Climate change and birds:
BTO research

Blaise Martay

Climate change and Birds

- BTO monitoring
- Scottish climate change
  - Present and future
- Effect of climate change on birds
  - present and future
- Adaptations: actions and policy

BTO Monitoring

Populations & Distribution:
- Bird Atlas
- Breeding Bird Survey
- Wetland Bird Survey
- Seabird Census (JNCC)

Demography:
- Ringing Scheme
- Nest Record Scheme

Casual:
- Garden Birdwatch
- BirdTrack

Single species:
- Fulmar Study
- Heronries Survey
- Norfolk Bat Survey
- Project Owl

BTO Monitoring

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Single species:
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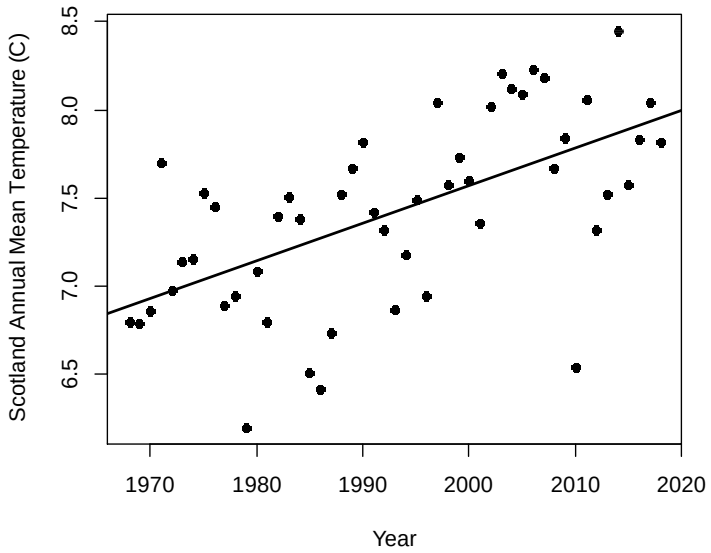
- Every 20 years from 1970
- Systematic surveys that cover all of UK
- Used to create maps of distribution and change

- Every year from 1994
- Systematic surveys of > 3000 random 1km squares
- Annual population indices
- Trends from 1966 (with predecessor CBC)
- ~3000/year England
- ~500/year Scotland

Climate change in Scotland

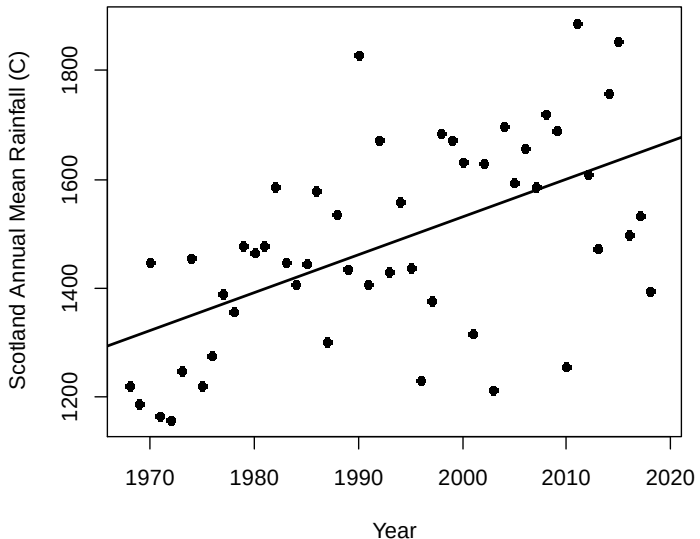


Temperature:

+ 1°C over past 50 years

+ 1.5°C in Spring

+ 0.9 – 4.5°C by the 2050s



Rainfall:

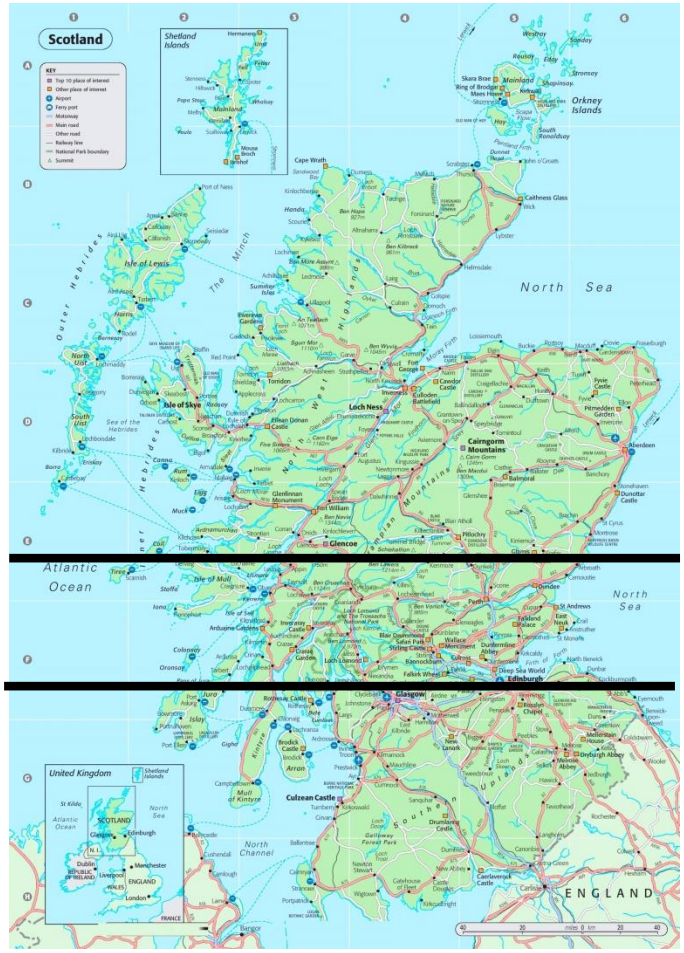
+ 350 mm over past 50 years

= +25%

Most change in Winter

Climate change in Scotland

What does 2°C mean to a bird?



