

BIRDS TO THE FUTURE



**PREDICTING THE
FUTURE OF SPECIES**

Predicting the future

What will happen to arctic species under climate change?

But first..

Can we make reliable predictions with time machines/species distribution models?



ARCTIC CENTRE
University of Lapland

LUOMUS
FINNISH MUSEUM OF NATURAL HISTORY

Sirke Piirainen, PhD student

Species distribution models (SDMs)

What are SDMs?

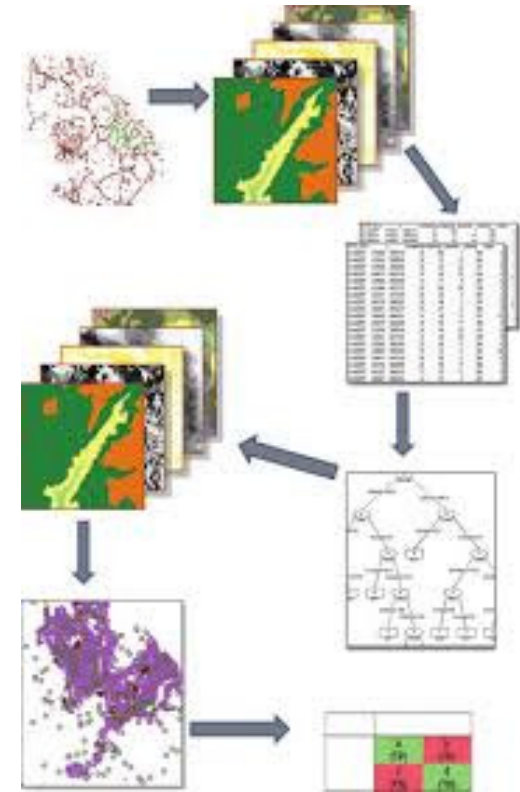
- combine observations & environmental estimates

What are they used for?

- Understanding biogeography
- Anticipating future risks (invasive species, **climate change**)
 - need for specific **local scale** predictions

But! Criticism

- Things change
 - New environmental combinations, biotic relationships, dispersal, evolutionary changes



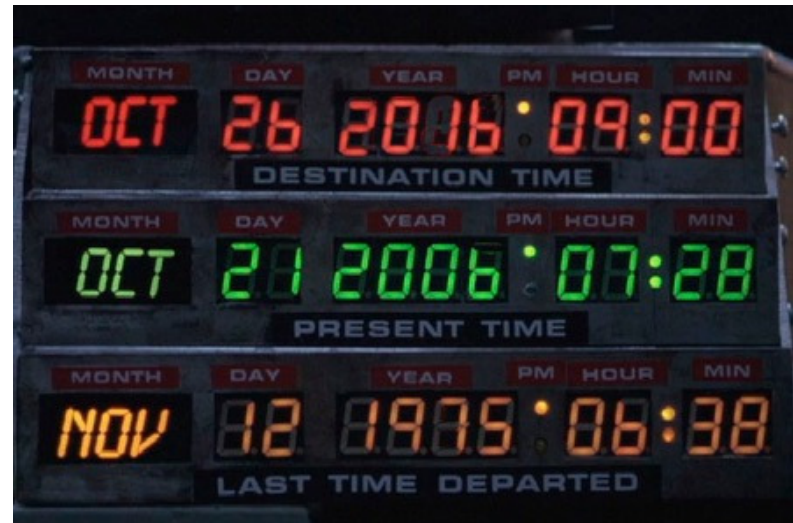
How to make sure that a model is reliable?

