Parasitism in ecological niche modeling
The Alcon Blue and its two hosts

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Overview

- **Brief introduction**

- **Framework of the niche modeling**

- **Preliminary results**

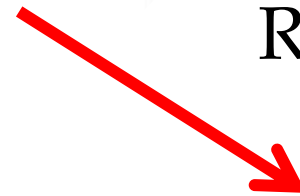- **Take home messages**

Focal species

Maculinea alcon
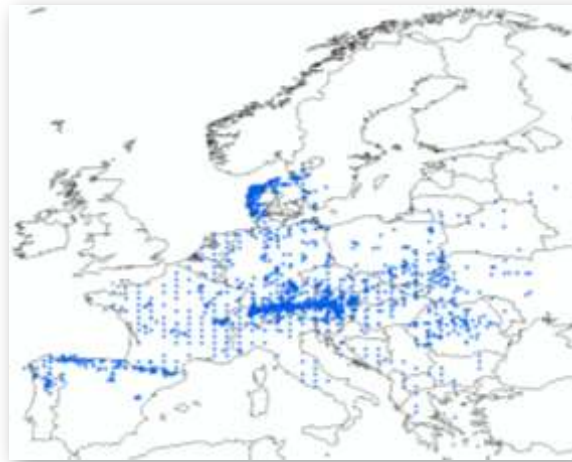Alcon Blue

Myrmica rubra
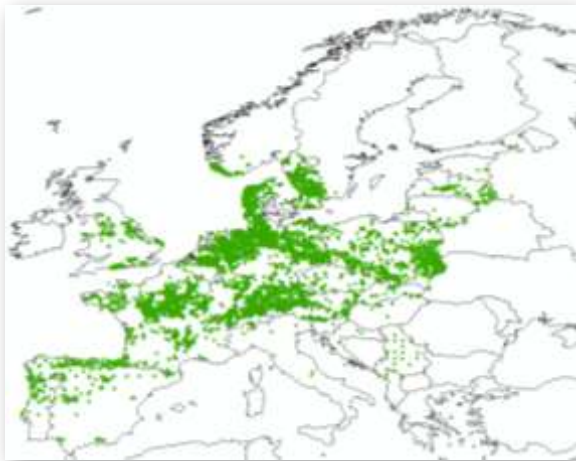Ruby ant

Gentiana pneumonanthe
Marsh Gentian

Distribution data

Maculinea alcon
Alcon Blue

Gentiana pneumonanthe
Marsh Gentian

Myrmica rubra
Ruby ant

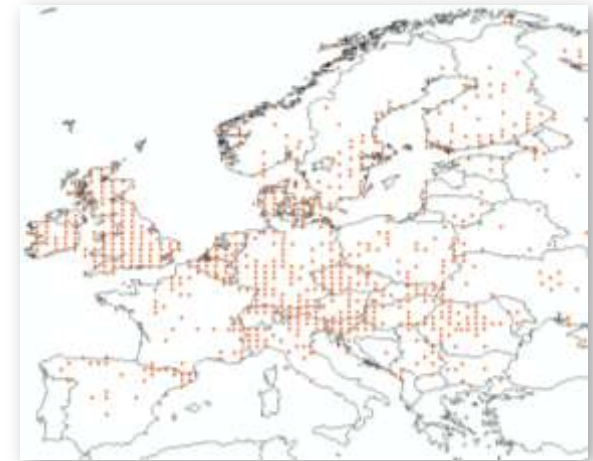# Known distribution of species – 50x50km grid

Alcon Blue
(*Maculinea alcon*)

