Niche dynamics and potential suitable areas of invasive freshwater invertebrates in New Zealand

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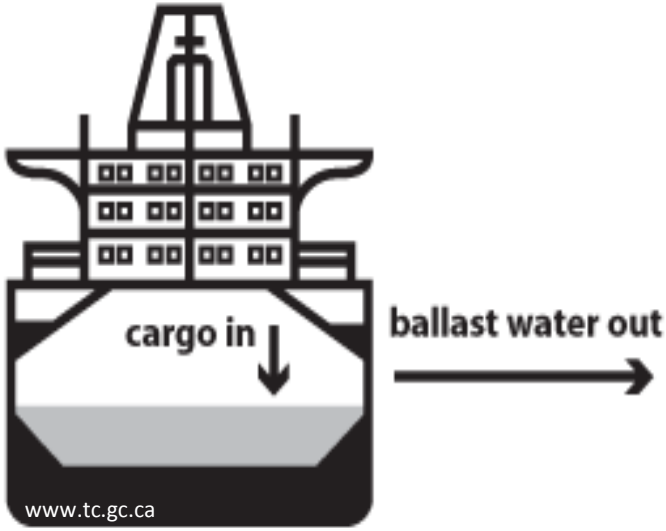
Introduction: Freshwater invasions in a nutshell

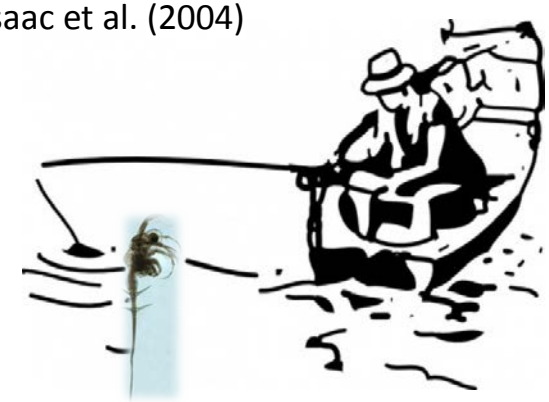


240 million organisms

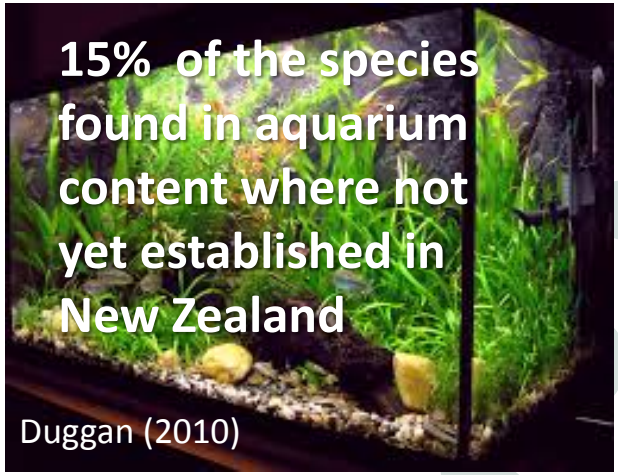
Silk and Ciruna (2005)

From one invaded lake to 18 lakes

MacIsaac et al. (2004)

