What are the drivers of plant translocation outcome? A global perspective

Thomas Abeli

4th Mediterranean Plant Conservation Week
Valencia 23-27 October 2023

Isoëtes malinverniana Ces. & De Not.

SUMMARY

WHY we need translocation

AIMS of translocation

DATASETS

DRIVERS of translocation outcome

WHAT’S next?

INTRODUCTION

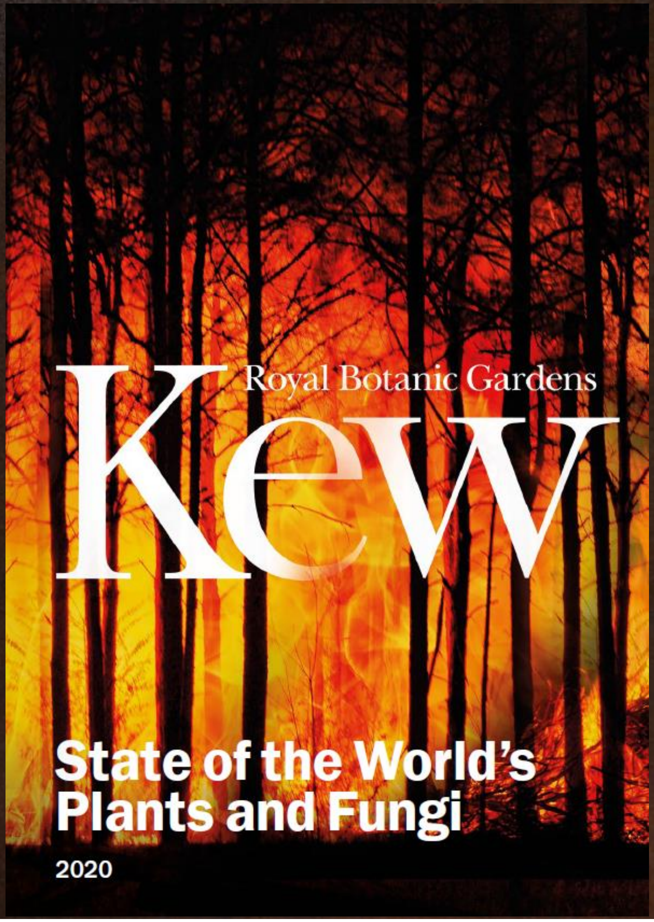
Biodiversity policies are supposed to contribute to the conservation of species and habitats.

Species are still disappearing!

40% of world's plant species at risk of extinction (*State of the World's Plants and Fungi*).

19 plant species extinct in Europe (Abeli et al., 2021 *Nature Plants*).

360 plant species extinct globally.



nature plants

Article

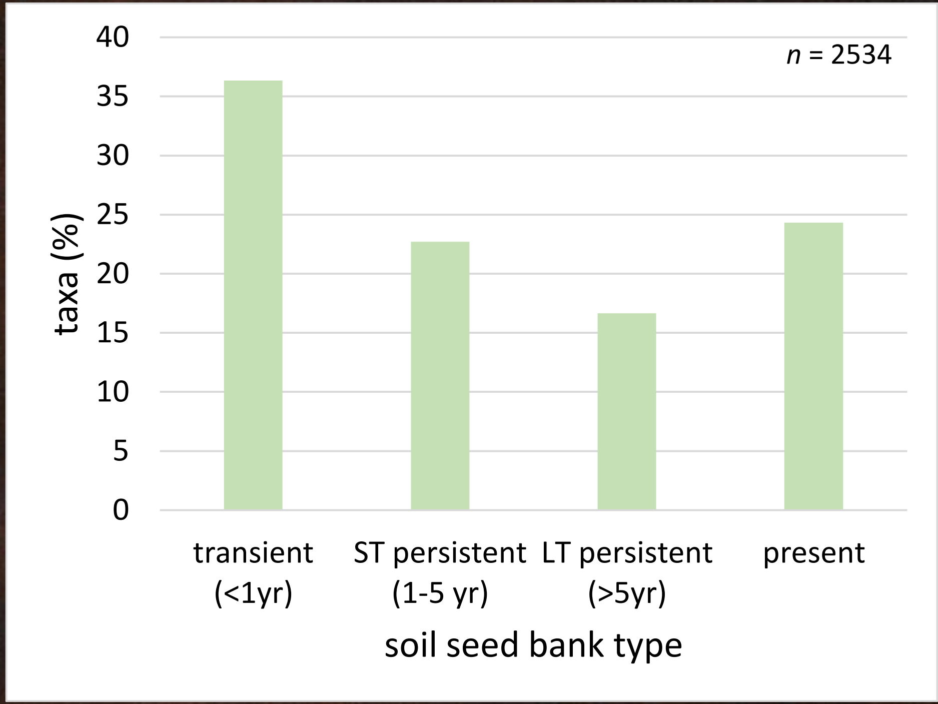
https://doi.org/10.1038/s41477-022-01296-7

Selecting the best candidates for resurrecting extinct-in-the-wild plants from herbaria

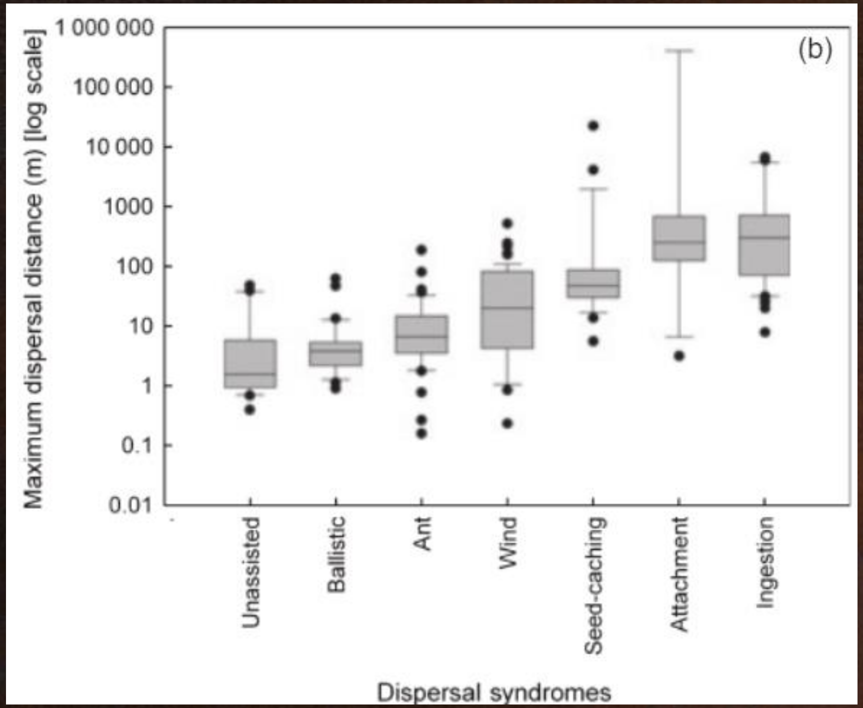
INTRODUCTION

Most species will not spontaneously return in areas where they used to occur.

Transient seed bank, limited dispersal capacity, habitat fragmentation.



Thompson et al., 1997



Thompson et al., 2011

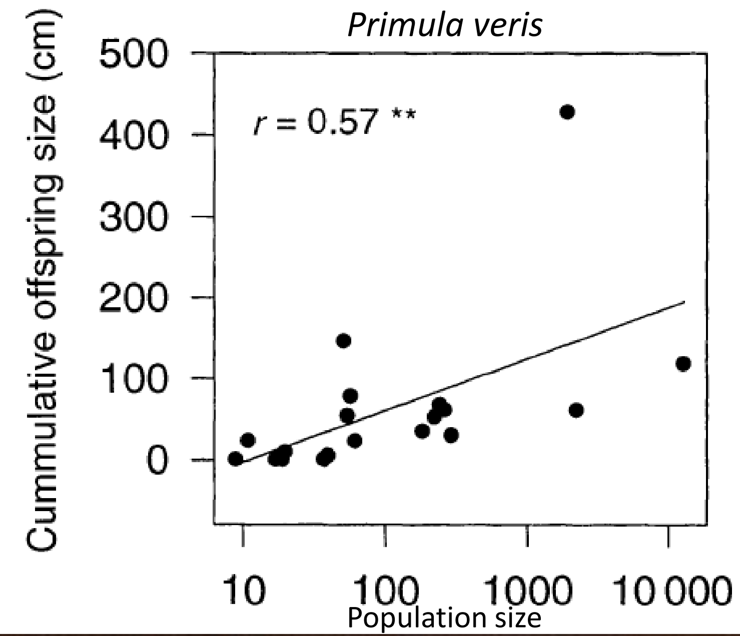
INTRODUCTION

Several species will not persist in the long run if their populations do not have a minimum viable size.

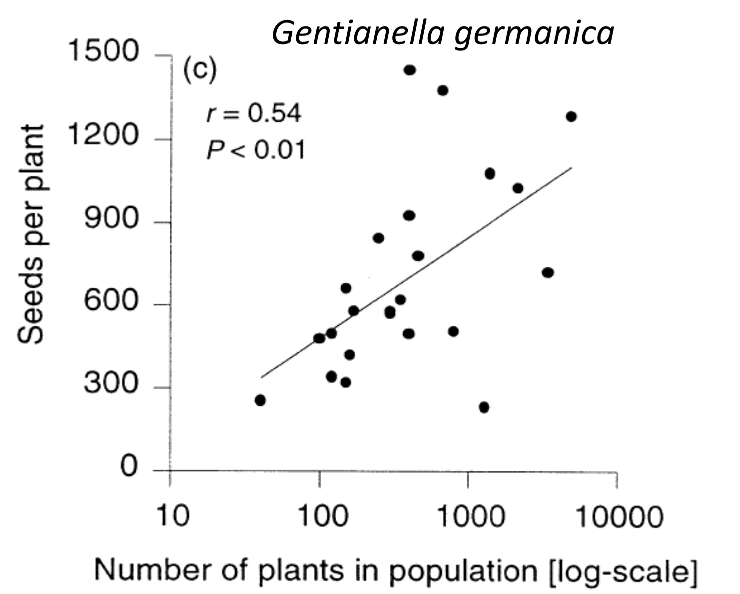
It may be necessary to:
Increase the size of the remaining populations (reinforcement) or restore historical populations (reintroduction) or create new ones (introduction).

