

FFII

Forecasting Future Invasions and their Impacts



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Biodiversity is threatened

The rate of species extinction currently exceeds historical rates by 100 to 1000



Western Black Rhino, declared extinct in 2011

A very large part of biodiversity could be lost within this century

Five major drivers of biodiversity loss



Habitat loss

Climate change



Pollution

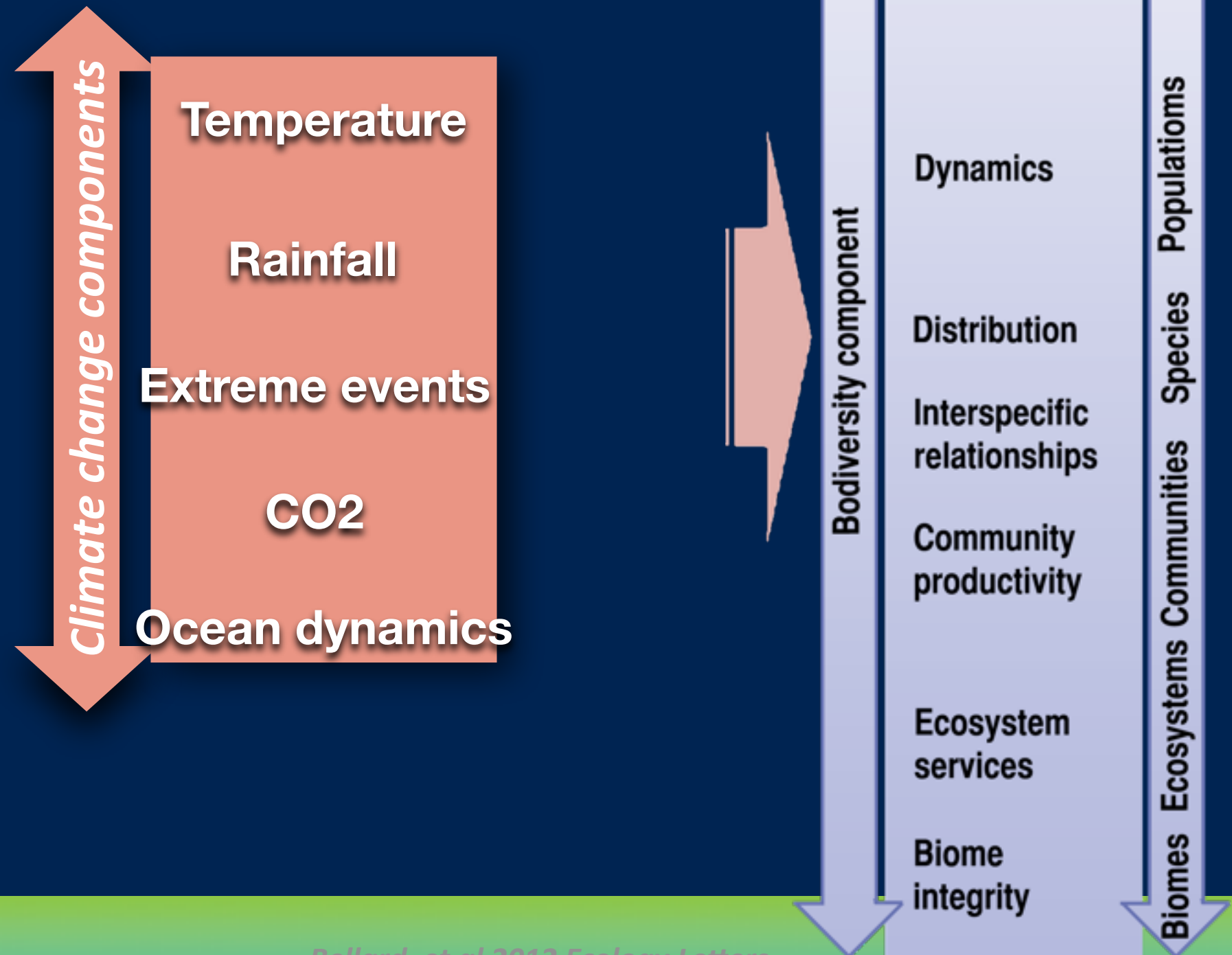


Biological invasions

Overexploitation



Climate change as a global threat



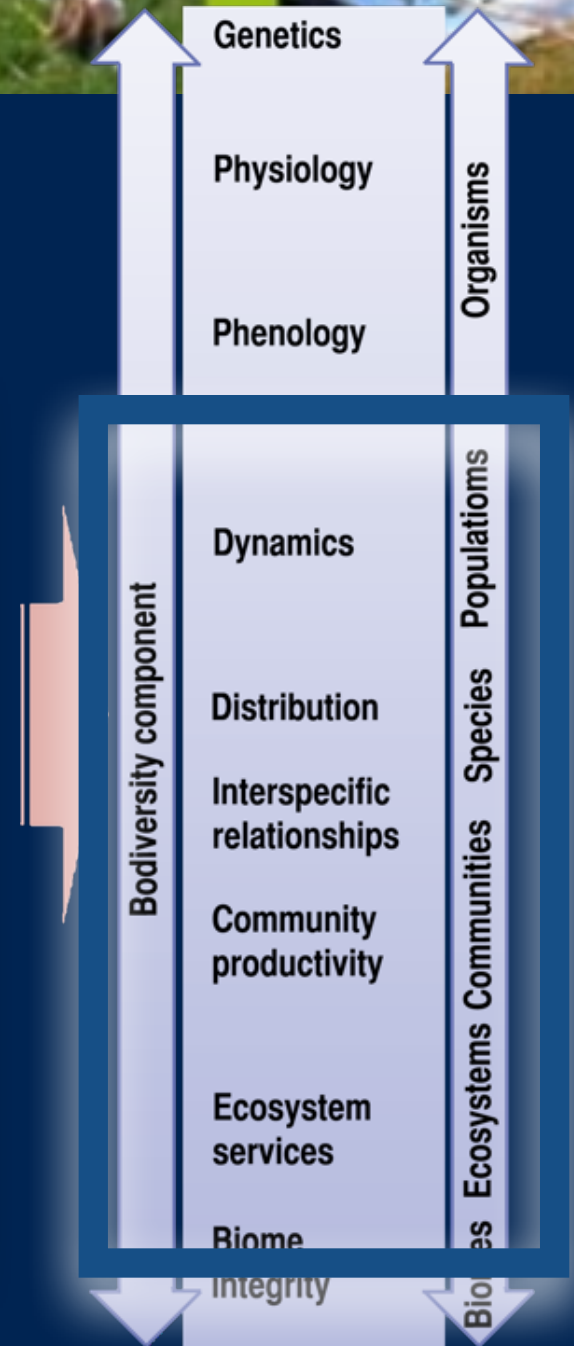
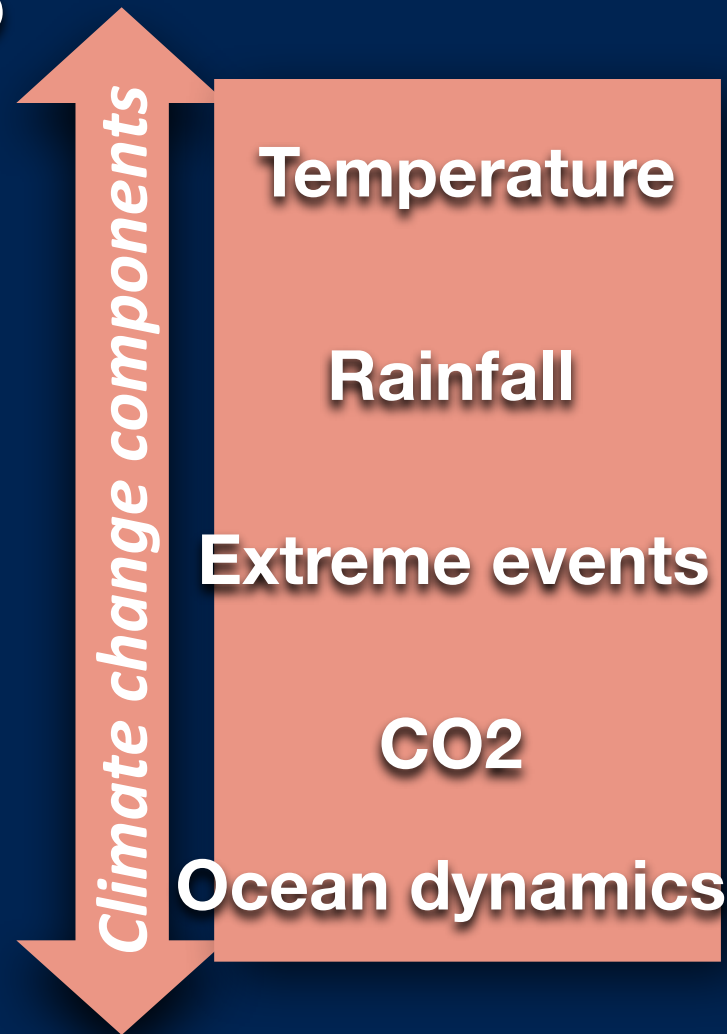
Biological Invasions as a global threat