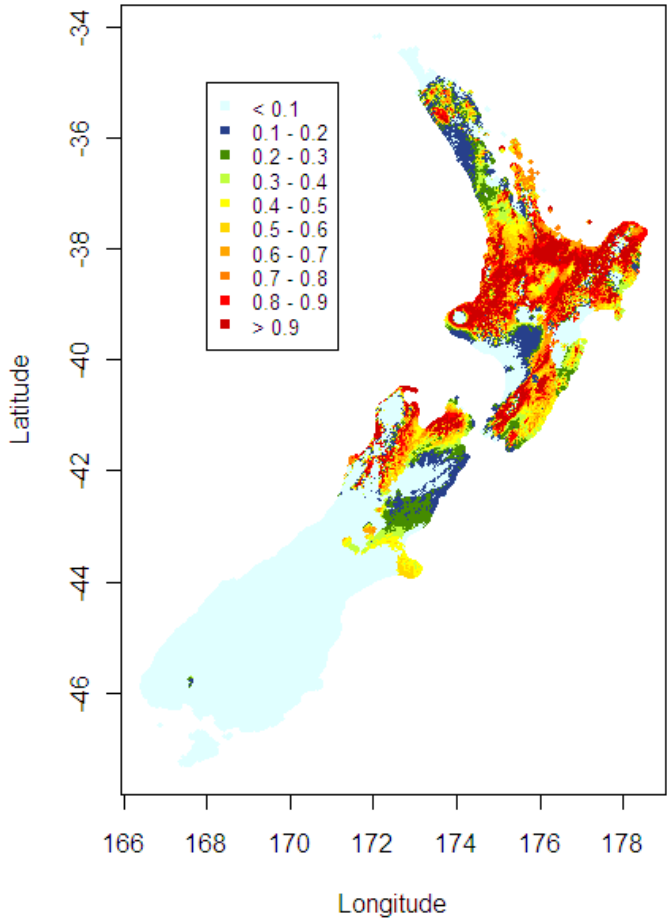


https://www.freepik.com



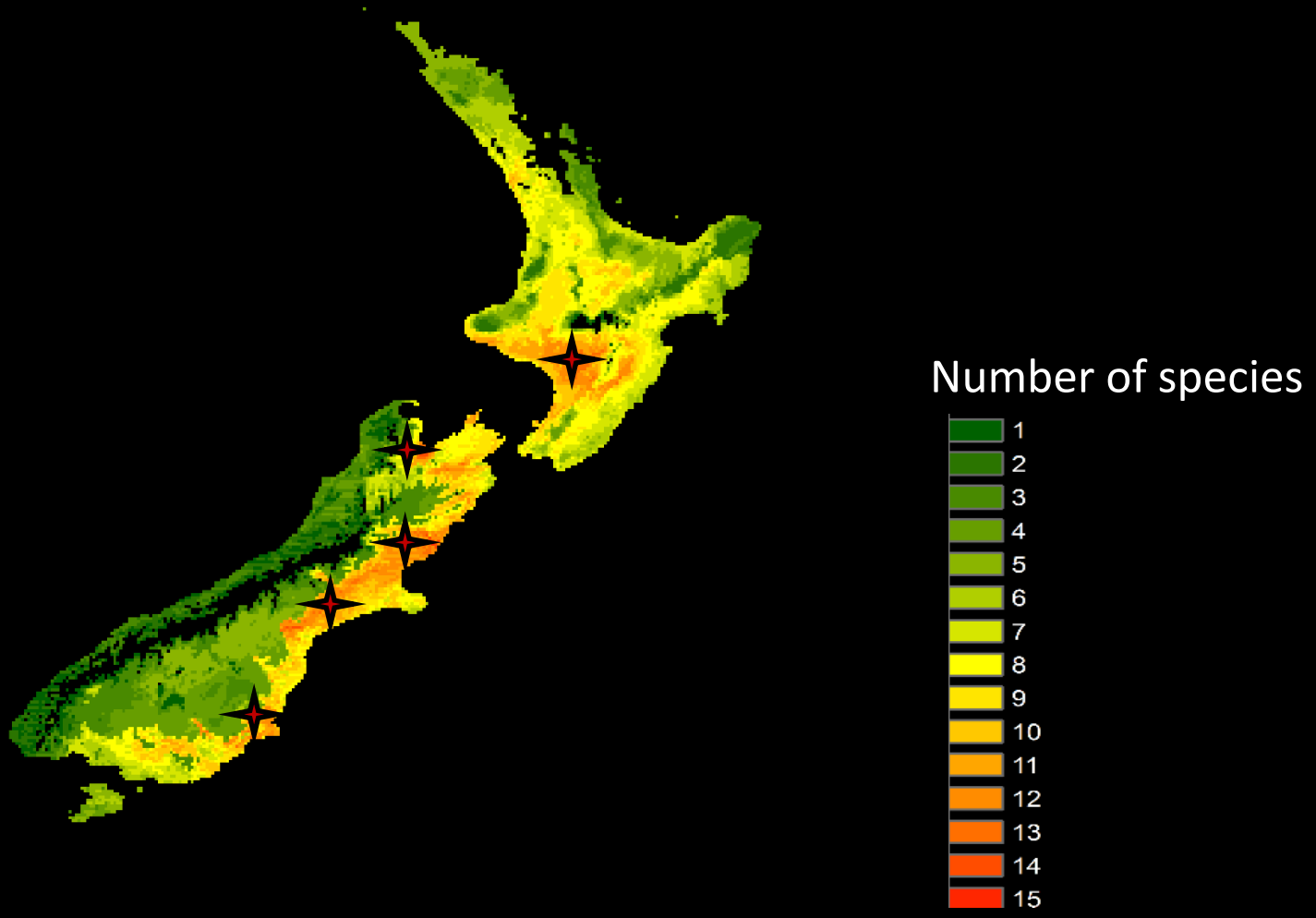
Early detection but where to look?

SDM: Species distribution models



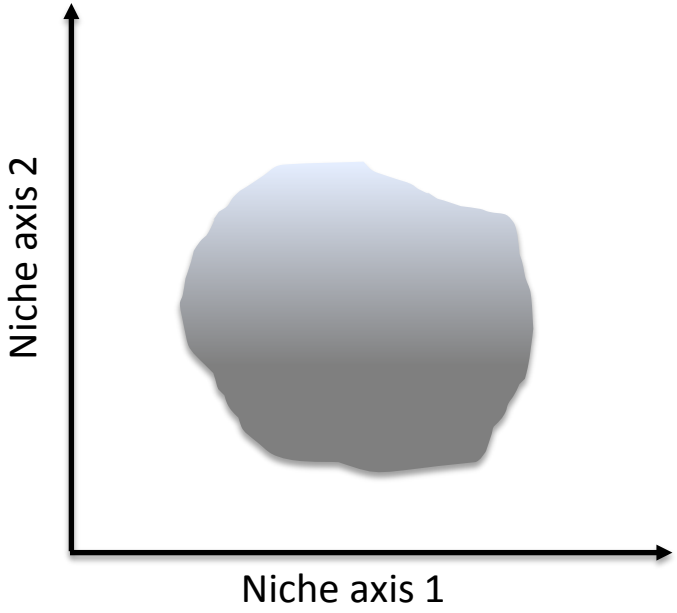
Chinese mitten crab

Invasion hotspots in New Zealand



Question: Are niches conserved for invasive freshwater species?