Model validation

Time traveling:

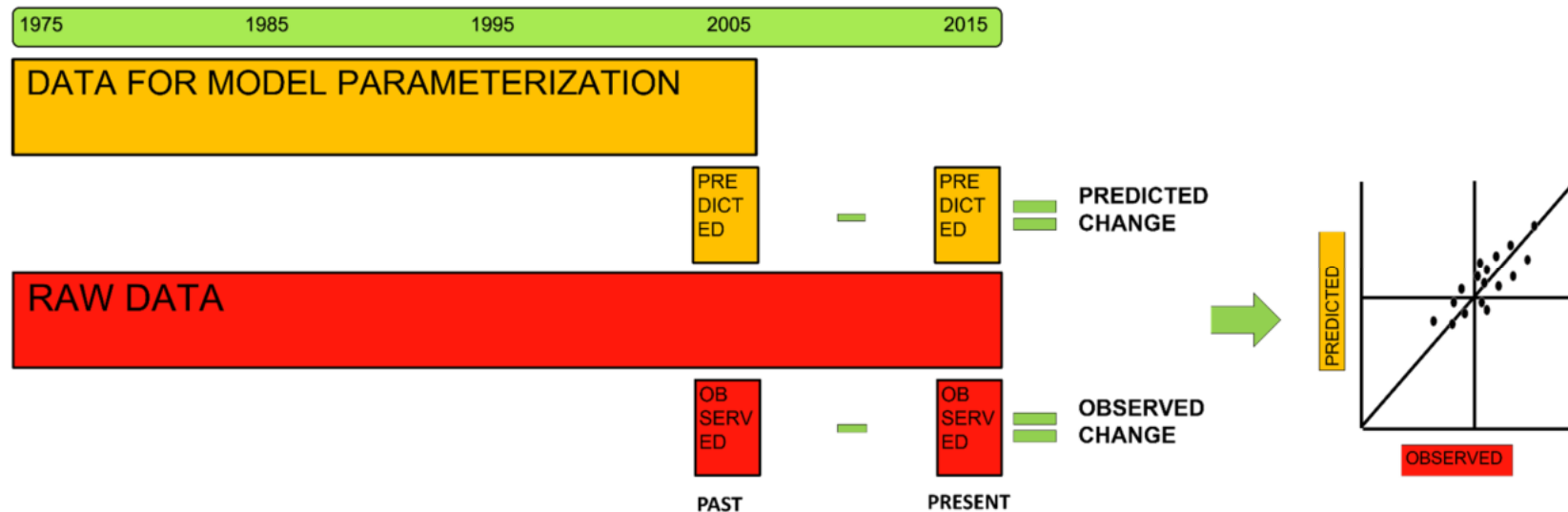
- Go back in time, make a prediction, come back in time and check if your prediction was correct!

Our novel method..



Our model validation 2.0

- **Change** in occurrence between past and present time periods



Validating **change** let's us zoom to local scale!

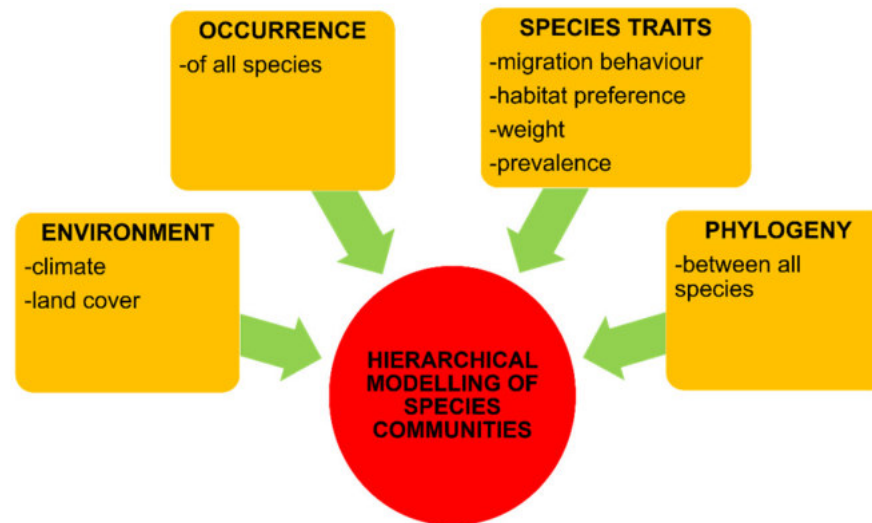
My study on birds

Occurrence:

