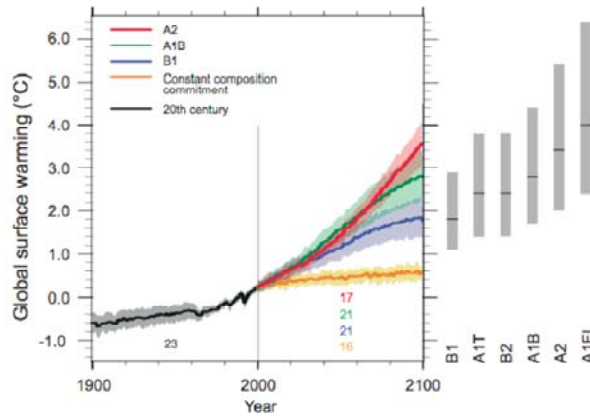


# Understanding the dynamics of current and emerging pests

Andrea Battisti  
University of Padova Italy



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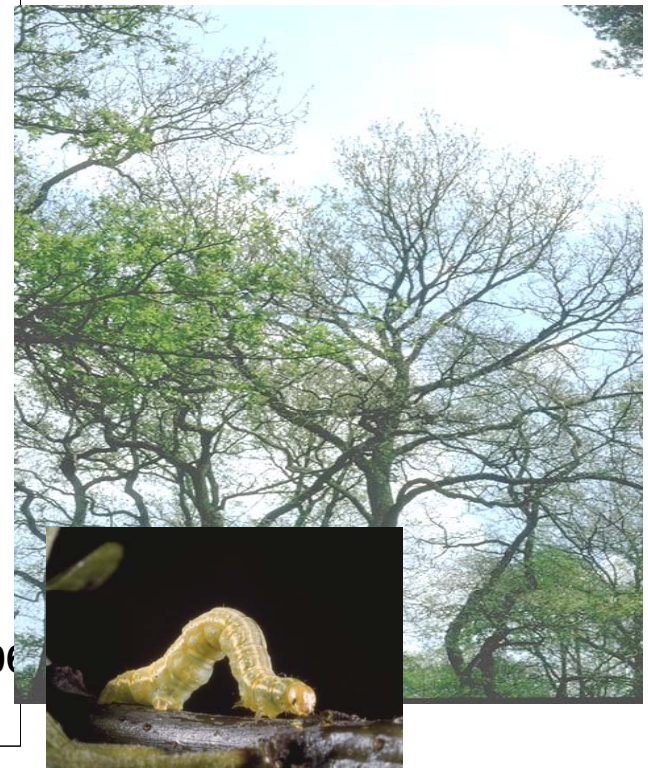
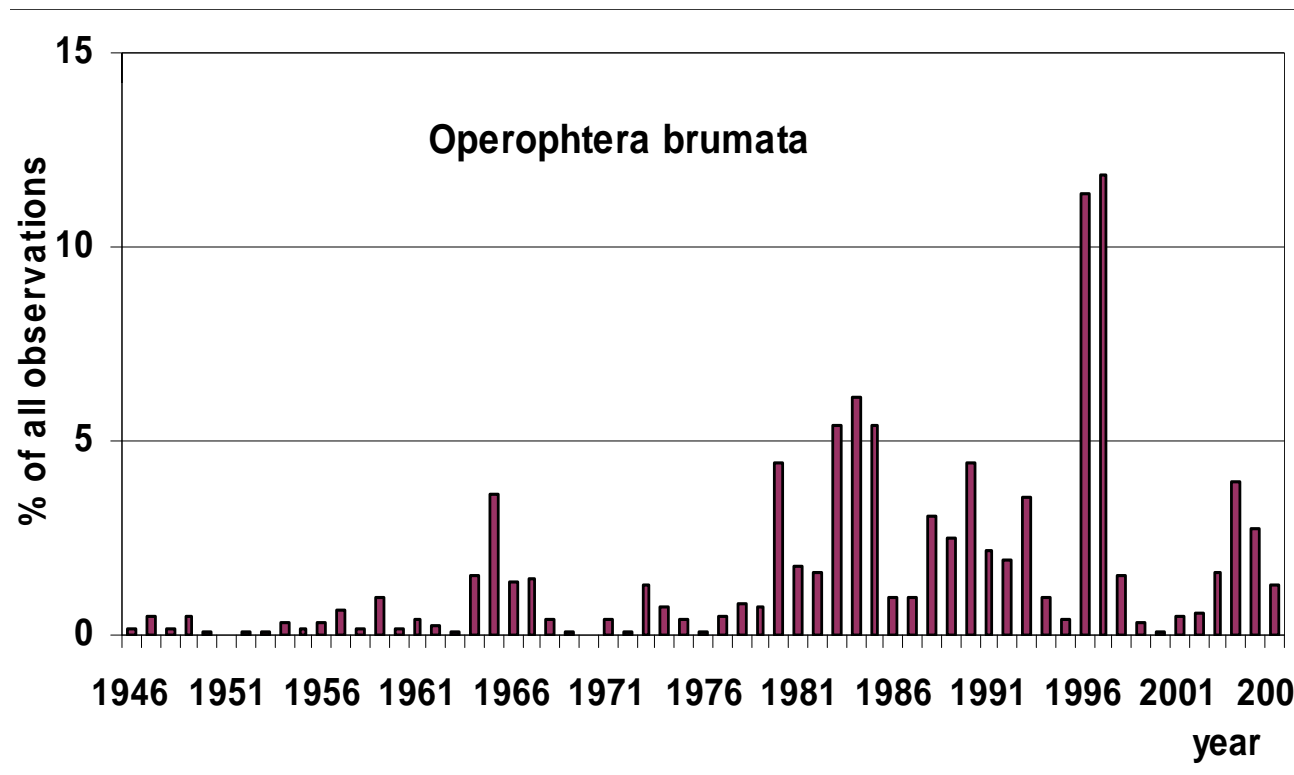
# Climate change

- Affects distribution range
- Affects performance of individuals
  
- What is the population response?
- What can we expect?