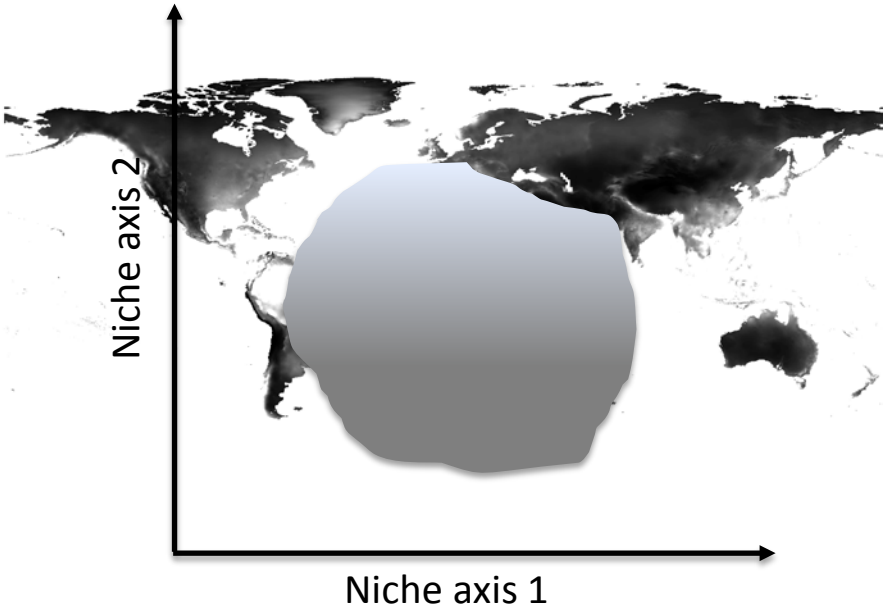
Environmental space



Native range

?