Considered the second largest
threat to biodiversity

It also has a huge impact on
economy and society



Will climate change affect biological invasions?

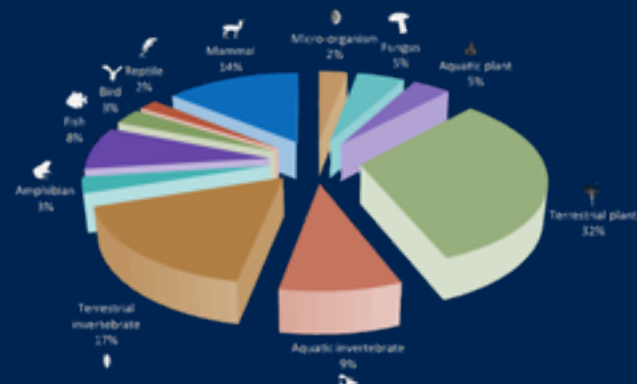


What are the **mechanisms** of spread and **impacts**?

What are the interactions with global changes?

Study scales

Model systems



Methods

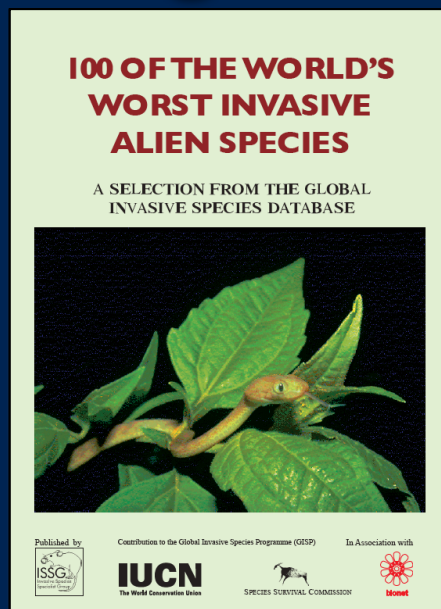


Spatial scales



Model systems

Large taxonomical and ecological samples

A screenshot of the 'GLOBAL INVASIVE SPECIES DATABASE' search interface. It has two tabs: 'Standard Search' and 'Taxonomic'. Below the tabs are four search fields: 'Species name', 'Country or location', 'Habitat' (with a dropdown menu set to 'all'), and 'Organism type' (with a dropdown menu set to 'all').

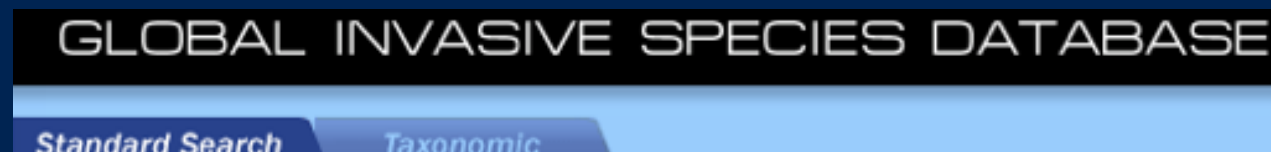
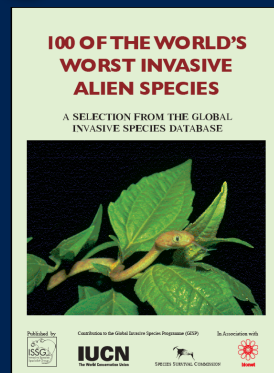
Impact on biodiversity and human activities

Variety of taxonomic groups, ecosystems, types of impacts

Large potential as an **illustration** of the various issues associated with invasions

Model systems

Large taxonomical and ecological samples



One relatively taxonomically smaller sample

Ecosystem engineers



20 highly
invasive ants

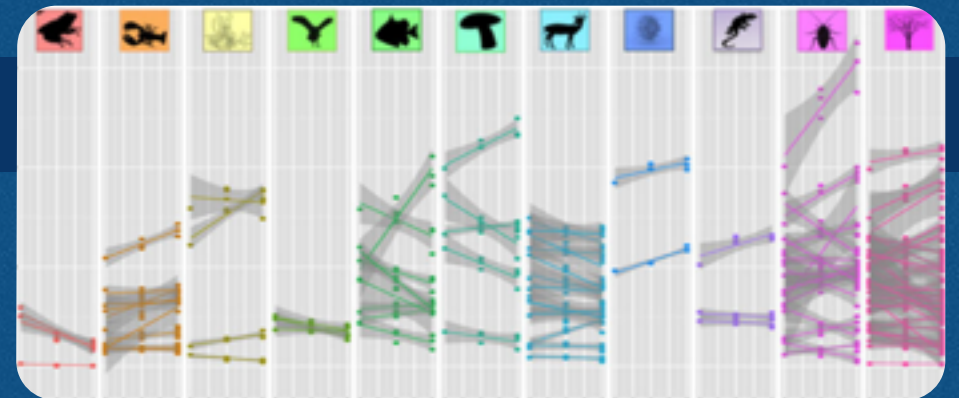


Methods

species distribution
models

life-history-trait statistical
models

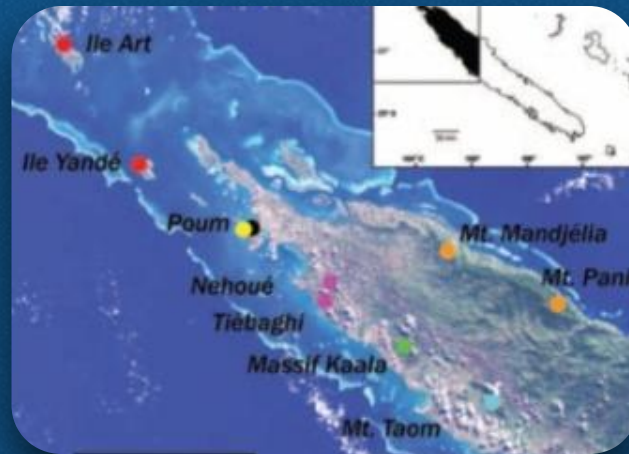
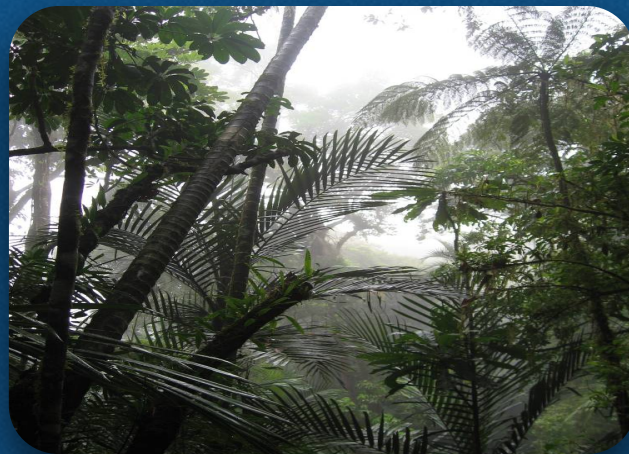
Theoretical