The EU FP7 BACCARA project 'Biodiversity and Climate Change: A Risk Analysis' 2009-2013

# Approach to the study

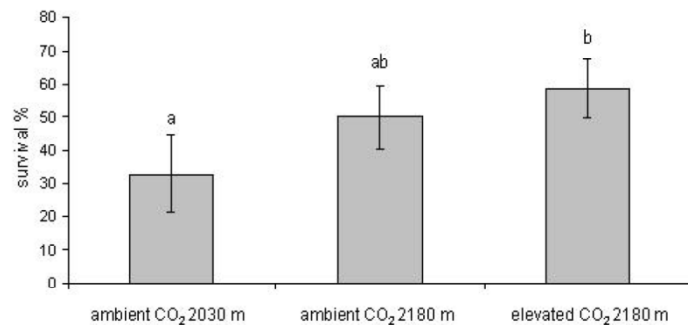
- Observational: long-term data sets
- Mechanistic



# Approach to the study

- Observational
- Mechanistic

Performances of an expanding insect under elevated  $\text{CO}_2$  and snow cover in the Alps



# Levels of complexity

**Predators,  
competitors,  
mutualists**

**Herbivores and  
pathogens**

**Trees: above and  
below ground**

↑ temp

Δ precip

Δ clouds

Δ storms

Δ snow

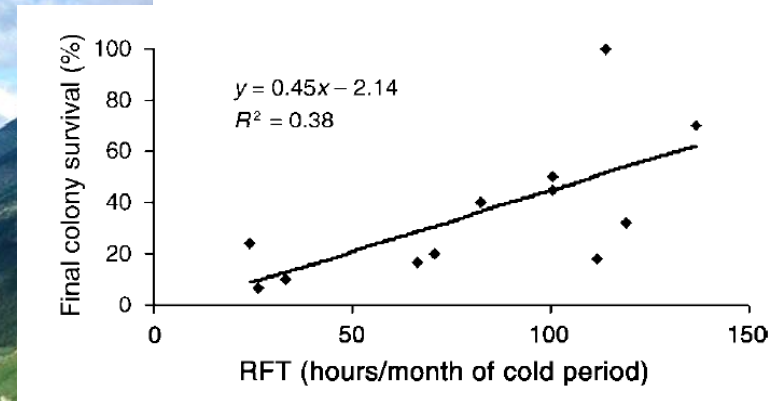
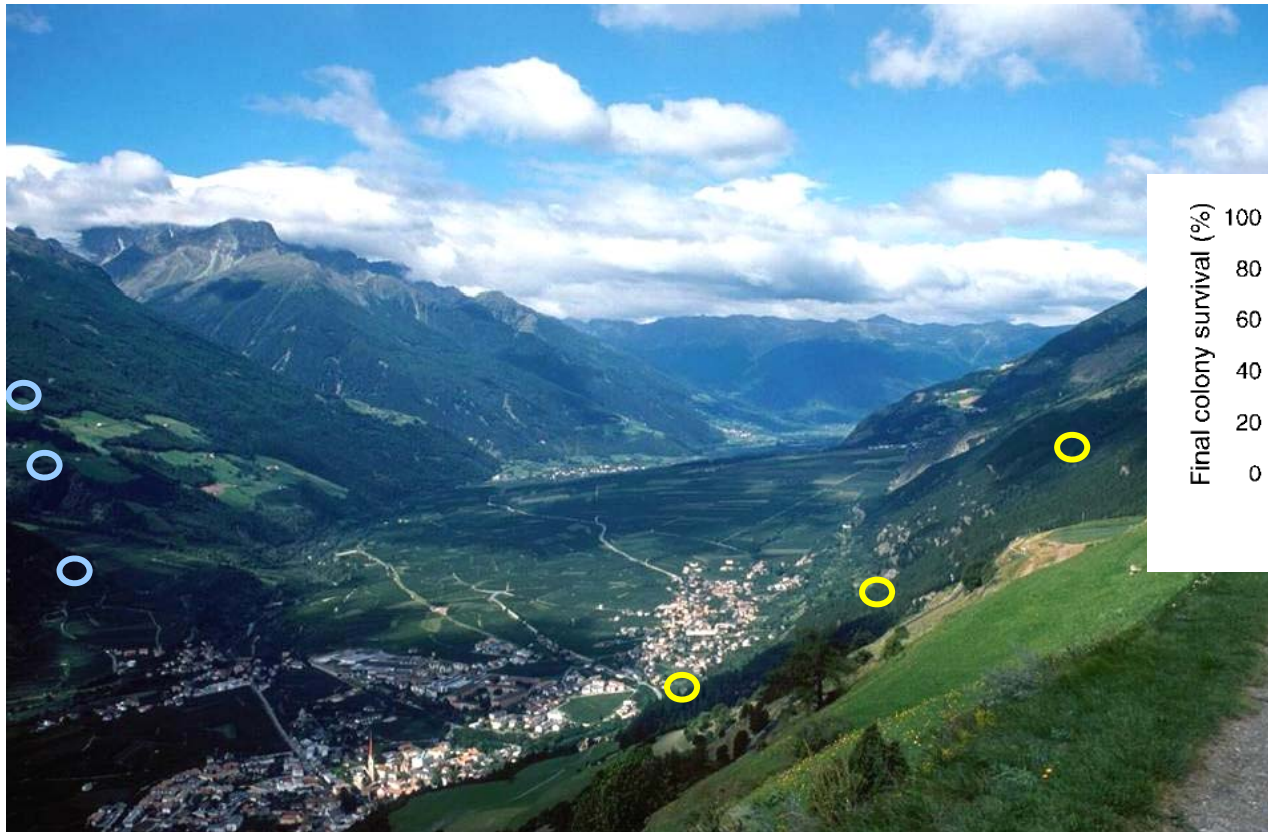
↑↑ CO<sub>2</sub>, CH<sub>4</sub>