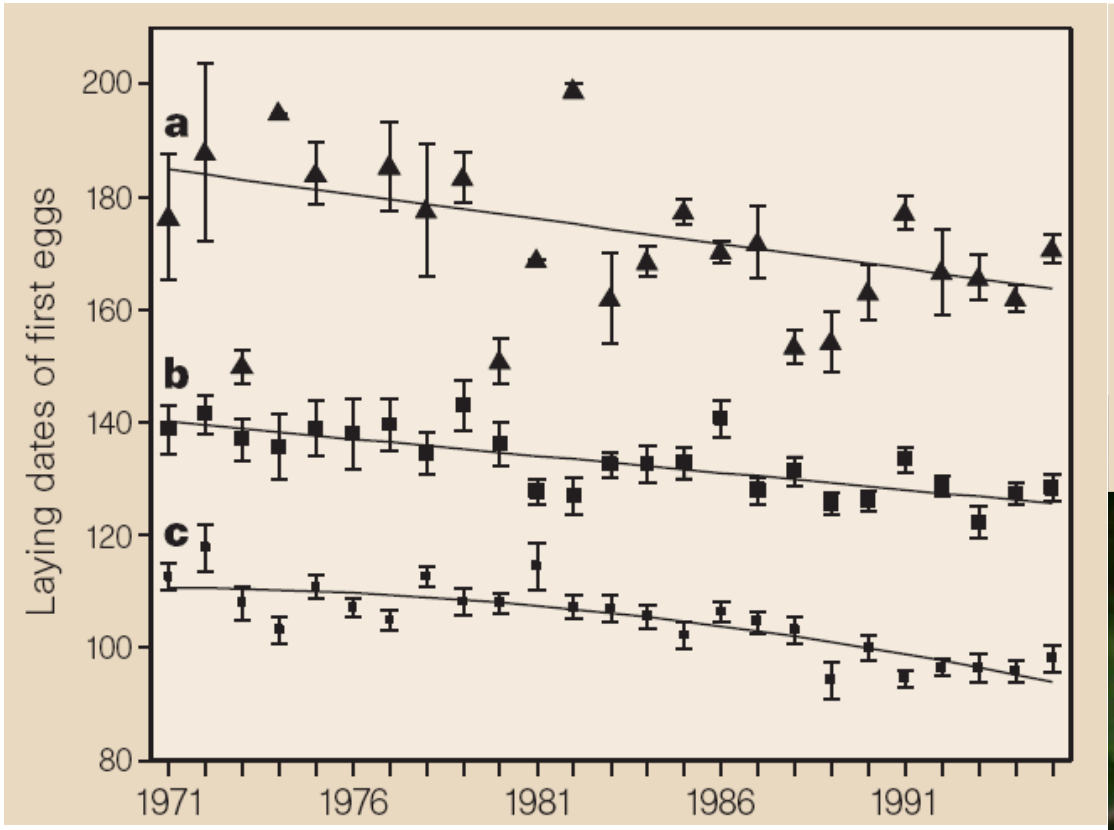
2 weeks earlier breeding

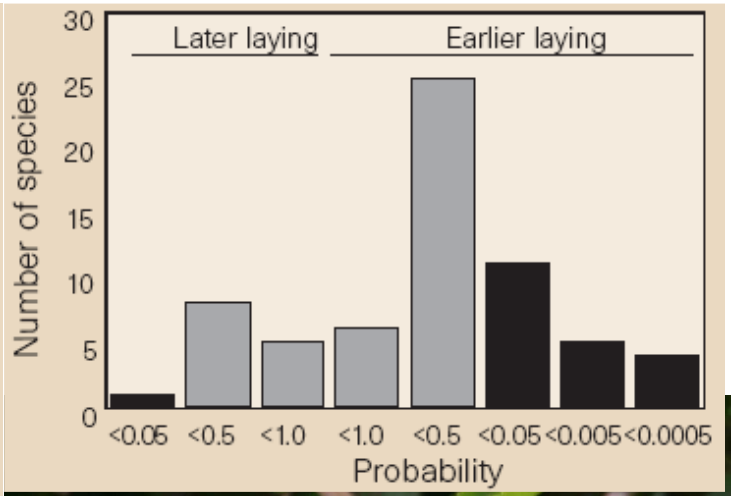
80 km northwards

Climate change in Scotland

- Phenology shifts
- Range shifts
- Population trends
- Community changes

Phenology



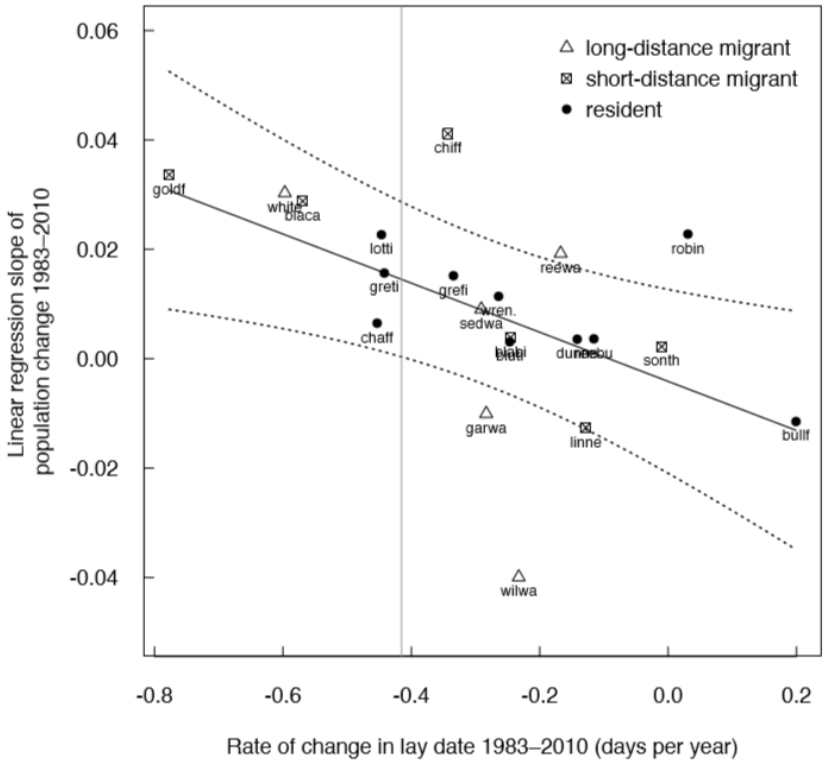