Field

Laboratory

Experimental

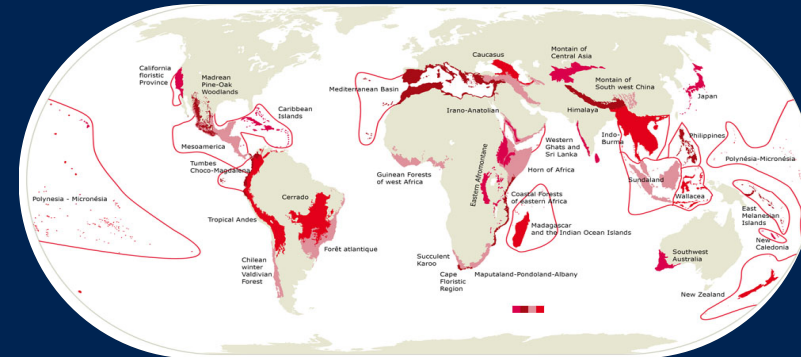


Spatial scales

Macroecology



Worldwide



2.3 % of the
Earth's land
surface

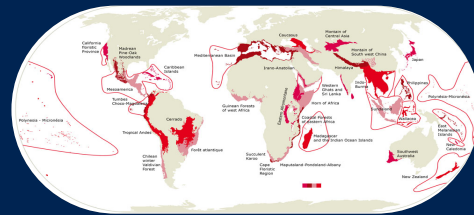
34 biodiversity hotspots

Endemic

>50% of the world's plants
42 % of all terrestrial vertebrate

Spatial scales

Macroecology



Finer scale: New Caledonia



High biodiversity

Endemic species



Invasive Ants

Nouméa
IRD station



Themes

Patterns

Potential species
distribution

High risk invasion

Processes

Development
meta-analysis
characteristics

Experiments
Interspecific interactions

Impacts

Meta-analysis
Categorize impacts

Experimentally
quantify impacts

Future

Themes

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Potential species
distribution

High risk invasion

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Future

Interactions with global change

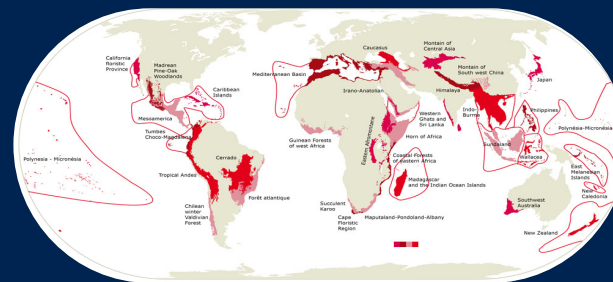
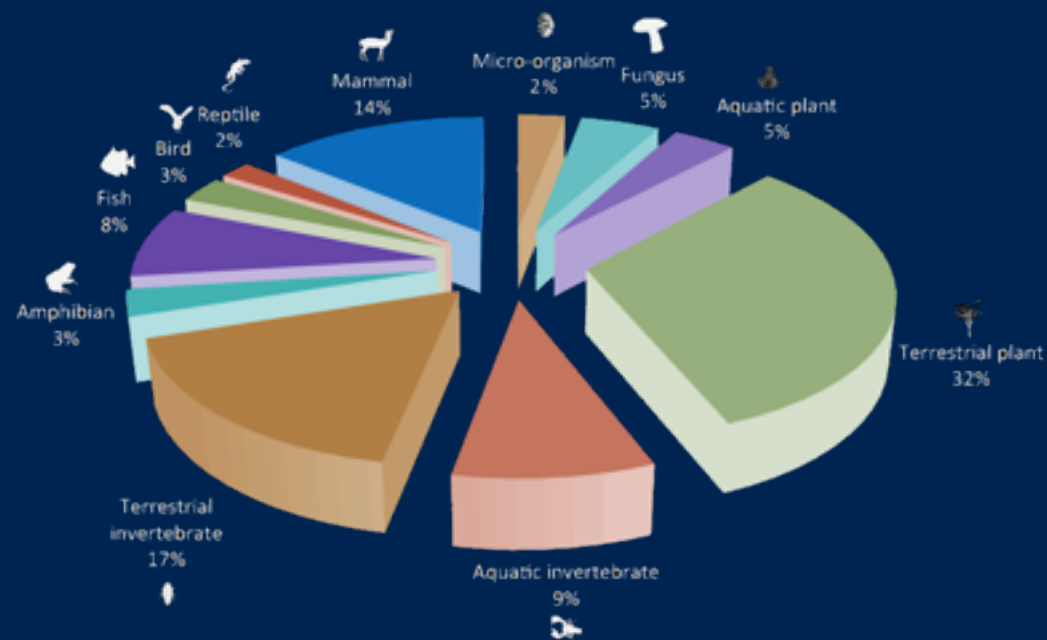
Climate change
Land use