# Climate-associated drivers

- Temperature
- Drought: water stress + temperature
- Wind storm
- Fire

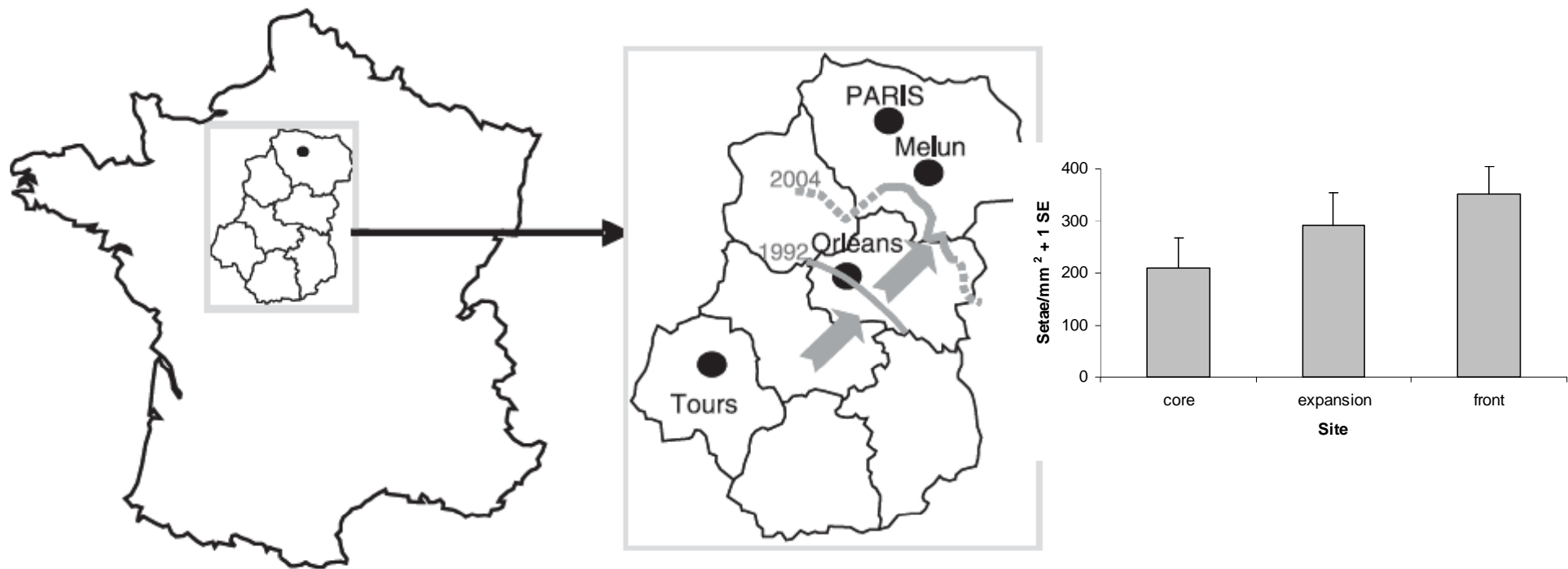
# Spatial analogues of climate change

- Natural gradients of elevation
- Natural gradients of latitude



# Spatial analogues of climate change

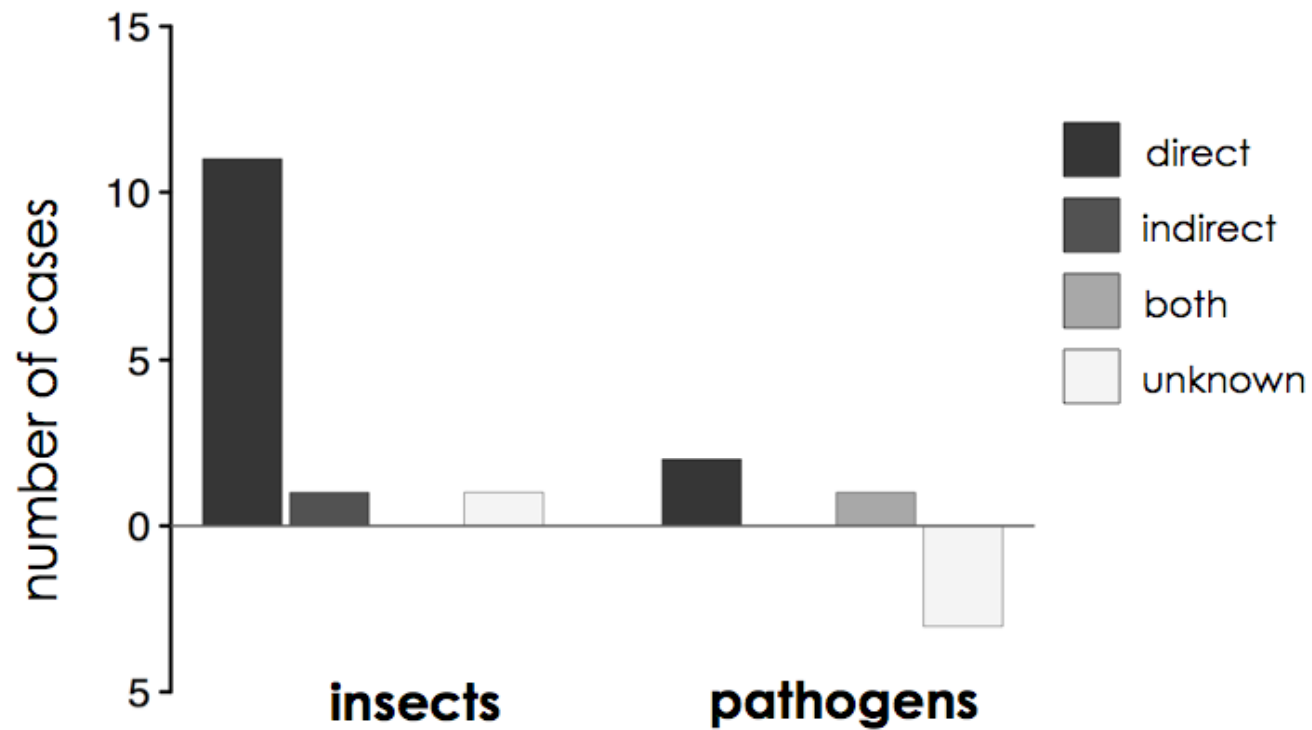
- Natural gradients of elevation
- Natural gradients of latitude



