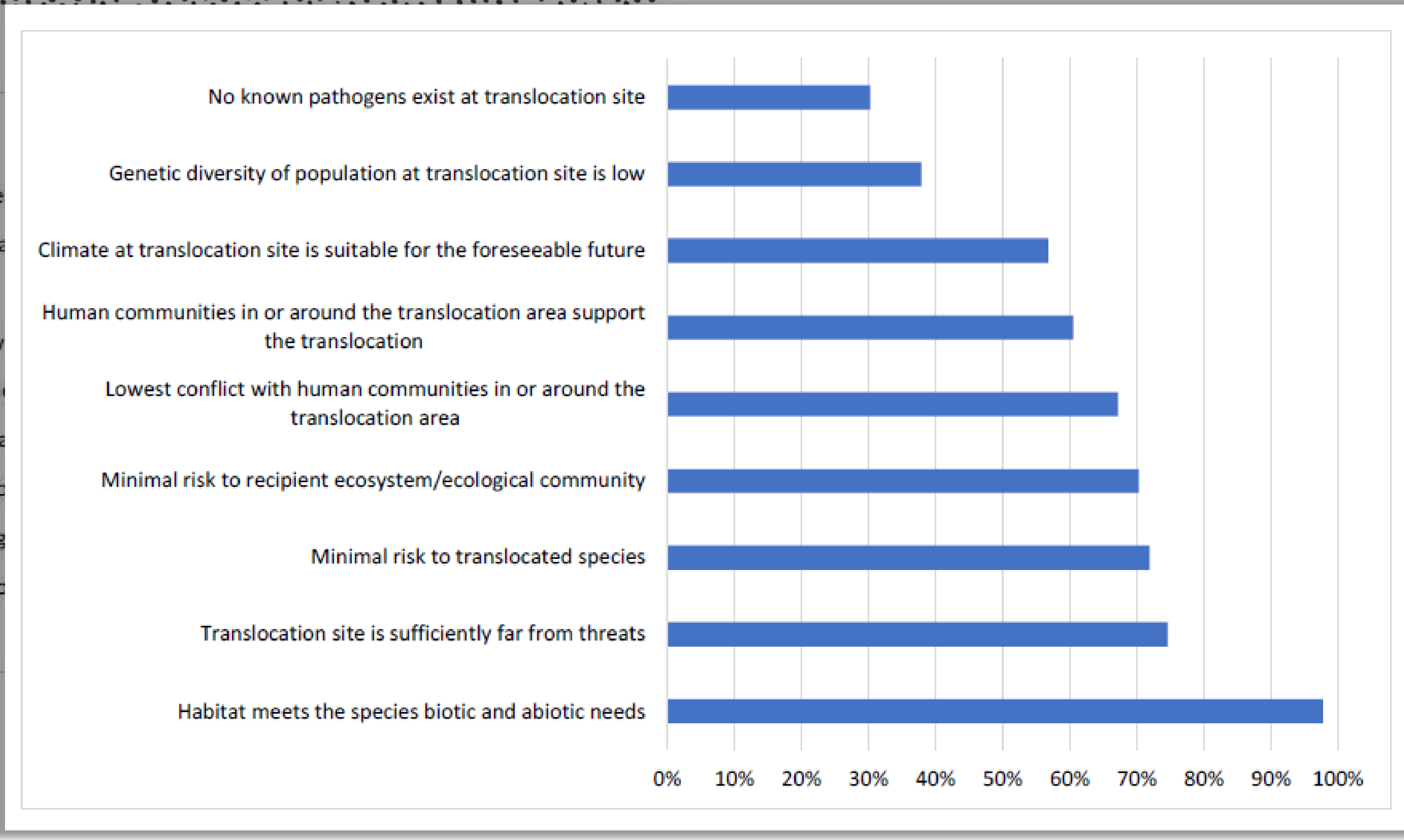
Joe Bellis*, David Bourke, Christopher Williams, Sarah Dalrymple

School of Natural Sciences and Psychology, Liverpool John Moores University, James Parsons Building, Byrom Street, Liverpool L3 3AF, United Kingdom of Great Britain and Northern Ireland

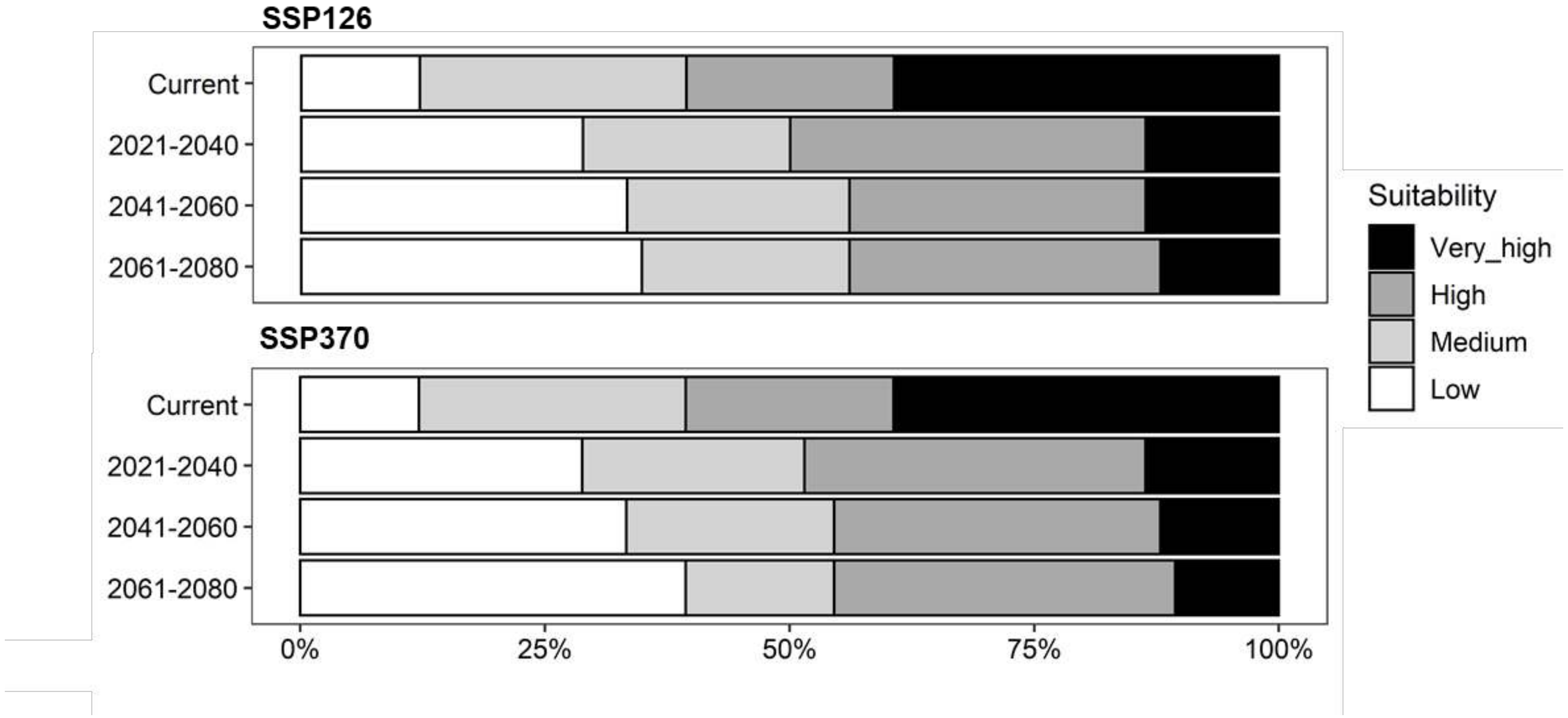
Factors reported as influencing the failure of terrestrial insect translocations (n=33). Several influential factors may have been reported for a single translocation project.