Marsh Gentian
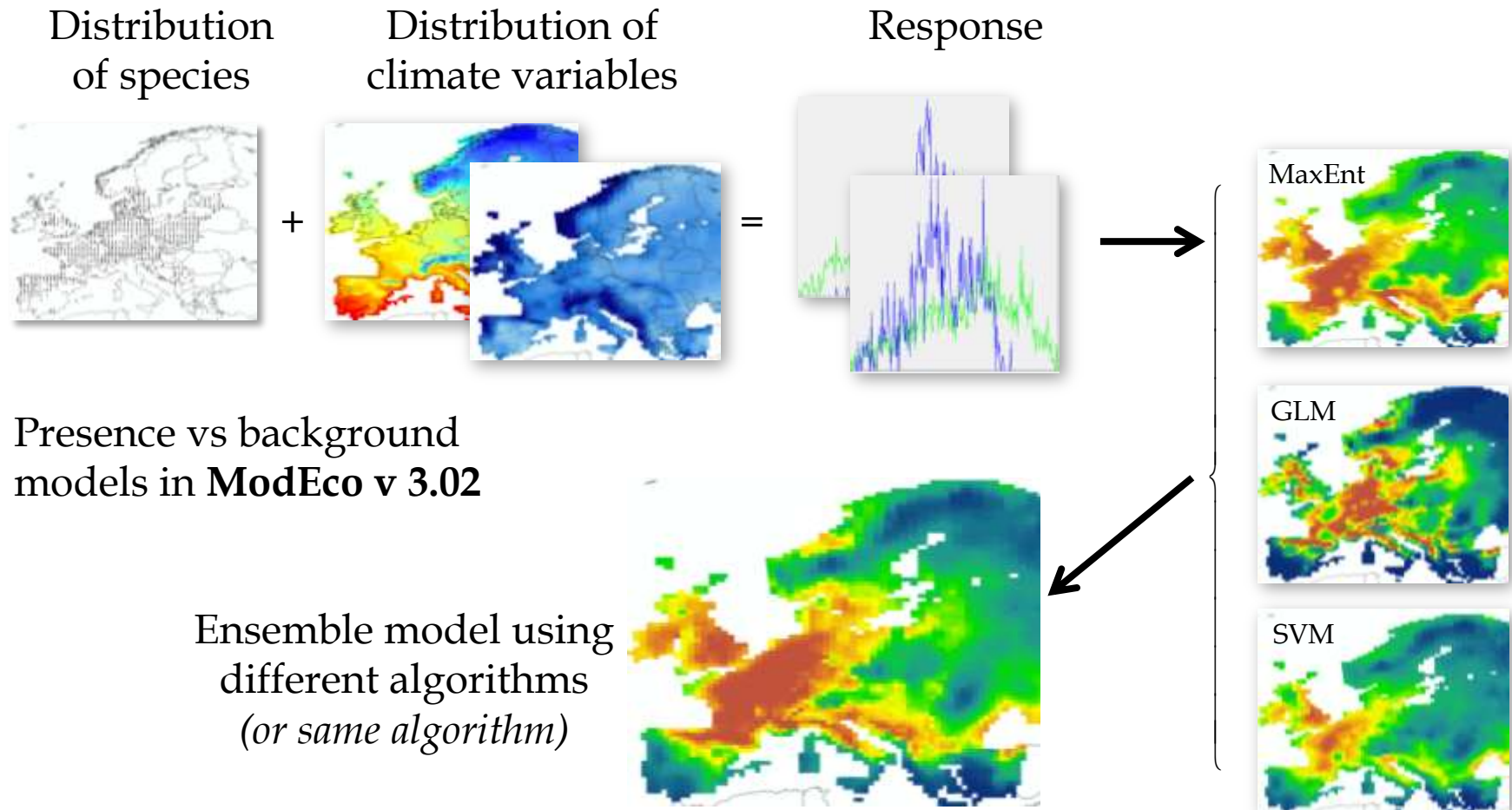(*Gentiana pneumonanthe*)

Ruby ant
(*Myrmica rubra*)

SDM's

- **Correlate climatic and other variables with species occurences**

- **Biological realistic?**
  - Species interactions
  - Dispersal (full or none)

- **Work on species interactions**
  - Species co-occurrences (Araújo & Luoto. 2007. Glob. Eco. Biogeo.)
 - Species' modeled suitability (Schweiger et al. 2008. Ecology)

Model work

Distribution of species

Distribution of climate variables

Response

MaxEnt

GLM

SVM

Presence vs background models in **ModEco v 3.02**

Ensemble model using different algorithms
(or same algorithm)

Model work

- Climate variables (*median of 50x50km grid cell*)
- Soil type and related variables
- Land cover

- Host species as predictor variable
- Modelling host species to account for distributional shift under climate change

