



Contrasting responses of two butterfly metapopulations to habitat and microclimate

Jenny Hodgson, Jon Bennie,
Callum Lawson, Chris Thomas
and Rob Wilson

the silver studded blue (*Plebejus argus*) and the silver spotted skipper (*Hesperia comma*)

both reach their
northern range margin
in UK



both suffered
widespread 20th-
century decline due
to habitat loss



the silver studded blue (*Plebejus argus*) and the silver spotted skipper (*Hesperia comma*)

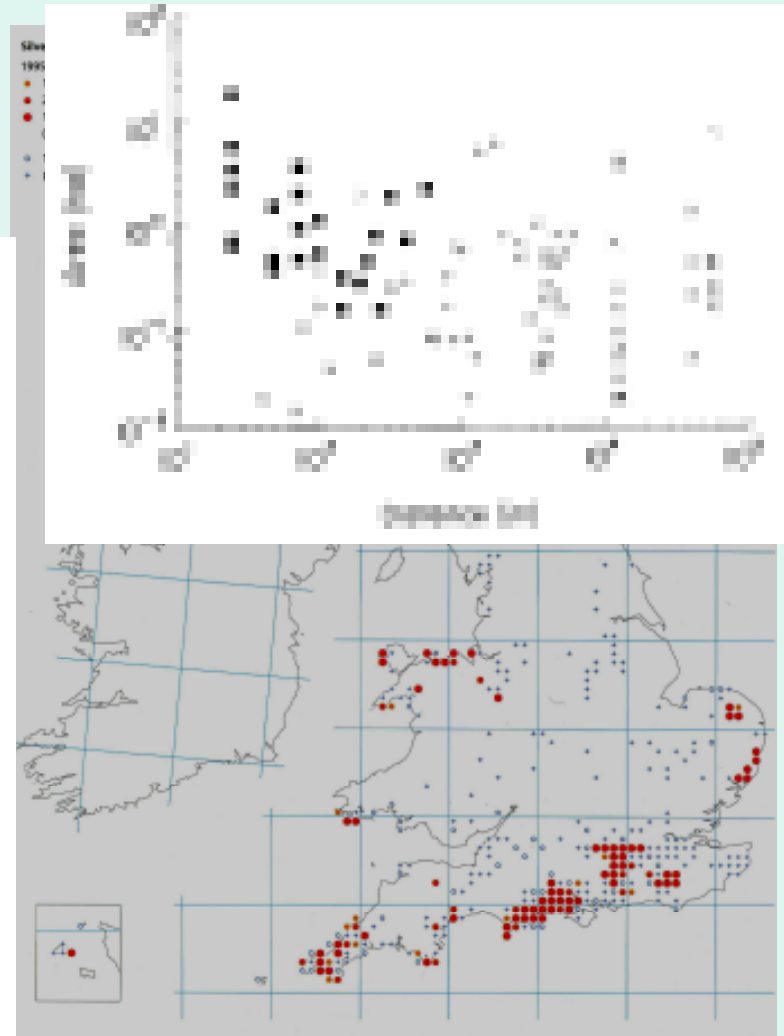
- both associated with calcareous grassland
- classic examples of metapopulations
- first surveyed by Chris Thomas 30 years ago