↓

TRANSLOCATIONS



Kéry et al., 2000



Fischer & Matthies, 1998

AIMS OF TRANSLOCATION

Specific aims:

- Increasing population size
- Increasing genetic diversity
- Restoring balanced sex ratio
- Restoring balanced age ratio

- Increasing the number of populations
- Creating meta-populations
- Restoring ecosystem functions
- Ecological substitution
- Anticipating effects of future threats (proactive intervention)

AIMS OF TRANSLOCATION

AIMS OF TRANSLOCATION

Biological aim: the establishment of a self-sustaining population.

Minimum viable population (MVP).

AIMS OF TRANSLOCATION

Some species may only rarely reproduce sexually, so the occurrence of vegetative reproduction can also be considered as a result.

Ecological Engineering 122 (2018) 112–119

Identification of success factors for the reintroduction of the critically endangered species *Eryngium viviparum* J. Gay (Apiaceae)

Pauline Rascle[a], Frédéric Bioret[a], Sylvie Magnanon[b], Erwan Glemarec[b], Catherine Gautier[b], Yvon Guillevic[c], Sébastien Gallet[a,*]

Table 3

Flowering rates and new generation appearance in each site and for each transplant period (mean ± SE).

Site	Season	Mean flowering rate (summer 2016)	Recruitment (November 2016)			Total population size		
			Mean number of seedlings	Mean number of clones from root plate	Mean number of clones from pseudovivipary	November 2016	June 2017	October 2017
LC	Autumn	0.5 ± 0.1	11.7 ± 3.5	0	0.8 ± 0.7	626	44	249
	Spring	0.7 ± 0.1	33.4 ± 13	1.8 ± 1.1	2.3 ± 1.5			
	Total	0.6 ± 0.1	22.5 ± 6.9	0.9 ± 0.6	1.55 ± 0.85			
TC	Autumn	0.8 ± 0.04	1.3 ± 0.7	11.9 ± 2.1	23.9 ± 8.15	1095	755	1443
	Spring	0.5 ± 0.1	8.6 ± 4	12.9 ± 4.5	23.7 ± 7.8			
	Total	0.6 ± 0.06	5 ± 2.2	12.4 ± 2.4	23.8 ± 5.5			

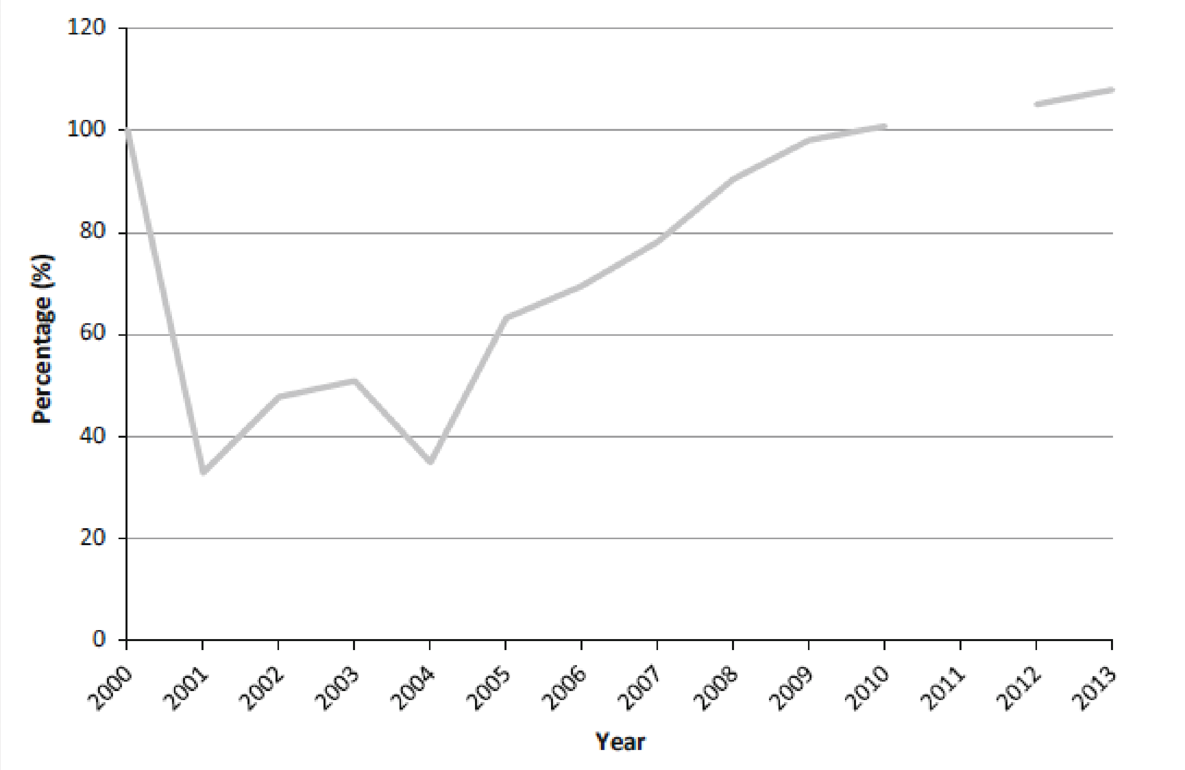
AIMS OF TRANSLOCATION

Aims:

- In the short-term: survival of transplanted individuals.

- In the medium-term: reproduction attempts.

- In the long-term: new generation.



Plant Ecol (2016) 217:193–206
DOI 10.1007/s11258-015-0524-2

CrossMark

Acquiring baseline information for successful plant translocations when there is no time to lose: the case of the neglected Critically Endangered *Narcissus cavanillesii* (Amaryllidaceae)

David Draper Munt · Isabel Marques ·
José M. Iriondo

AIMS OF TRANSLOCATION

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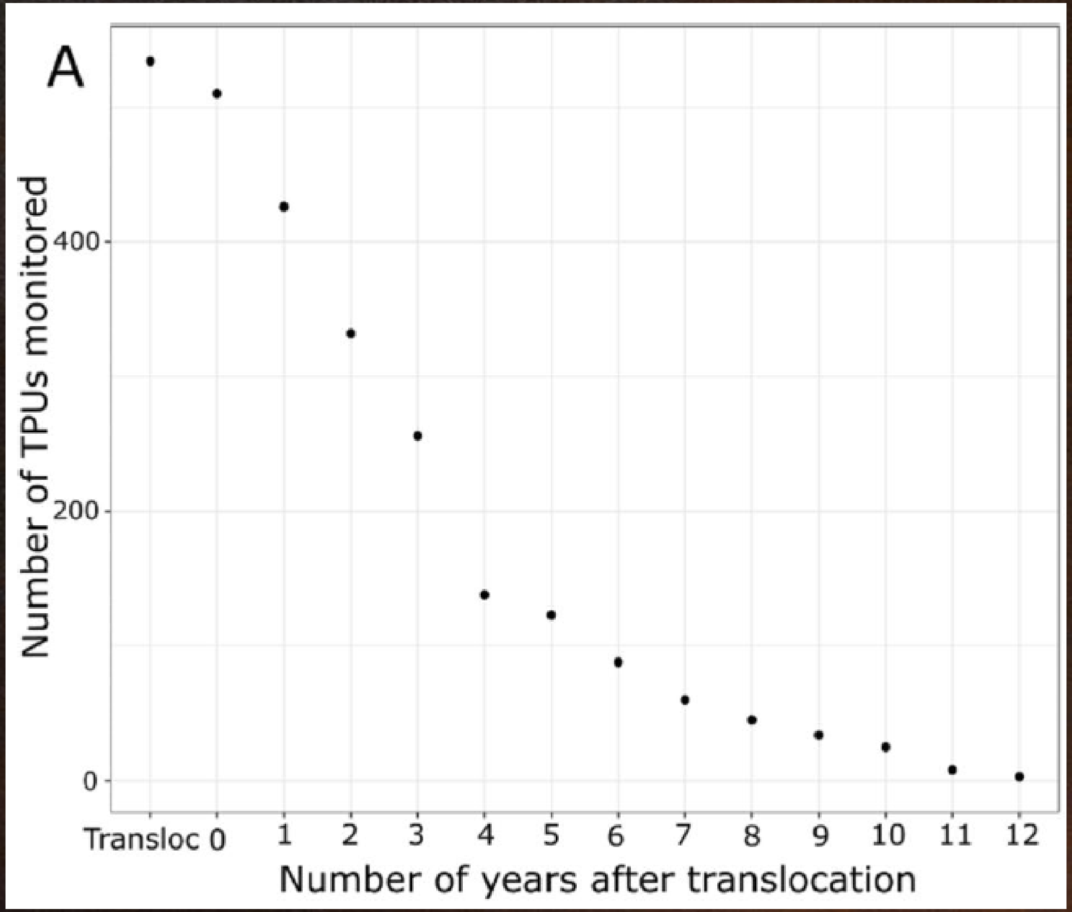
TRANSLOCATION OUTCOME



Plant Ecology (2023) 224:791–802
https://doi.org/10.1007/s11258-023-01311-7

Monitoring time of conservation-driven and mitigation-driven plant translocations in Europe

Margaux Julien[1,2] · Bertrand Schatz[1] · Alexandre Robert[3] · Bruno Colas[4]

DRIVERS OF TRANSLOCATION OUTCOME

Key question: WHAT INFLUENCES A TRANSLOCATION OUTCOME?

# translocation	# plant tax	Geographic scop	Source
249	172	Global	Godefroid et al. (2011)
949	849	Global	Godefroid & Vanderborght (2011)
304	128	Global	Dalrymple et al. (2011)
214	205	Global	Corli et al. (2023)
222	154	China	Liu et al. (2015)
1001	376	Australia	Silcock et al. (2019)
665	-	Australia	Whitehead et al. (2023)
76	50	Australia	Monks et al. (2023)
275	127	US	Bellis et al. (2023)
185	117	Italy	Abeli et al. (2021); D'Agostino et al. Unpubl.
436	193	France	Diallo et al. (2023); Julien et al. (2023)
836	572	Mediterranean	Fenu et al. (2023)

DRIVERS OF TRANSLOCATION OUTCOME

Survival of transplants declines with time.