Advances in timing of breeding

Crick et al. 1997. Nature 388:526

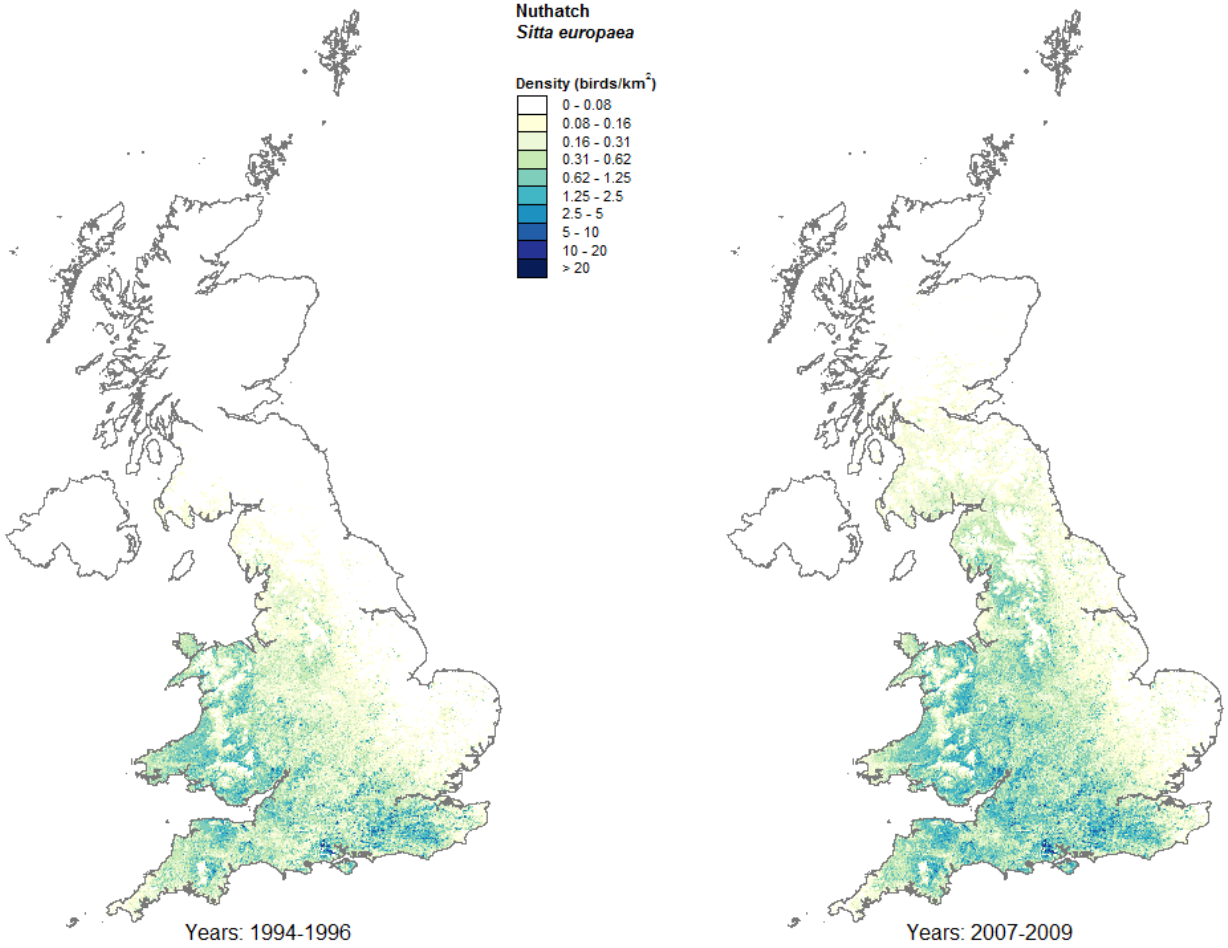
Phenology

Species that have not changed their phenology are declining.



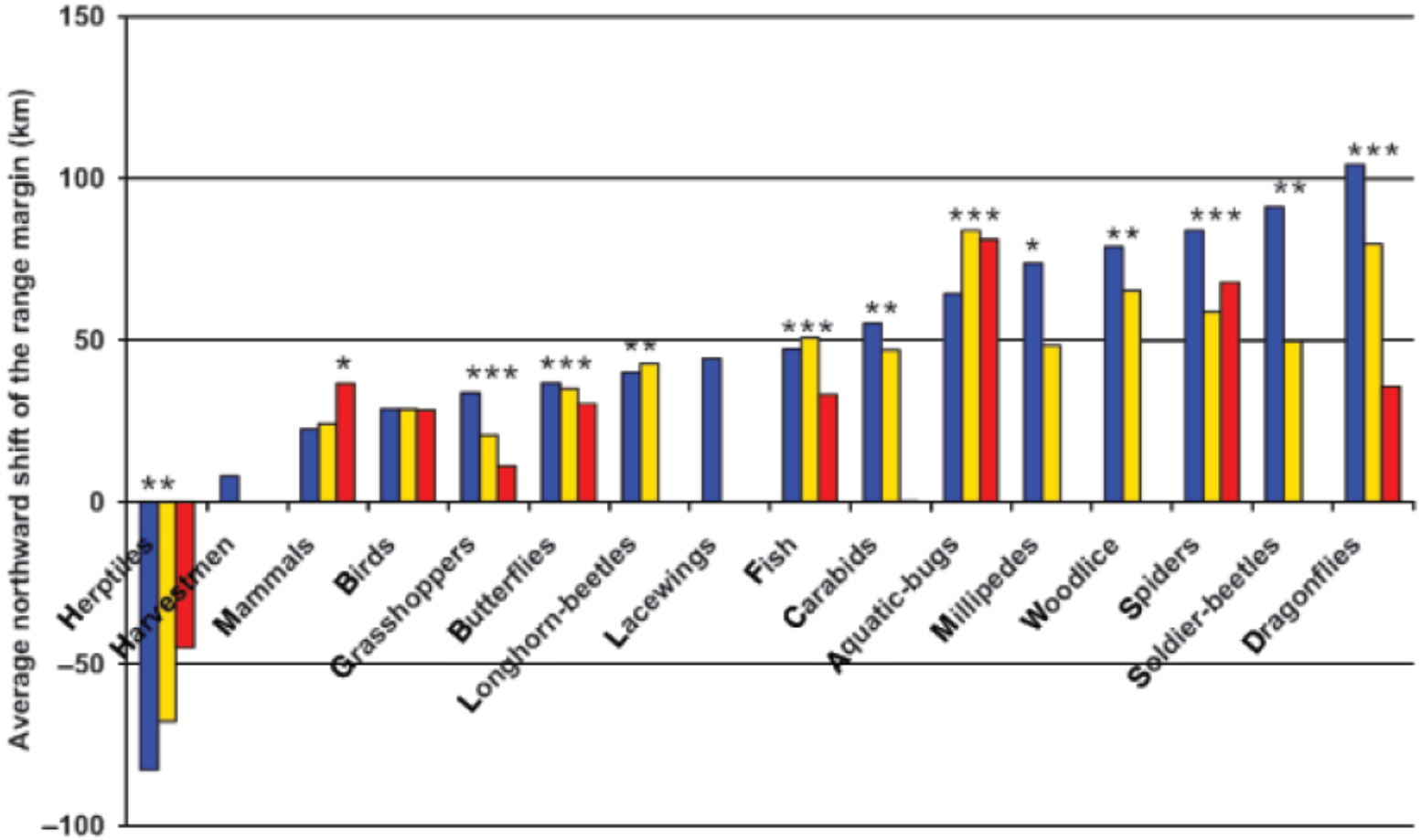
Franks et al. 2018 Global Change Biology