The silver studded blue in North Wales

Surveys

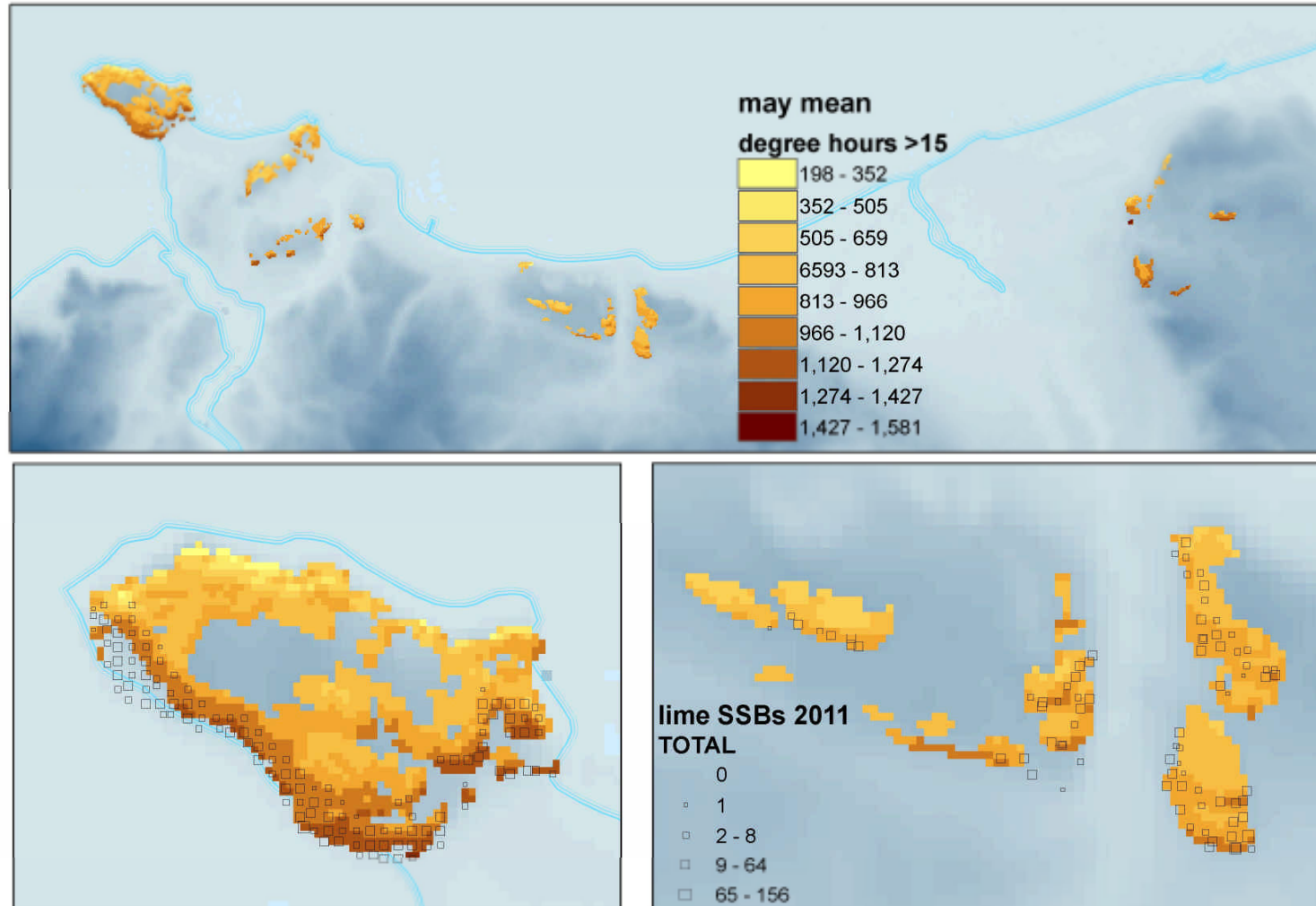
1982, 1990, 1997, 2004, 2011



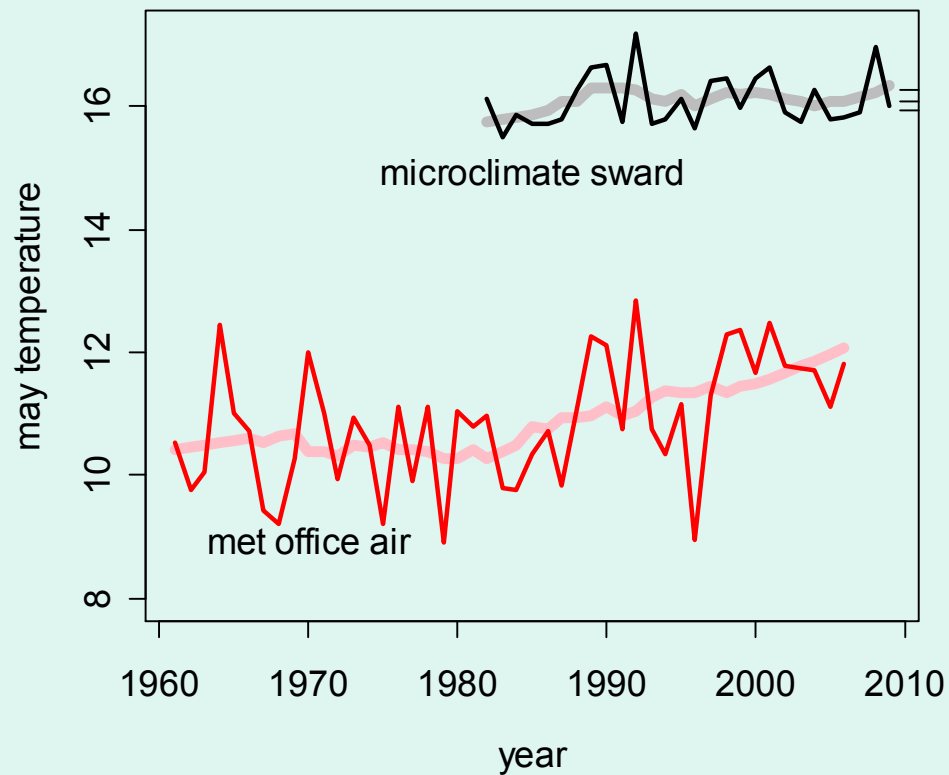
Thomas & Harrison 1992 J. Animal Eco. 61: 437;