Drivers of outcome included:
- source population characteristics
- number of released plants
- site protection
- pre- and post-release site management

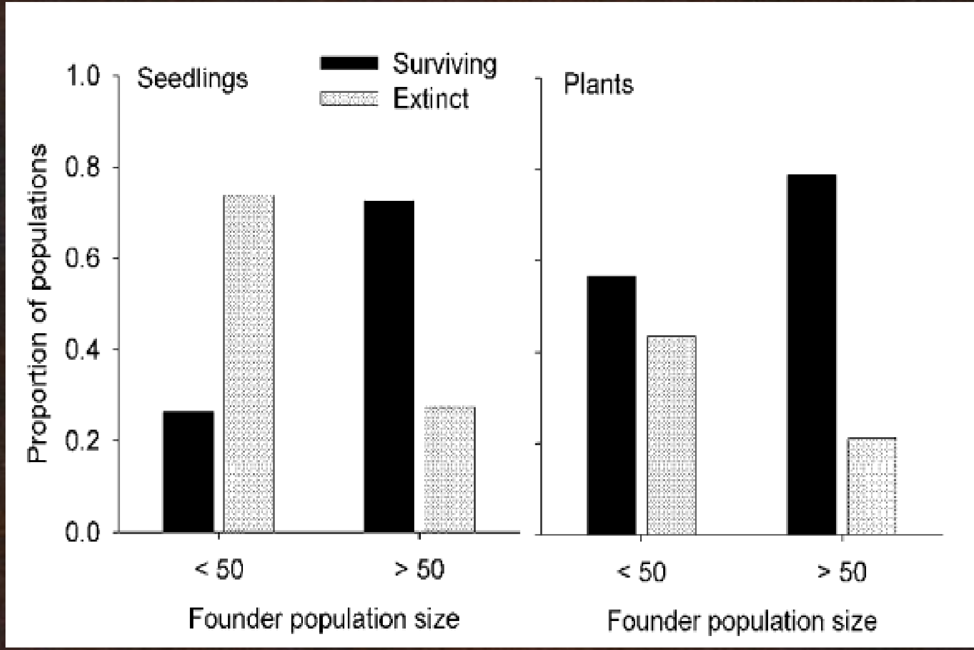
Table 1
Percentage variation in reintroduction success explained by explanatory variables and level of significance (Monte Carlo test, 999 permutations). Only 24 trials could be included in this analysis.

Explanatory variable	Variance explained by single variable (%)	Cumulative variance explained (%)	*P*-level
Plants from diverse source populations	21	21	0.007
Knowledge of cause of decline/extinction	9	30	0.096
Reducing competition by removing surrounding plants	16	46	0.008
Protected area	12	58	0.005
Fencing of the reintroduction area	6	64	0.061
Knowledge of environmental characteristics	2	66	0.310
Project type: reintroduction/ reinforcement	2	68	0.498
Number of individuals reintroduced	0	68	0.857
Burning before reintroduction	1	69	0.672
Material type: seeds	0	69	0.859

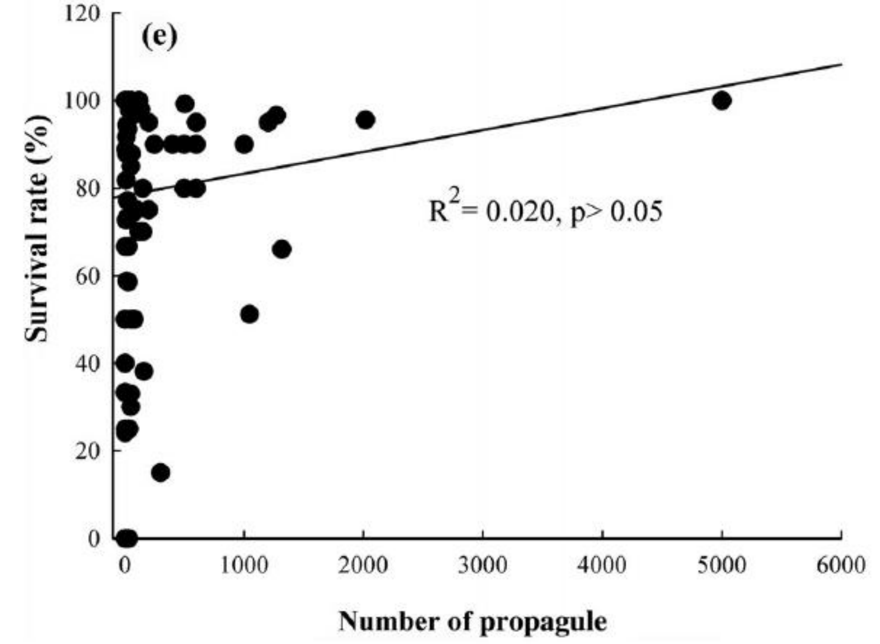
Godefroid et al. (2011)

DRIVERS OF TRANSLOCATION OUTCOME

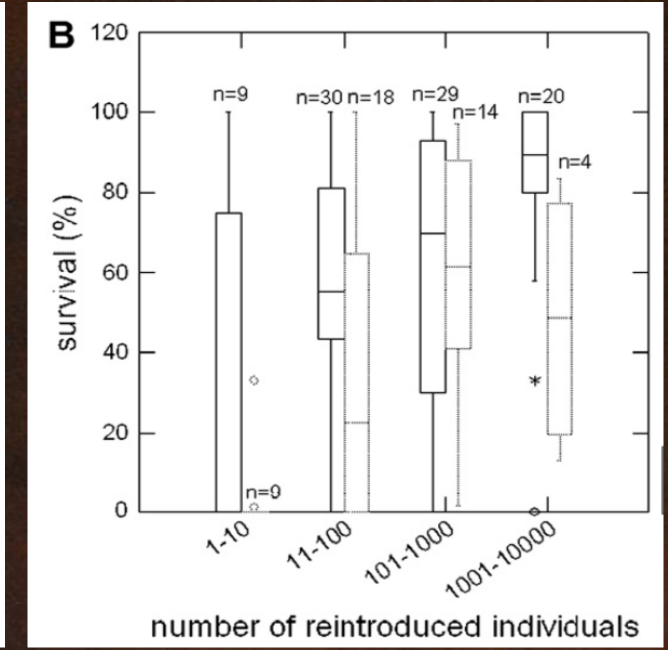
The highest the number of released propagules, the highest the survival percentage.



Albrecht & Maschinski, 2012



Liu et al., 2015



Godefroid et al., 2011

DRIVERS OF TRANSLOCATION OUTCOME

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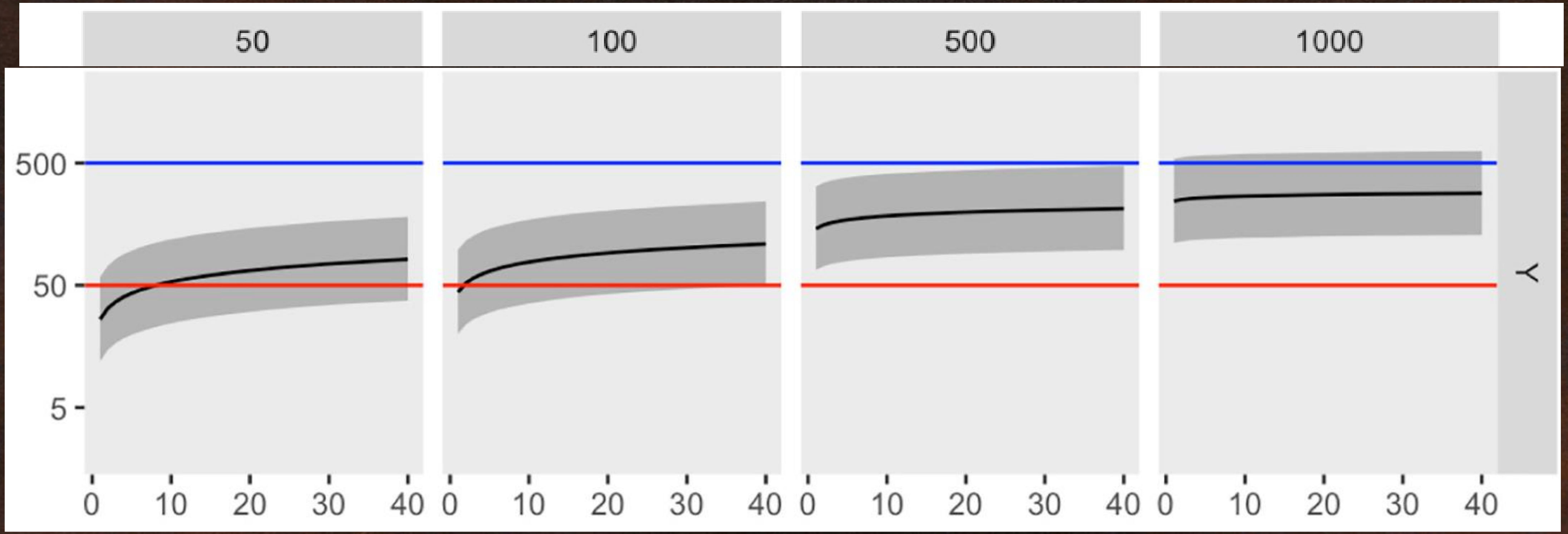
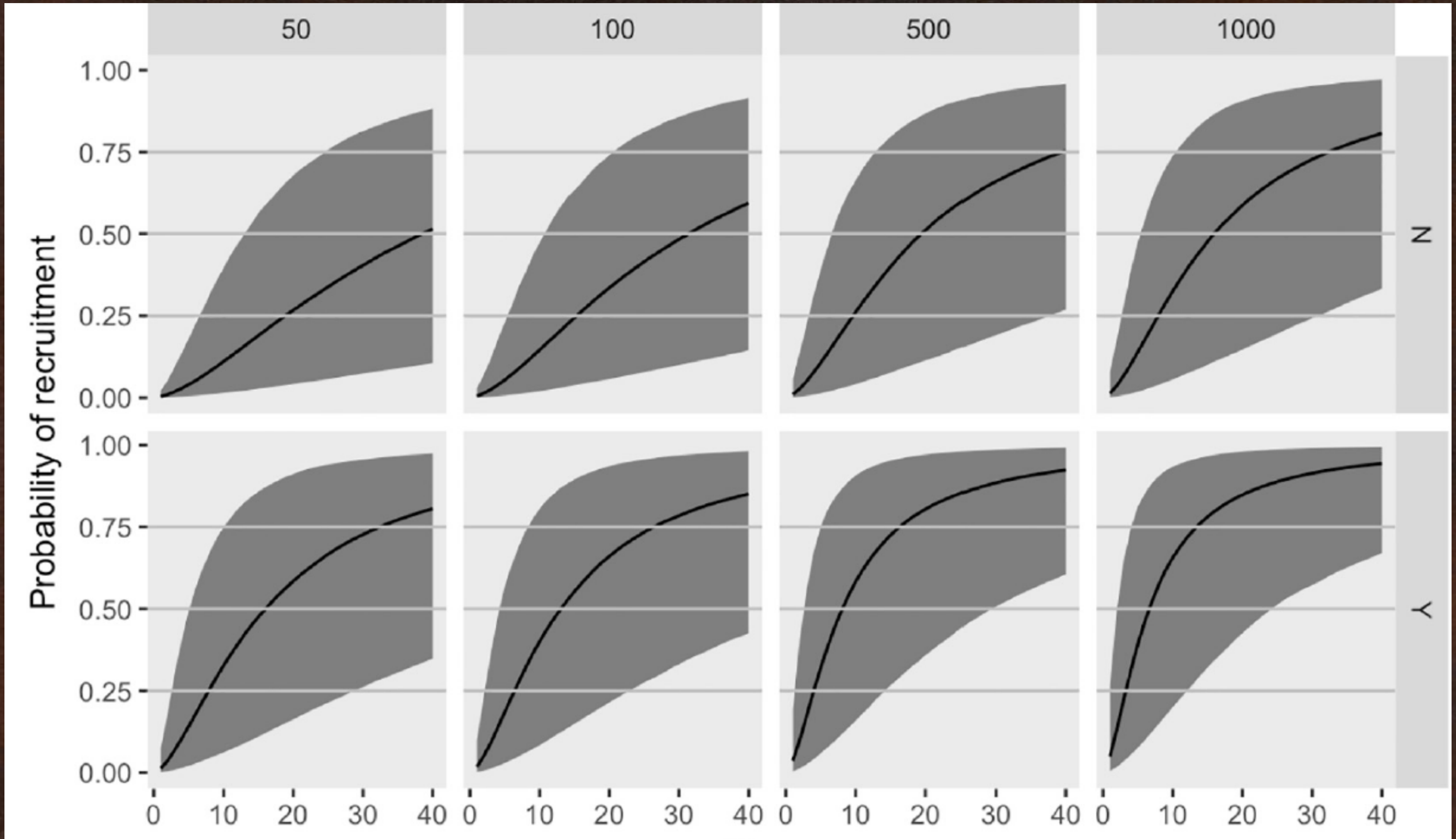