- Single best-fit model
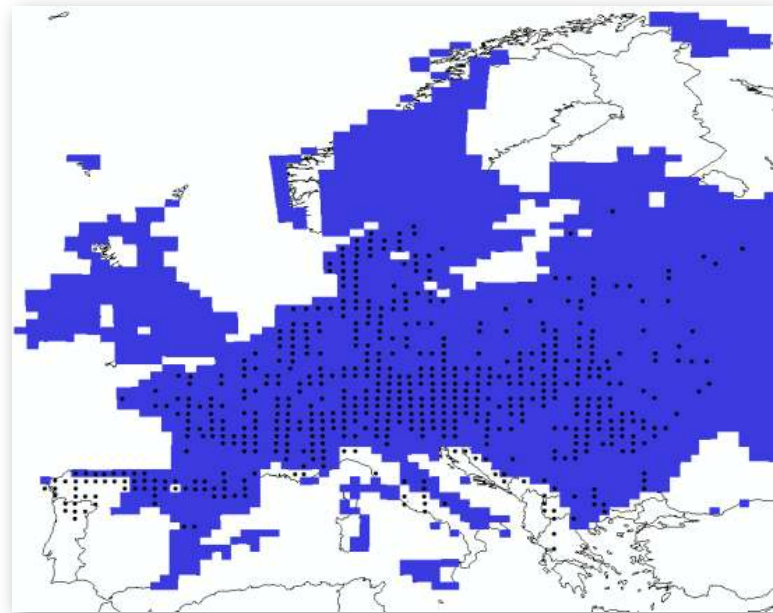- Ensemble modeling and forecasting