- 127 species distribution & abundance
- 2591 line transects in Finland, Sweden & Norway
- 1975-2016



Bayesian joint species distribution model



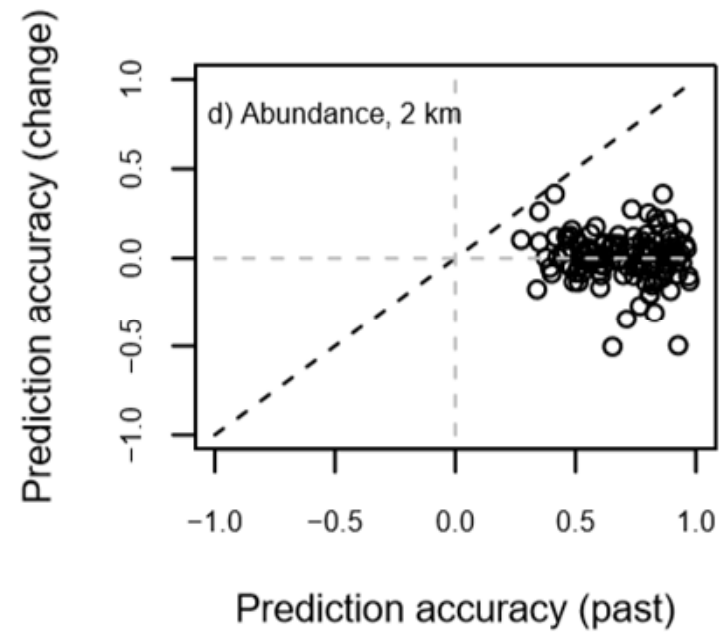
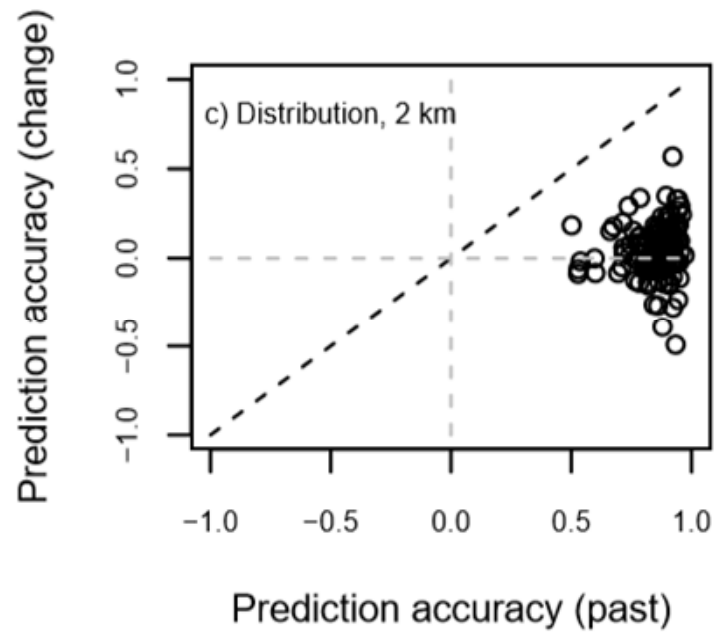
Ovaskainen *et al.* 2017: How to make more out of community data?
A conceptual framework and its implementation as models and software

My study questions

- Do SDMs predict future better than by random?
- Is prediction more successful on local or regional scale?
- Is prediction more successful for change in distribution or change in abundance?
- Is predicting the future especially challenging for some species?

Do SDMs predict future better than by random?