Silcock et al., 2019

DRIVERS OF TRANSLOCATION OUTCOME

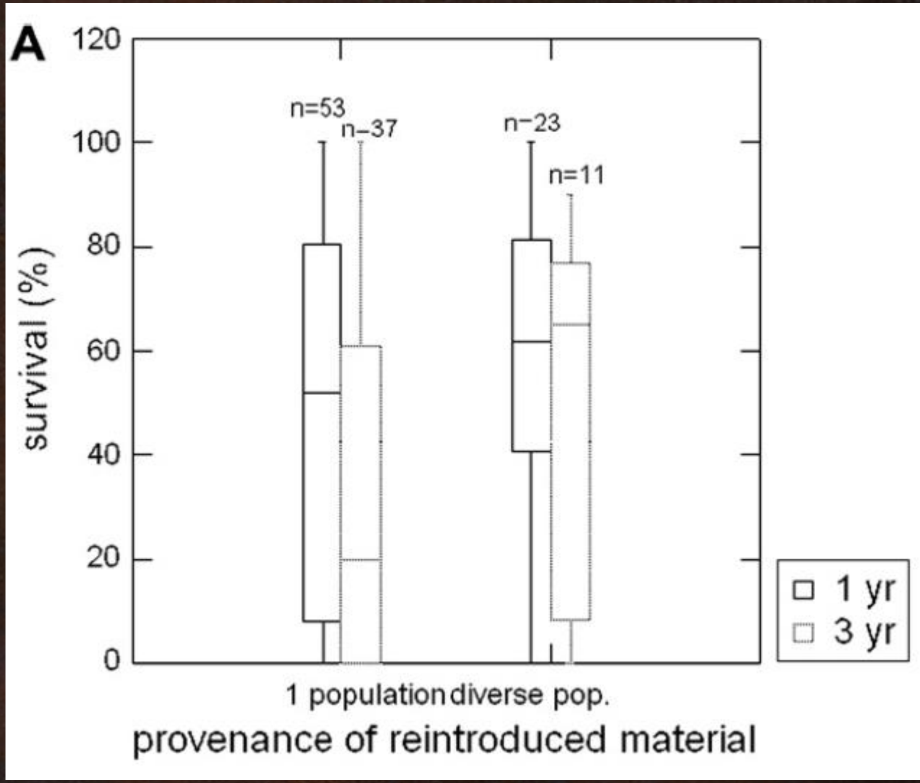
The highest the number of released propagules, the highest the probability of recruitment.



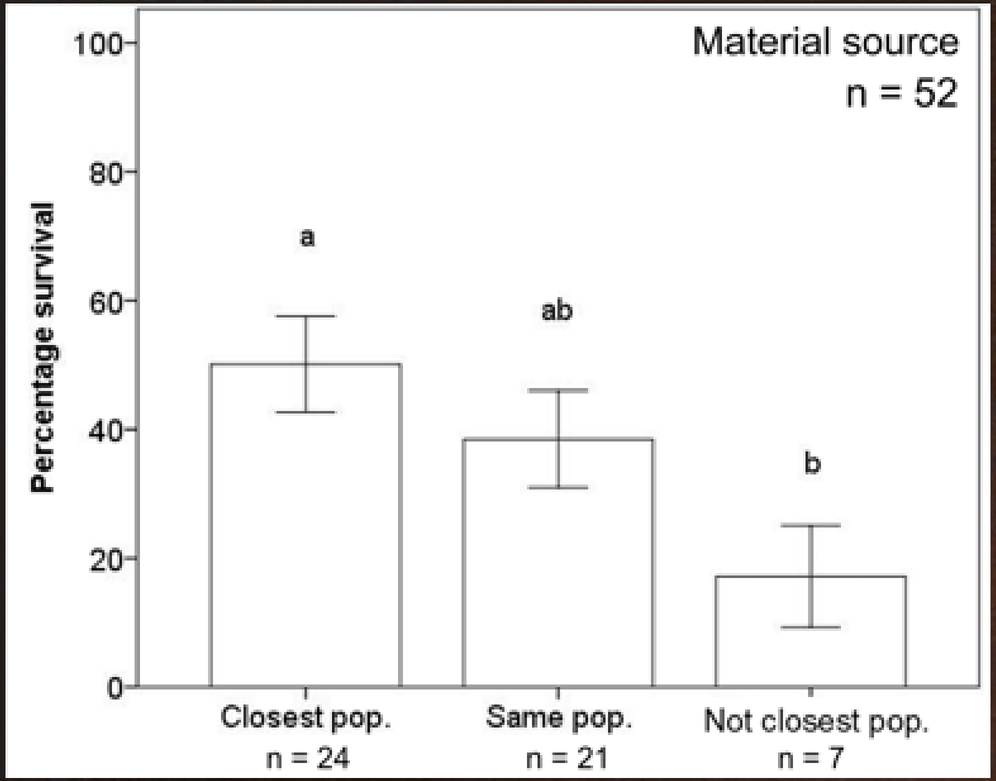
Silcock et al., 2019

DRIVERS OF TRANSLOCATION OUTCOME

To mix or not to mix?