Range shifts

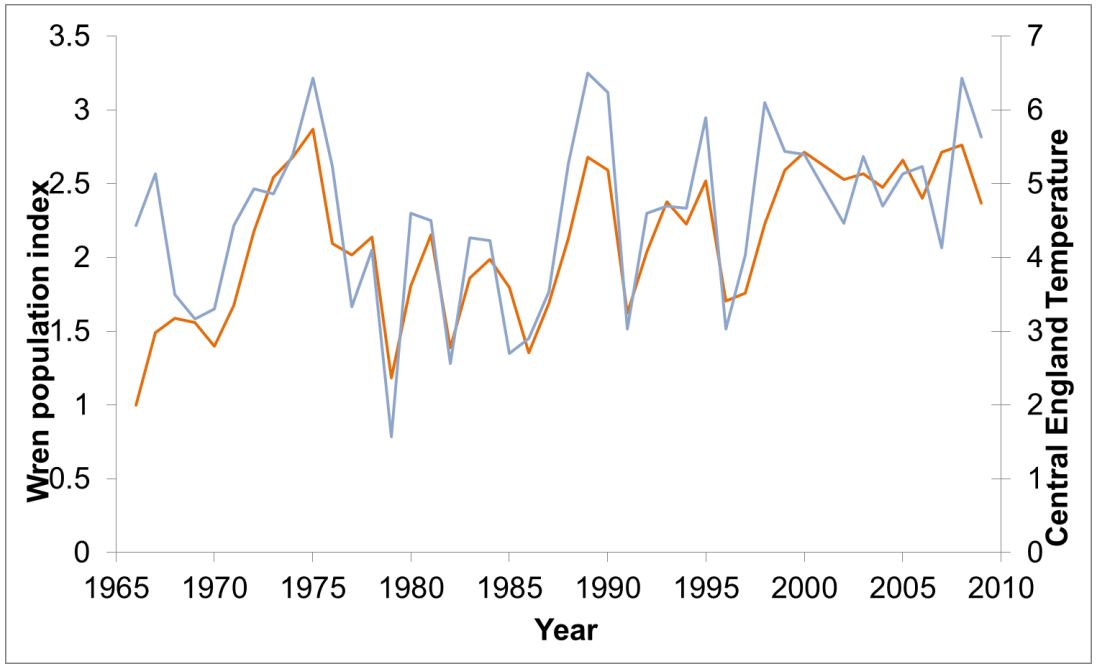


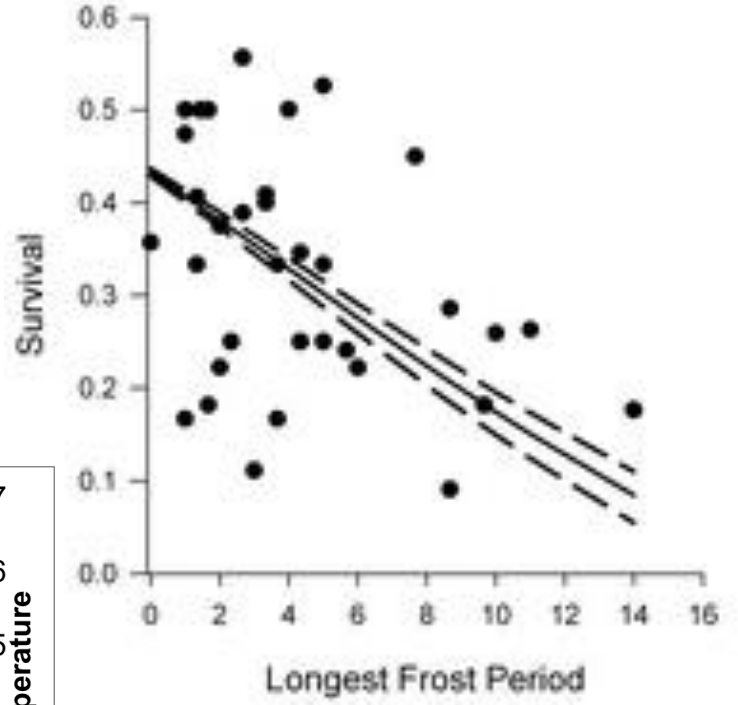
Range shifts

Hickling et al. 2006 GCB 12: 450-455



Population trends





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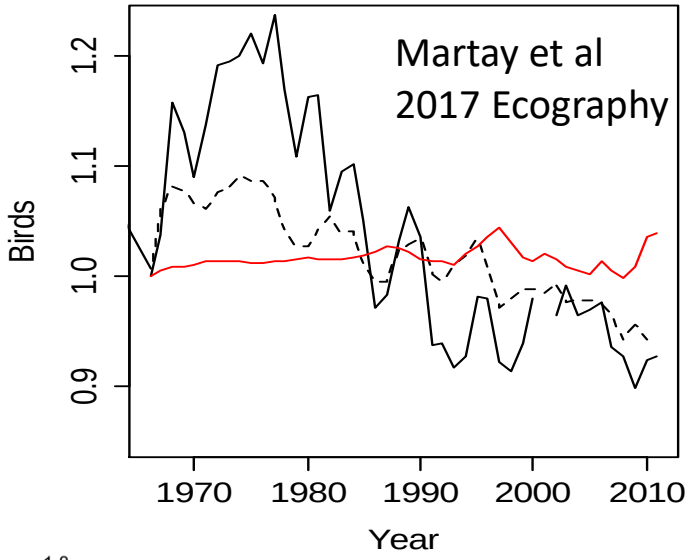
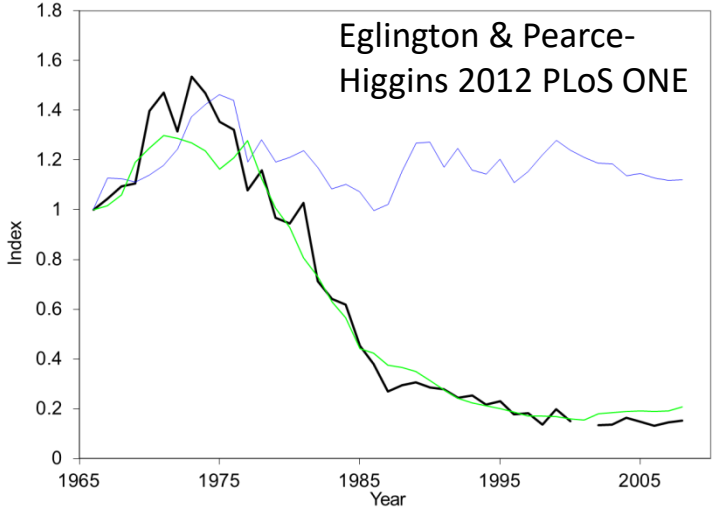




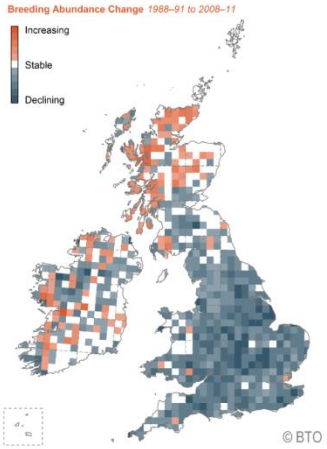
- Bird decline not largely driven by climate change

- 13/68 species: positive CC impact
- 3/68 species: negative CC impact
  - Cuckoo, Little Owl, Reed Warbler

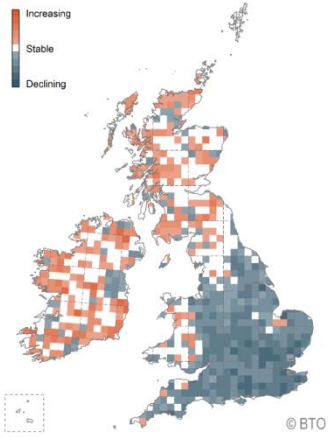
(Pearce-Higgins & Crick 2019 Bird Study)