Patterns

Worldwide pattern of invasion

100 OF THE WORLD'S WORST INVASIVE ALIEN SPECIES

A SELECTION FROM THE GLOBAL

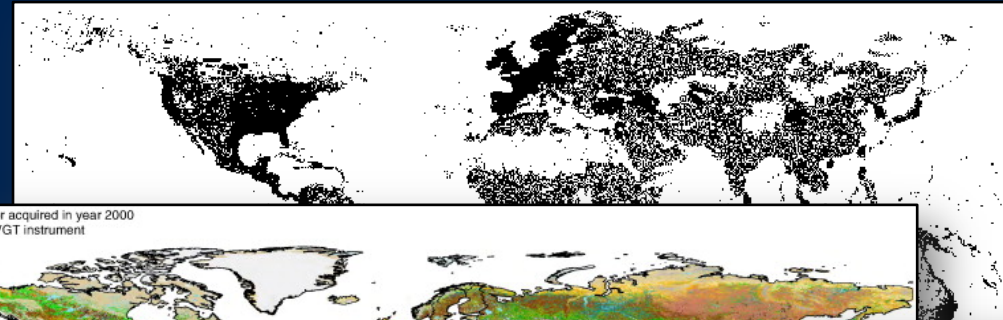


Patterns

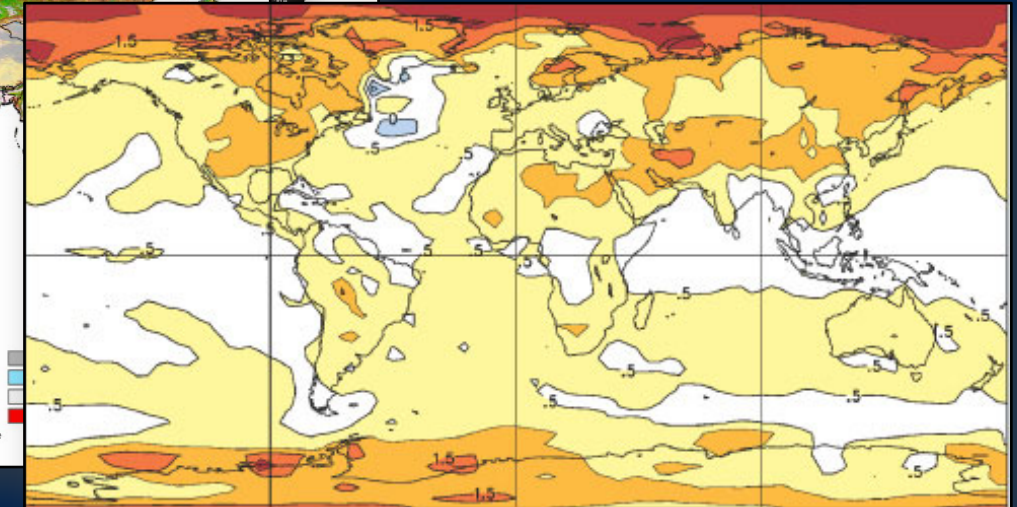
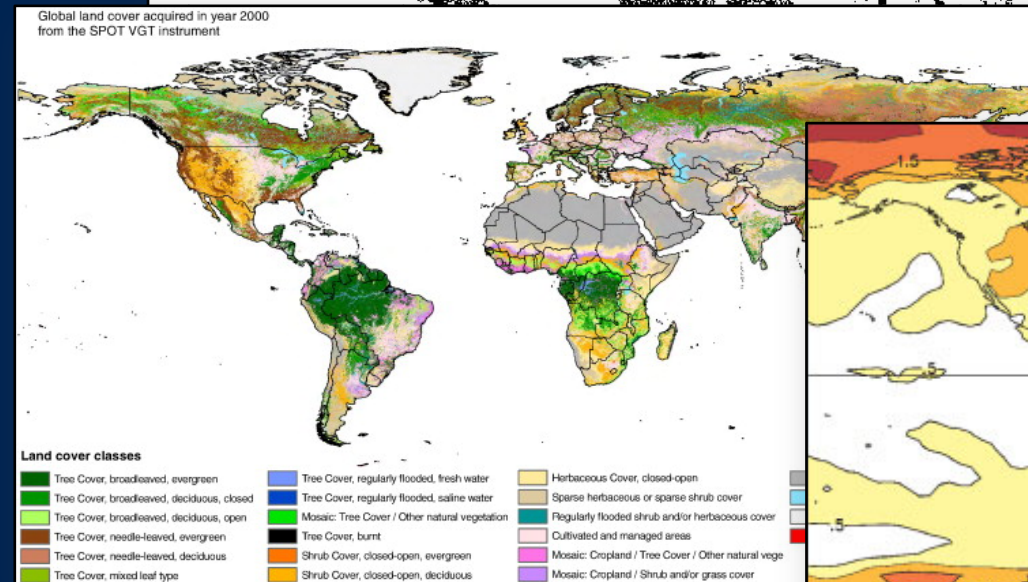
Worldwide pattern of invasion

**100 OF THE WORLD'S
WORST INVASIVE
ALIEN SPECIES**

A SELECTION FROM THE GLOBAL

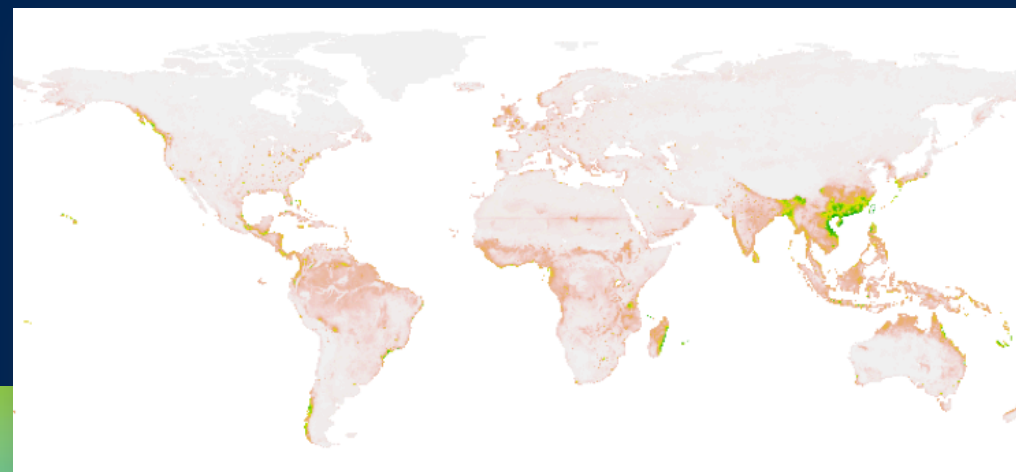


Collect of occurrence
points (average 3,815/sp)



Bioclimatic models with climatic
and land use data

Map of potential distribution



Processes

Theoretical approach

Ecological characteristics of invasive ants



Home Search Contributors New Species Other Species Authors Countries Export Menus



Franck Courchamp
[Log Out]

Search:

Country	Equals	France	✓
Diet	IsDifferent	Omnivorous	✓
WorkerPolymorphism	Equals	Yes	✓
Sting	Equals	Yes	✓

3 results

Show 10 per page

Name	Gyny	ColonyDensity	Workers	WorkerPolymorphism	MinBodySize	MaxBodySize	SterileWorkers	Sting	
<i>Pheidole pallidula</i>	Monogynous	Abundant		Yes	2	4		Yes	➡
<i>Messor bouvieri</i>	Monogynous			Yes	4	8		Yes	➡
<i>Messor wasmanni</i>	Monogynous			Yes	3	9		Yes	➡