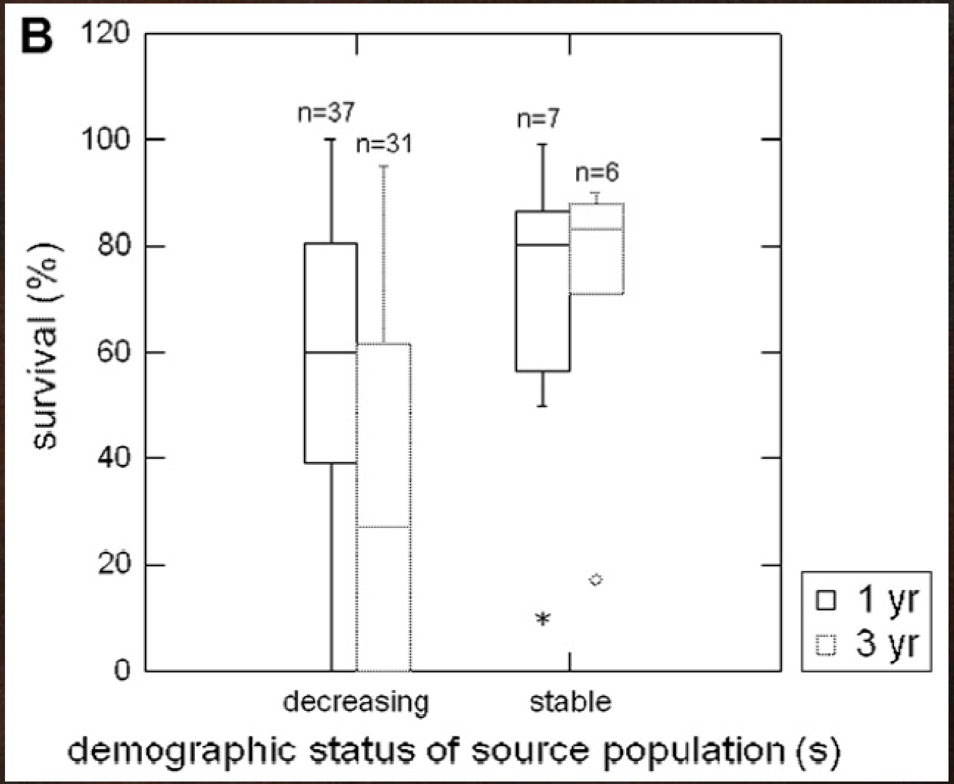
Godefroid et al., 2011



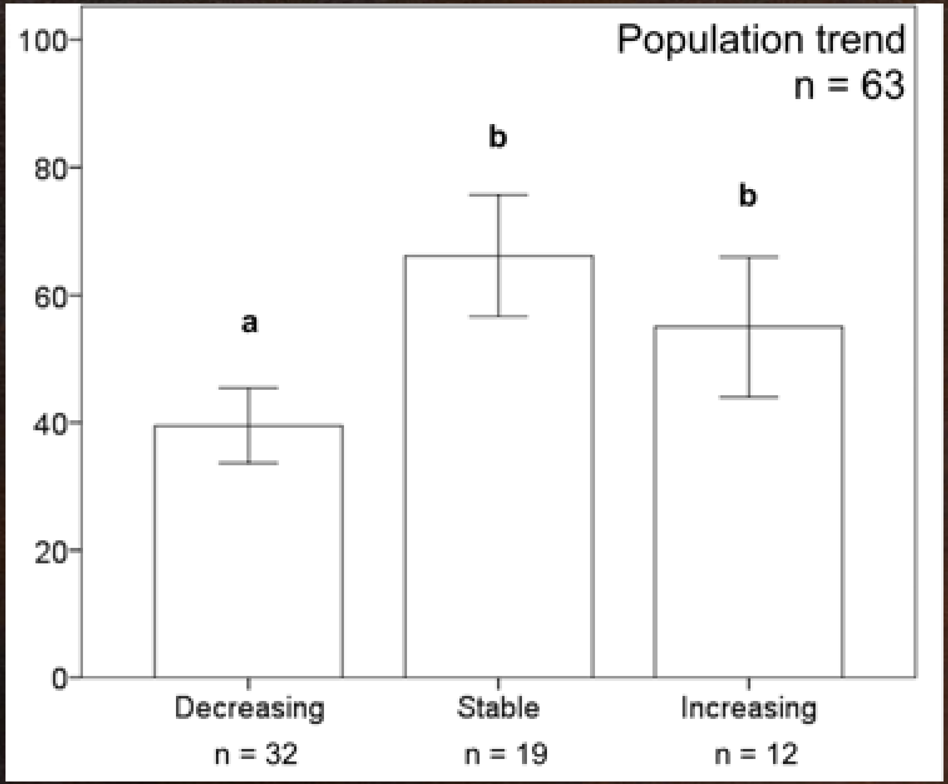
D'Agostino et al., Unpub.

DRIVERS OF TRANSLOCATION OUTCOME

Source population trend



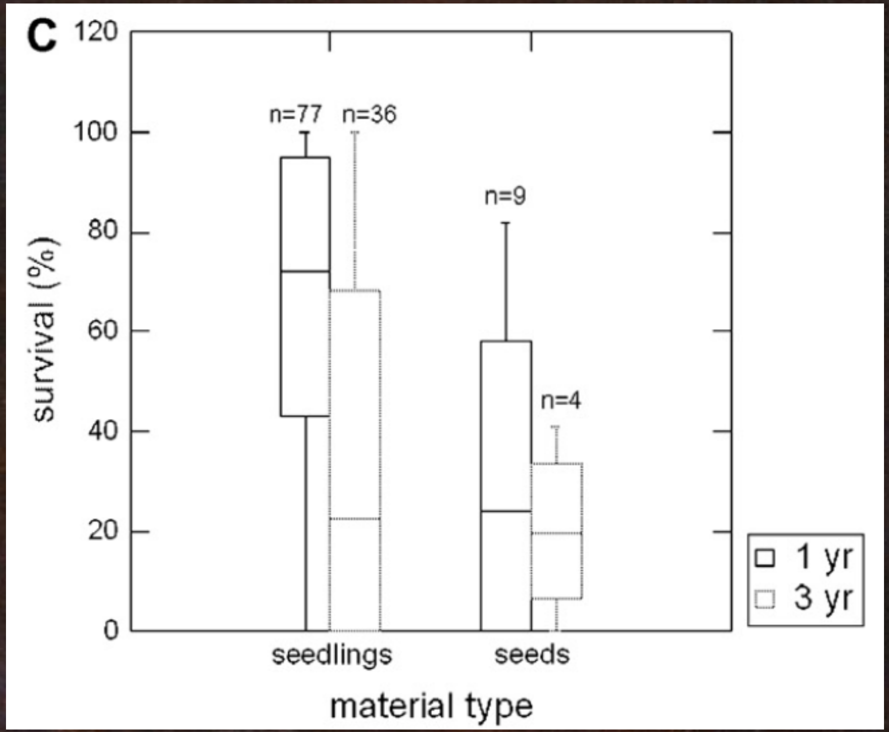
Godefroid et al., 2011



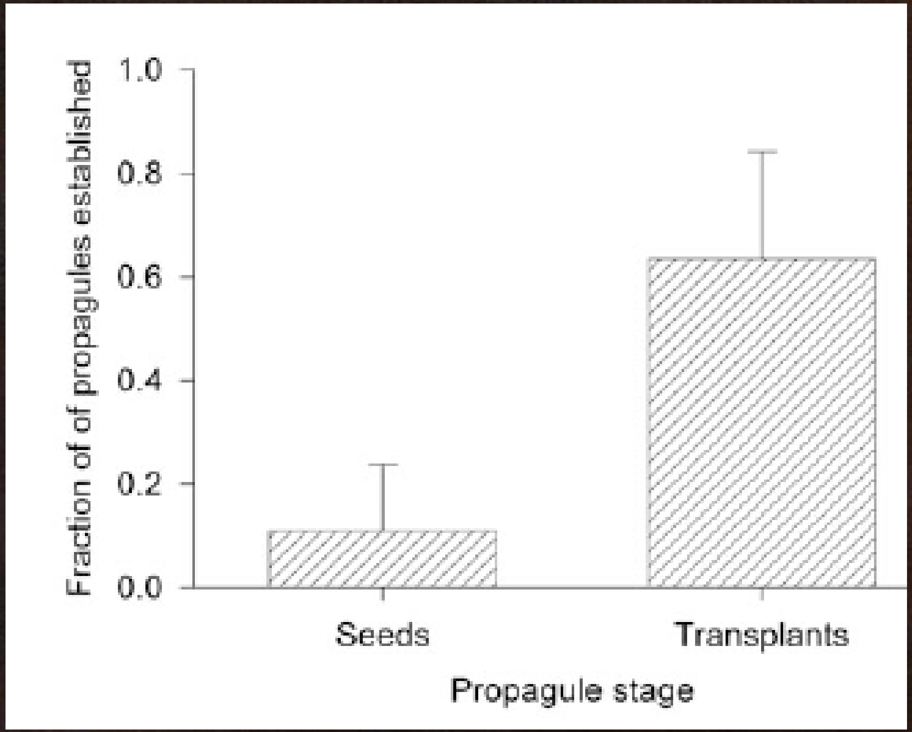
D'Agostino et al., Unpub.

DRIVERS OF TRANSLOCATION OUTCOME

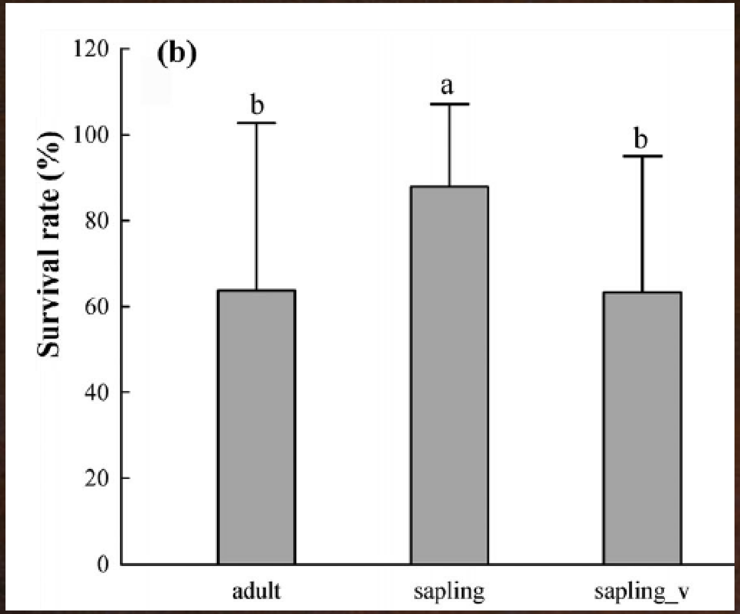
Best performance is usually achieved when using older propagules.



Godefroid et al., 2011



Albrecht & Maschinski (2012)



Liu et al., 2015

DRIVERS OF TRANSLOCATION OUTCOME

Site preparation and aftercare also contribute to increased survival in the short-term.


Biological Conservation 214 (2017) 88–100

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

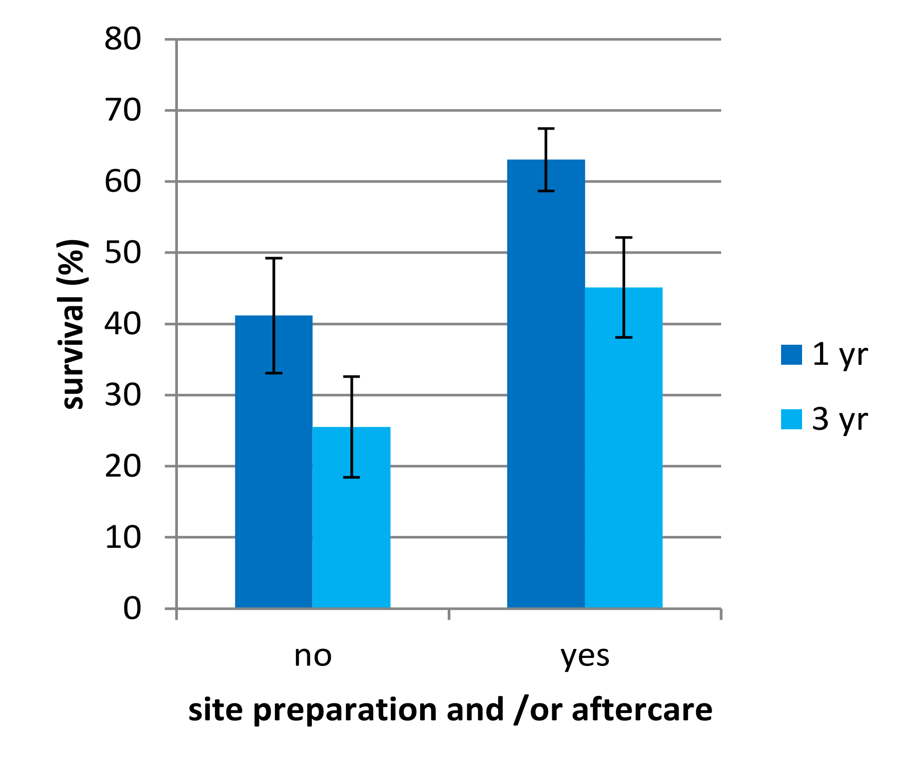
ELSEVIER

BIOLOGICAL CONSERVATION

CrossMark

Drastic site-preparation is key for the successful reintroduction of the endangered grassland species *Jurinea cyanoides*