Geographic space



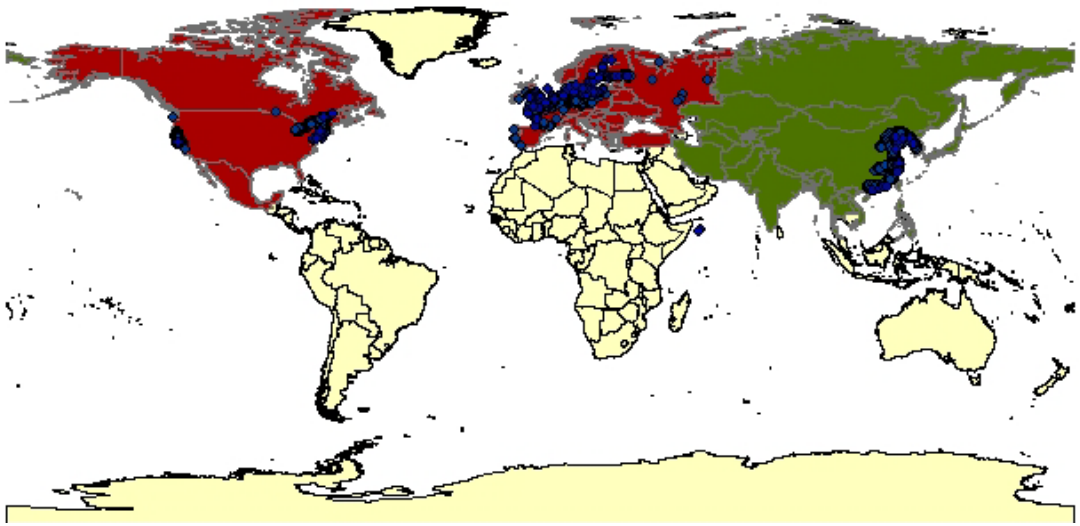
Other regions

Methods: data

Species distribution

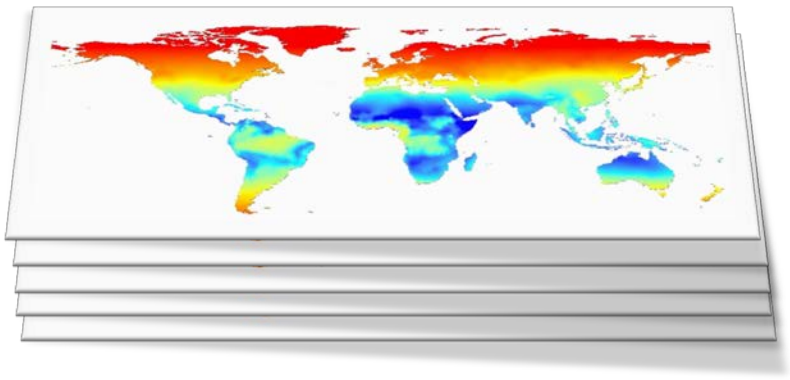
Invasive range

Native range



21 invasive freshwater invertebrates

Climatic variables

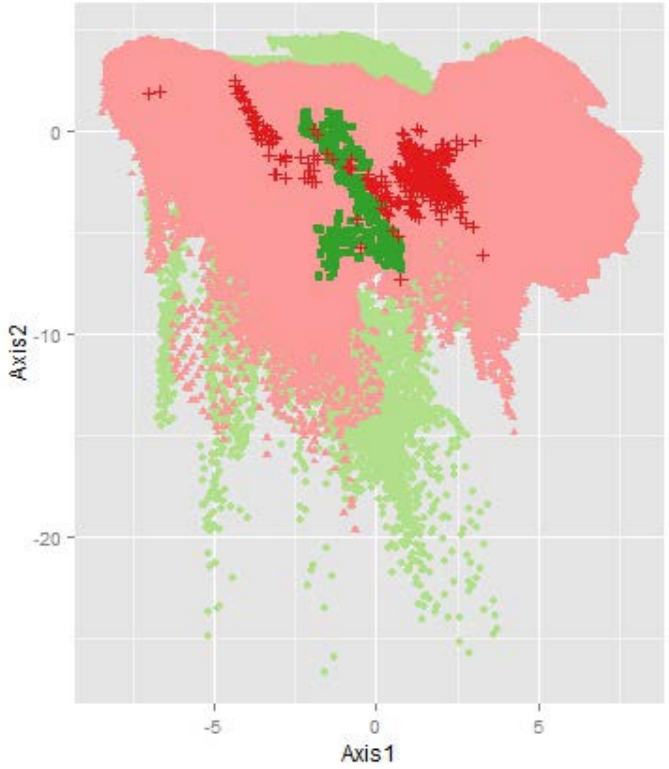


35 variables

CliMond

Methods: niche representation PCA-ENV

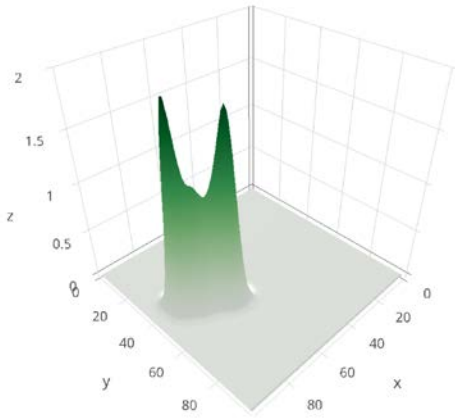
Principal component analysis



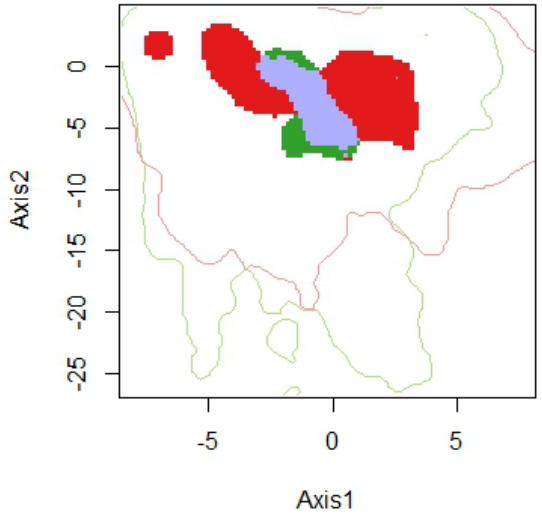
Kernel density estimator

.id
Native environment
Invasive environment