Site selection decisions





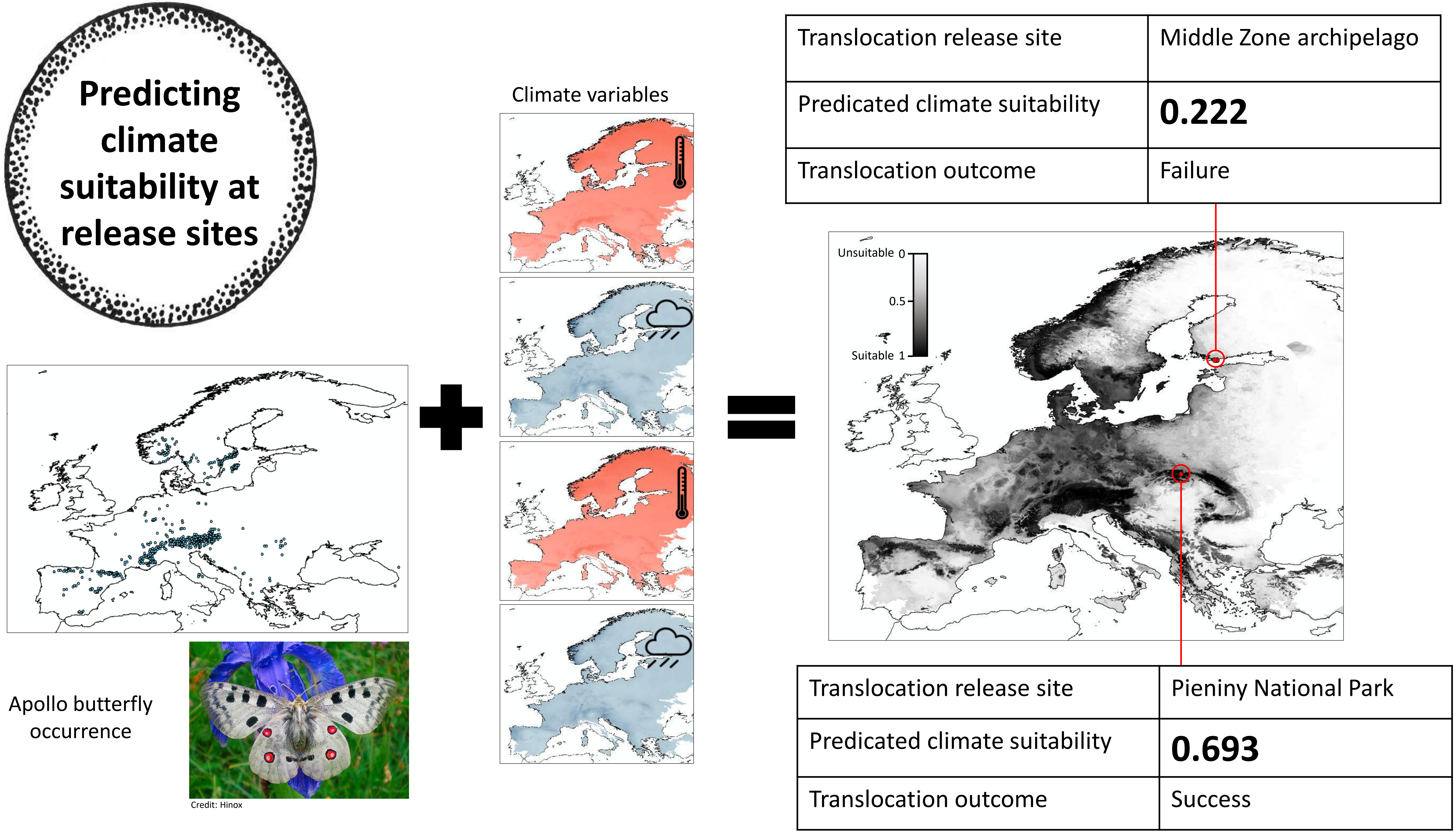
How will reintroductions fare in the future?



Predicted standardised suitability of translocation recipient sites (*n* = 66) under current macroclimatic conditions and future projected conditions for 2021-2040, 2041-2060 and 2061-2080. Future projections have been averaged across 5 GCMs for each SSP scenario. Suitability categorisations are as follows: Low = 0 – 0.25, Medium = 0.25 – 0.50, High = 0.50 – 0.75 and Very high = 0.75 – 1.

Joe Bellis (2021), unpublished PhD thesis, Liverpool John Moores University, accepted by *Diversity & Distributions*

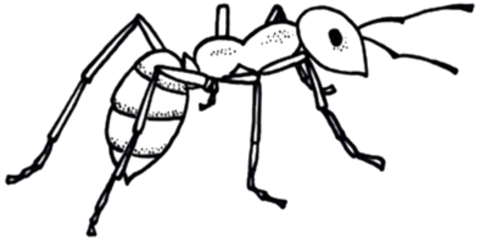
Evidence to support the use of Species Distribution Models in translocations

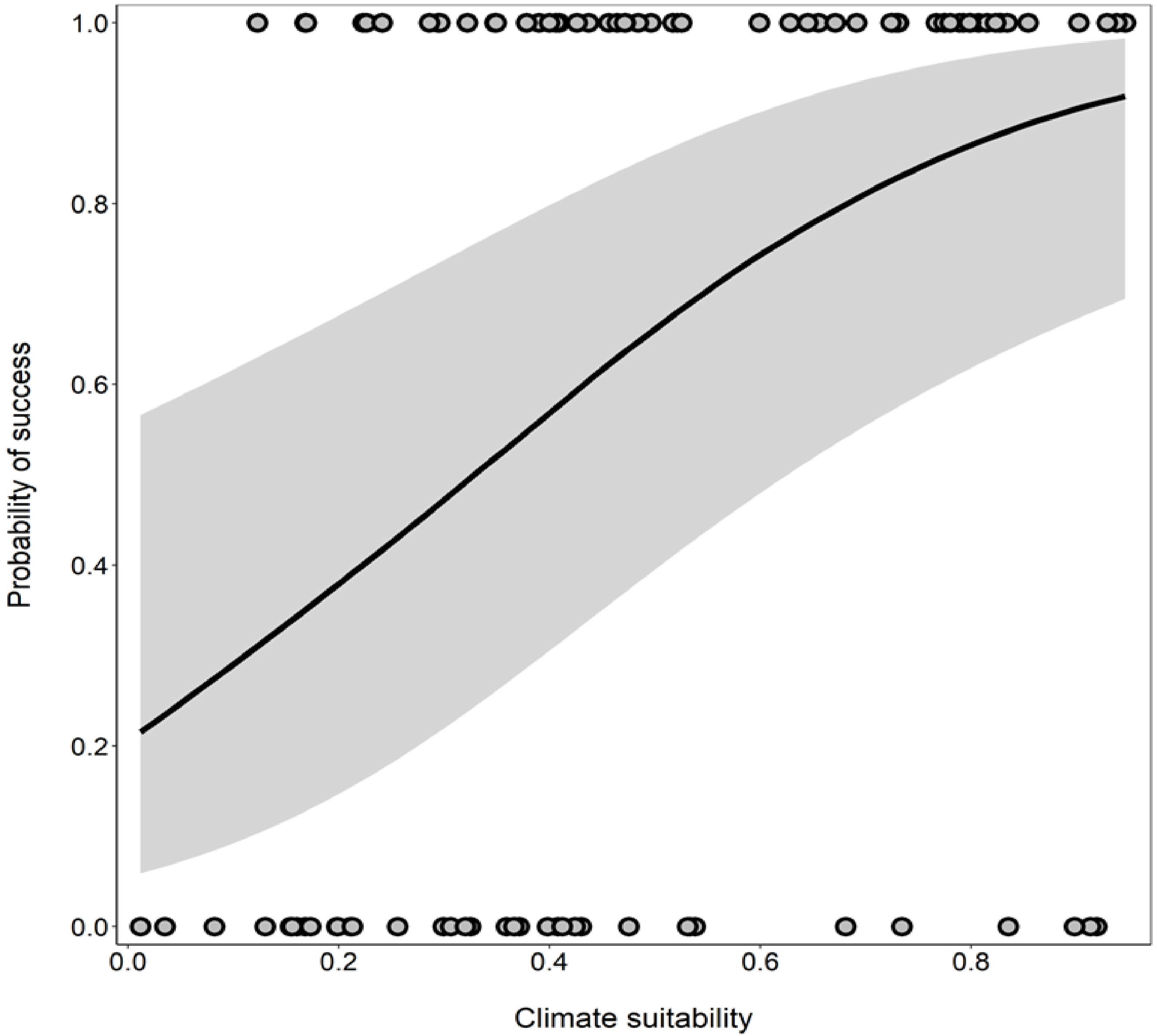


Predicting climate suitability at release sites
Climate variables
Apollo butterfly occurrence
Credit: Hinox
Unsuitable 0
0.5
Suitable 1
Translocation release site
Middle Zone archipelago
Predicated climate suitability
0.222
Translocation outcome
Failure
Translocation release site
Pieniny National Park
Predicated climate suitability
0.693
Translocation outcome
Success