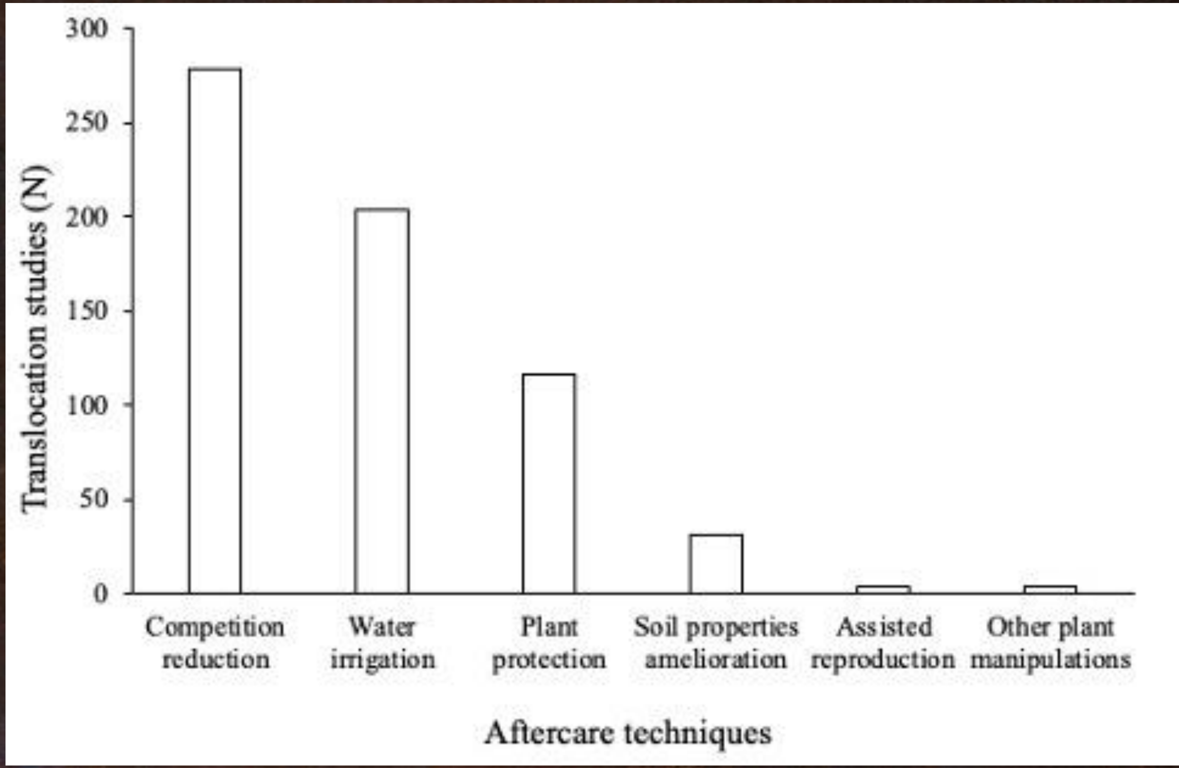
Sabine Tischew[a,*], Florian Kommraus[a], Leonie K. Fischer[b,c], Ingo Kowarik[b,c]

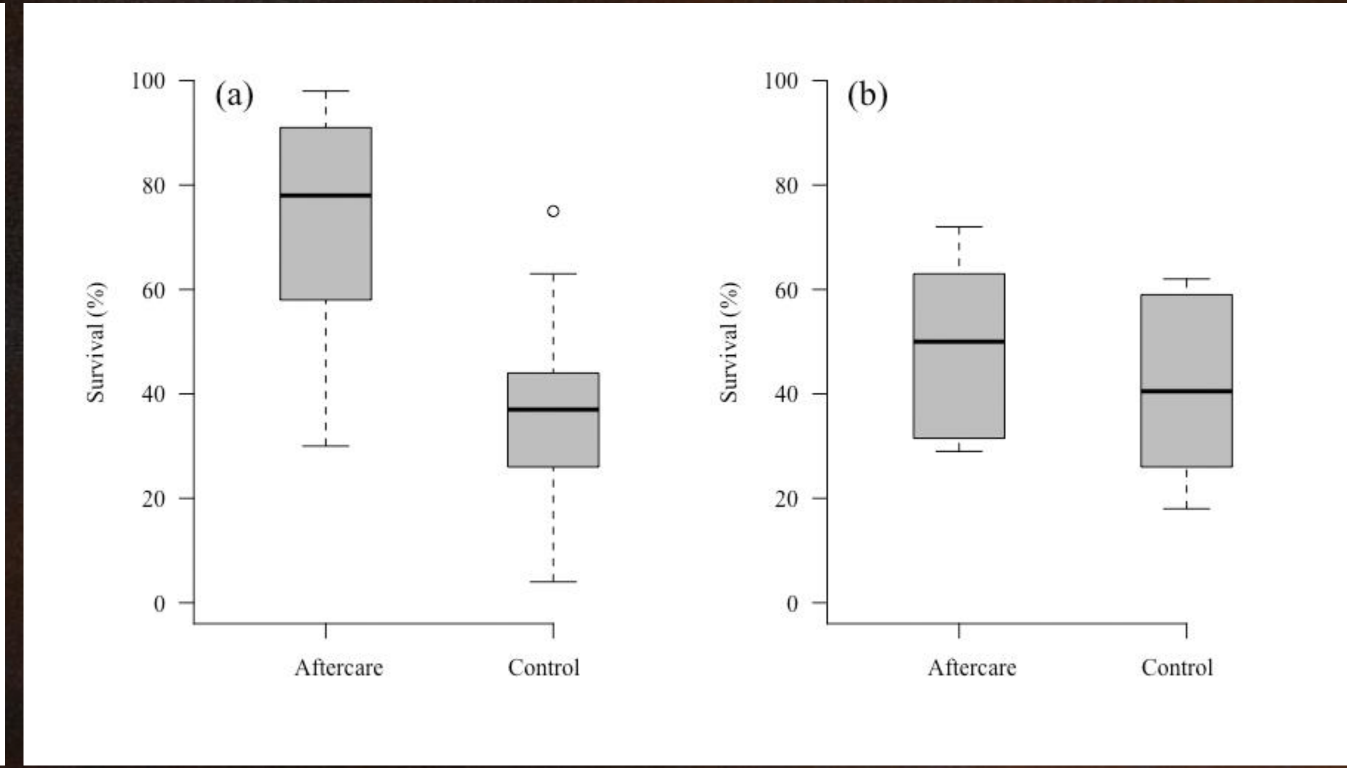


Godefroid et al. (2011)