Native niche
Invasive niche

Probability density of occurrences

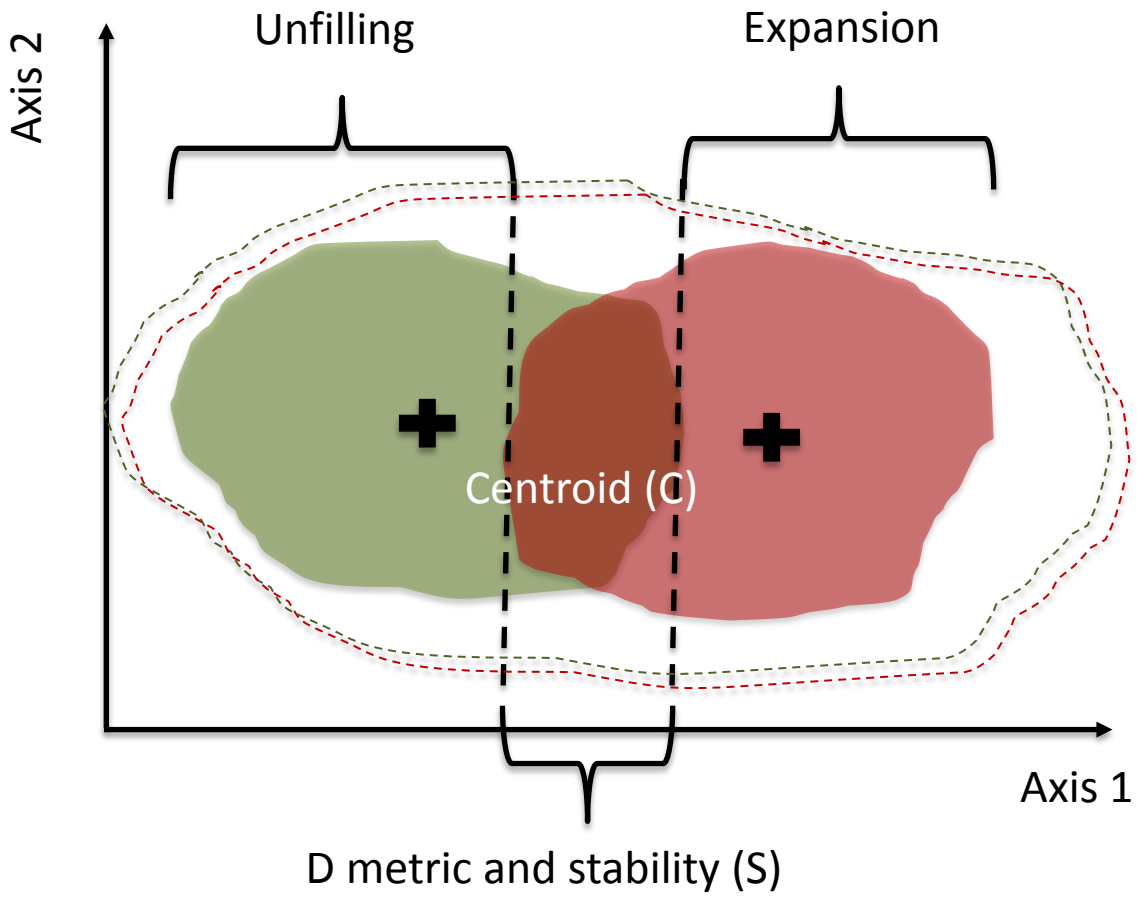


PCA-ENV

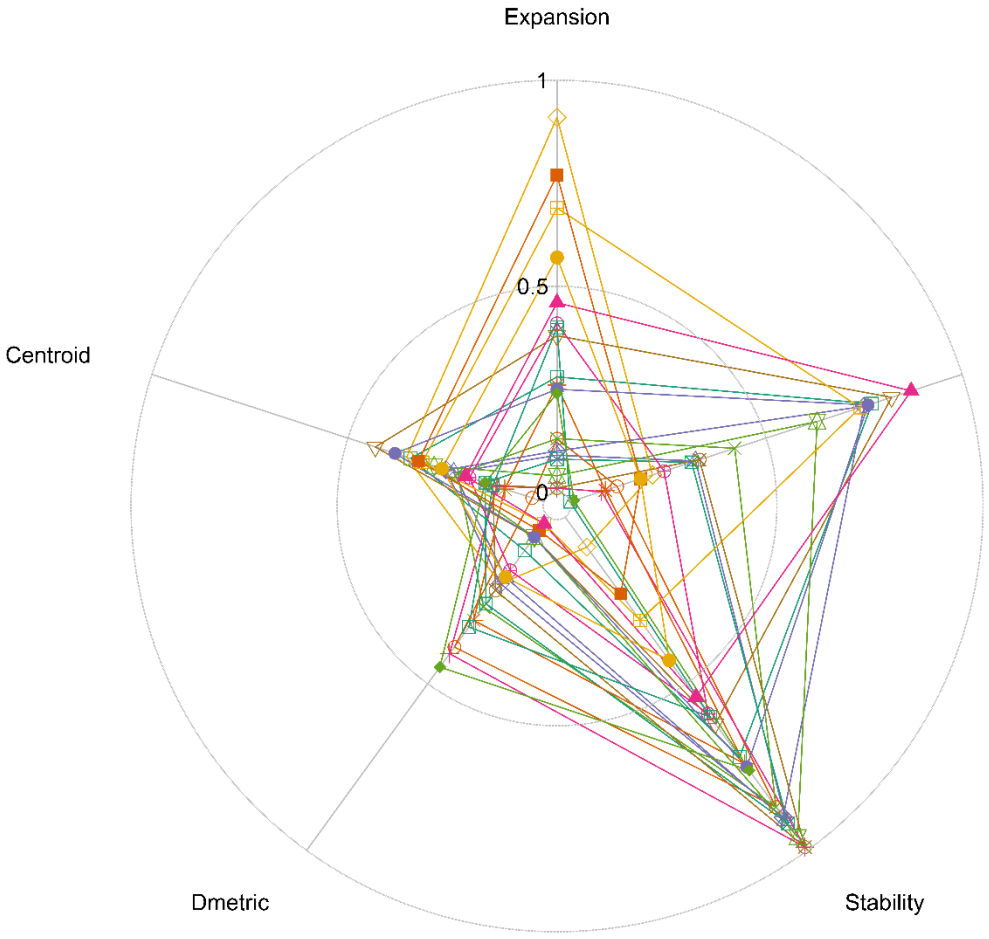


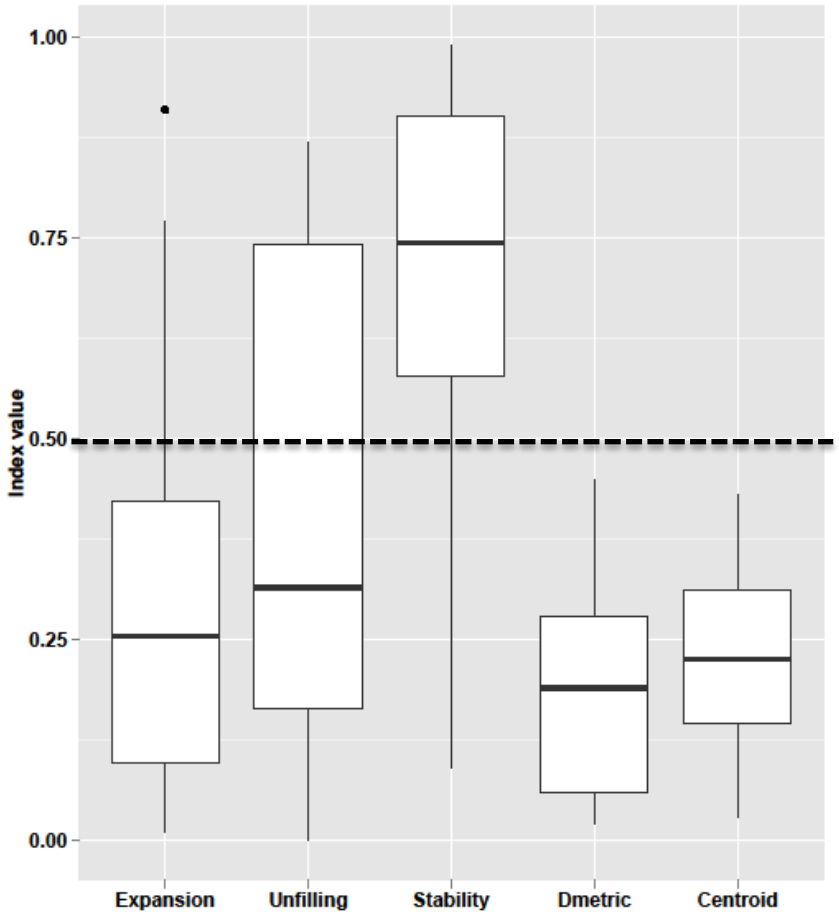
Broenimann et al. 2012

Methods: niche metrics



Results: niche dynamics





Results: niche dynamics

Chinese mitten crab

Spinycheek crayfish

Results: the efficient invaders

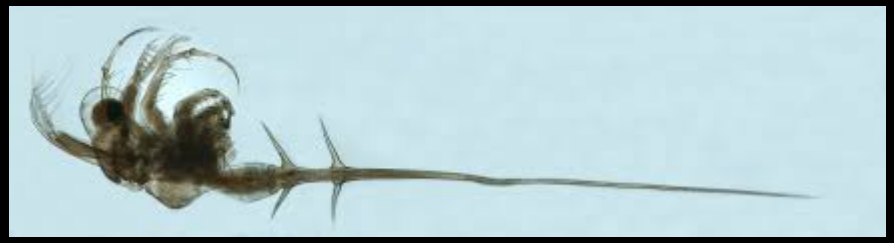
Chinese mitten crab

Estuarine mud crab

Japanese mystery snail

Zebra mussel

Spiny water flea