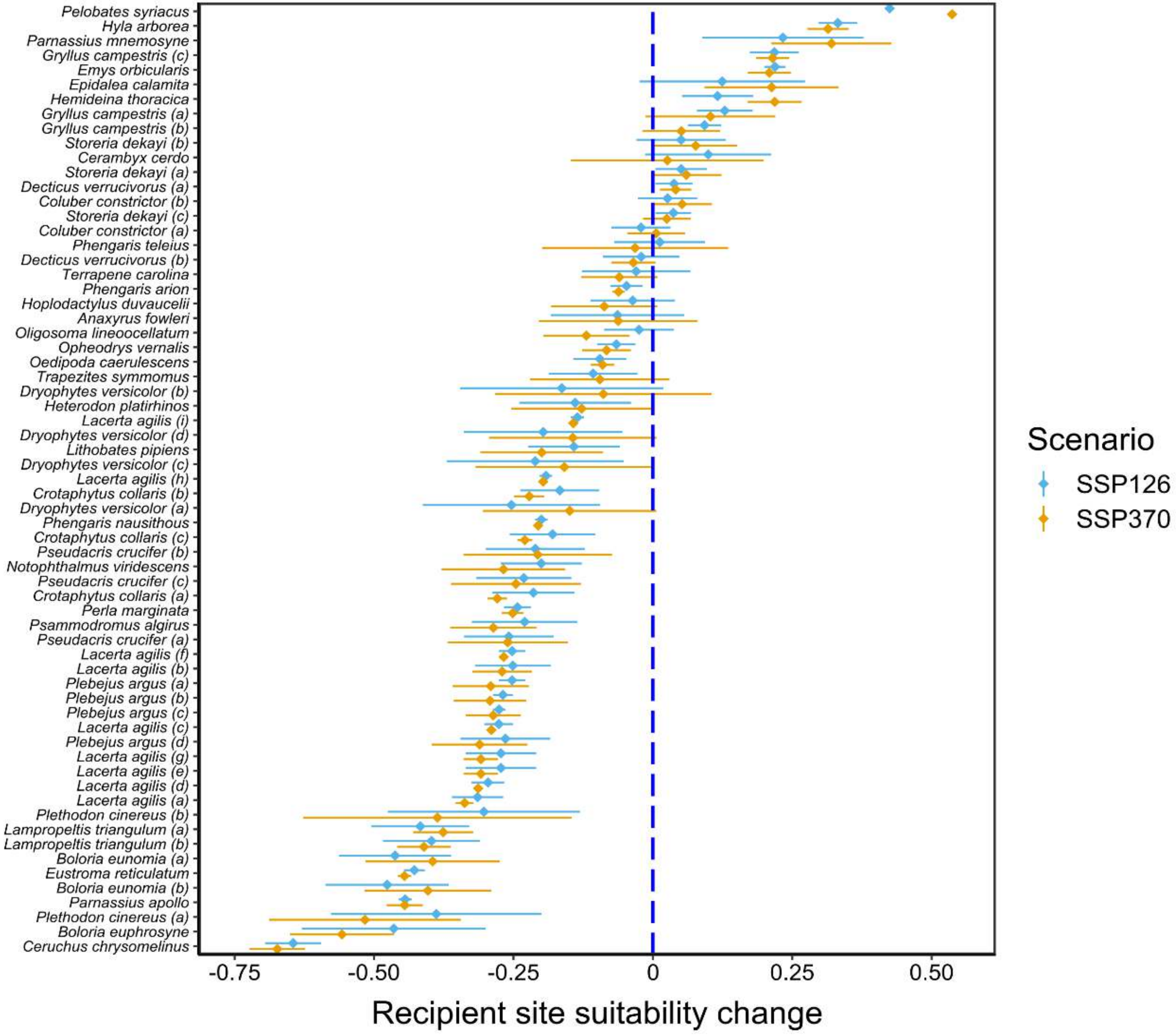
Increasing climate suitability = higher translocation success

Effect of predicted climate suitability on model-based probabilities of translocation success for amphibians, reptiles and terrestrial insects. The shaded area indicates 95% confidence intervals.





Climate suitability change at release sites

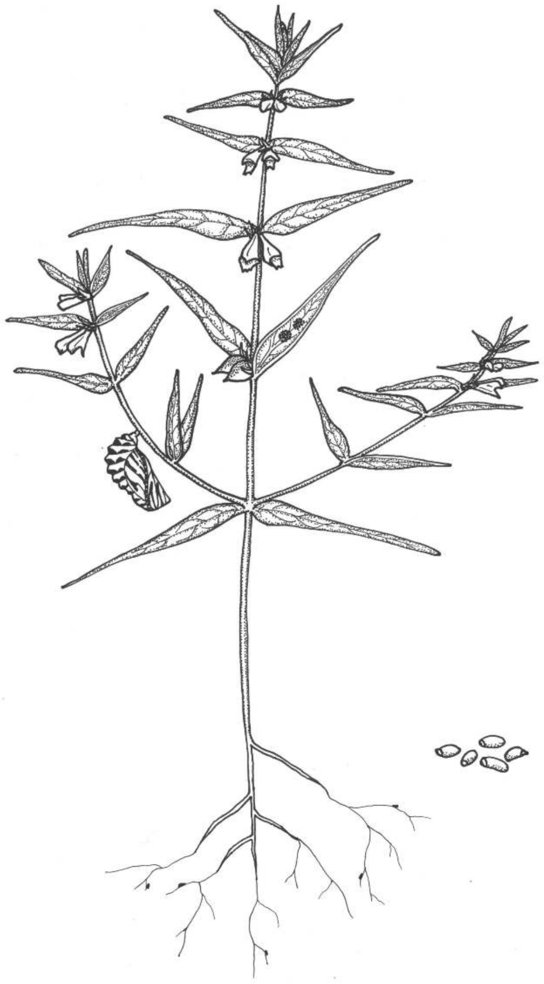


Mean (SD) predicted changes in standardised suitability at 66 translocation recipient sites between current conditions and those projected for mid-century (2041-2060), according to two different climate change scenarios: SSP126 (left) and SSP370 (right). Future projections have been averaged across 5 GCMs for each SSP scenario.

Joe Bellis (2021), unpublished PhD thesis, Liverpool John Moores University, accepted by *Diversity & Distributions*

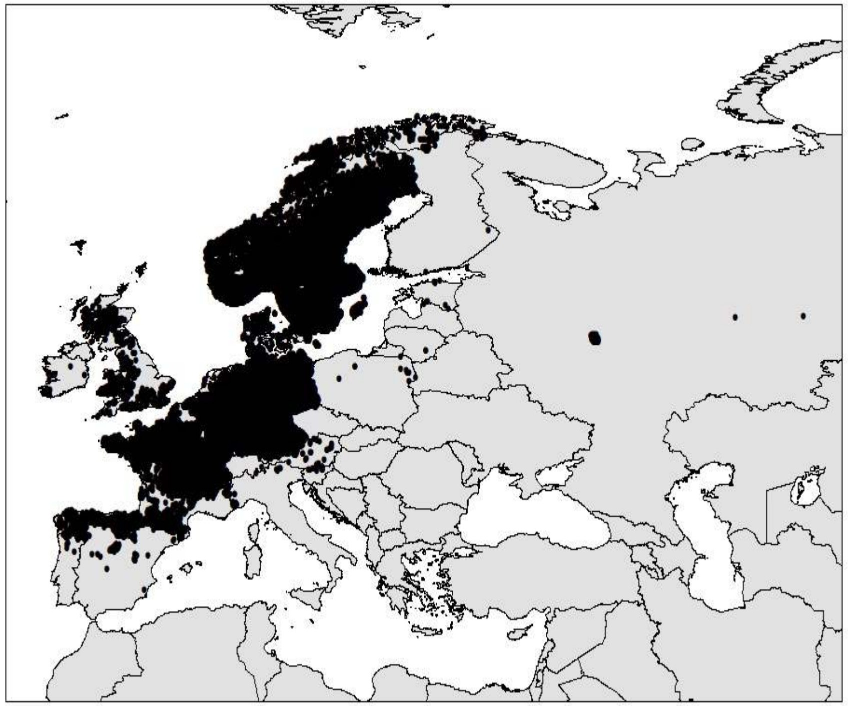
Strengths and opportunities
vs
caveats and limitations