DRIVERS OF TRANSLOCATION OUTCOME

AFTERCARE



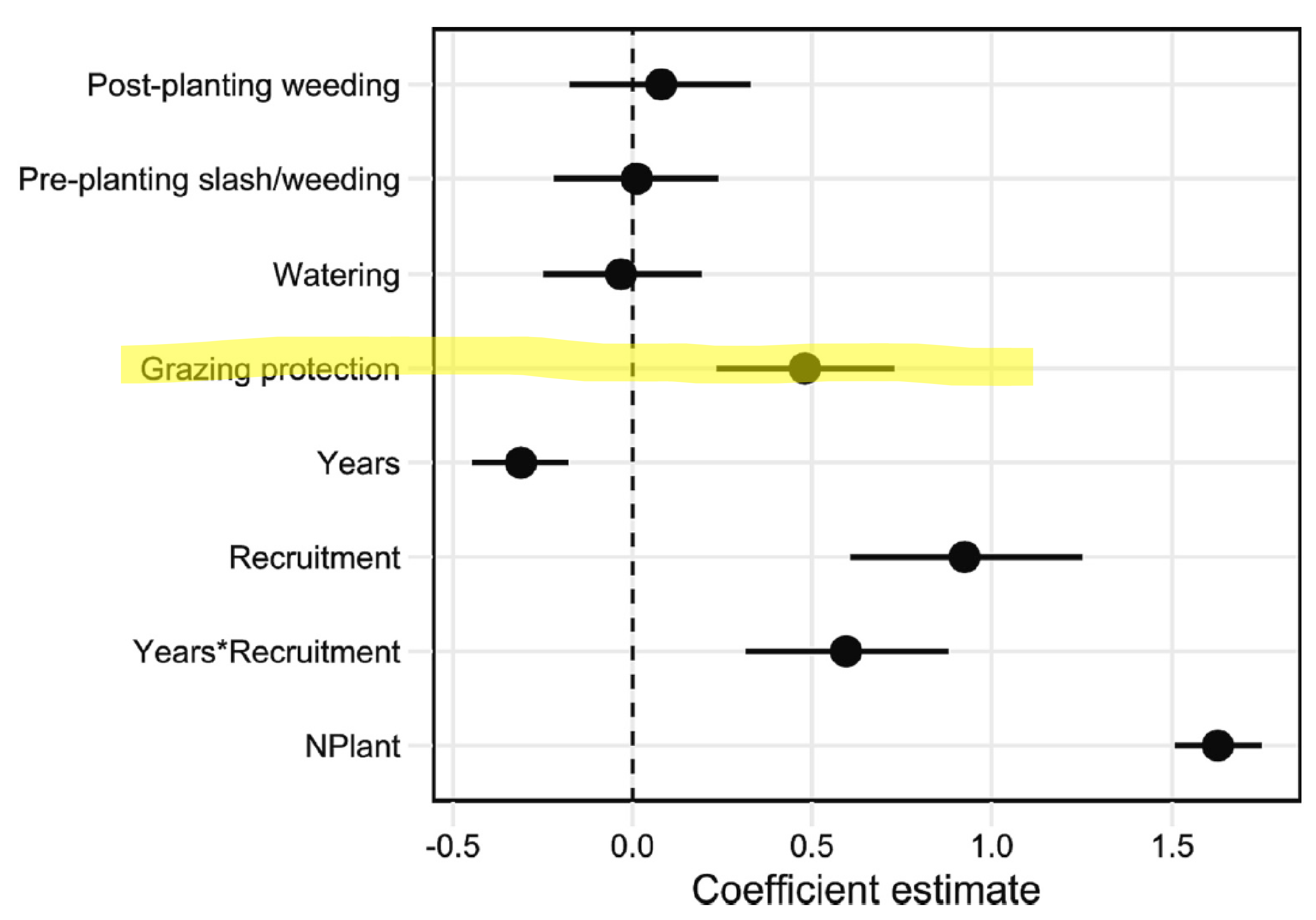


Plant protection

Competition reduction

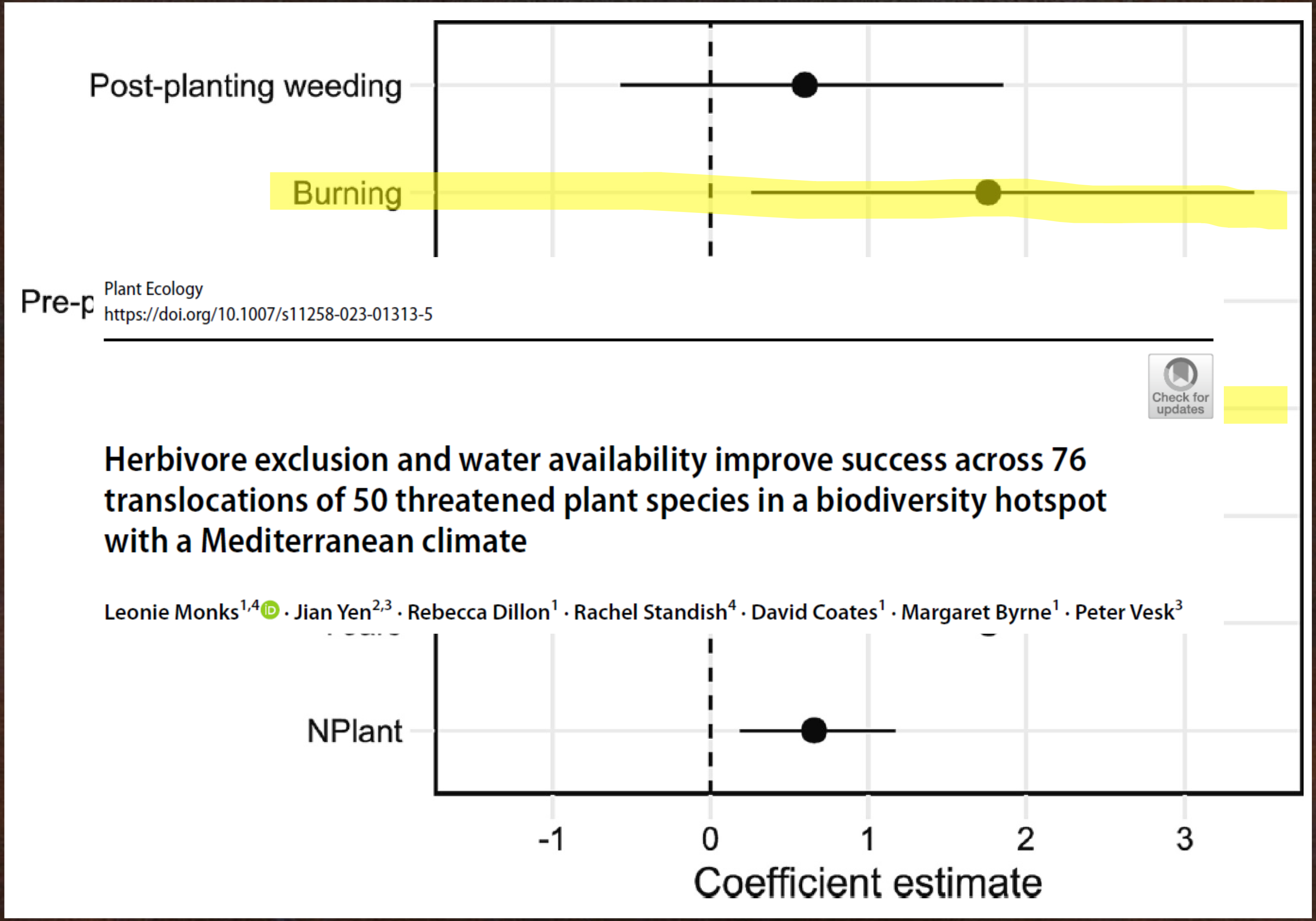
Corli et al., 2023

DRIVERS OF TRANSLOCATION OUTCOME



Whitehead et al., 2023

DRIVERS OF TRANSLOCATION OUTCOME



Plant Ecology
https://doi.org/10.1007/s11258-023-01313-5

Check for updates

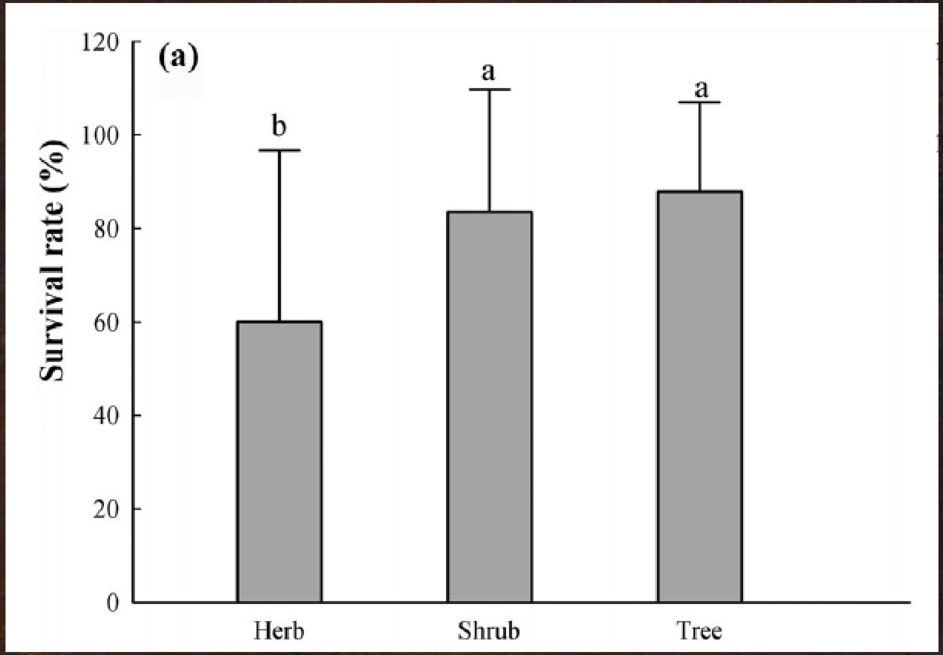
Herbivore exclusion and water availability improve success across 76 translocations of 50 threatened plant species in a biodiversity hotspot with a Mediterranean climate

Leonie Monks[1,4] · Jian Yen[2,3] · Rebecca Dillon[1] · Rachel Standish[4] · David Coates[1] · Margaret Byrne[1] · Peter Vesk[3]