Thomas et al 2002 Proc. R. Soc. B 269: 563

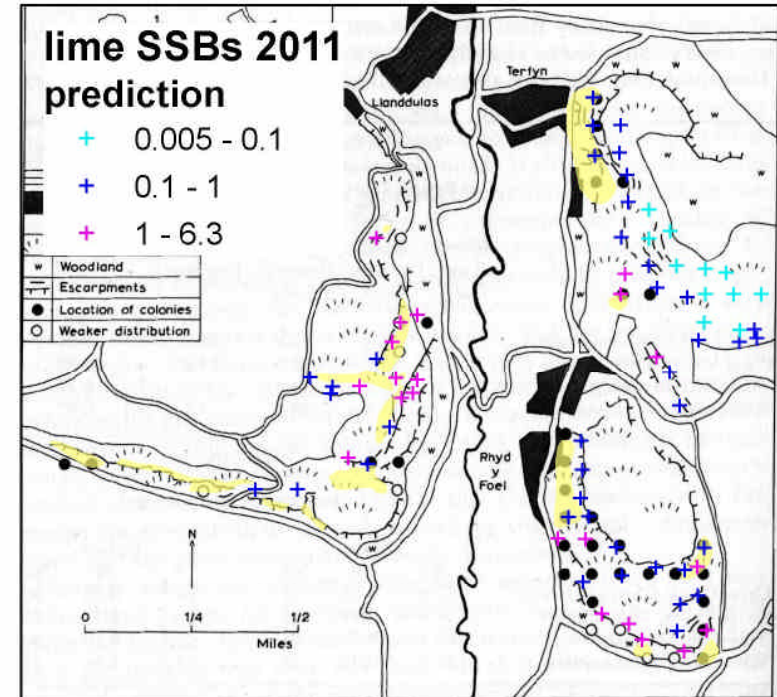
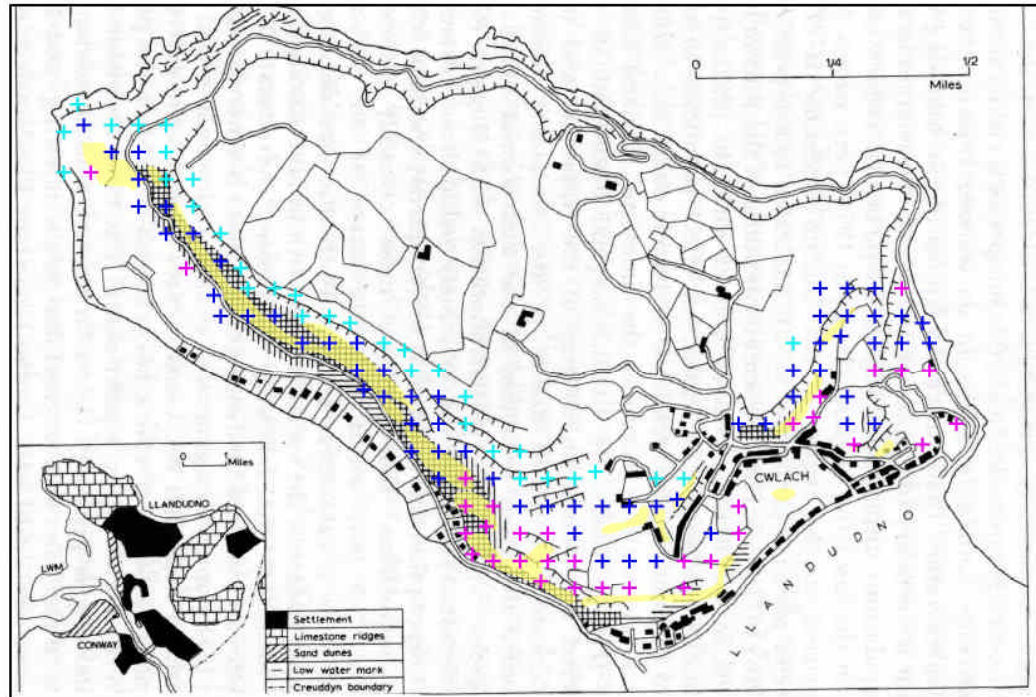
Strongly associated with average may temperature



May temperature has been increasing



But over time the relationship does not hold



Dennis (1977) *The British butterflies – their origin and establishment*. EW Classey.