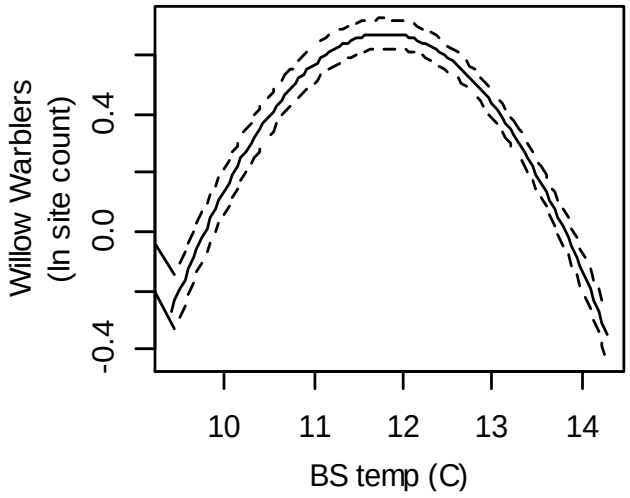
Population trends

Cuckoo



Willow warbler





Scotland vs England

England ↓, Scotland ↑:
Cuckoo
Tree Pipit
Willow Warbler
Mistle Thrush
House Martin
Yellowhammer
House Sparrow

England ↑, Scotland ↓:
Oystercatcher
Coal Tit

More research needed!

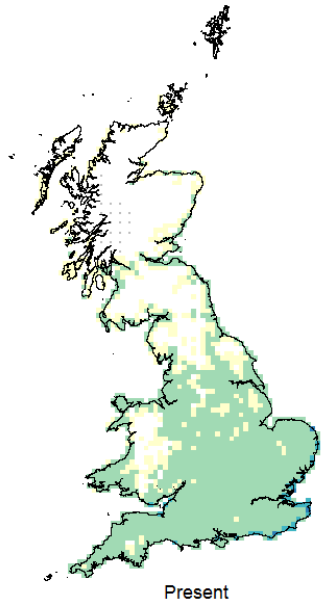
Community change

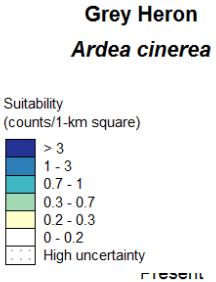
More impacted species:

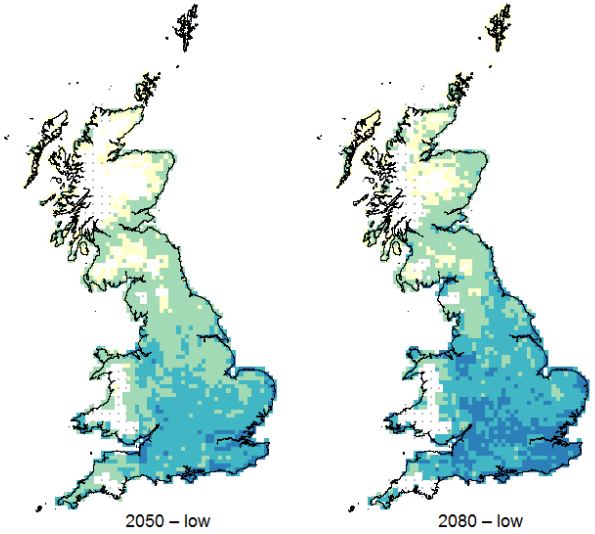
- Secondary consumers
- Species of conservation concern
- Habitat specialists
- Cold-associated species: northern & upland