Current climatic niche for Alcon Blue
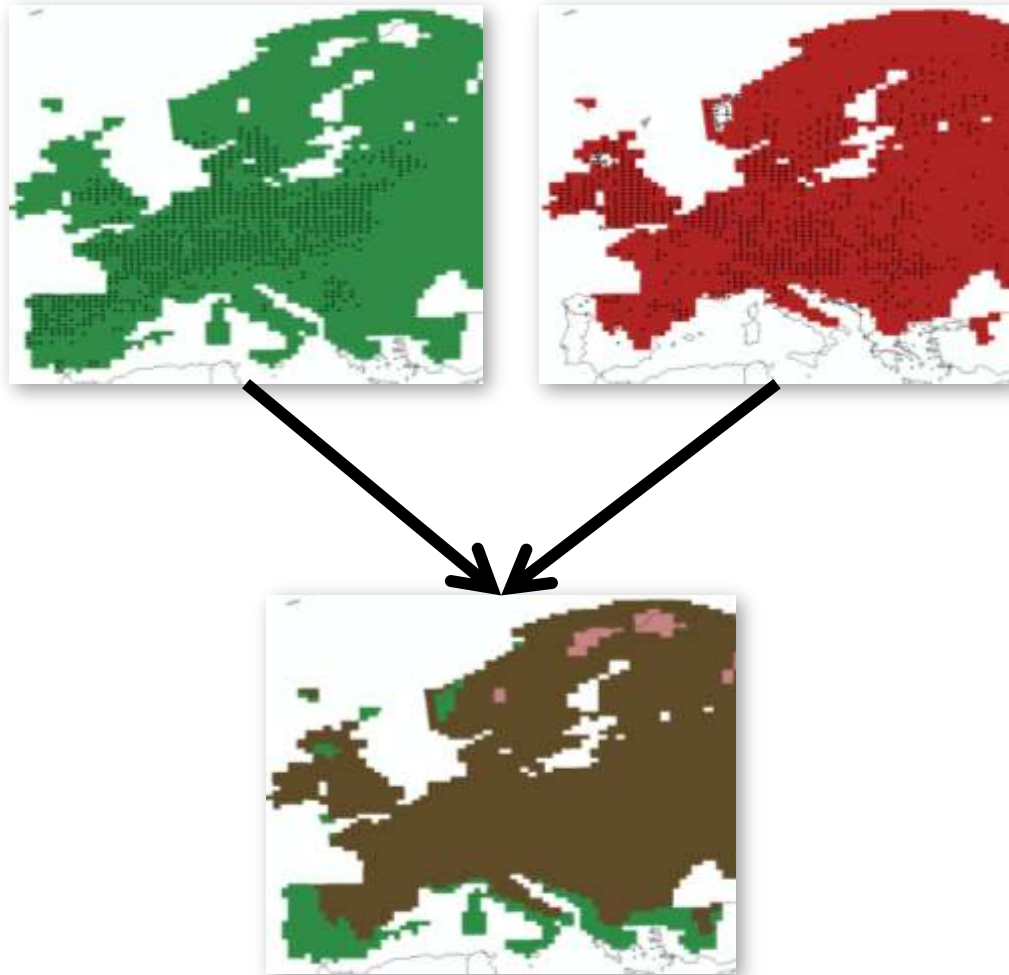
Continuous predictive map