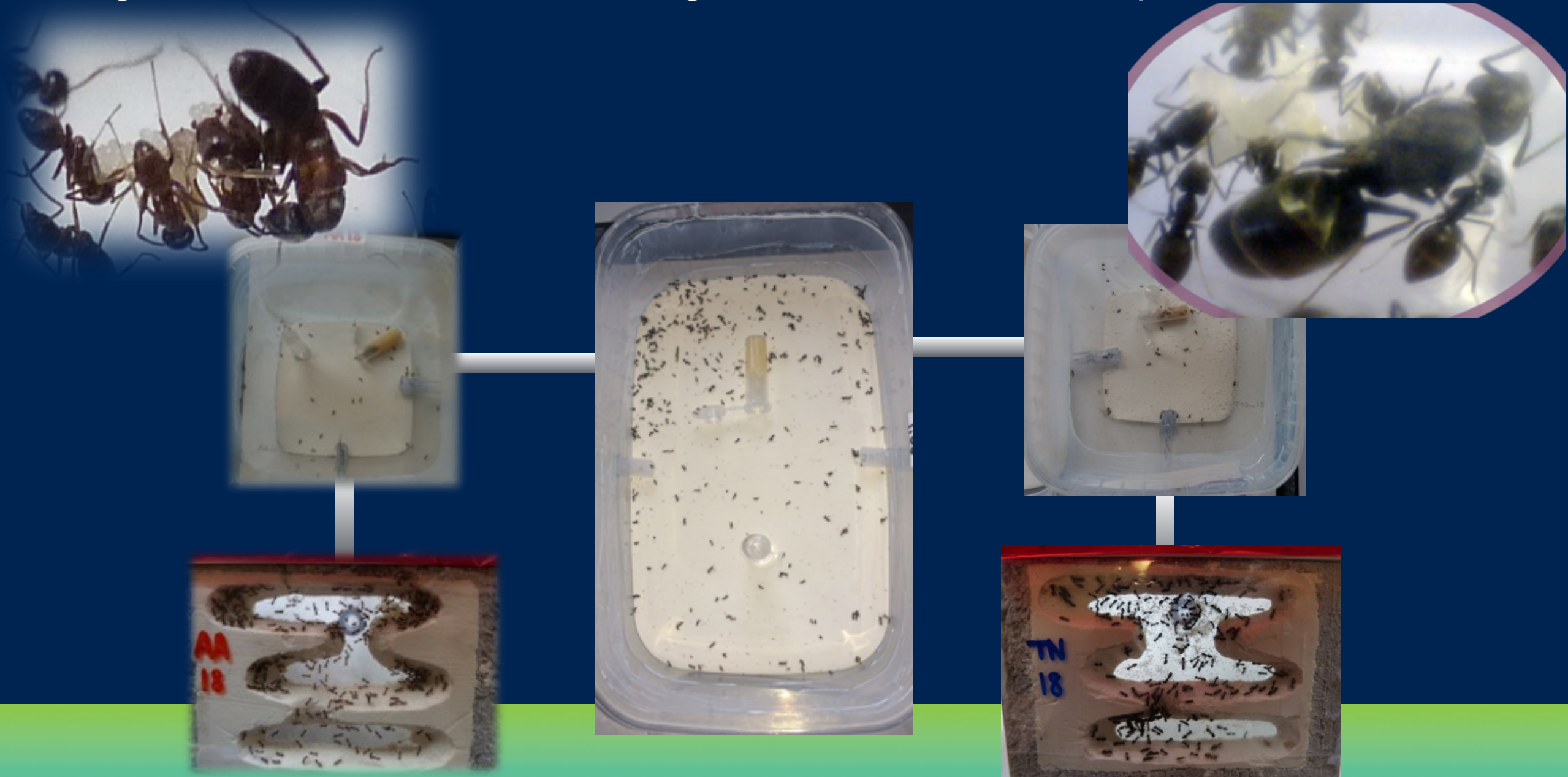
ANT PROFILER

Processes

Experimental approach: Laboratory

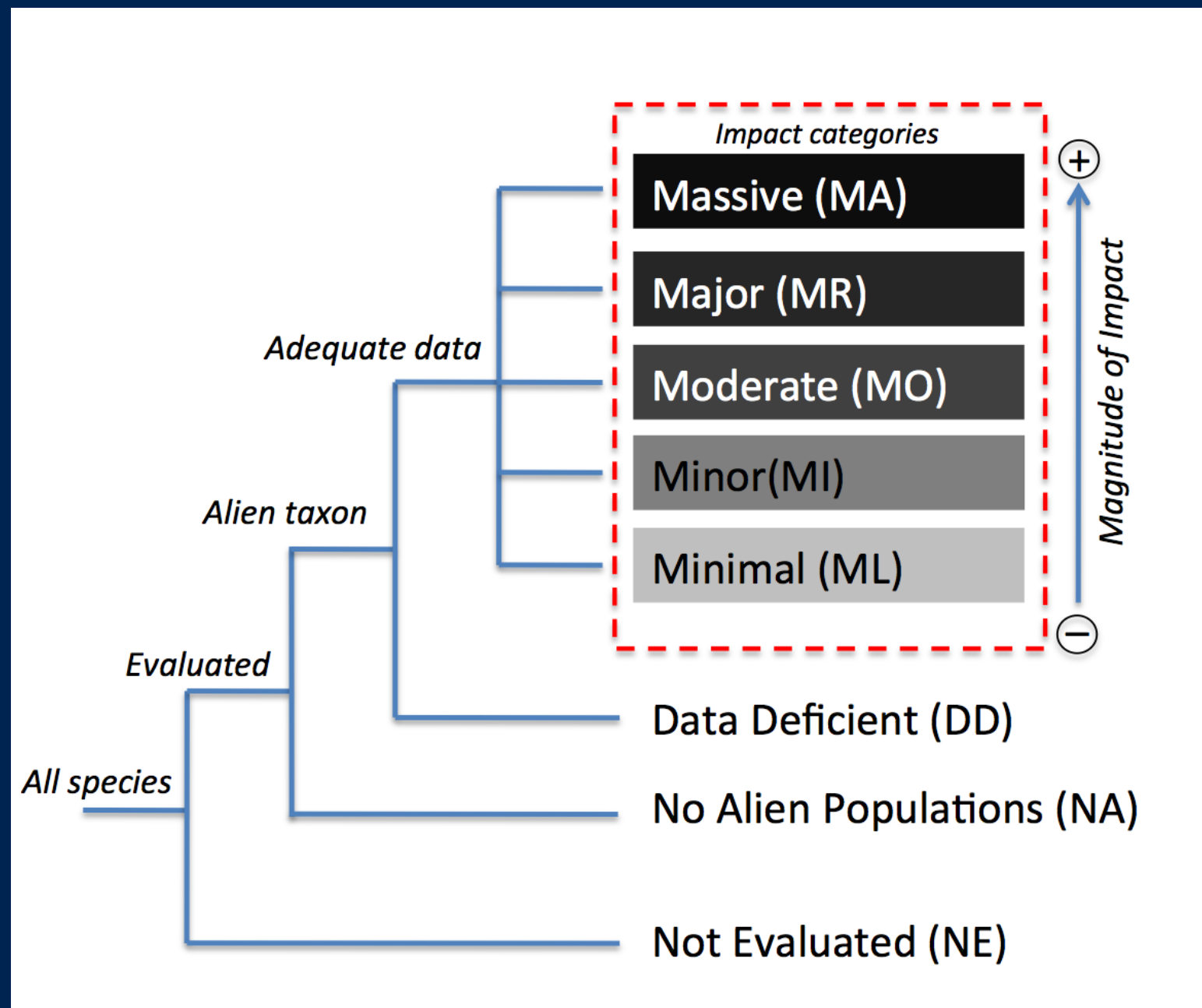
Study of interspecific interactions

Mitigation of invasive ants through biocontrol with competitors



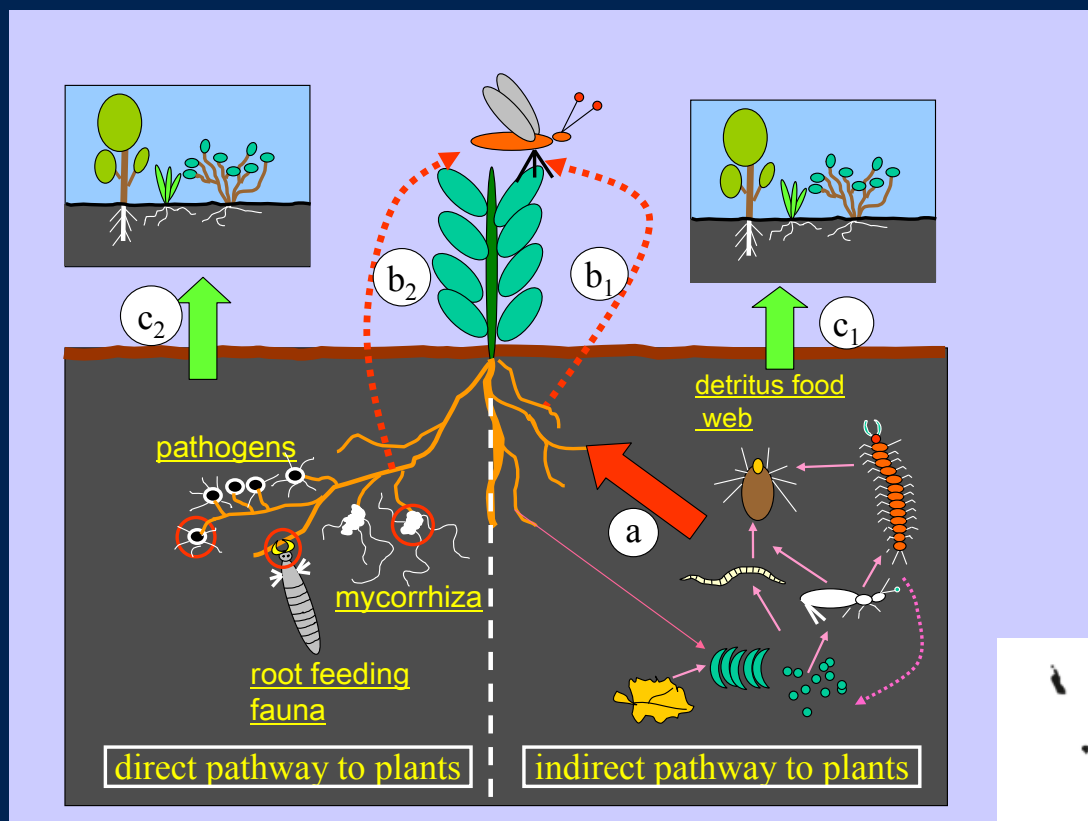
Impacts

Theoretical approach