Quagga mussel

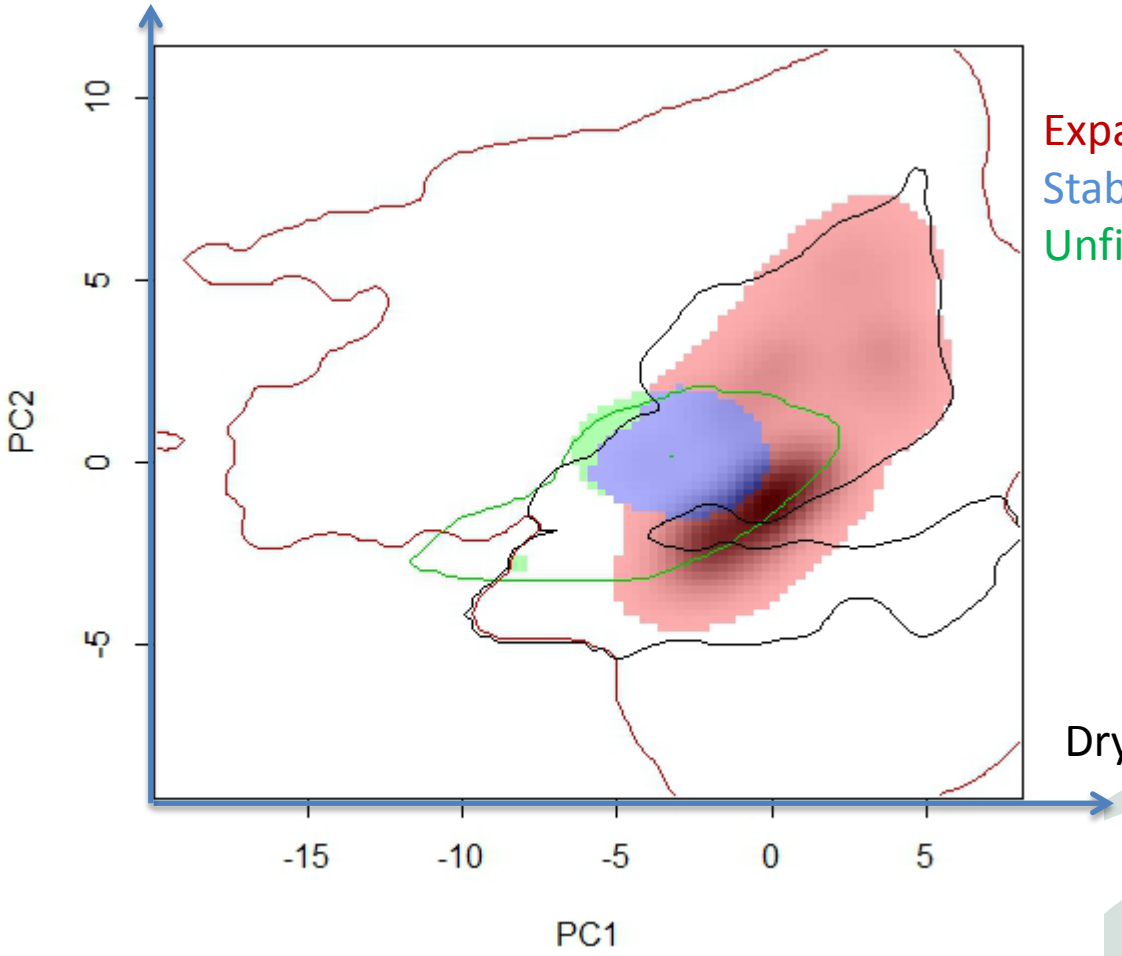
Northern crayfish

Golden apple snail

Results: a NZ species

New Zealand mud snail

Hotter areas



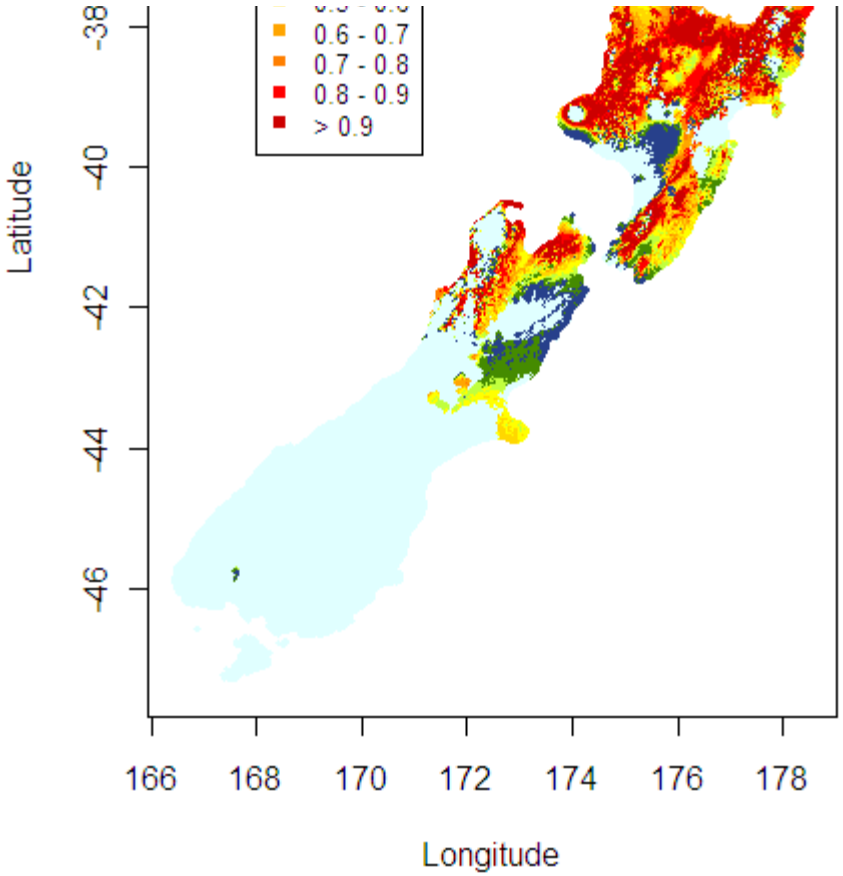
Dryer areas

Expansion: 0.86
Stability: 0.14
Unfilling: 0.09

How certain are we about predictions when niche changes are observed?

Future work

- Including niche expansion information in predictions
- Project will be developed in Lausanne University (Guisan's group)



Chinese mitten crab

Time for questions!

References:

- Broennimann, O. et al., 2012. Measuring ecological niche overlap from occurrence and spatial environmental data. *Global Ecology and Biogeography*, 21(4), pp.481–497.
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- Silk, N., & Ciruna, K. (2005). *A practitioner's guide to freshwater biodiversity conservation* (The Nature.). Washington DC: Island press.

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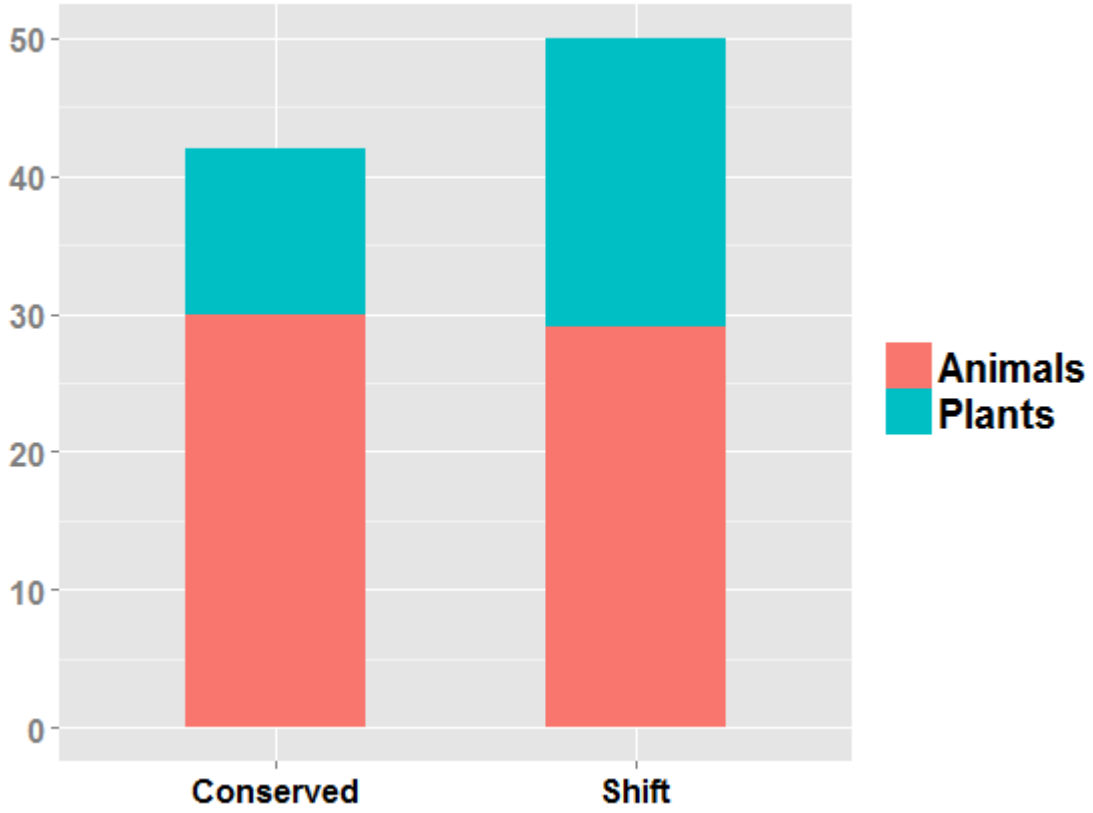
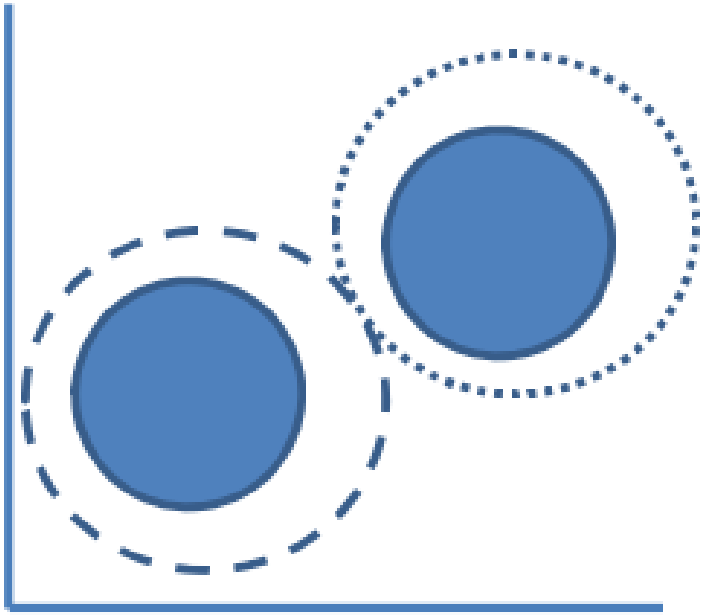
the super Eco Info team
and my loved one