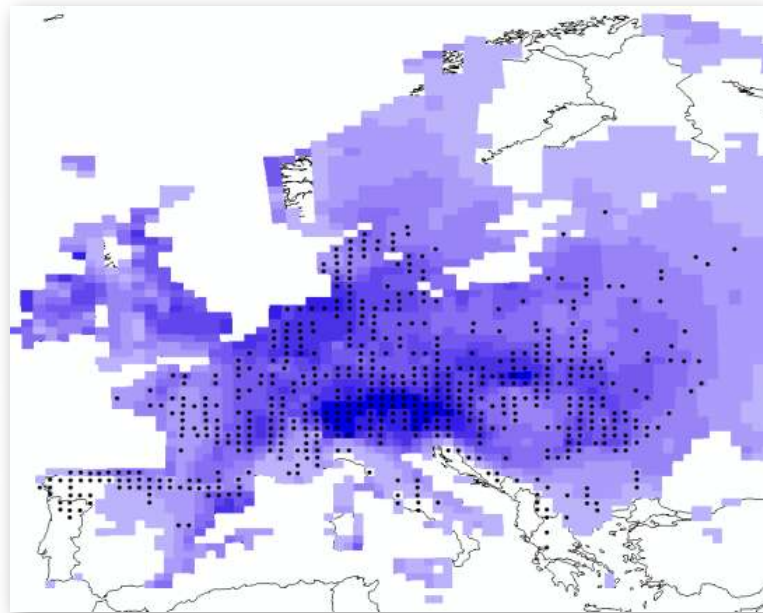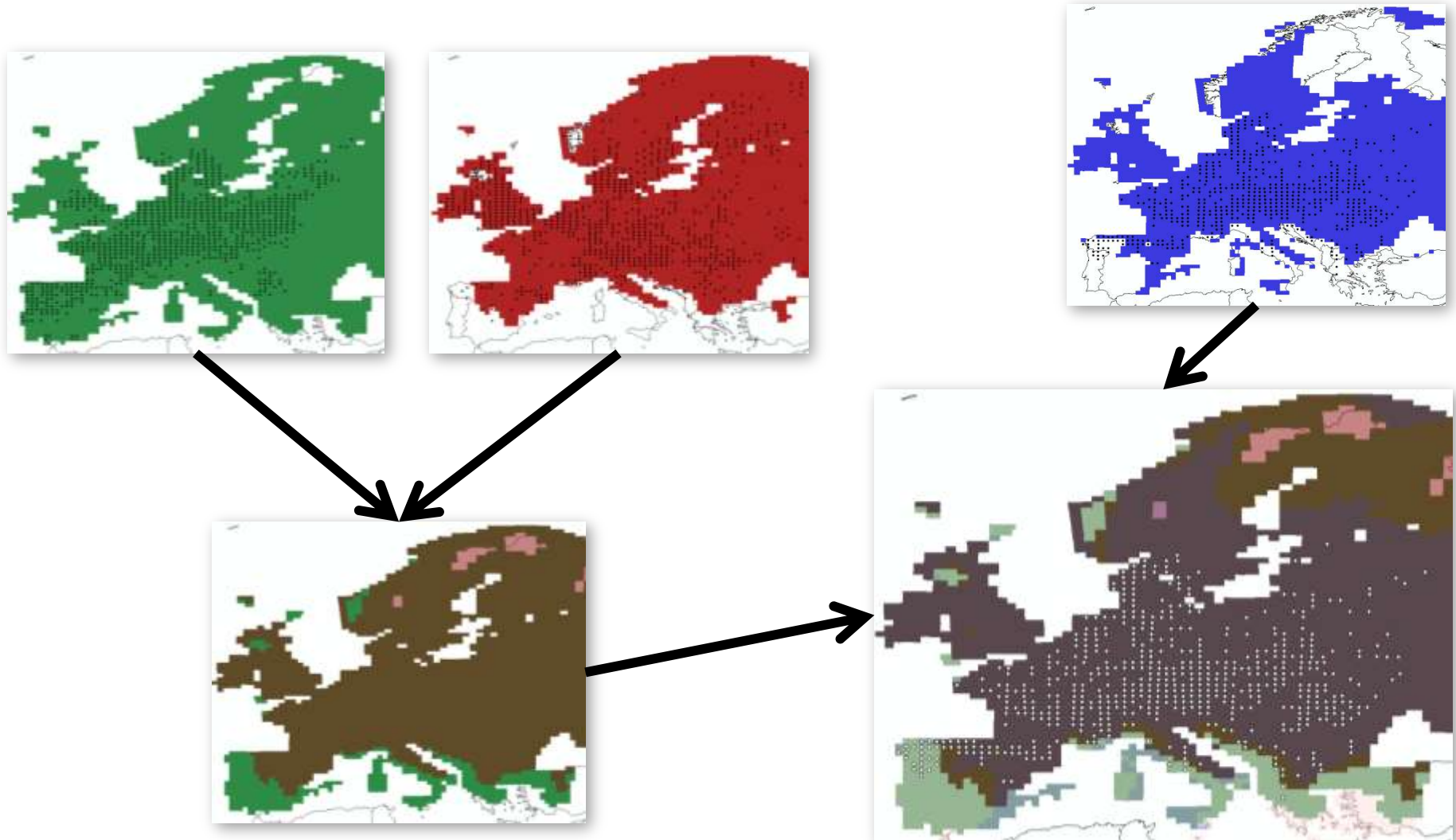
Binary predictive map