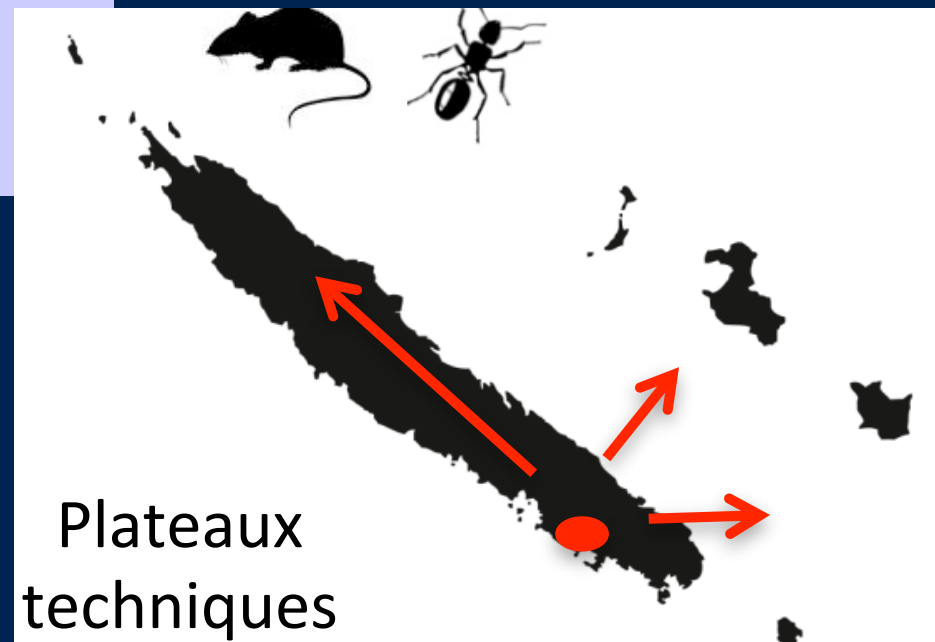
Impacts

Experimental approach



Below-above ground

4 invasive ants



Plateaux techniques

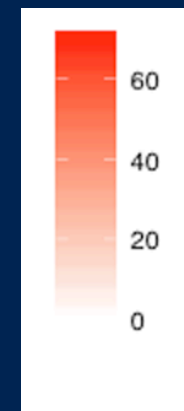
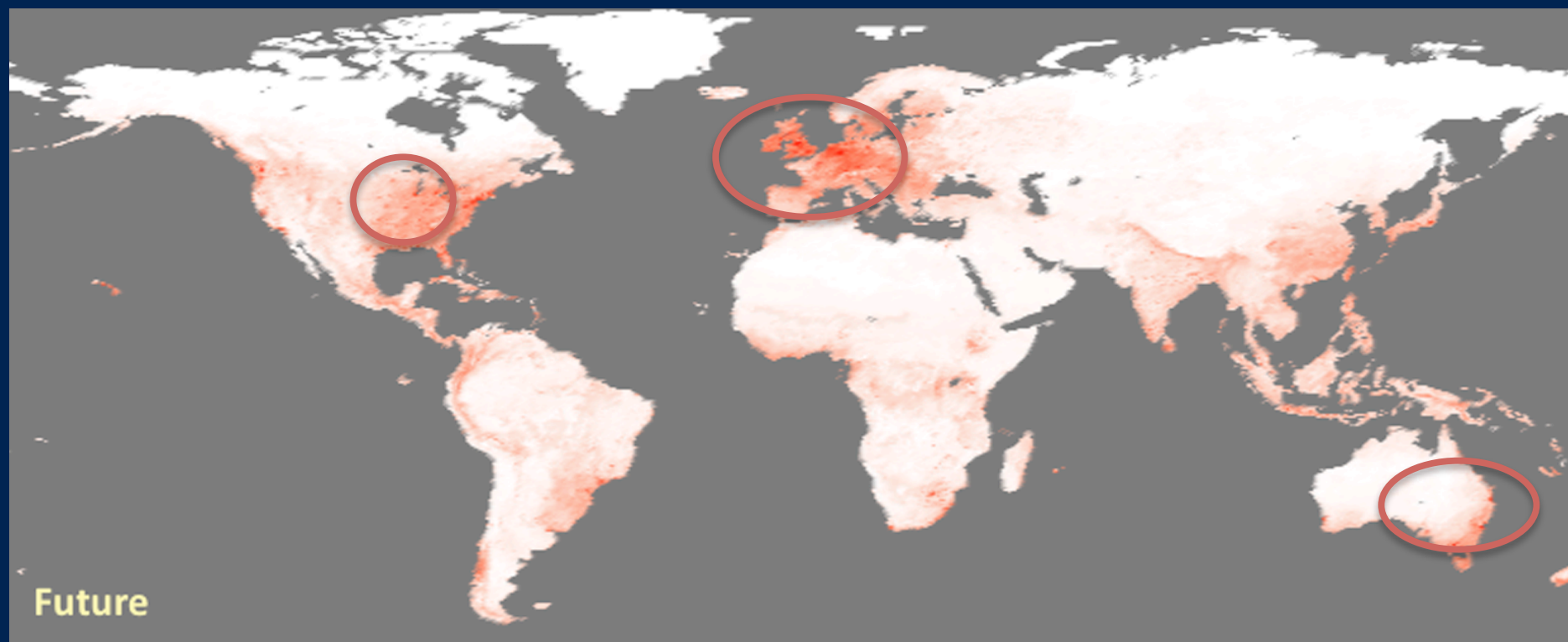


Tendency to exclude each other

Future Will climate change affect the patterns of invasion?