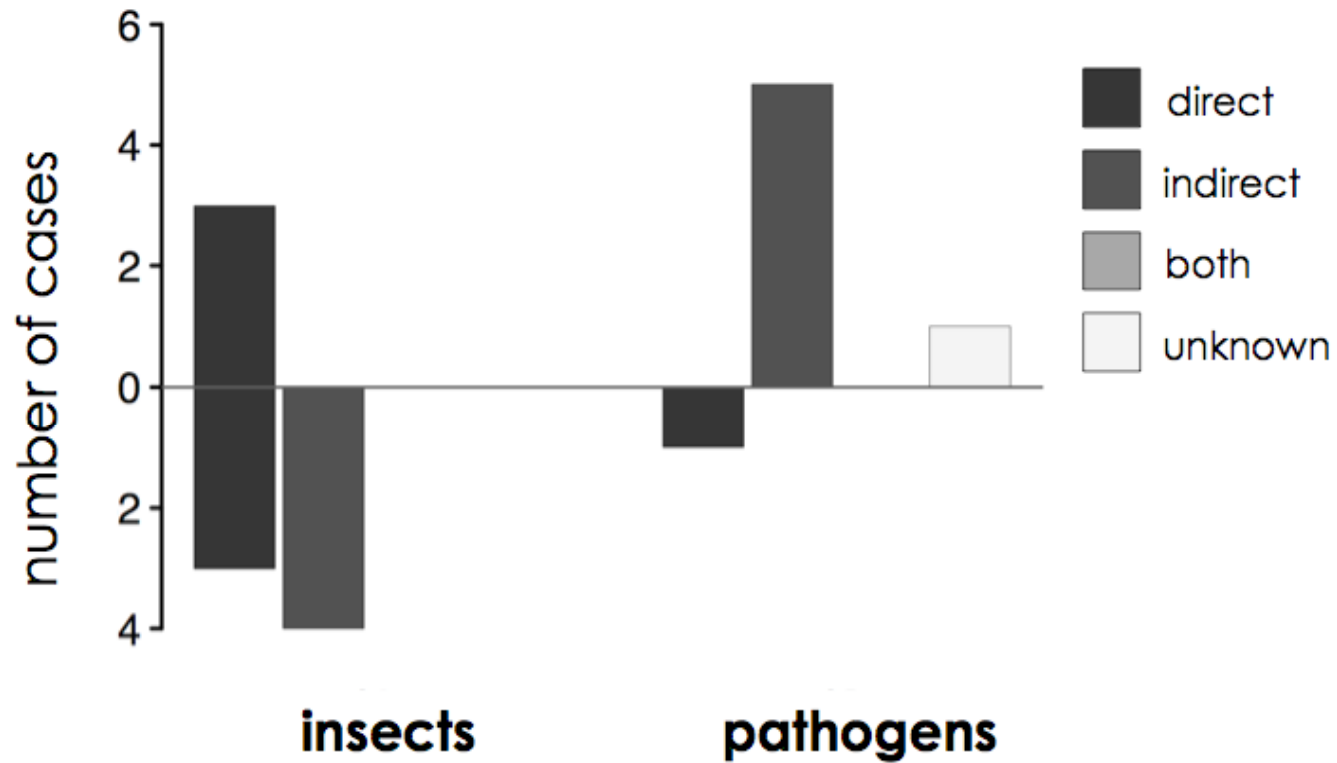
# Species response to drivers

- 21 insects and 22 fungi out of about 150 pests/pathogens in EU
- > 30 species are pests/pathogens in the Mediterranean area
- A few species are already expanding to upper elevation/latitude
- Retraction of range and relaxation of pestilence is not observed at southern edge