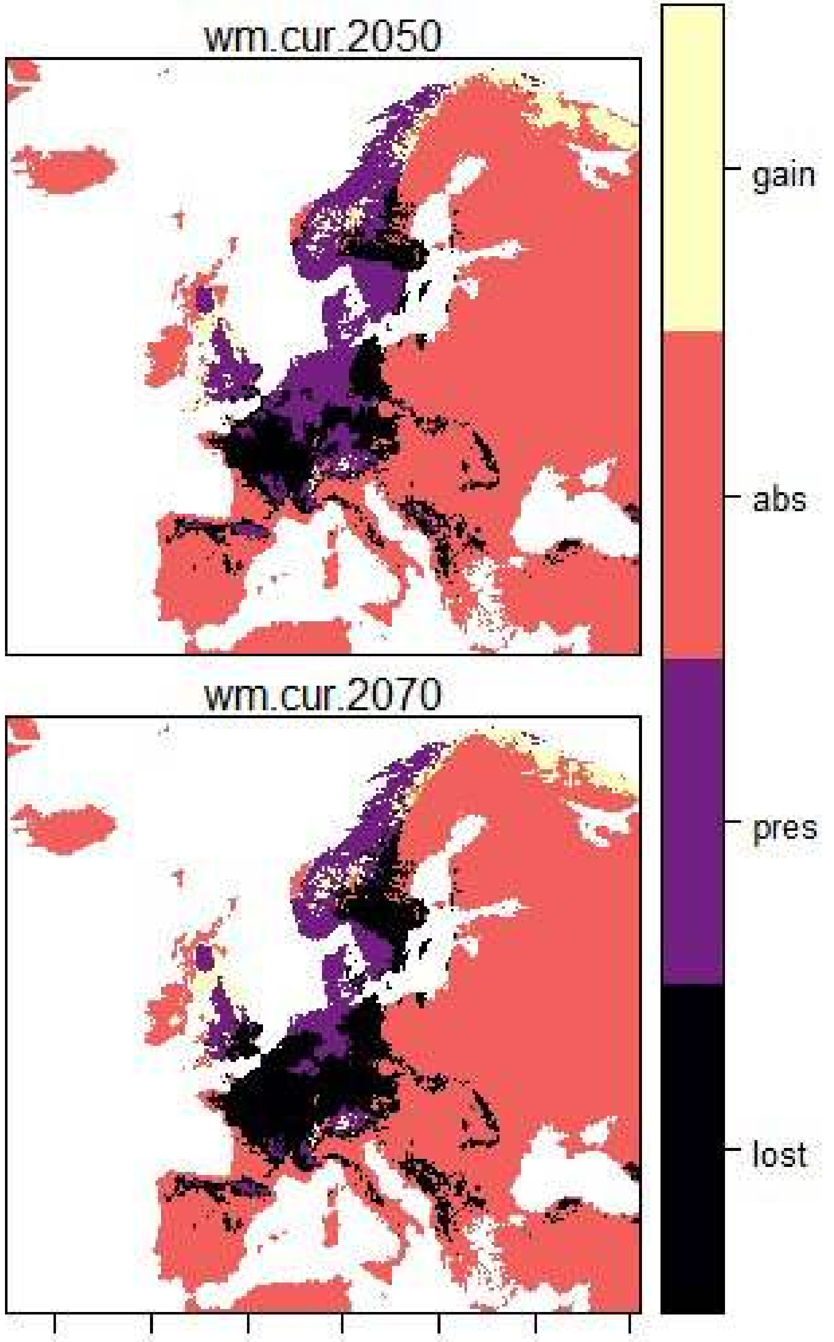
Binary outputs???



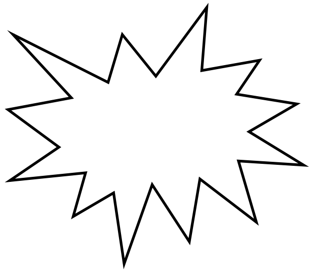
Climate niche model projections of *Melampyrum pratense* under IPCC RCP 8.5 for 2050 and 2070