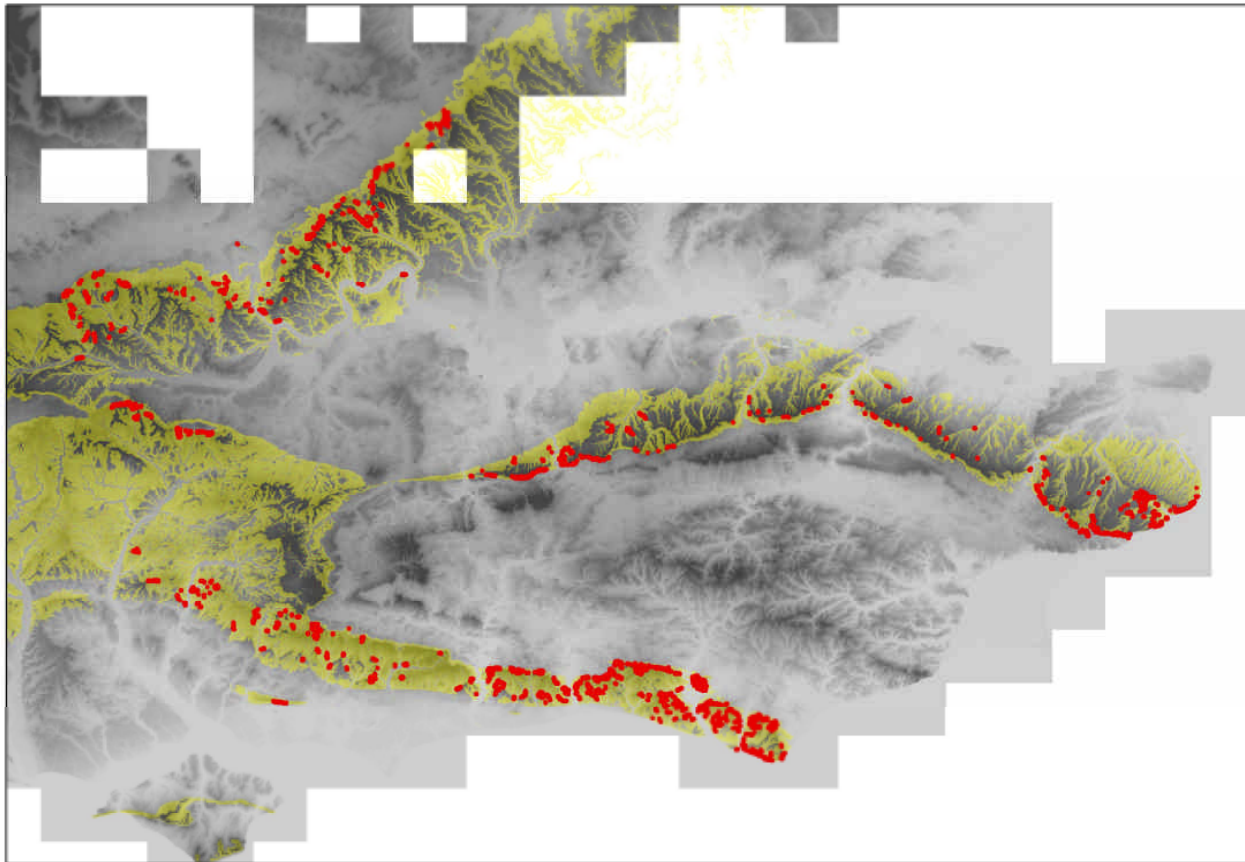
what's the explanation

- Spurious correlation?
 - model incl microclimate explains 20% of dev
 - model with just topography explains 18%
- Extra constraints?
 - nutrient status
 - ant association
- Dispersal limitation?
 - but distances are tiny