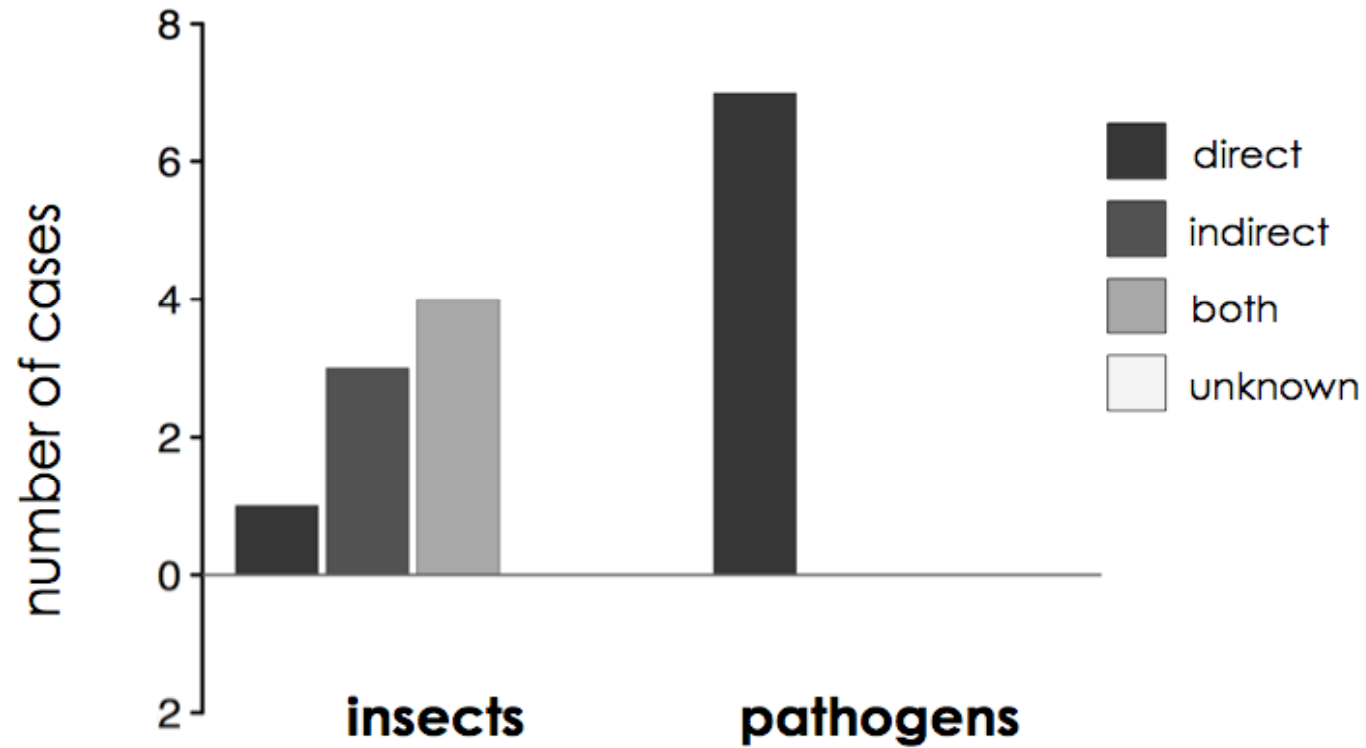
# Response to temperature



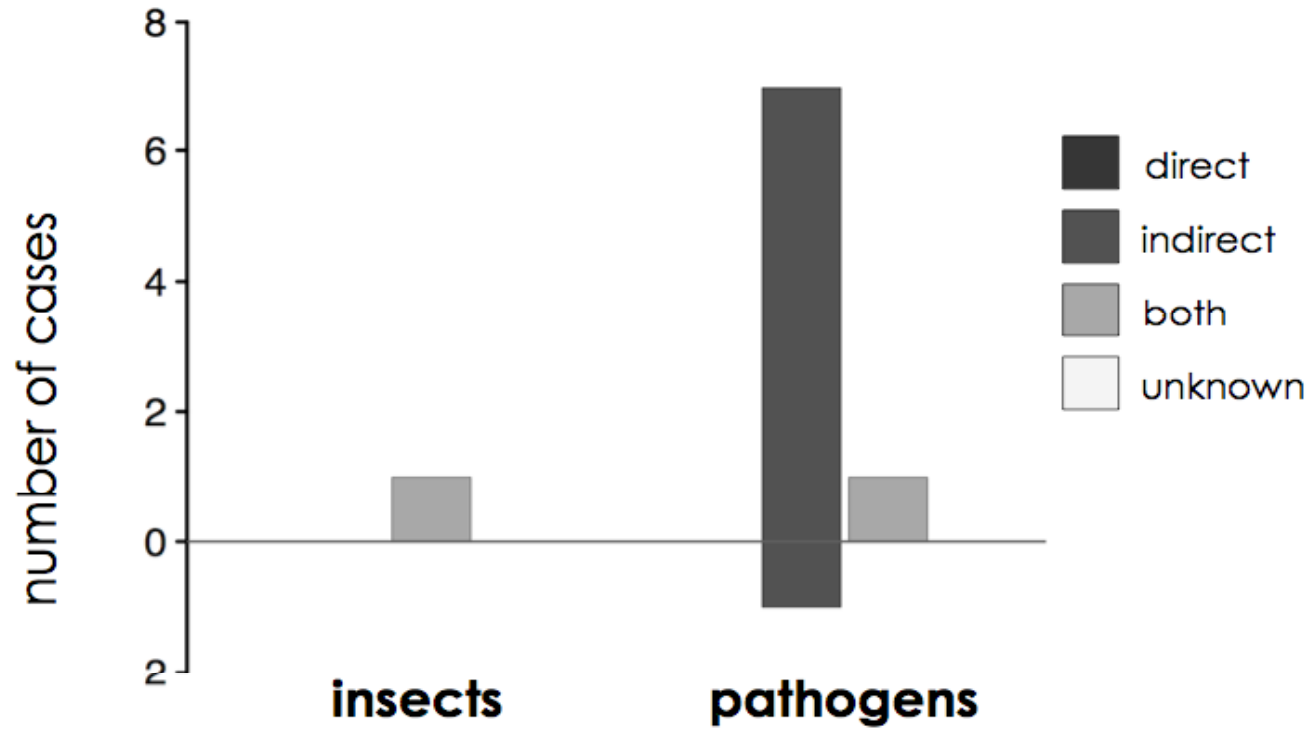
# Response to drought



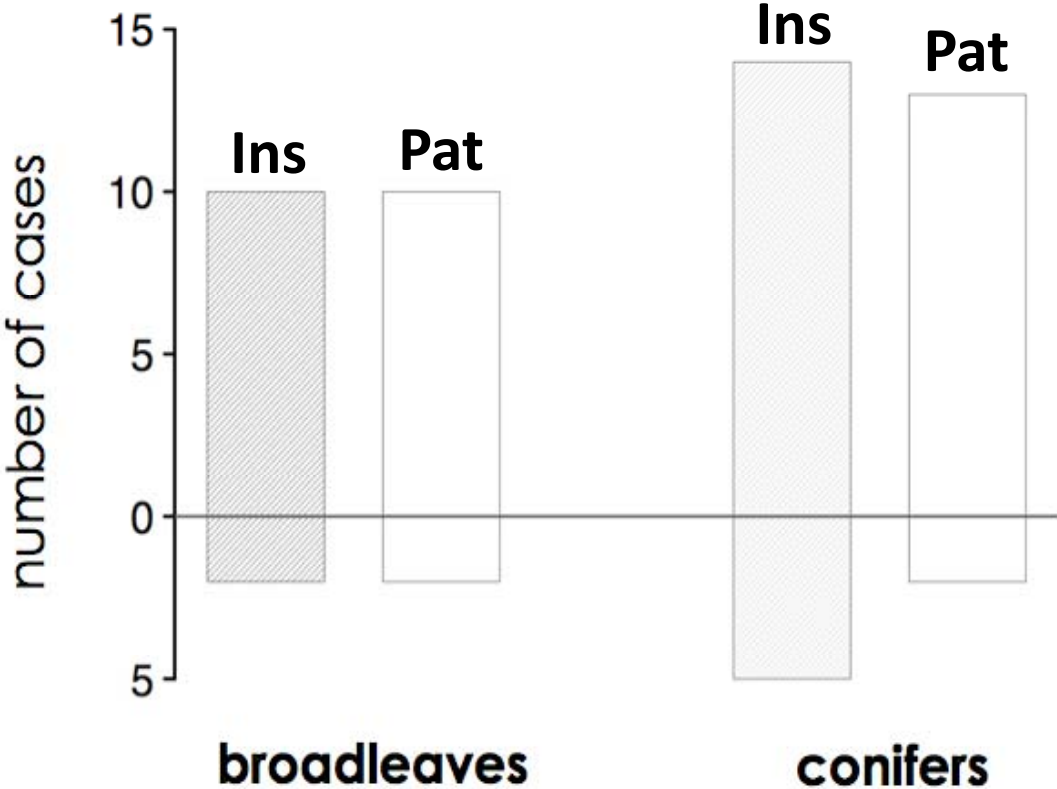
# Response to wind storm



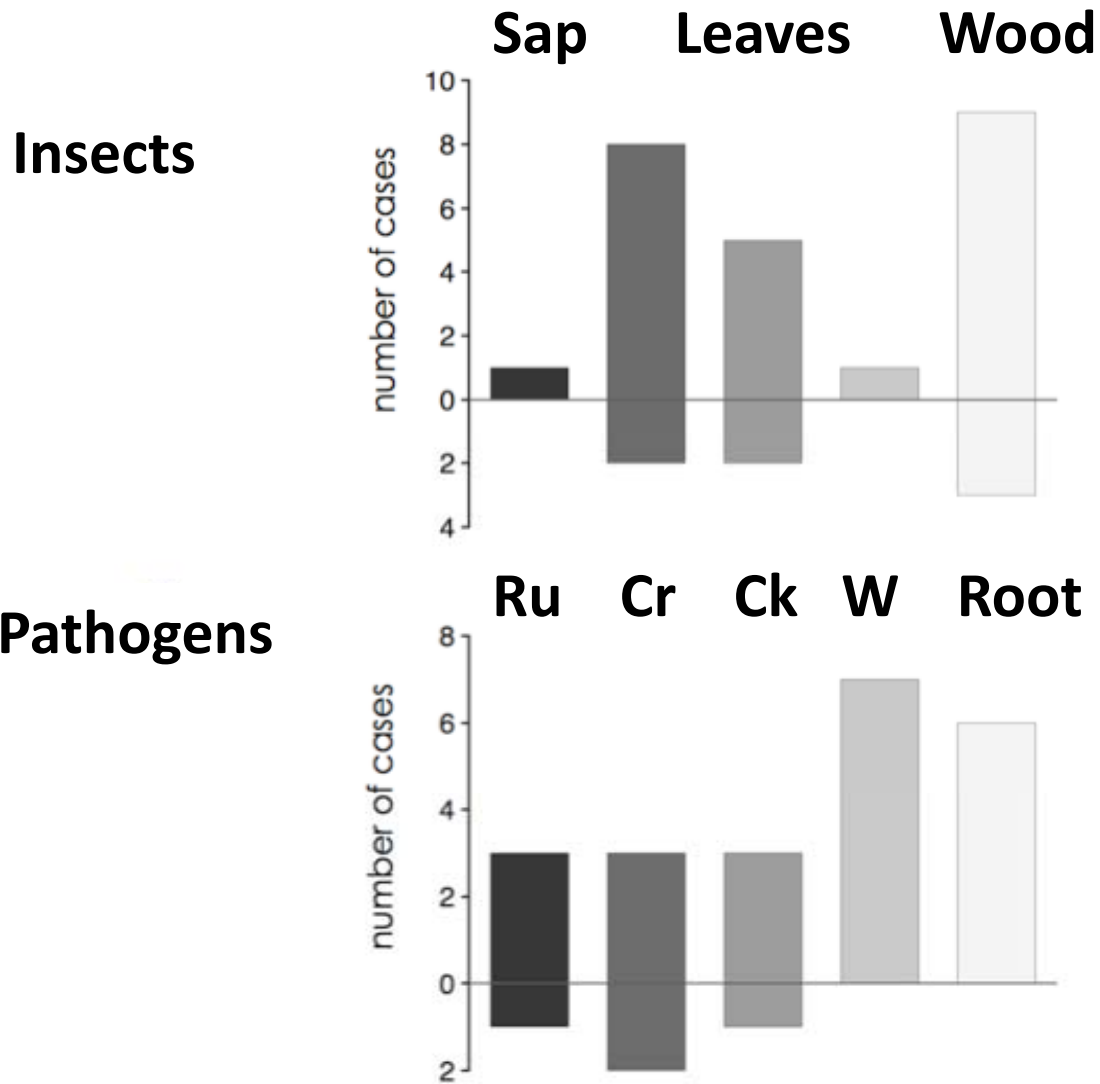
# Response to fire



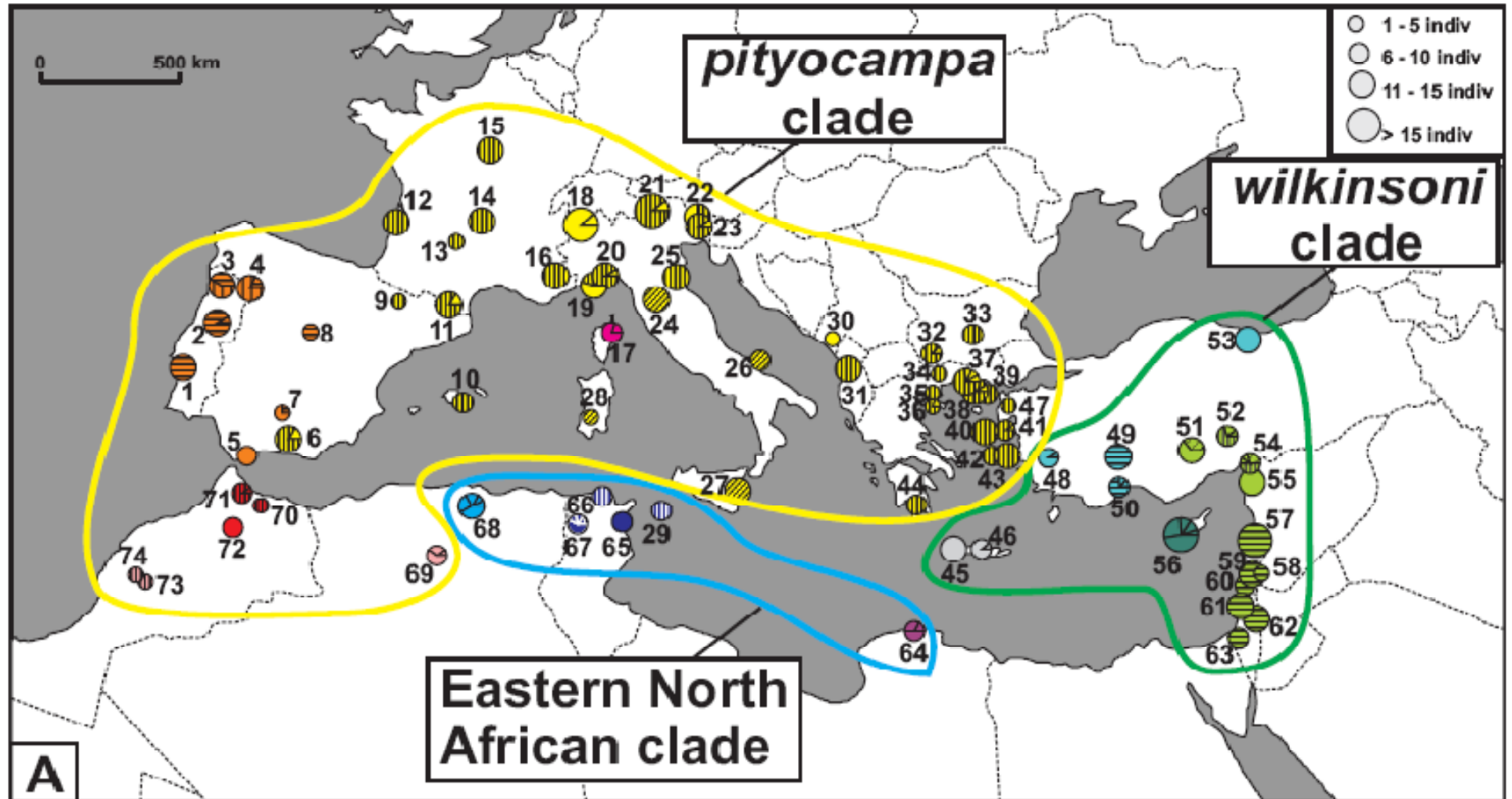