- **No**



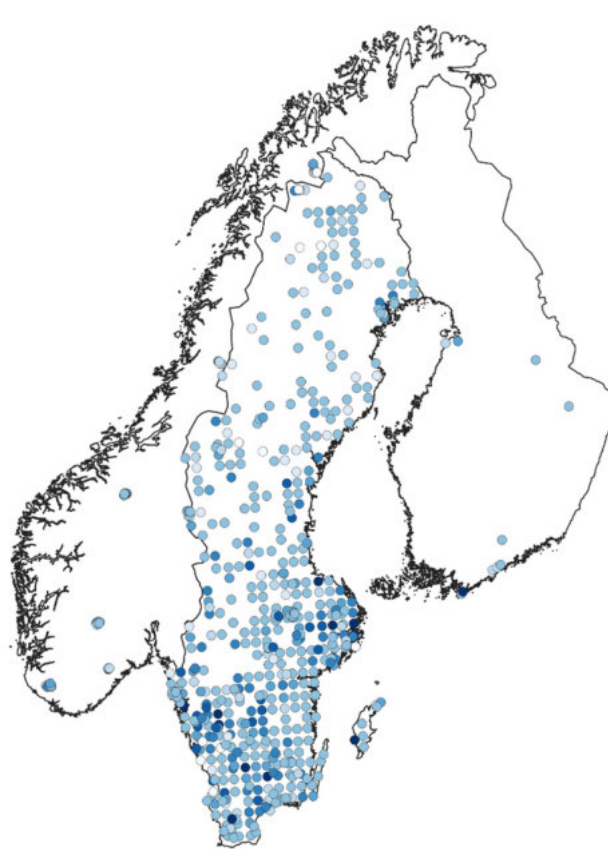
Cuckoo



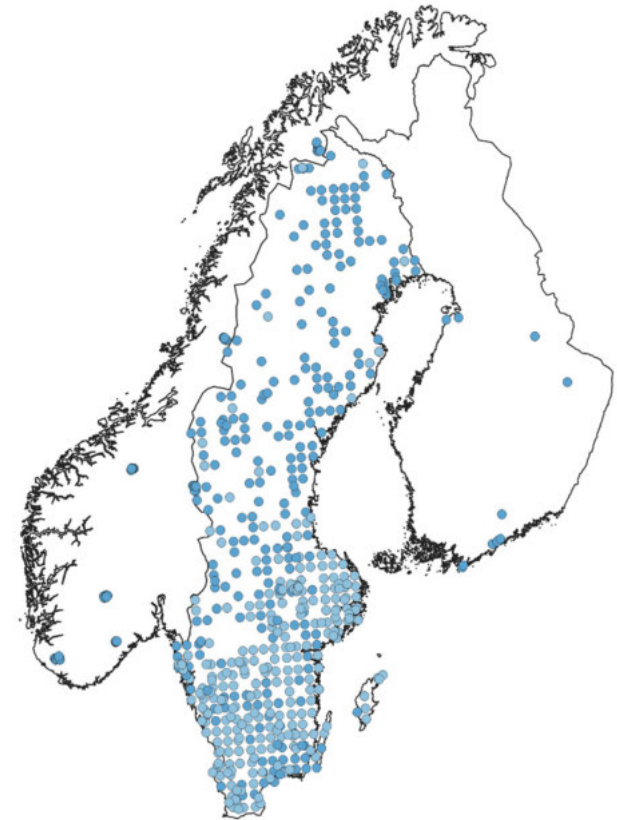
-0.26



Observed change in
occurrence probability

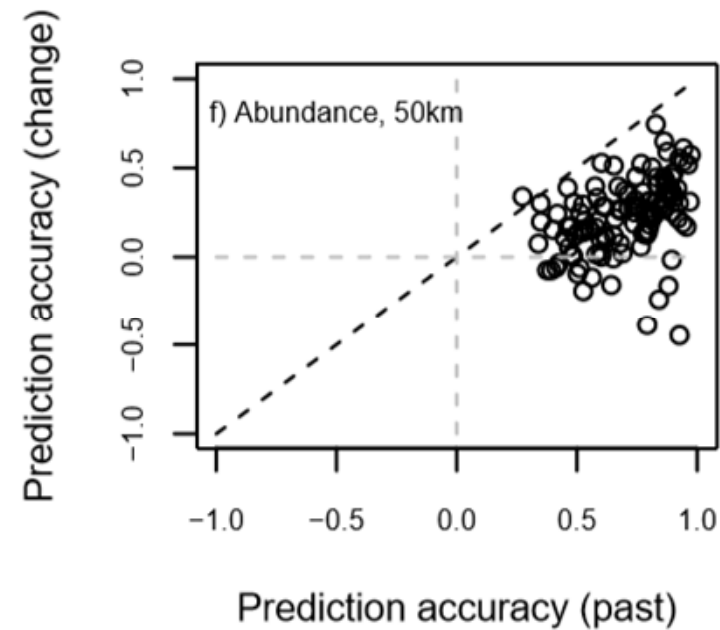
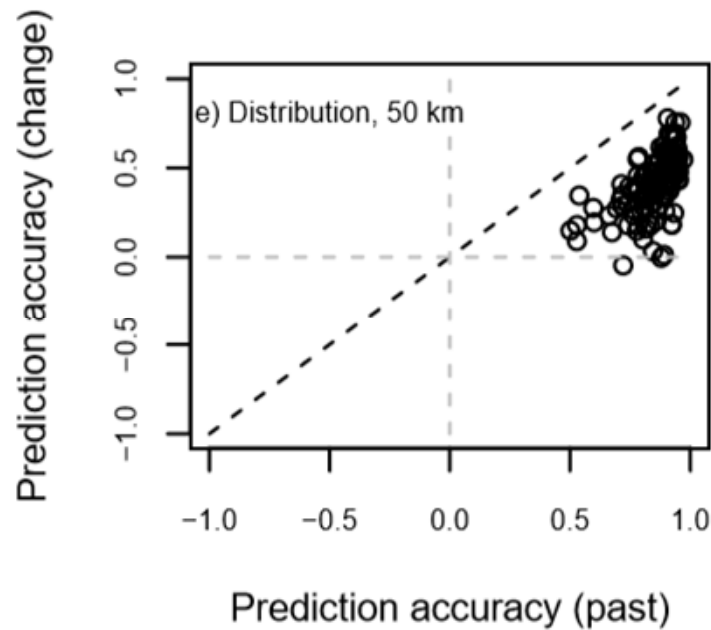


Predicted change in
occurrence probability



Is prediction more successful on local or regional scale?

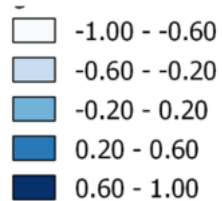
- Pooled observations, 50 x 50 km grid (local -> regional)
- **On regional scale**