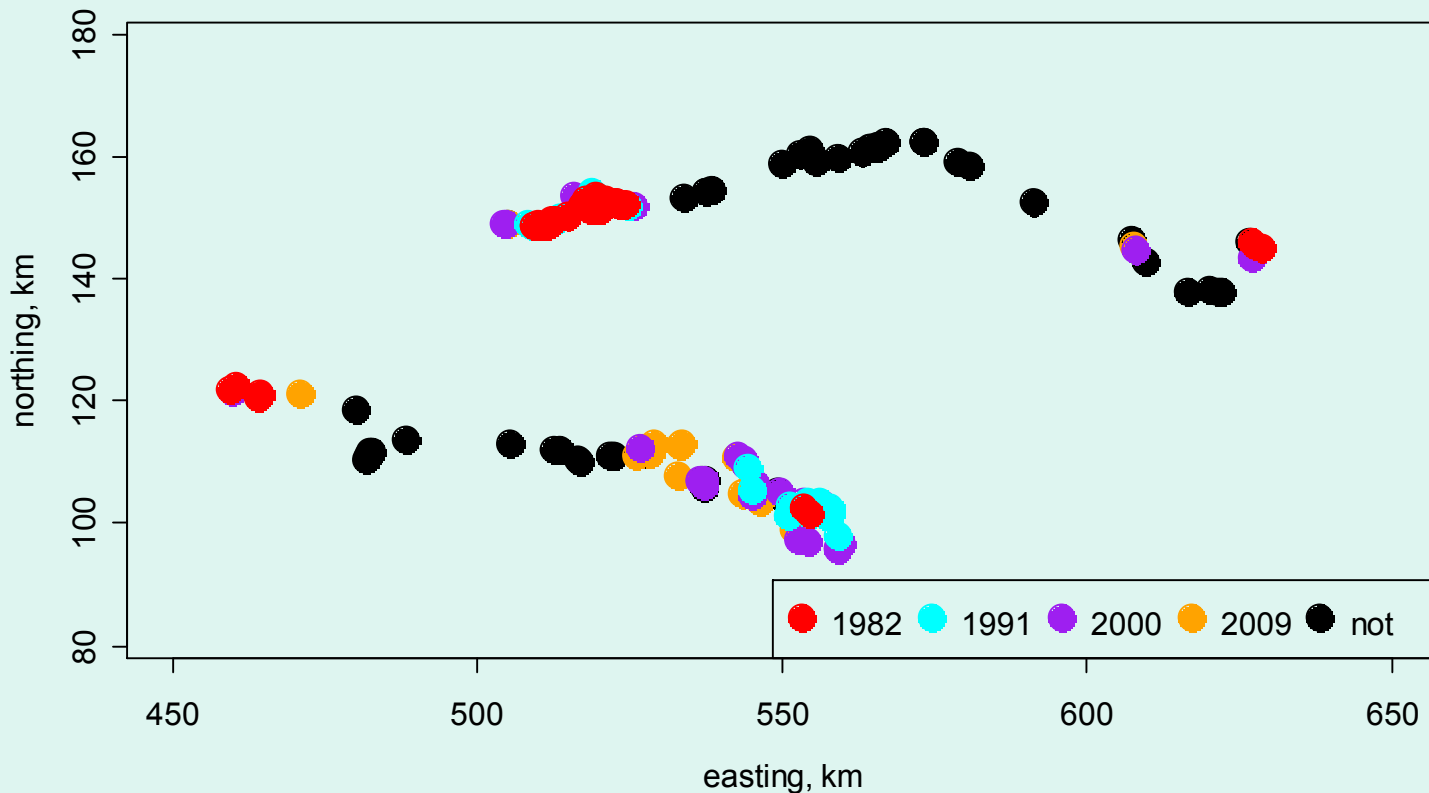
The silver spotted skipper in southern England