-Ensemble modelling in biomod2



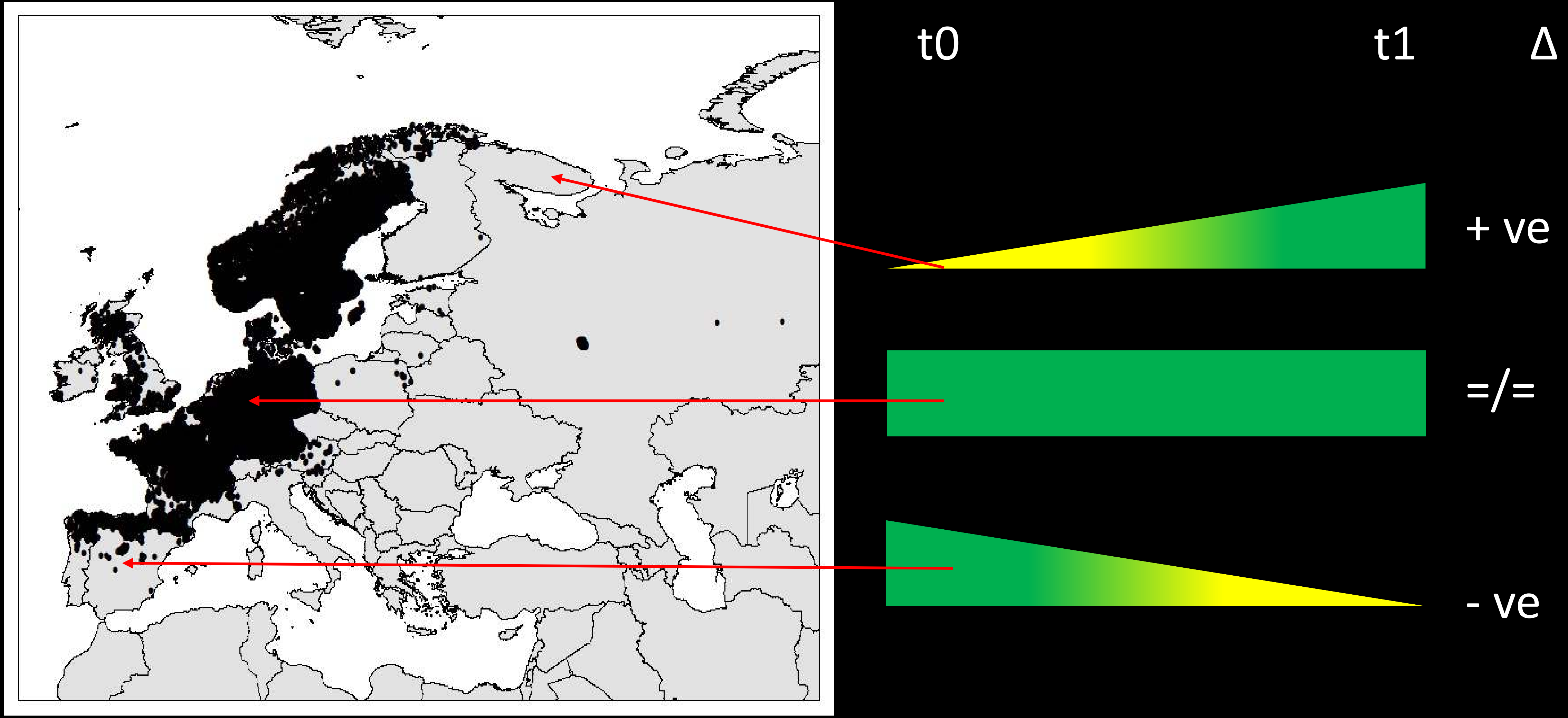


Be aware of artificial suitability thresholds

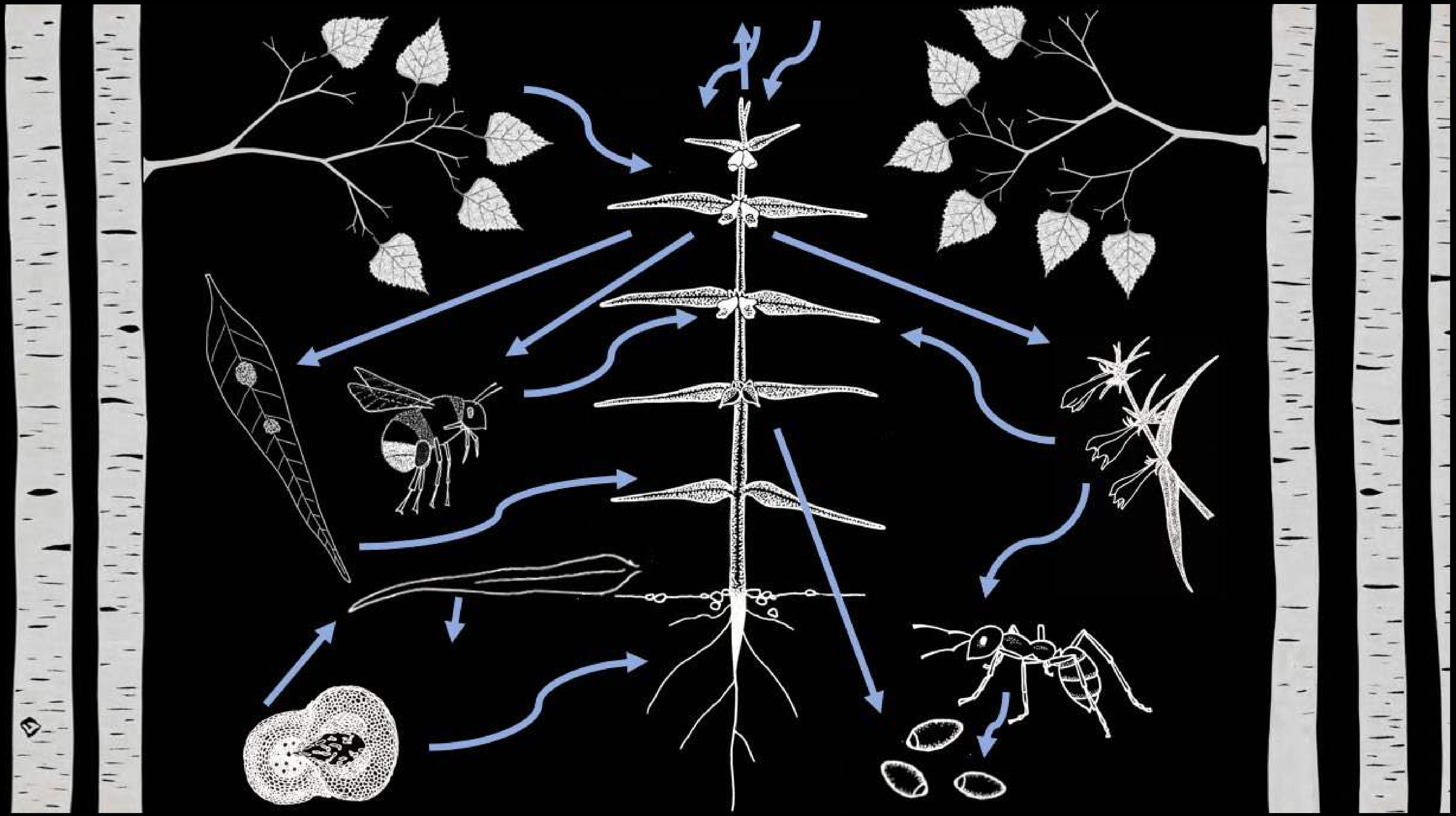


Climate suitability varies across a species’ range

Relative climate suitability



Climate ≠ not the whole story



Accessing the models

Data requirements for SDMs

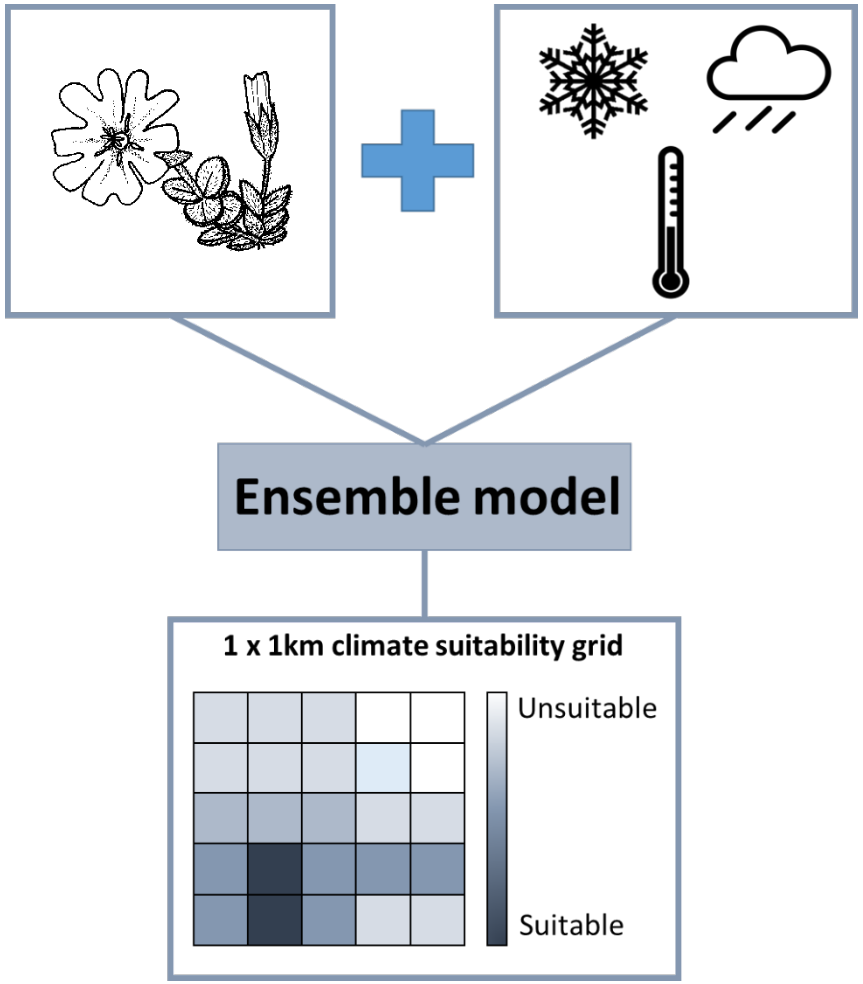
Species distribution modelling

<u>Data</u>

- Species occurrence data – cleaned GBIF records
- Climate data at a 1 x 1km resolution (Worldclim)

<u>Modelling</u>

- Biomod2 package in R
- Ensemble modelling approach to produce a consensus estimate of climate suitability



Available packages/apps

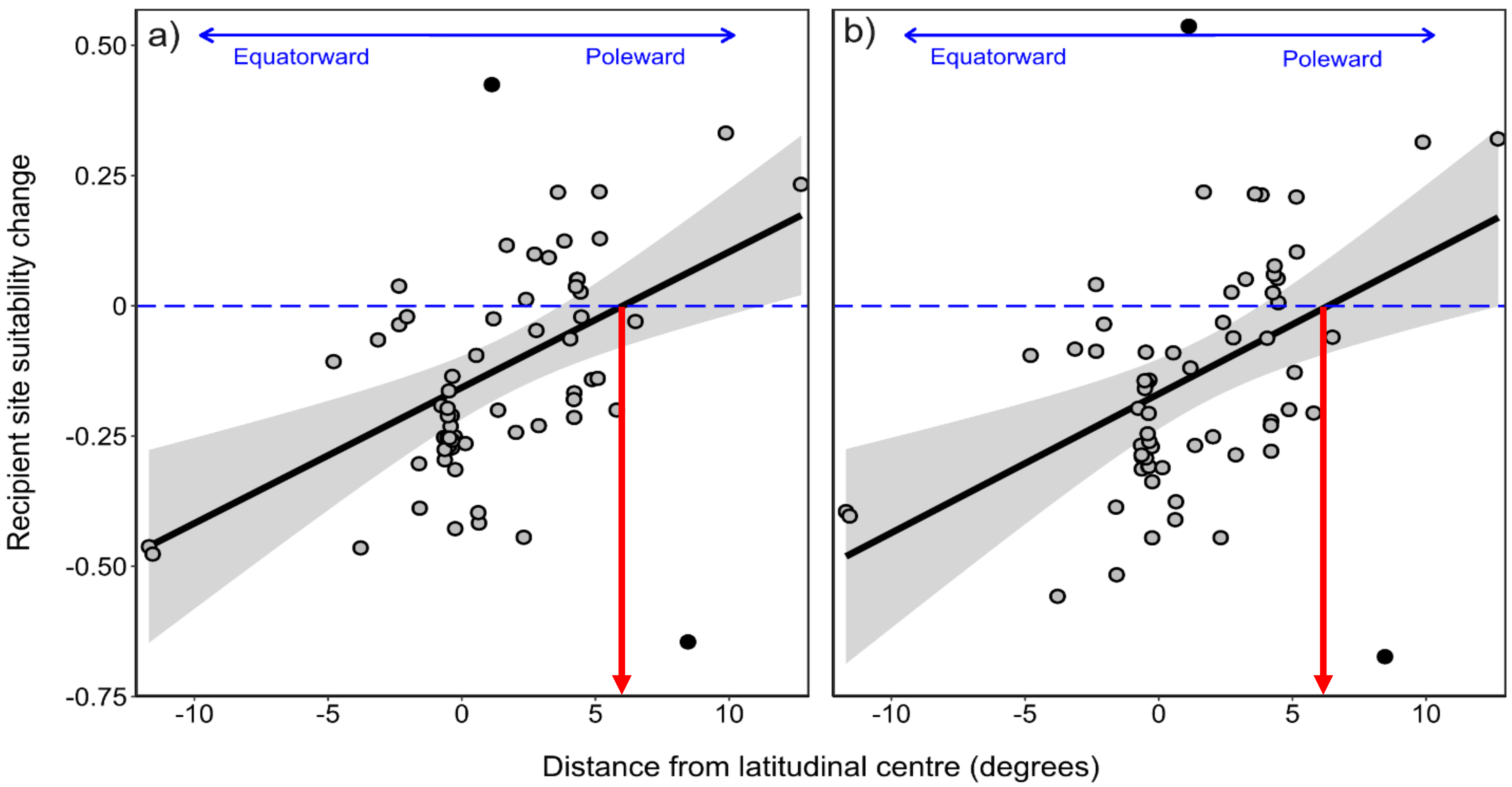
https://www.diva-gis.org/

https://biodiversityinformatics.amnh.org/open_source/maxent/

Curated list of R packages:

https://github.com/helixcn/sdm_r_packages

Proxies



Effect of distance from latitudinal centre (decimal degrees) on predicted changes in macroclimatic suitability at recipient sites, according to SSP126 (left) and SSP370 (right) for the period 2041-2060. Effect plots for other time horizons are presented in Figure A8.1. The two black dots (upper = *Pelobates syriacus*; lower = *Ceruchus chrysomelinus*) represent outliers that were omitted from the LMM.