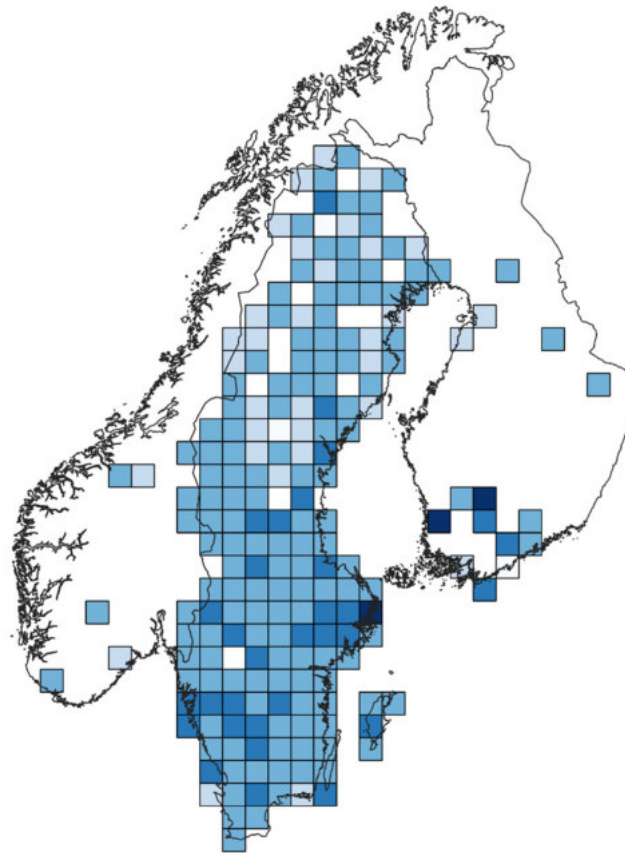
Cuckoo



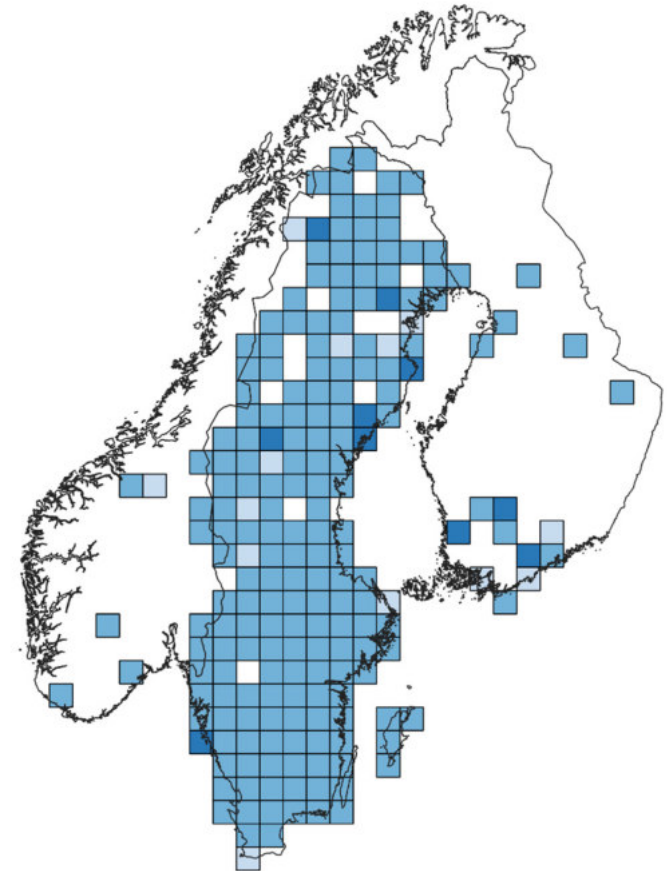