# Broadleaves vs conifers



# Guilds

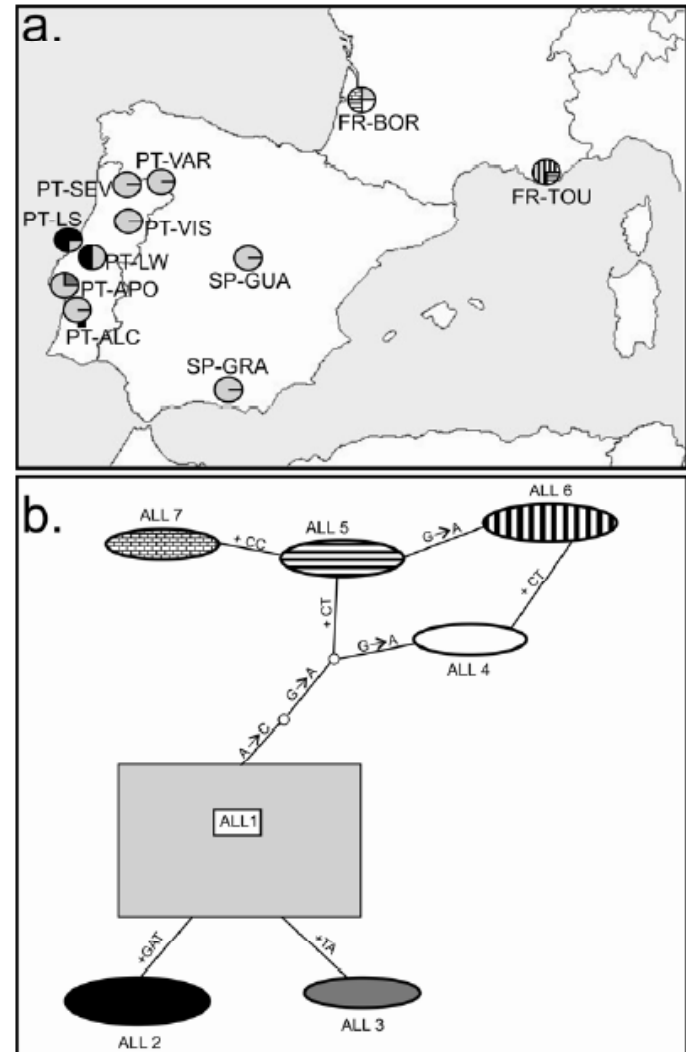


# Adaptation to climate change



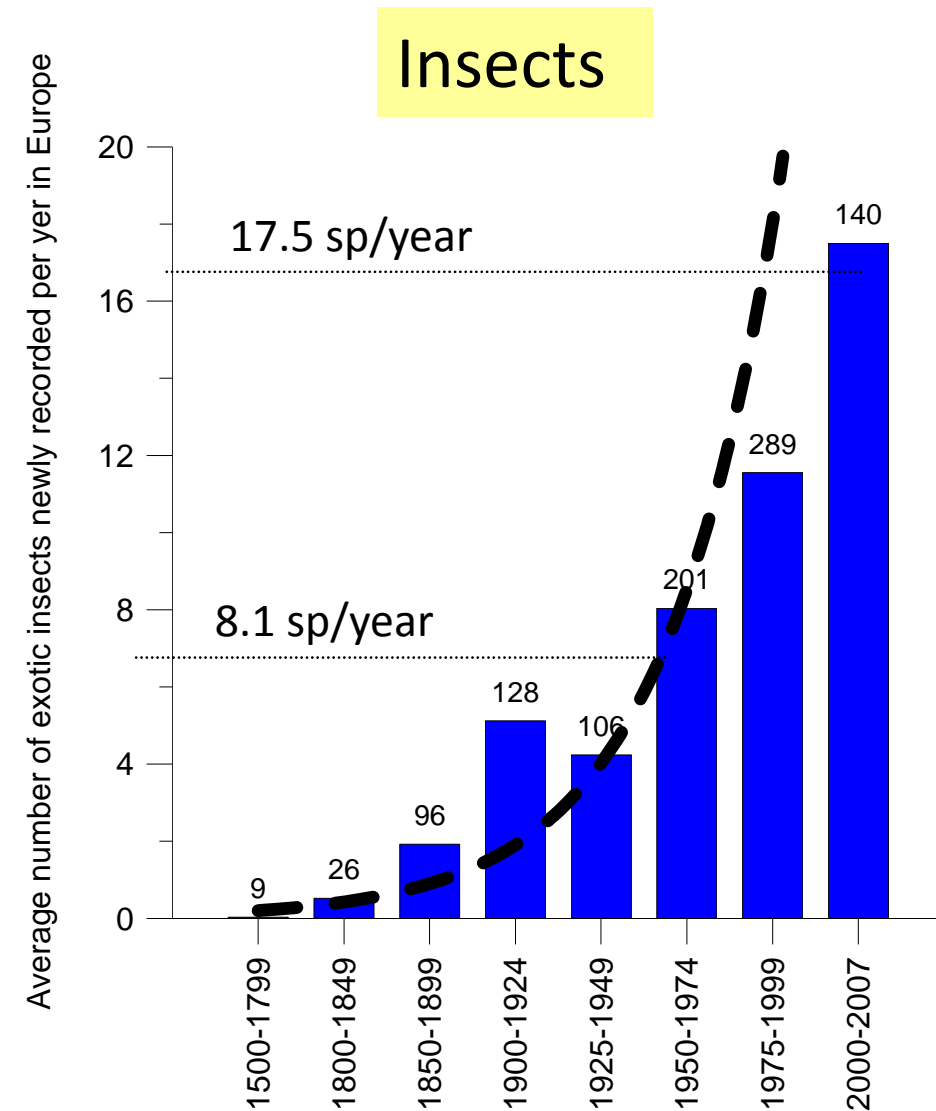
# Local adaptation

- Phenology shift of PPM



# Invasion and climate change

- EU DAISIE inventory