surveys 1982, 1991, 2000, 2009

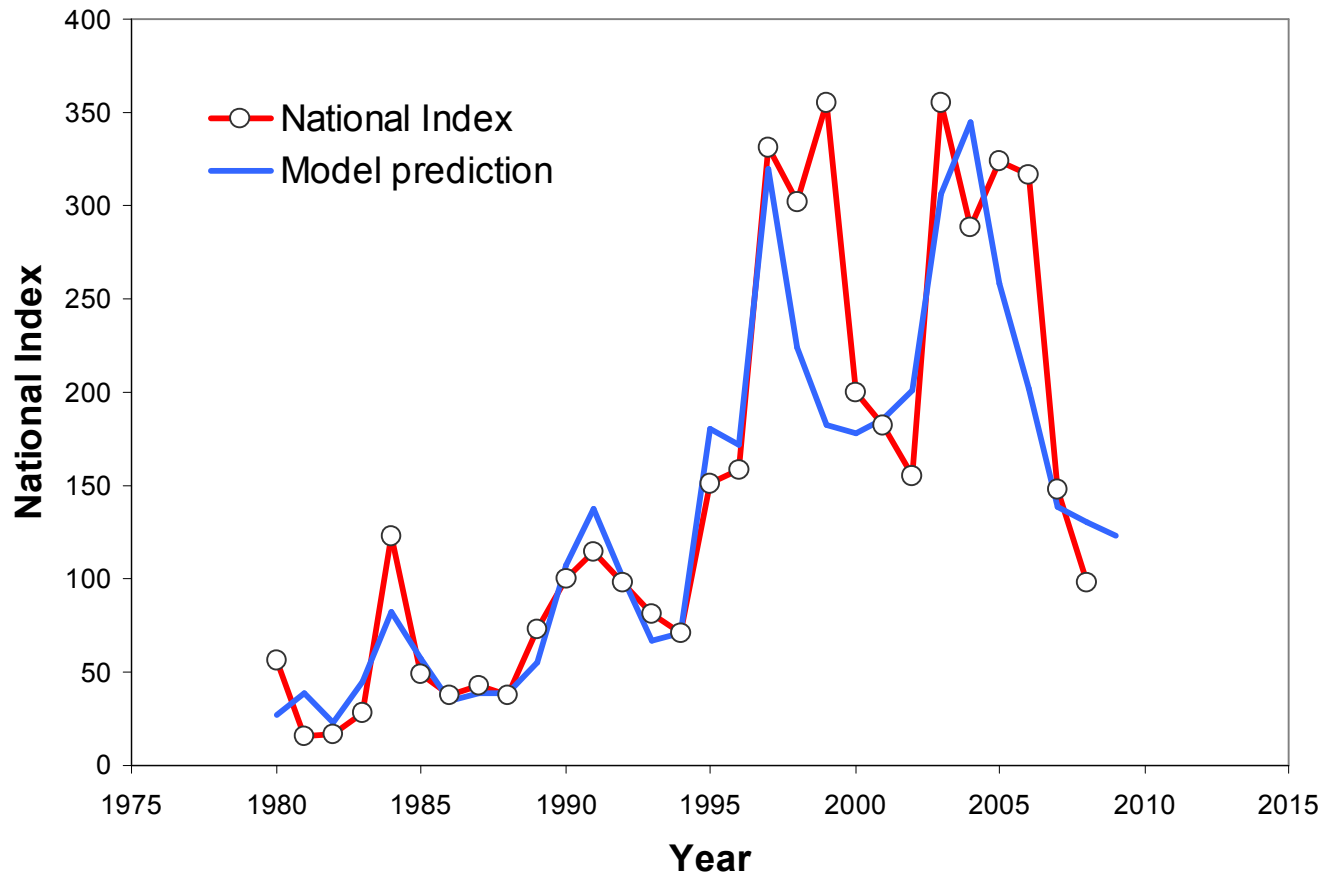


The silver spotted skipper in southern England

- has achieved rapid range expansion

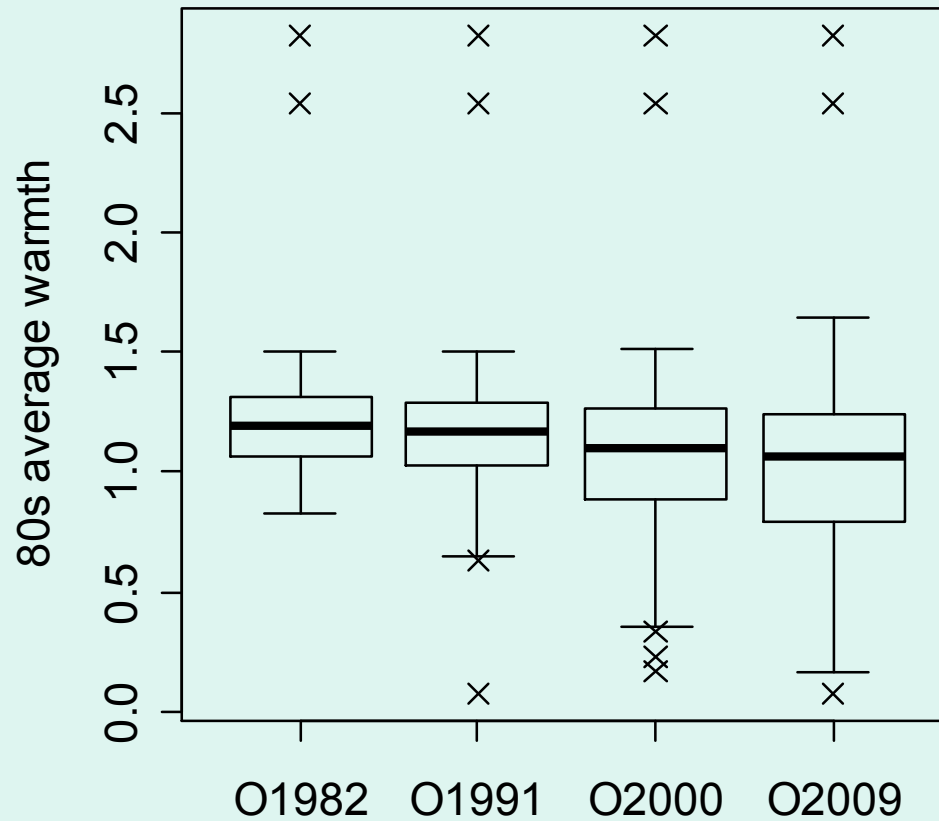


Strongly associated with August temperature

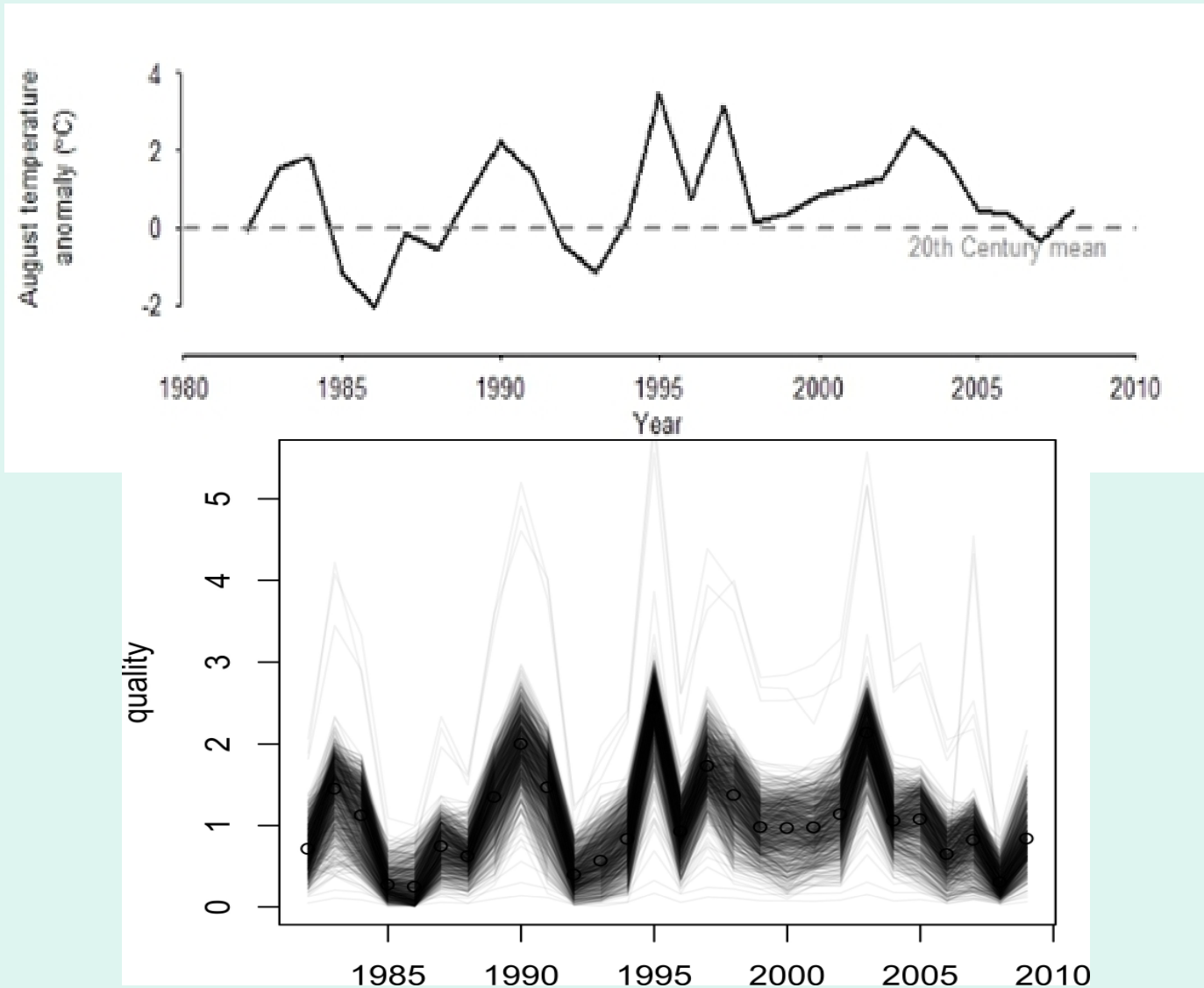


$$\log(N_{t+1}) = 0.747\log(N_t) + 0.118T_{aug} - 1.409$$