0.38



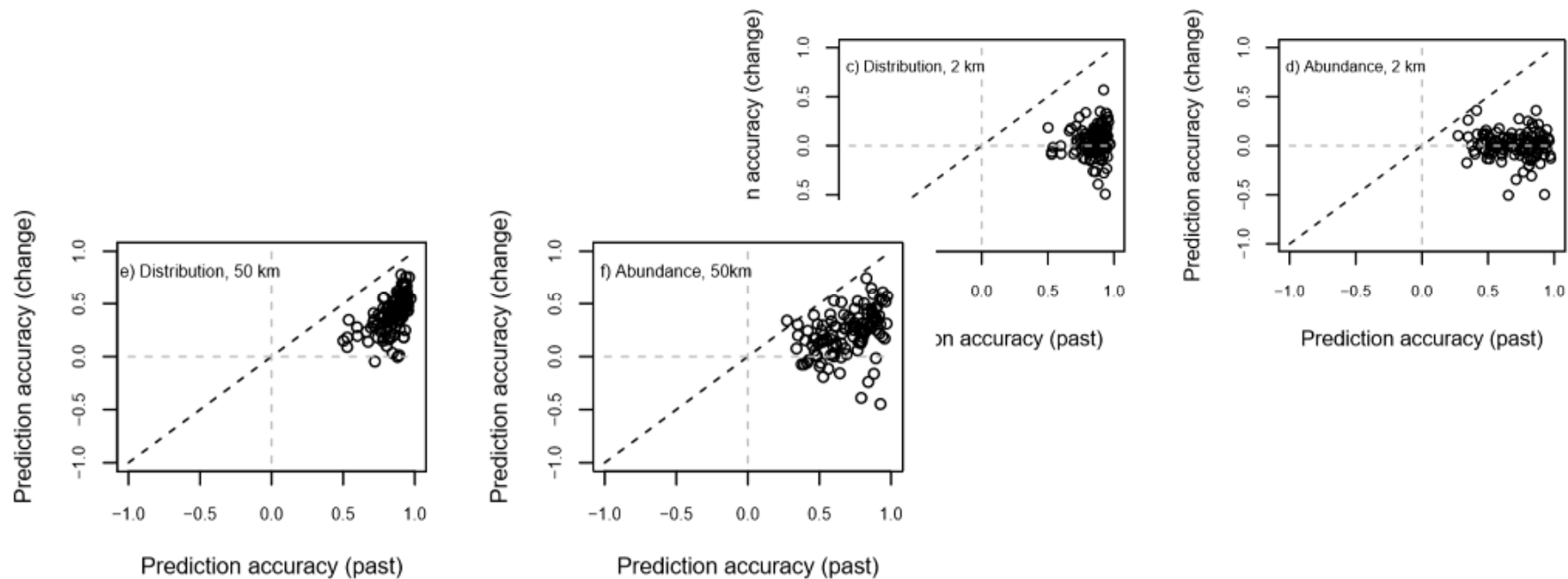
Observed change in
occurrence probability