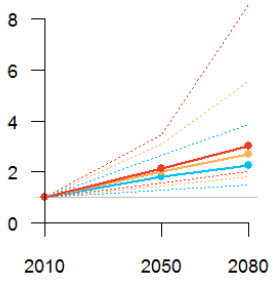
Predicting the future

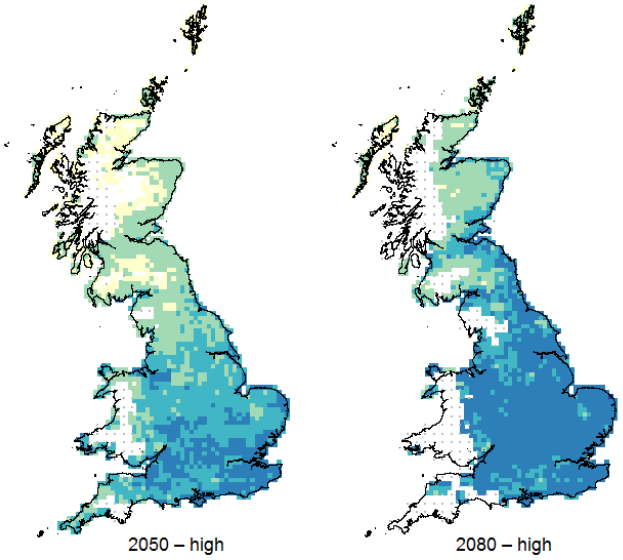
Massimino *et al.* 2017 *Clim. Res.* 145: 117-130











Predicting the future

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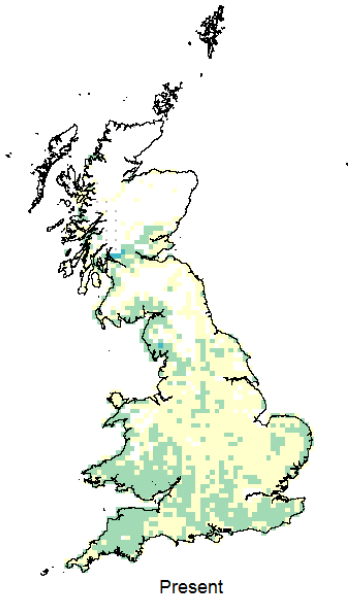
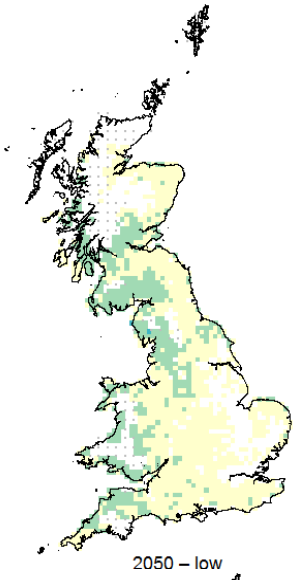
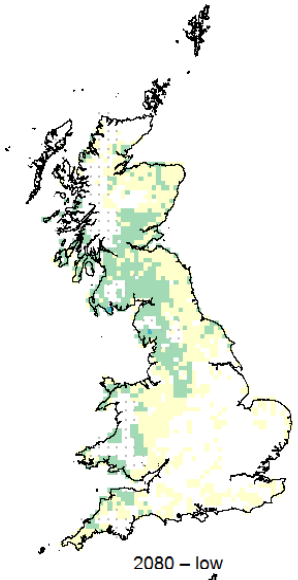
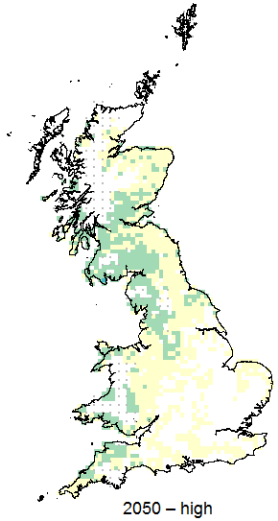


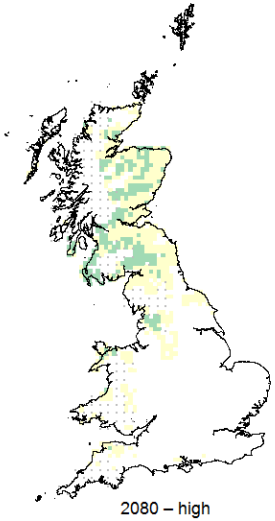
Garden Warbler
Sylvia borin

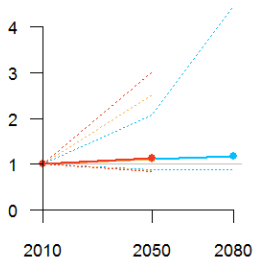
Suitability
(counts/1-km square)
> 3
1 - 3
0.7 - 1
0.3 - 0.7
0.2 - 0.3
0 - 0.2
High uncertainty





