Managing dynamic and unpredictable species invasions Jeff Diez

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How important are invasions?



IPBES 2019 Global Assessment Report on Biodiversity and Ecosystem Services

Similarities & differences between species invasions and responses to climate change



Spread & Impacts

Climate change



Species invasions







1.What are the effects of invasive species on native communities?

2. What does it mean that invasions are dynamic?

Studies on invasion biology increasing



Enders et al. 2019 Neobiota

In particular: what is the relationship between invader abundance and impact?



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IAS abundance

Global meta-analysis of invasion impacts

- 1,258 empirical studies (from 201 publications)
- contained at least 4 invader abundances
- responses: (i) native species abundance; (ii) community responses (diversity, richness, etc)

In particular: what is the relationship between invader (IAS) abundance and impact? And does trophic level matter?



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Invasions can be dynamic in several possible ways:

- Changing abundance
- Changing gene frequencies
- Changing species interactions
- Changing impacts

modified from Strayer et al. (2017)

Example: Plant-soil feedbacks can control abundance

Do plant-soil feedbacks become more negative over time?

- 1340 plots (36m²) across the Peninsula
- Variation in arrival times of non-native plants & relative abundance

Do plant-soil feedbacks become more negative over time?

Study Species

Ac – Anthriscus caucalis As – Arenaria serpyllifolia Ca – Cerastium alpinum Cc – Crepis capillaris Cg – Cerastium glomeratum Da – Dianthus armeria Dd – Dianthus deltoides Ls – Lactuca serriola Se – Sisymbrium erysimoides So – Sisymbrium officinale Sm – Stellaria media Va – Veronica arvensis

Yes: Novelty advantage declined over time

Do invasions take care of themselves?

Biological Invasions 6: 161–172, 2004. © 2004 Kluwer Academic Publishers. Printed in the Netherlands.

Now you see them, now you don't! – population crashes of established introduced species

Daniel Simberloff* & Leah Gibbons

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And secondary invasions may be common

What does this mean for management?

"...seems particularly unwise to adopt a 'do nothing' management strategy based on the assumption that problematic non-native species will soon go away on their own."

Strayer et al. (2017) Ecology Letters

Optimal strategy changes over time

Simberloff et al. TREE 2013

Concluding thoughts

- Invasions are dynamic
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Good news

- the longer invasions happen, the more long-term data we get!
- Social media, citizen science, etc.. = more and more distributed and long-term data
- Management efforts are an important counter-balance to the forces of homogenization.

Thank you

Collaborators

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