Predicted change in
occurrence probability

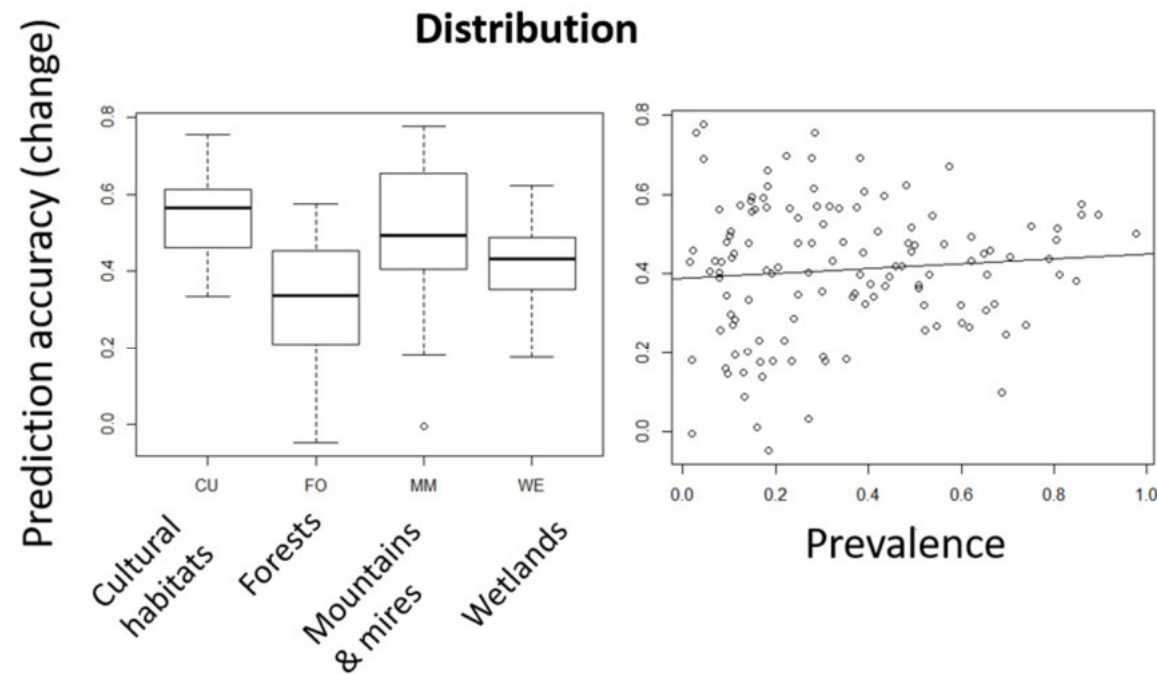


- Is prediction more successful for change in distribution or change in abundance?
- **For distribution**



Is predicting the future especially challenging for some species?

- **For rare species from forest habitats**



Habitat, prevalence, mass, migration behaviour

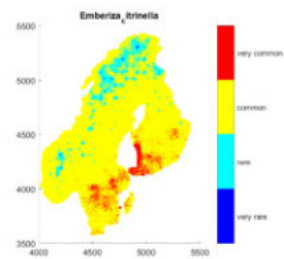
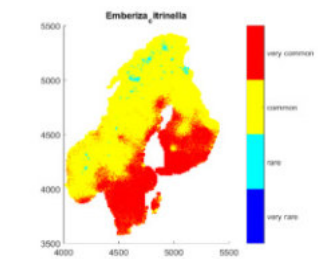
Conclusions

- Predicting the future on local scale is not better than by random but improves on regional scale, trade-off between local info & reliability
 - Observation bias
 - Short time period (stochasticity)
- Predictions are challenging for rare species
 - Challenge for arctic endangered species
- Predictions are challenging for forest species...
 - Forest species are often generalists
- ...but successful for cultural and mountain & mire species
 - Arctic species are often specialists in mountains and mires

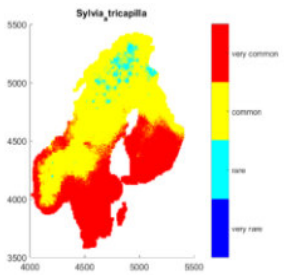
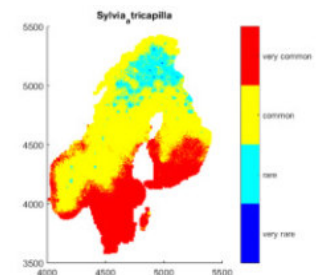
Next task..

Present

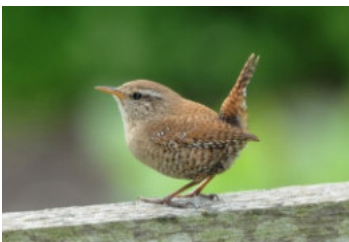
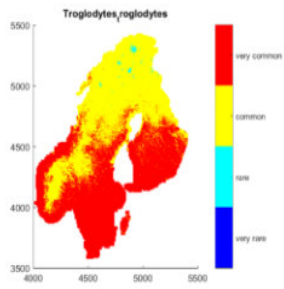
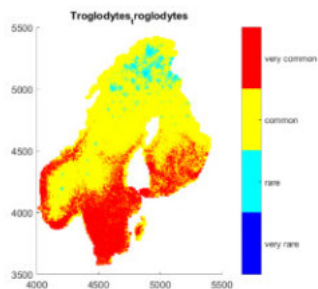
2050, B1 climate scenario



Yellowhammer



Eurasian blackcap



Eurasian wren

To be continued...

Thank you!



BIRDS
TO
THE FUTURE

The logo features the words "BIRDS", "TO", and "THE FUTURE" in a bold, italicized, sans-serif font. The text is colored with a gradient from orange to yellow and has a thick blue outline. A large yellow arrow points to the right, positioned behind the word "BIRDS".