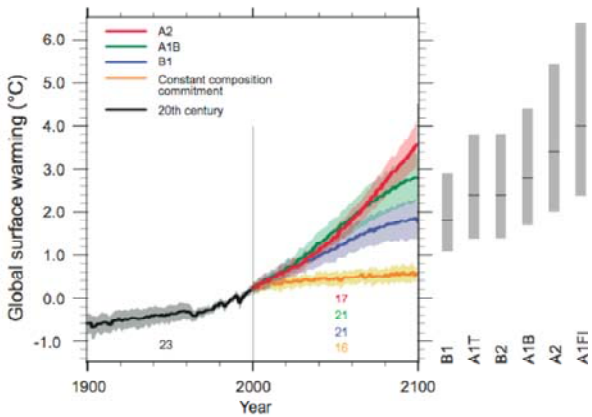


# Invasion and climate change

- Ex Pine Wood Nematode  
Portugal and Spain



# Conclusions and perspectives



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Yes, but ...

# Conclusions and perspectives

- Not for all species
- Depend on new interactions with hosts and antagonists
- Depend on adaptive responses
  
- Higher risk of invasions
- Need long-term studies

# Acknowledgements

- EU 5 FP PROMOTH
- EU 6 FP DAISIE
- EU 7 FP PRATIQUE and BACCARA
- ARN FRANCE URTICLIM
- SWEDISH RESEARCH COUNCIL
- IUFRO MEDINSECT WORKING GROUP