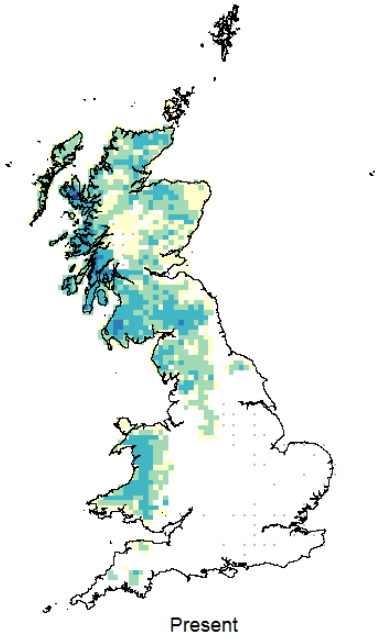






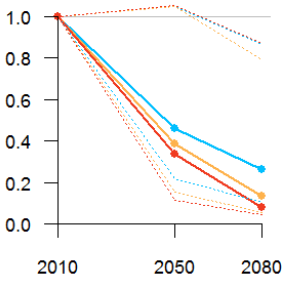
Predicting the future

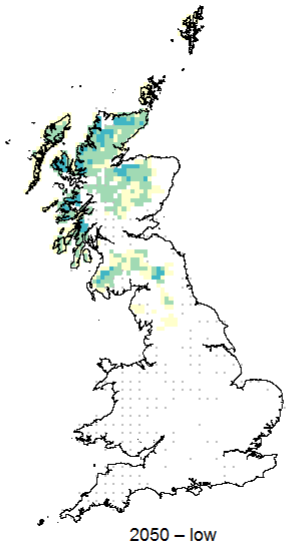
Massimino *et al.* 2017
Res. 145: 117-

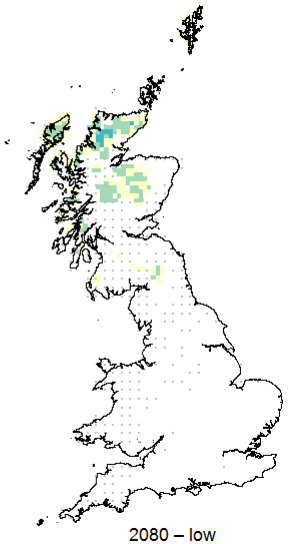


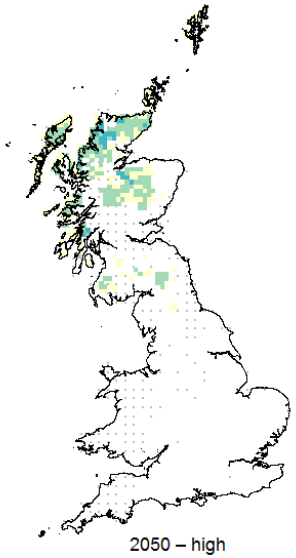
Lesser Redpoll
Carduelis cabaret

Suitability
(counts/1-km square)
- > 3
- 2 - 3
- 0.8 - 2
- 0.4 - 0.8
- 0.2 - 0.4
- 0 - 0.2
- High uncertainty









Predicting the future

- Declines in northern / upland species
- Declines in species of conservation concern
- Increases in southerly and invasive/colonist species
- Specific species assessments:
  - E.g. Natural England Commissioned Report NERC175 – England
  - Pearce-Higgins & Crick 2019

Edmund Fellowes

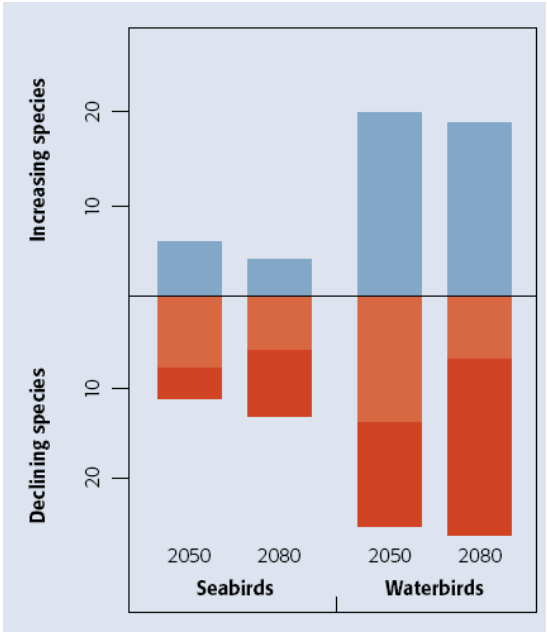
Adaptation

- What is the problem (vulnerability assessment)?

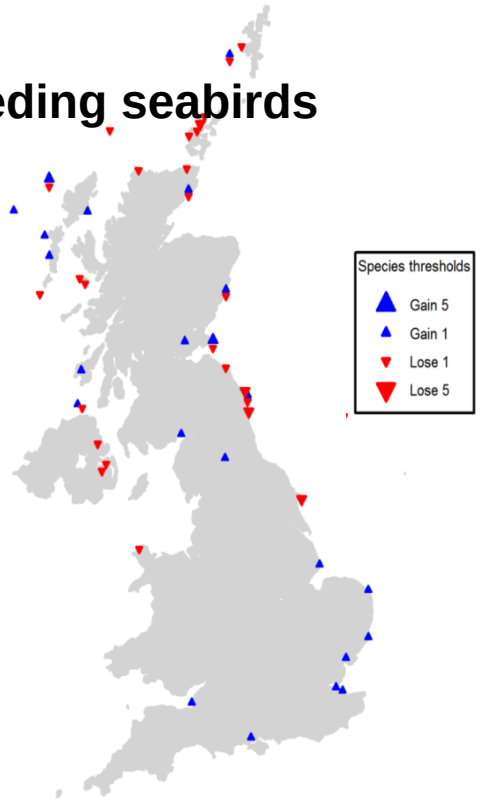
- What are the solutions?
  - Protected areas
  - Wider countryside management
  - Species management

Adaptation: Protected areas

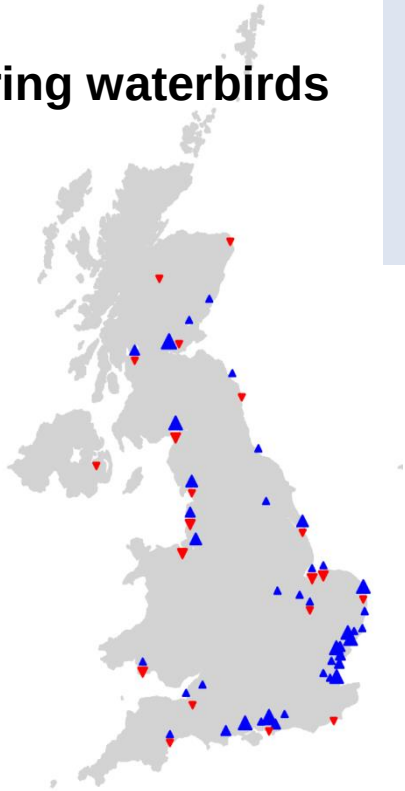
Johnston et al. (2013)
Nature Climate Change 3:1055-1061