Rough approximation
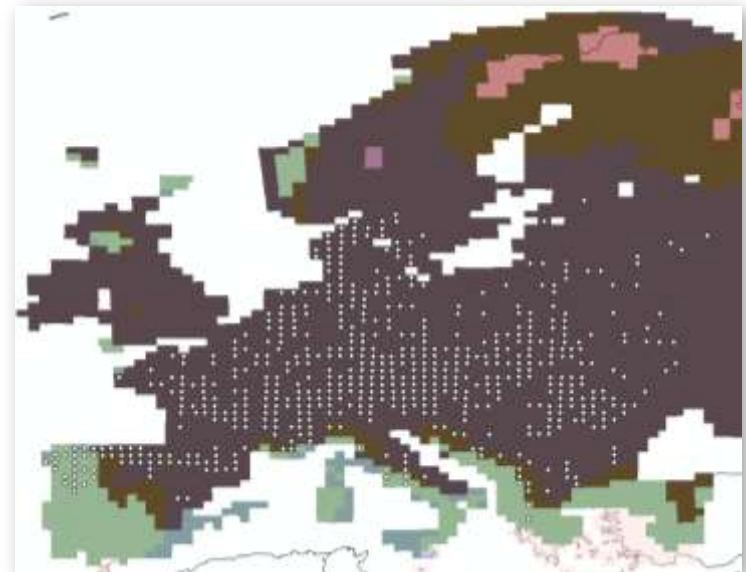
Current climatic niche for the host species
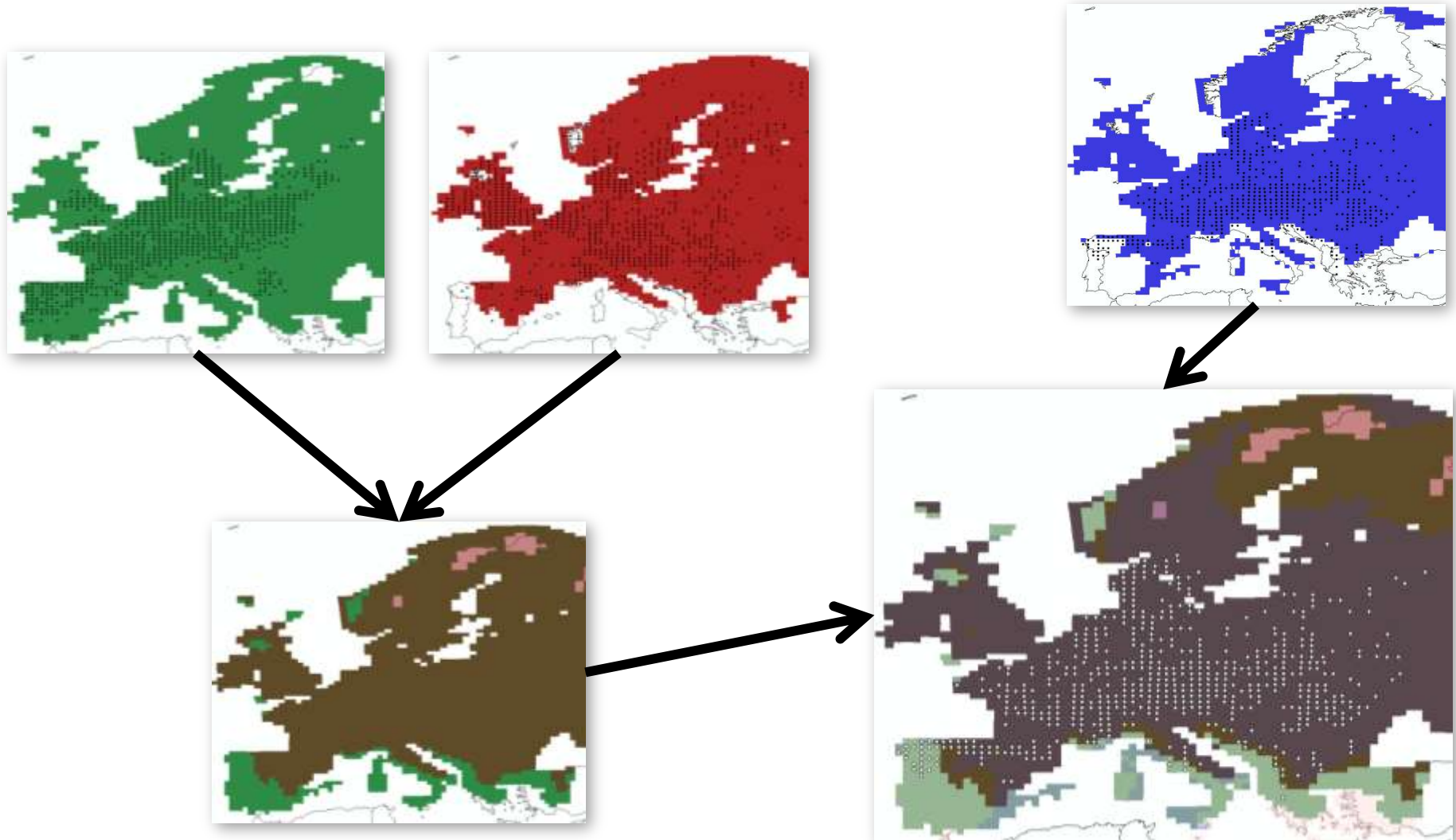
Current climatic niche for Alcon and hosts