CROSS-JOURNAL SPECIAL FOCUS
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Journal of Ecology
Ecological Solutions and Evidence
https://besjournals.onlinelibrary.wiley.com/hub/plant_translocations_and_climate_change

Thanks

LIVERPOOL JOHN MOORES UNIVERSITY

s.e.dalrymple@ljmu.ac.uk

sarahedalrymple.github.io

Ecological Solutions and Evidence

AER Applied Ecology Resources

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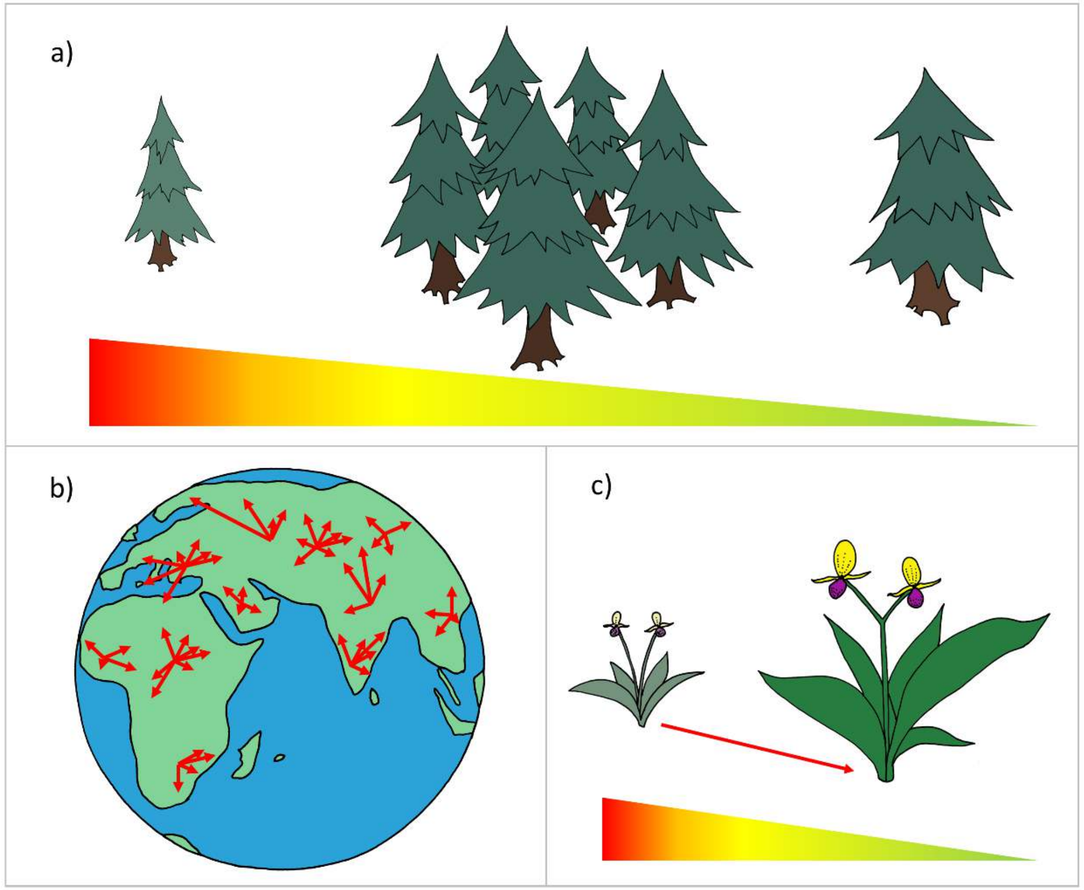
PLANT TRANSLOCATIONS AND CLIMATE CHANGE:
BIOASSAY, SURVEILLANCE AND SOLUTION TO A GLOBAL THREAT?

Guest Editorial

Exploring the potential for plant translocations to adapt to a warming world

Sarah E. Dalrymple[1] | Richard Winder[2] | Elizabeth M. Campbell[2]



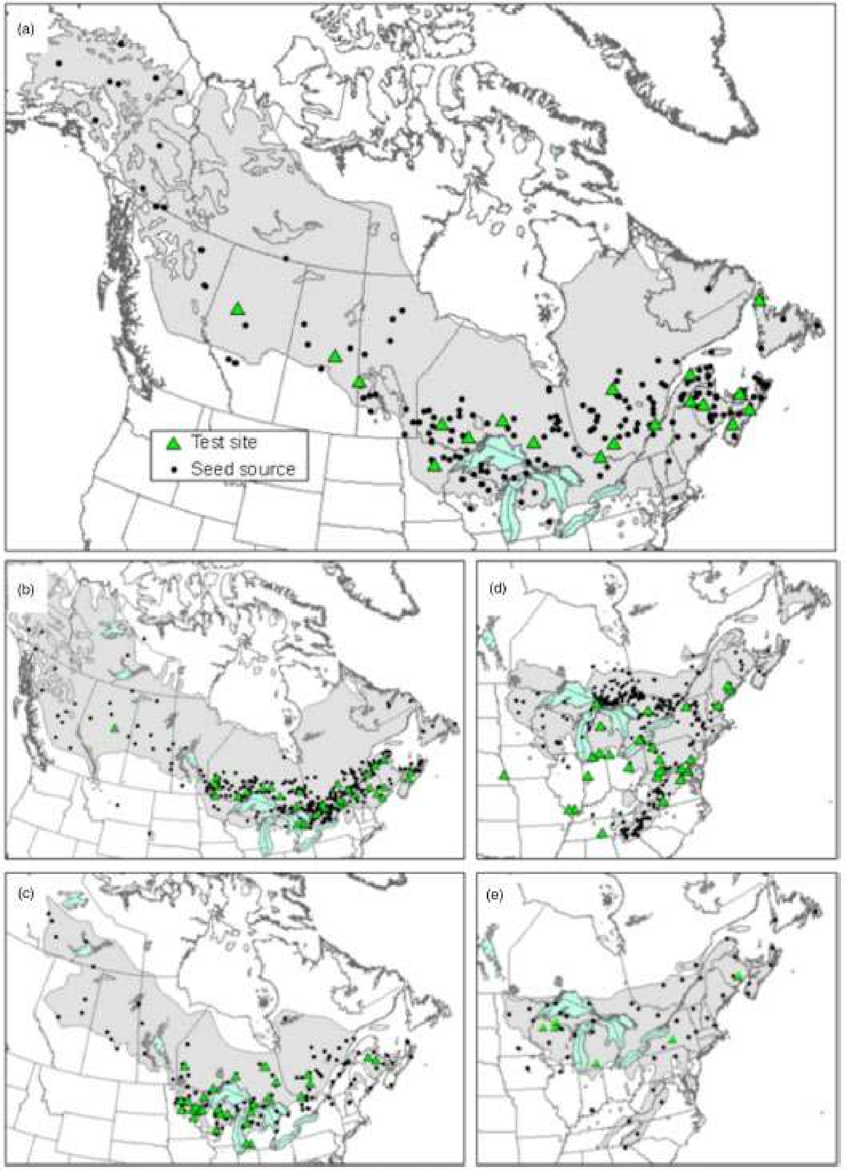


FIGURE 1 Spatial distribution of test sites and seed sources included in provenance data for (a) black spruce, (b) white spruce, (c) Jack pine, (d) white pine and (e) yellow birch. Grey shading indicates each species' geographical distribution (Little, 1971)