Breeding seabirds



Wintering waterbirds

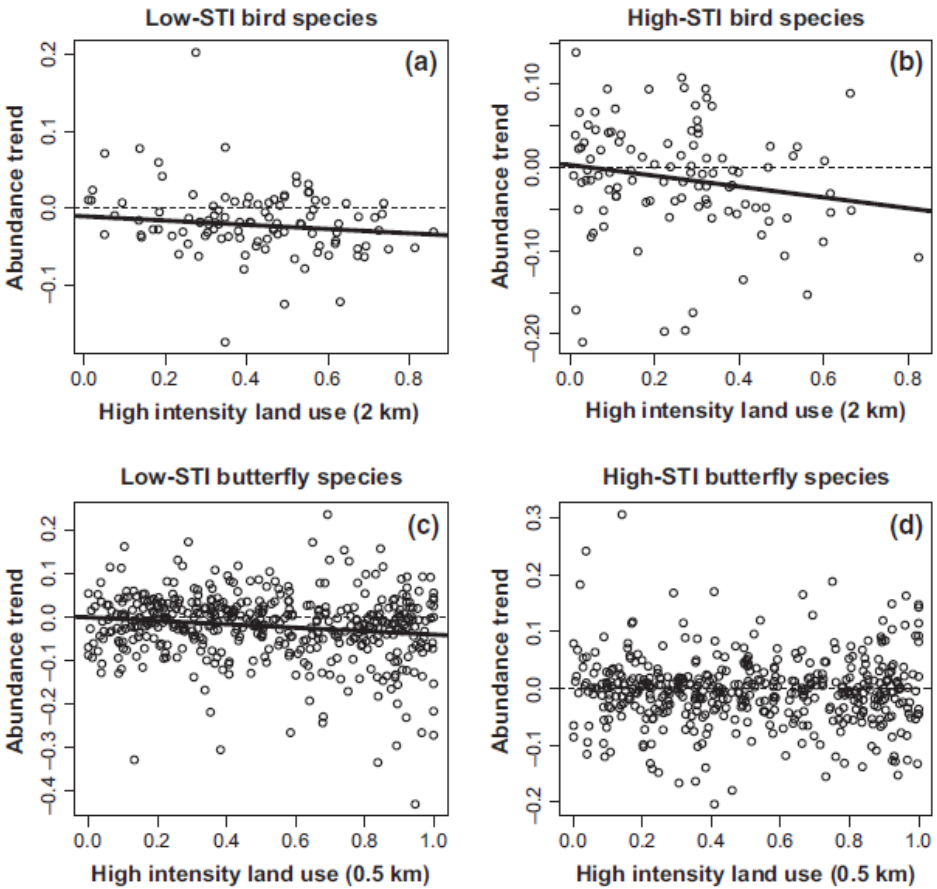


Adaptation: Protected areas

- Protected areas act as stepping-stones
- Can slow climate-related declines
- Balance between retaining currents species and encouraging colonisation

  (Thomas & Gillingham 2015)

Adaptation: Wider countryside management



Northern species decline reduced with low-intensity land-use

Adaptation: Wider countryside management

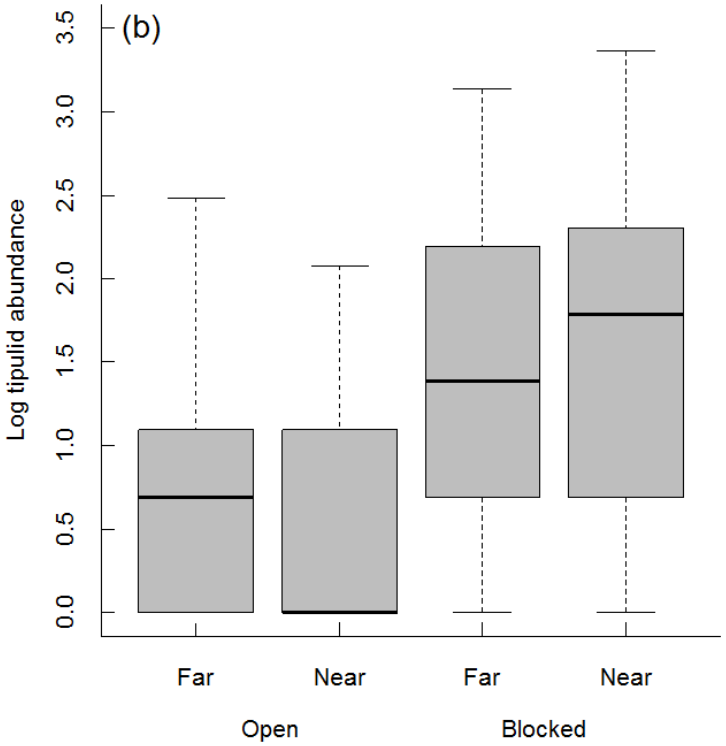
Woodland birds:

Patch connectivity and area of woodland habitat may buffer weather-mediated declines.

Habitat provision:

Can Scottish reforestation targets offset predicted Willow warbler declines?

Adaptation: Species management

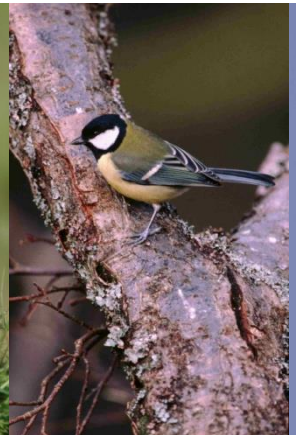


Carroll *et al.* (2011) *Global Change Biology 17*: 2291-3001

Conclusions

- Clear impacts of a temperature increase apparent:
  - Range shifts, phenology, population trends
- On average climate change largely positive for UK birds
- Climate change losers: upland, northern and threatened
- Future changes
  - Upland, northern and threatened species
  - Spatial considerations needed for species assessments




Scottish considerations

- Upland and northern species particularly vulnerable
- Increasing colonists likely
- Often English or UK focussed research
- Spatially divergent population trends
- Less data for assessing trends and risks
  - Big effort to increase BBS coverage of upland areas.