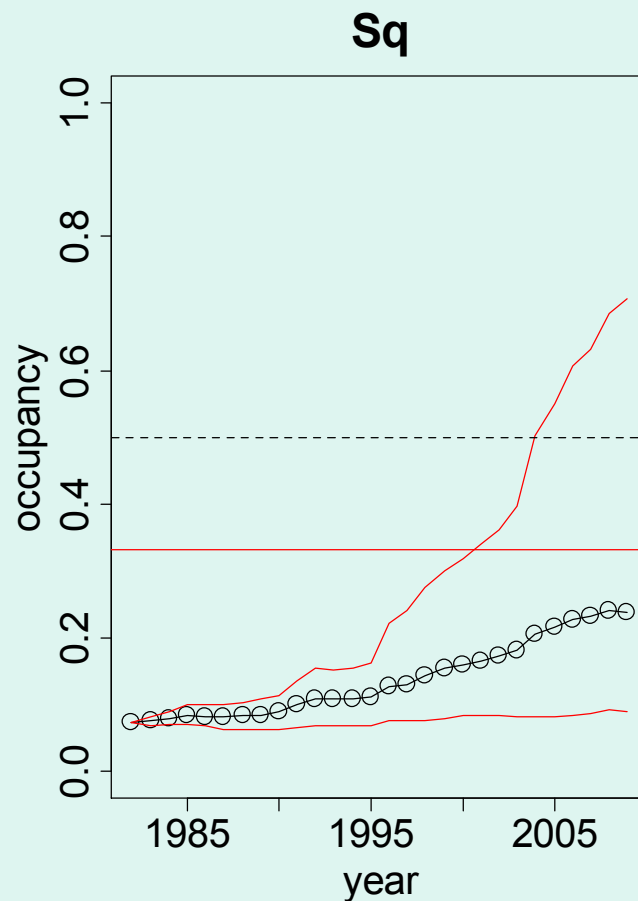
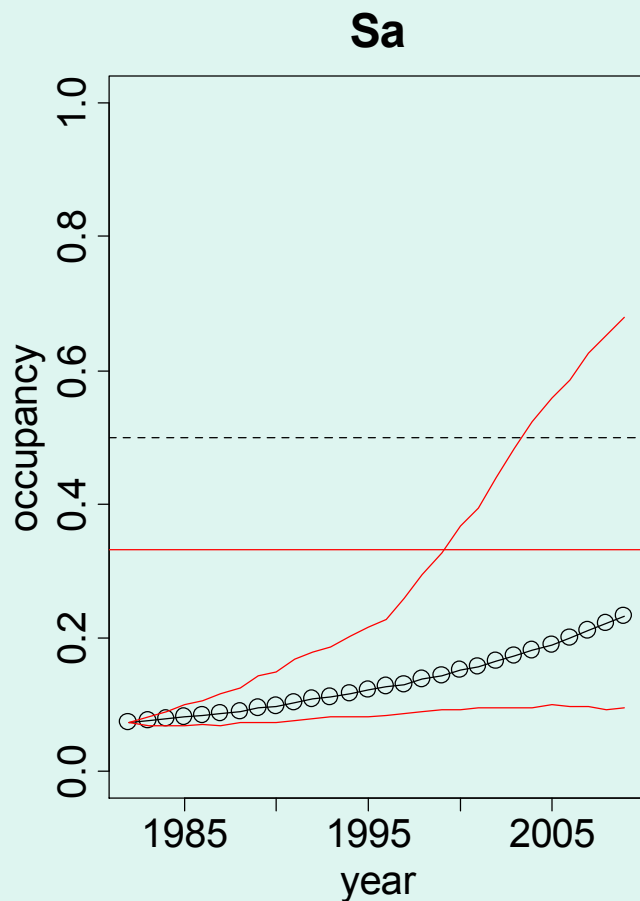
Has expanded to occupy cooler sites on average



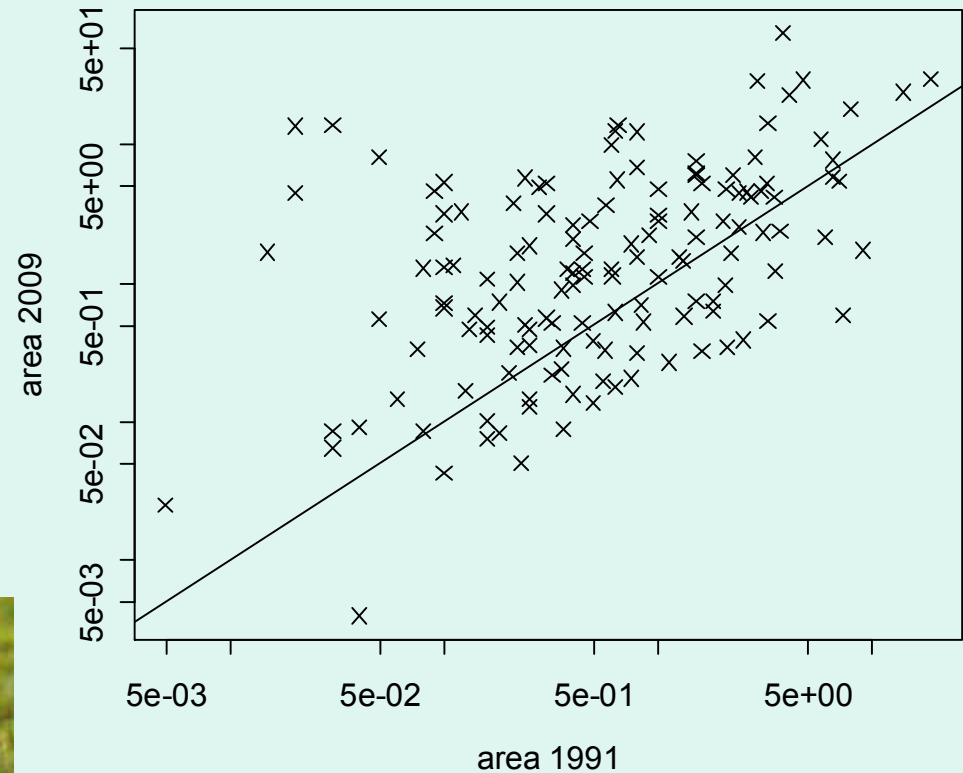
But not much upward trend in August temperature



Temperature variations make little difference to the overall expansion



The role of habitat improvement?



Conclusions

- extrapolating climate relations from space to time (or vice versa) is risky
- climate change and habitat change will interact
- long-term studies are a precious resource for studying these interactions
- but it is only feasible to study a few species in this way

Acknowledgements

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