Climate and Land use changes

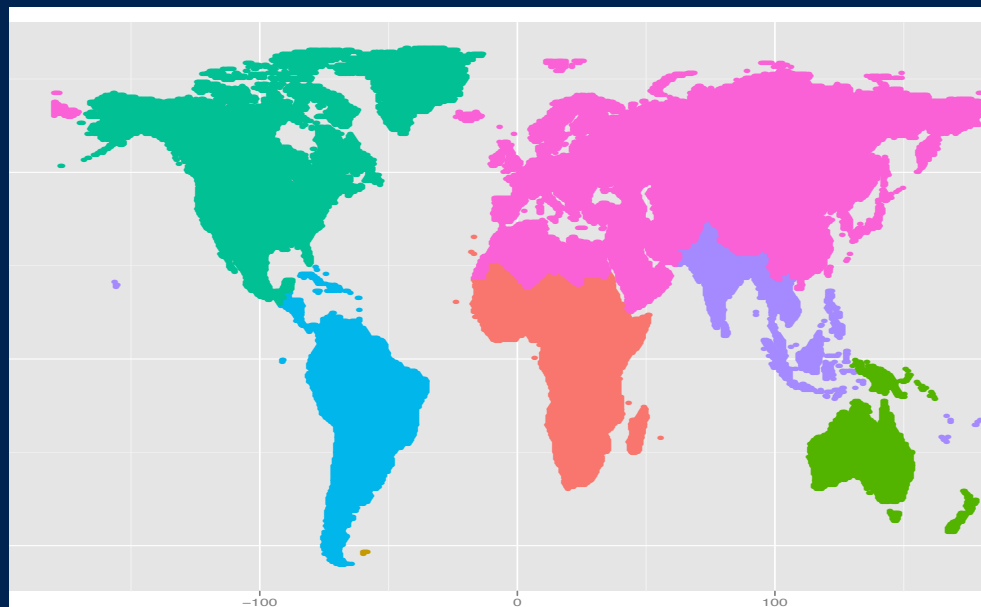
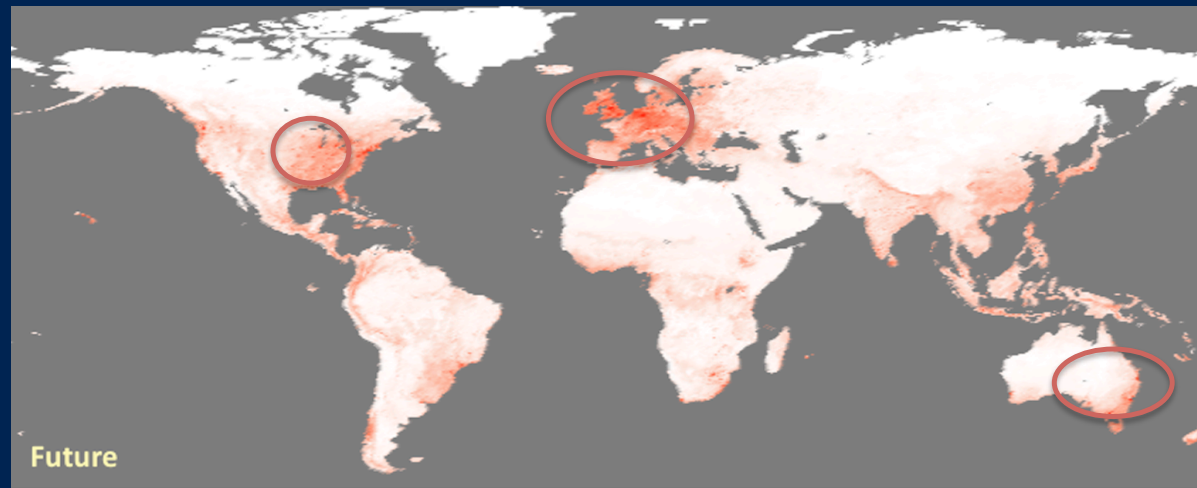
Future high risk regions for 100 IAS



Number of
Invasive Alien
Species

Future Will climate change affect the patterns of invasion?

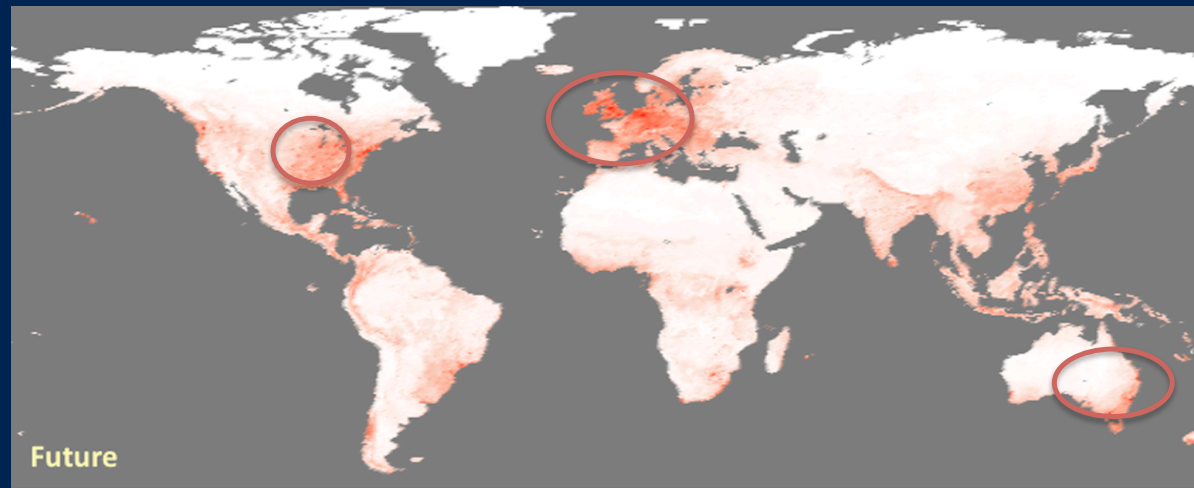
Future high risk regions for 100 IAS



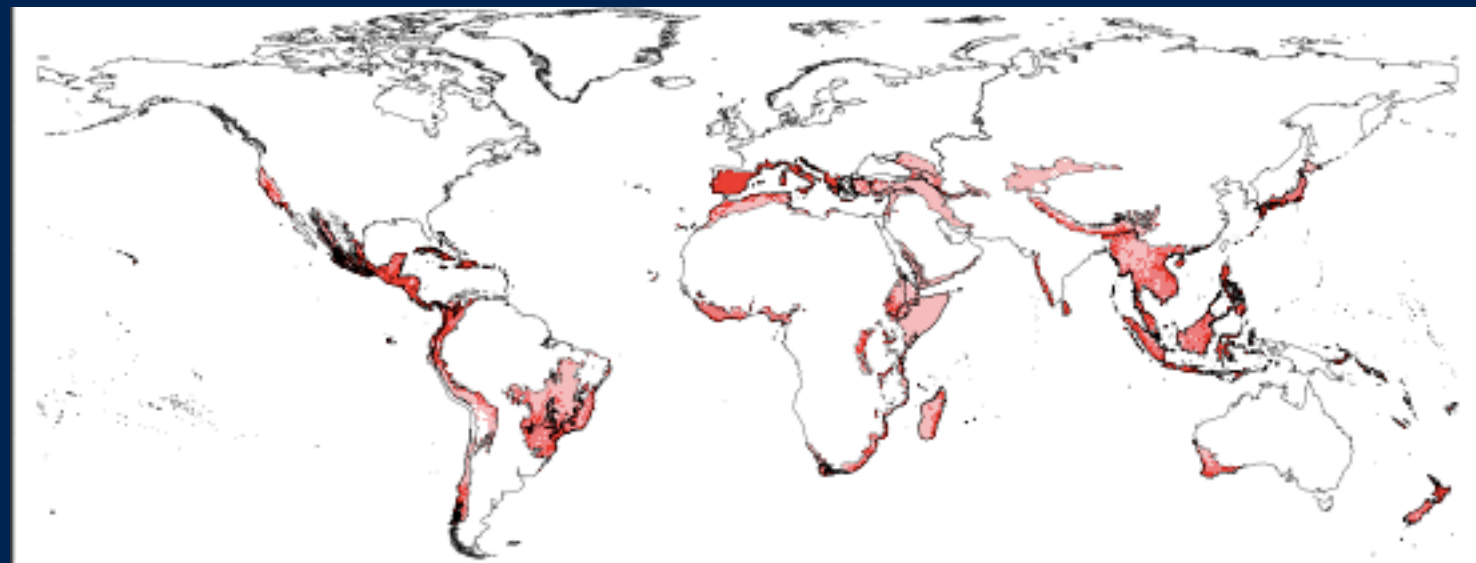
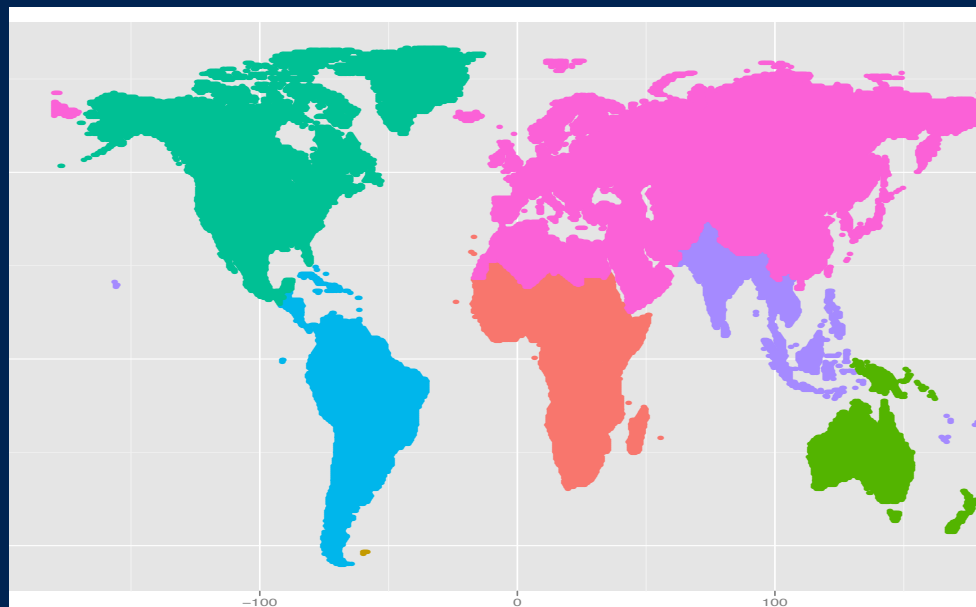
Biological invasions per region