Modeled ecological niche of Alcon

- **Southern Europe**
  - ´Mostly´ filling its potential ecological niche
- **Scandiniavia**
  - Potential climate niche unoccupied because of host limitation
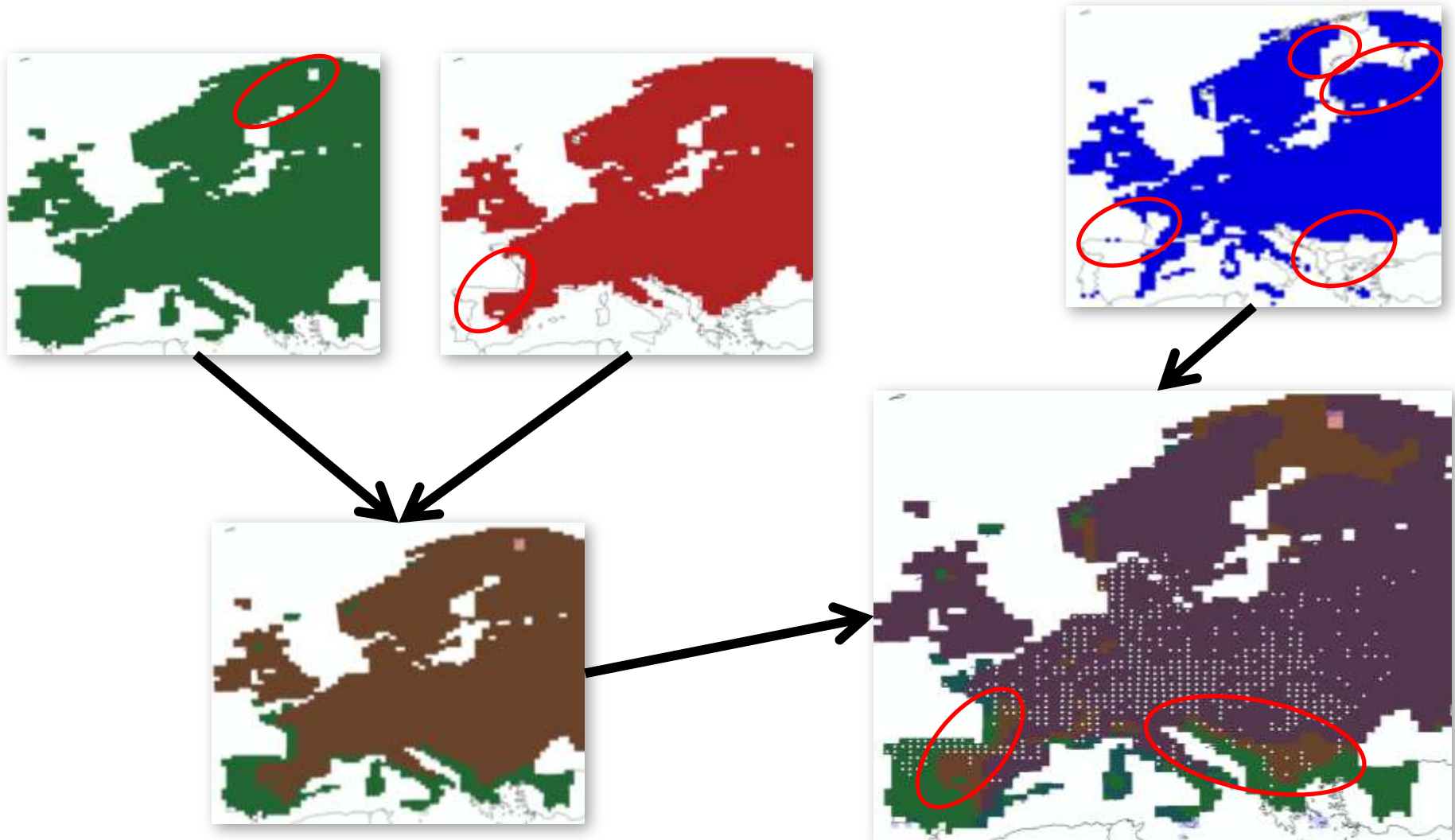- **UK**

  Dispersal limited

**Parasitism in
niche modeling**

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EVOLUTION AND CLIMATE

CENTRE FOR
SOCIAL EVOLUTION

Current climatic niche for Alcon and hosts

Future climatic niche

How to include biotic interactions?

- **Site abundance of species**

- **SDM output overlay of species**

- **Species distribution data as binary predictor (only current conditions)**

- **Modeling based on binary and continuous environmental suitability (current and future)**

- **Environmental variables at timing of interaction**

- **Scale issue**

- **Independent data for model validation** (Nash, Tartally et al. *unpubl.*)

Take home messages

- **Bioclimatic variables (Bio1-19) are not always sufficient to define species' niches and response to climate change**

- **Climate suitability space of dependent species**
  - Niche filling and limitation (e.g. hosts or dispersal)
  - Estimation of the potential vs realized niche
  - Potential zones for persistence, expansion or retraction under climate change

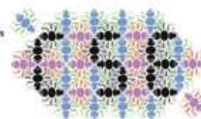- *Continued work to develop and optimize models*

Acknowledgement

- **Data providers**
  - GBIF and MEB2
  - National and regional species surveys/collections
  - Single researchers

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Thank you for listening

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