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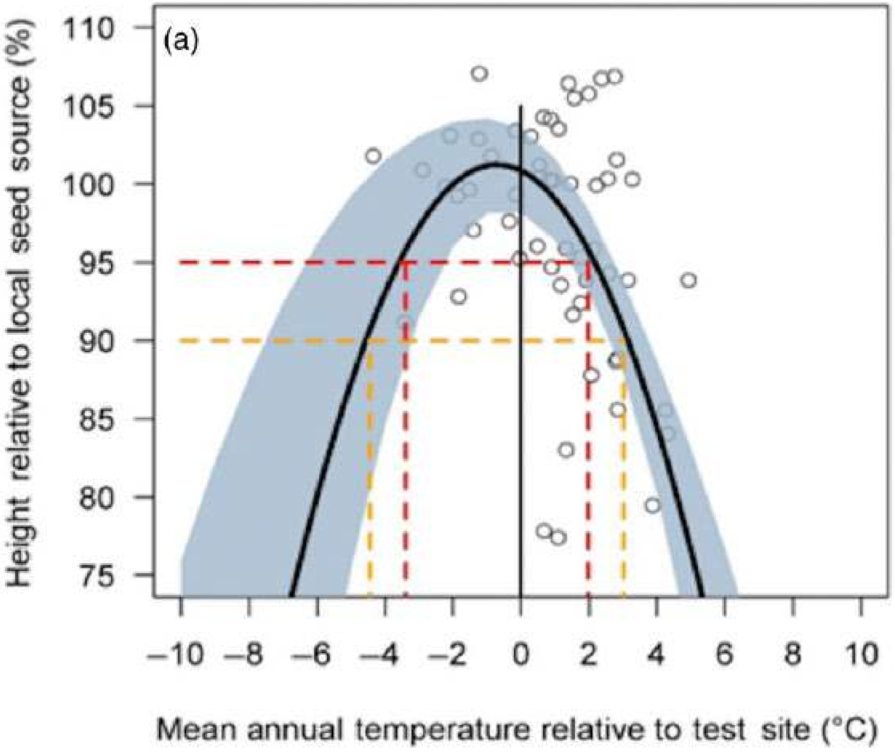
PLANT TRANSLOCATIONS AND CLIMATE CHANGE: BIOASSAY, SURVEILLANCE AND SOLUTION TO A GLOBAL THREAT?

Research Article

Critical seed transfer distances for selected tree species in eastern North America

John H. Pedlar[1] | Daniel W. McKenney[1] | Pengxin Lu[2]



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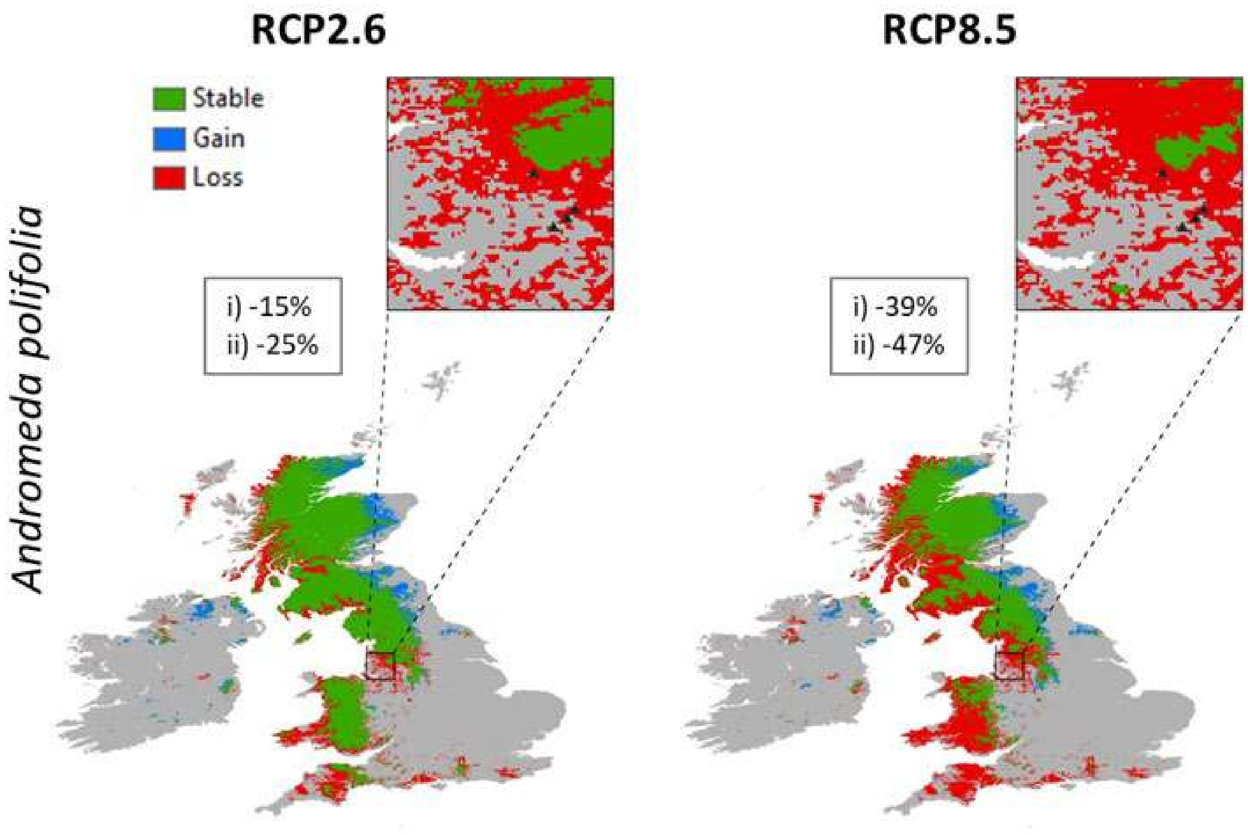
PLANT TRANSLOCATIONS AND CLIMATE CHANGE: BIOASSAY, SURVEILLANCE AND SOLUTION TO A GLOBAL THREAT

Research Article

Using macroecological species distribution models to estimate changes in the suitability of sites for threatened species reintroduction

Joe Bellis[1] | Mike Longden[1,2] | Joshua Styles[3,4] | Sarah Dalrymple[1]



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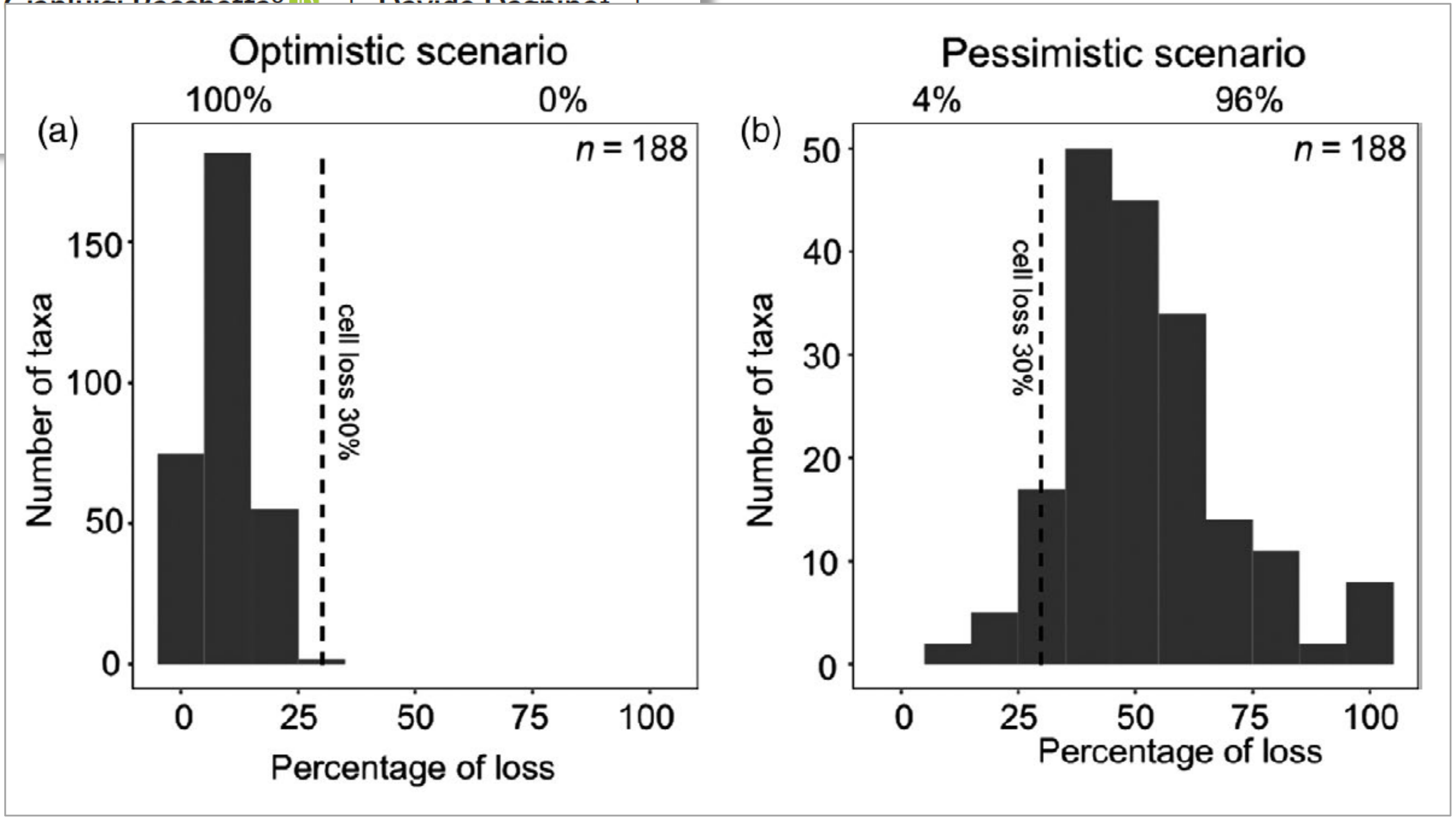
PLANT TRANSLOCATIONS AND CLIMATE CHANGE: BIOASSAY, SURVEILLANCE AND SOLUTION TO A GLOBAL THREAT?