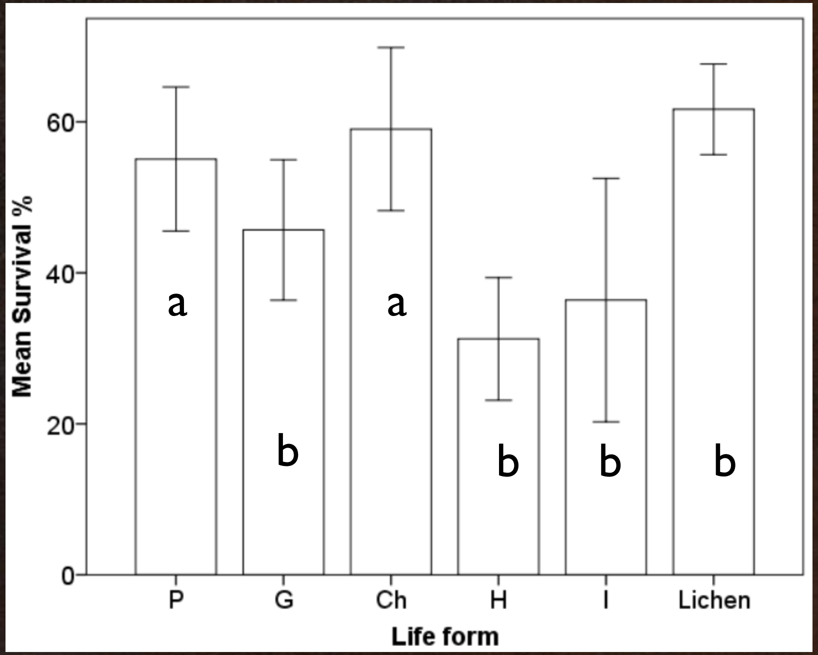
Whitehead et al., 2023

DRIVERS OF TRANSLOCATION OUTCOME

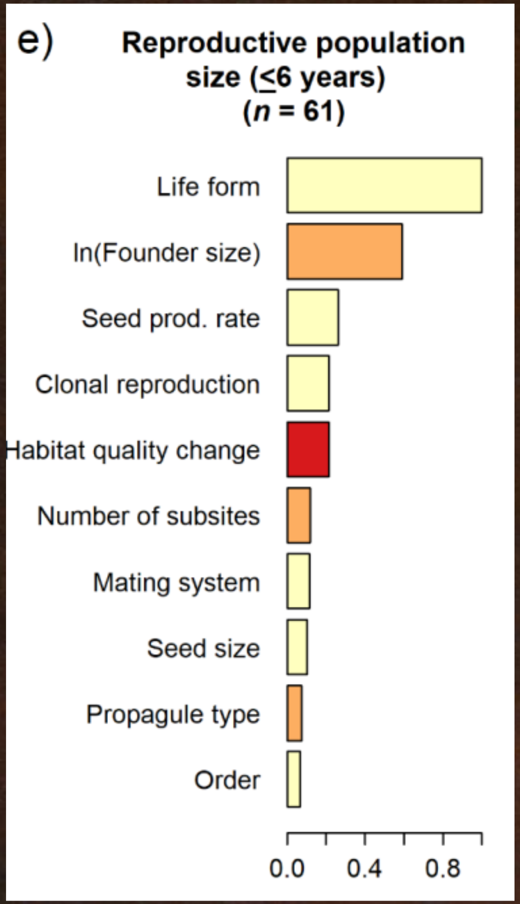
Life form affects translocation outcome



Liu et al., 2015



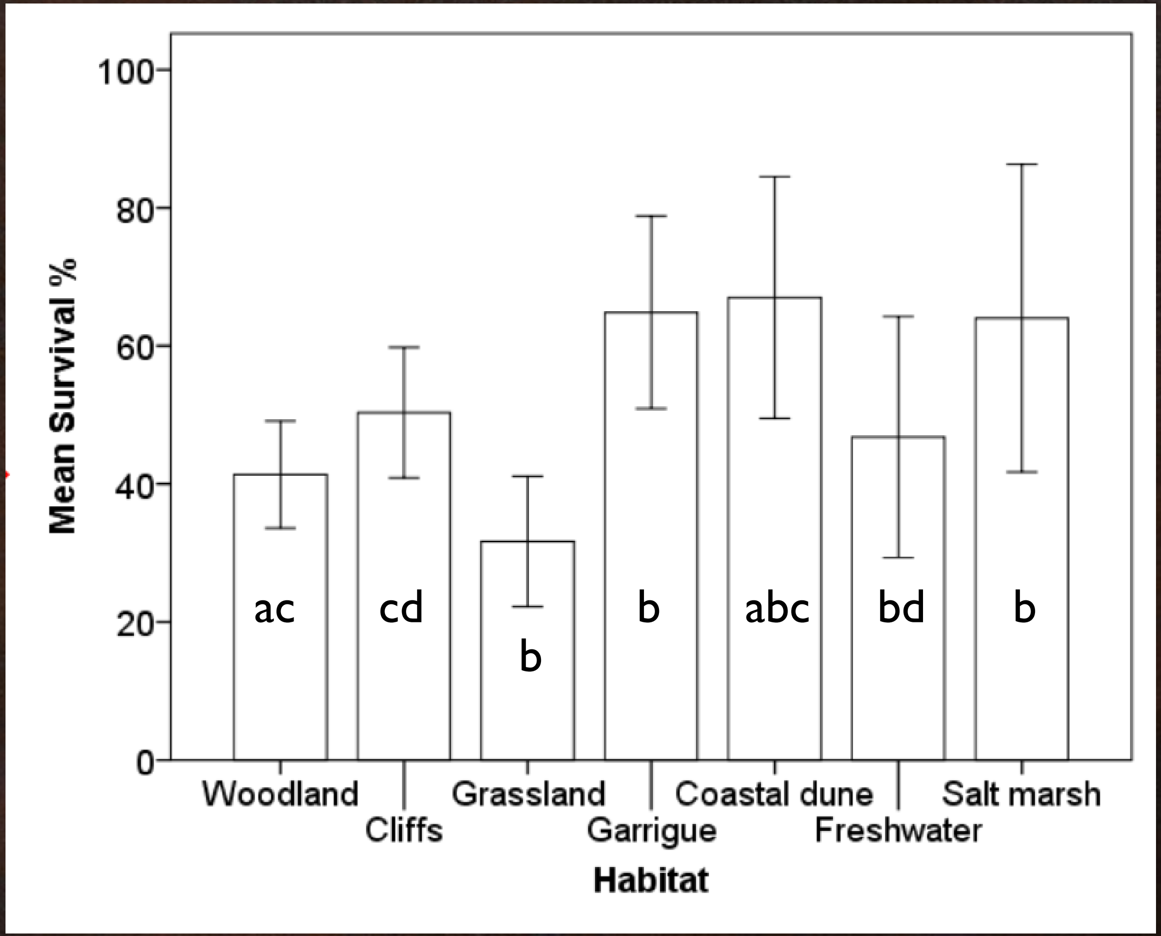
D'Agostino et al. Unpub.



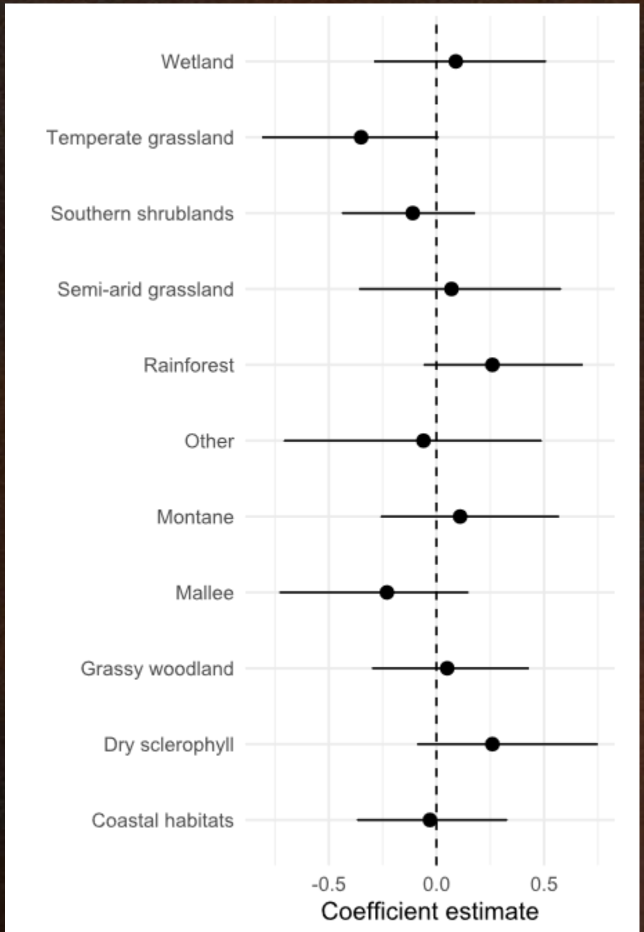
Bellis et al., 2023

DRIVERS OF TRANSLOCATION OUTCOME

Habitat also affects translocation outcome



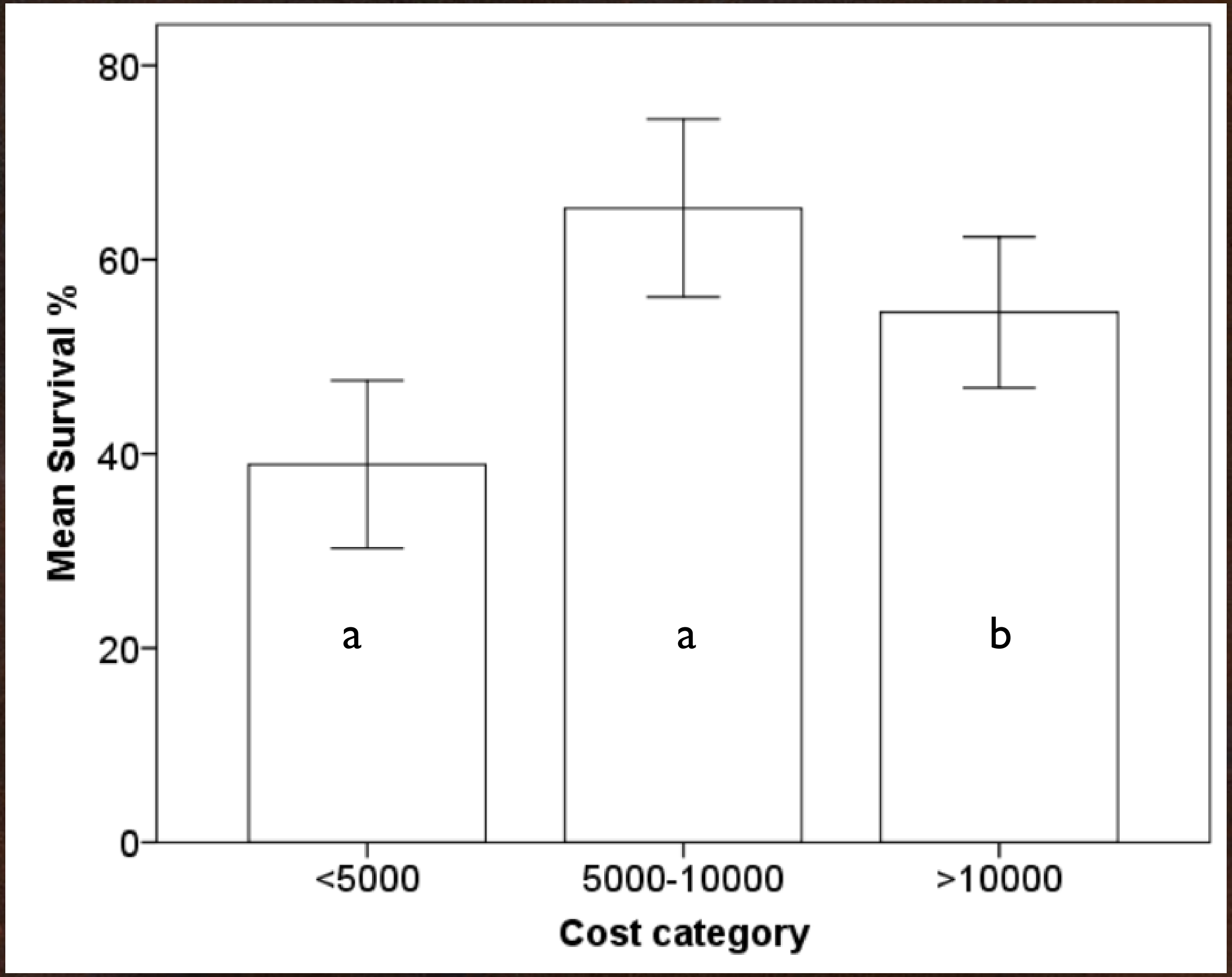
D'Agostino et al. Unpub.



Whitehead et al. 2023

DRIVERS OF TRANSLOCATION OUTCOME

Do funds available affect translocation outcome?



D'Agostino et al. Unpub.

WHAT'S NEXT?

New European Database in progress, > 3000 cases
https://www.conserveplants.eu/en/

More data on standardised site preparation and aftercare

More data on standardised categories of life form and habitats

THANK YOU FOR YOUR ATTENTION

Albrecht & Maschinski (2012)