Future Will climate change affect the patterns of invasion?

Future high risk regions for 100 IAS



Biological invasions in the hotspots





P1

David Wardle

Swedish University of
Agricultural Sciences



P2

Franck Courchamp

University of
Paris South



Comprendre le monde,
construire l'avenir®



P3

Eric Vidal

IRD of Nouméa
New Caledonia



P4

Jonathan Jeschke

Leibniz-Institute of Freshwater
Ecology and Inland Fisheries (IGB)

Berlin



Research group



P1
David Wardle



Community and ecosystem impacts of invasives

Swedish University of Agricultural Sciences

Key SLU personnel

Michael Gundale
Biogeochemical cycling

Paul Kardol
Soil biology

2-years post-doctoral support (2015-2016)



P2
Franck
Courchamp



UNIVERSITÉ
PARIS
SUD

Comprendre le monde,
construire l'avenir®

Biological Invasions and Climate Change

University of Paris South

Key personnel



Elsa Bonnaud



Gloria Luque



Sébastien Ollier

Post - doctoral students



Celine Bellard



Boris Leroy



Olivier Blight



Cleo Bertelsmeier

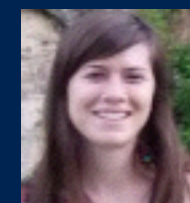
Graduate students



Camille Leclerc



Melanie Fichaux



Irene Castañeda



P3
Eric Vidal



Biological invasions and Biodiversity Conservation

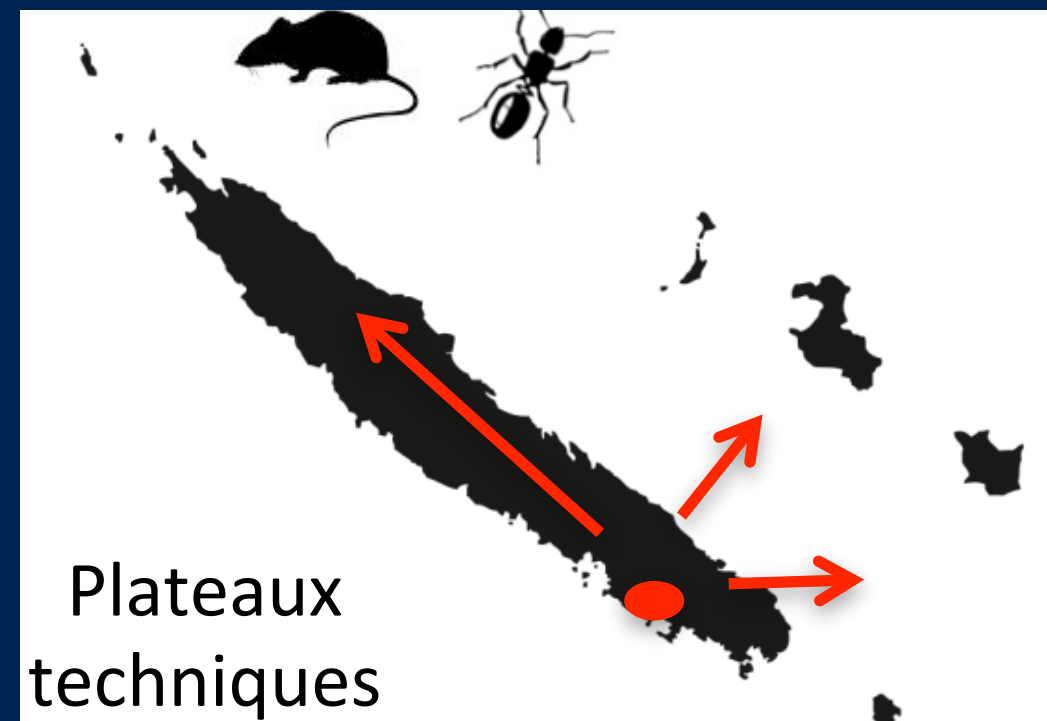
Centre IRD of Nouméa
New Caledonia



Herve Jourdan
(Ant Ecology)

Key personnel

PhD students
Master students
Technical support



Plateaux
techniques



P4
Jonathan
Jeschke



Predator-Prey systems Biological invasions

Leibniz-Institute of Freshwater Ecology and Inland Fisheries
(IGB) Berlin



Piero Genovesi



Wolf Saul
PhD
student

Post-doc for
last year

Themes

Patterns

Processes

Impacts



Nouvelle-Calédonie
Vanuatu



Future



Themes

Patterns

Processes

Impacts

Global Change Biology

Global Change Biology (2013), doi: 10.1111/gcb.12344

Will climate change promote future invasions?

CELINE BELLARD*, WILFRIED THUILLER†, BORIS LEROY‡§, PIERO GENOVESI¶, MICHEL BAKKENES|| and FRANCK COURCHAMP*

Chapter 18 • Ant Profiler

Myrmecological News

18

73-76

Online Earlier, for print 2013

Forum

Ant Profiler – a database of ecological characteristics of ants (Hymenoptera: Formicidae)

Biol Invasions
DOI 10.1007/s10530-012-0390-y

ORIGINAL PAPER

Global warming may freeze the invasion of big-headed ants

Cleo Bertelsmeier • Gloria M. Luque •
Franck Courchamp

Conservation Biology

Contributed Paper

Increase in Quantity and Quality of Suitable Areas for Invasive Species as Climate Changes

CLEO BERTELSMEIER, * GLORIA M. LUQUE, AND FRANCK COURCHAMP

Future

FFII

Forecasting Future Invasions and their Impacts

THANK YOU!



David Wardle

Franck Courchamp

Eric Vidal

Jonathan Jeschke