Research Article

Combining conservation status and species distribution models for planning assisted colonisation under climate change

Gabriele Casazza[1] | Thomas Abeli[2] |
Giuseppe Fenu[4] | Domenico Gargano[5]
Simone Orsenigo[7] | Lorenzo Peruzzi[8]

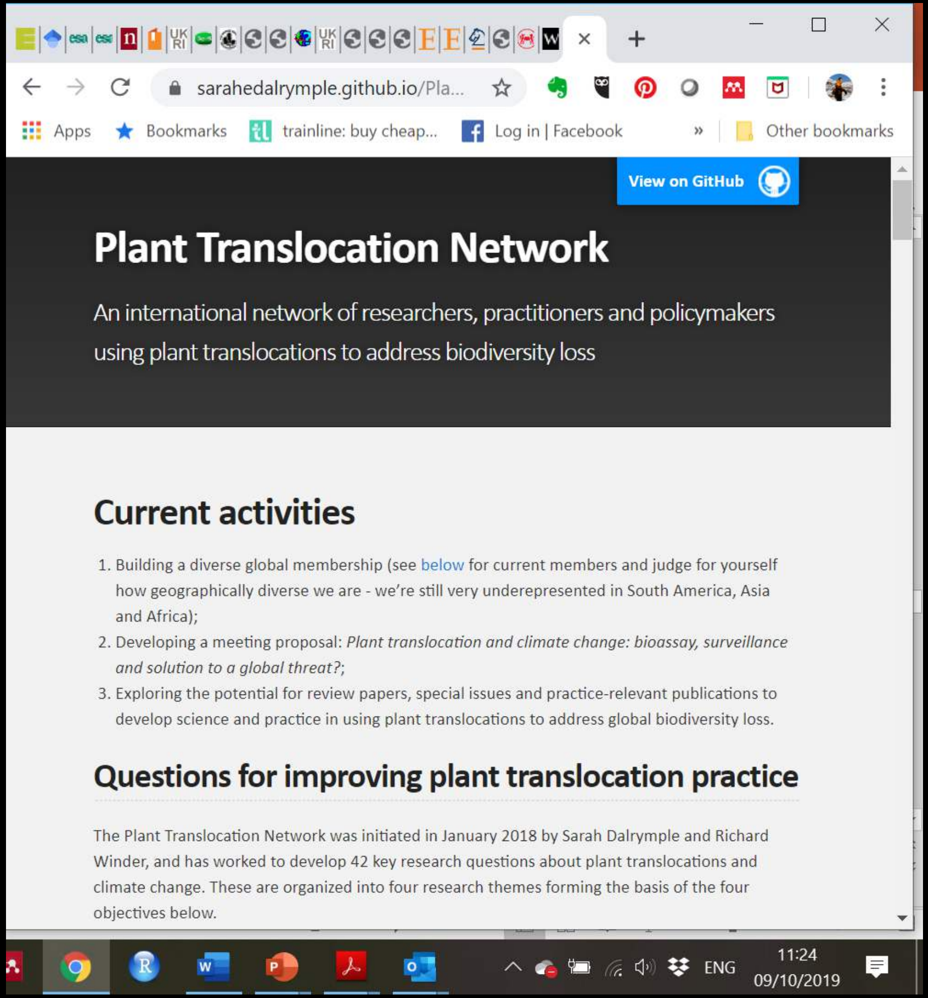


Collaborative opportunities…

Plant Translocation Network = 105 members in 19 countries

- foresters
- conservationists
- practitioners
- researchers

> 200 species
>1200 translocation attempts



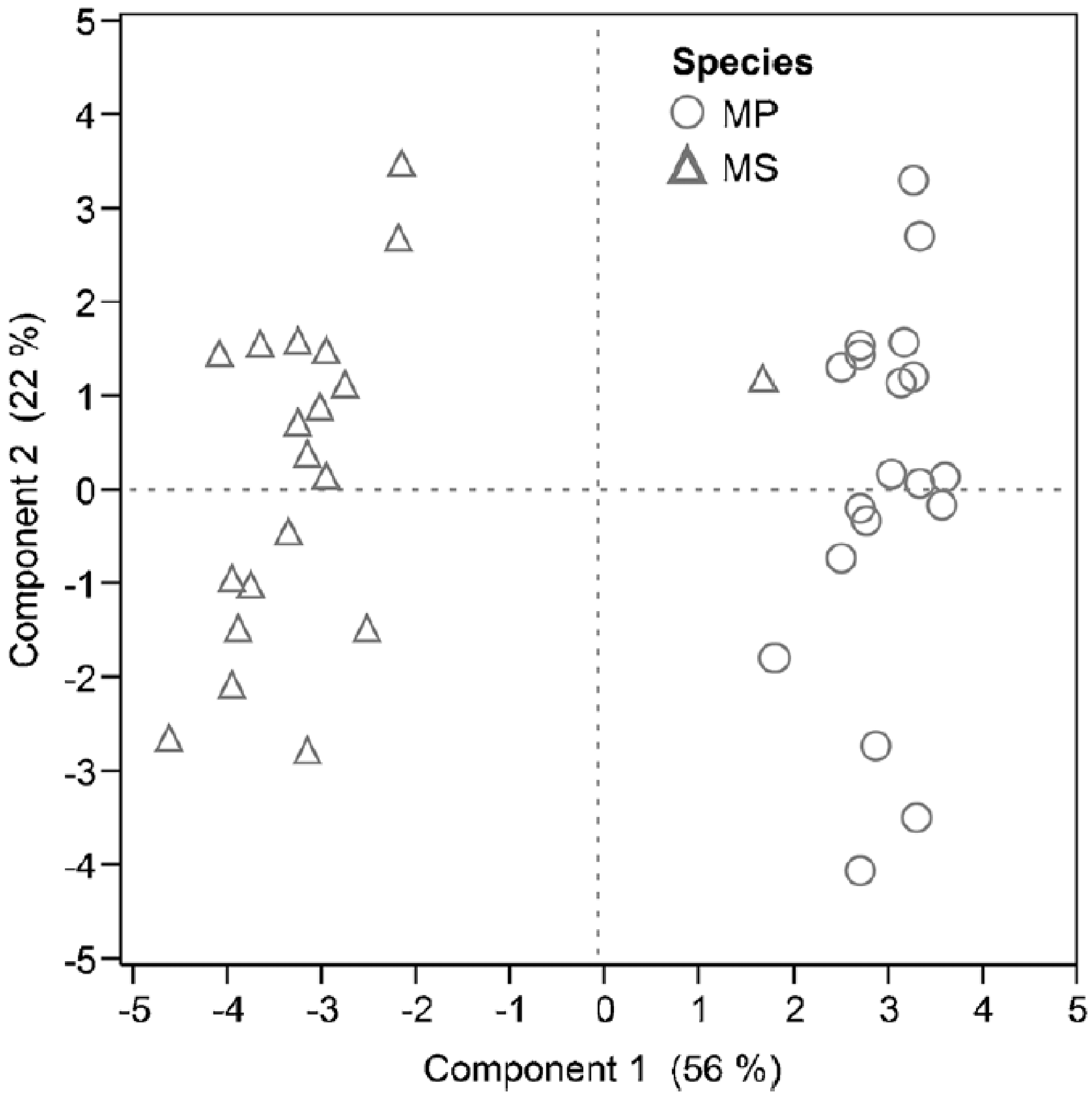
Case study: replacement of cogenerics to maintain ecological function under a changing climate

- studies demonstrate highly overlapping functional niches of two cogenerics
- distributions are also highly overlapping even with co-existence at very small scales/in same sites
- one species is more restricted though – less able to cope with drier/warmer conditions and apparently retracting at the southerly range edge

Q: should we move the species with the broader climatic niche into sites instead of reintroducing the climate-restricted species?

Twist

Phenolic profiles are different and affect the inoculation of fungi



Kaitera, J. & Witzell, J. (2016). Phenolic profiles of two … species differing in susceptibility to Cronartium rust. *European Journal of Plant Pathology*, *144*(1), 133–140.