How stable is the climatic niche?

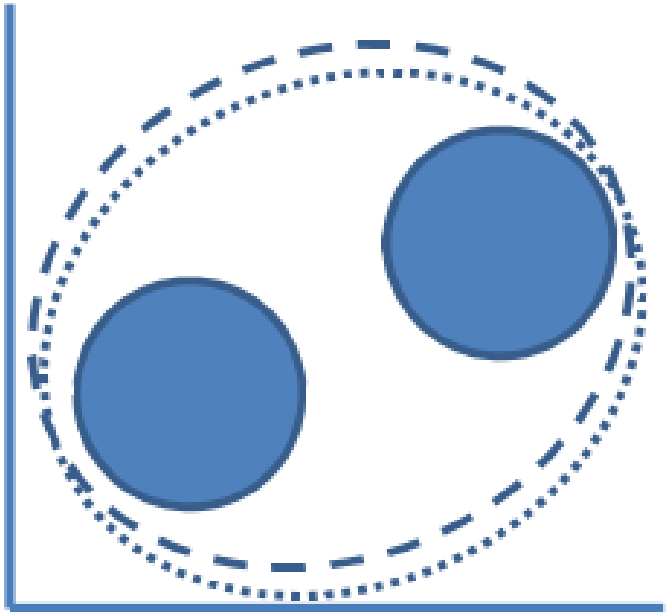
36 studies, 183 species
(Guisan et al. 2014)



Measuring overlap in the same environmental conditions



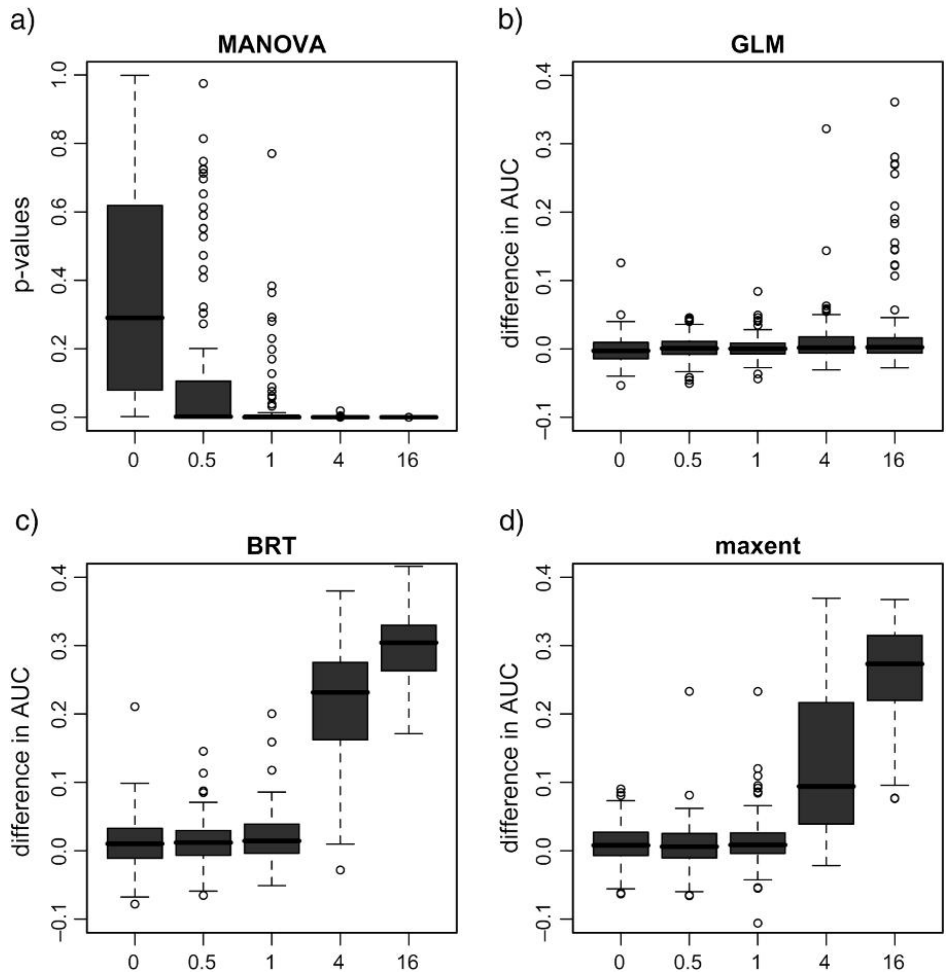
Non-overlap of background conditions = false difference



Complete overlap of background conditions = true difference

Peterson 2011

Measuring overlap in the same environmental conditions



Godsoe 2010