

# Climate change and the distributions of crop pests and diseases: Ten Observations

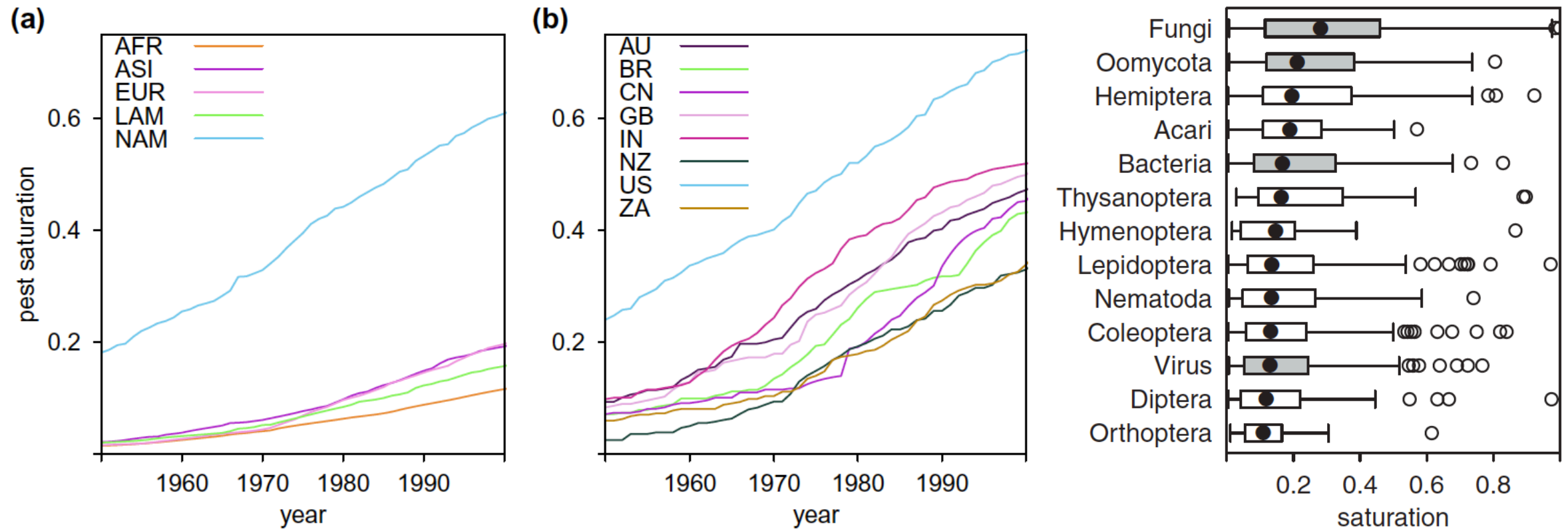
Dan Bebber

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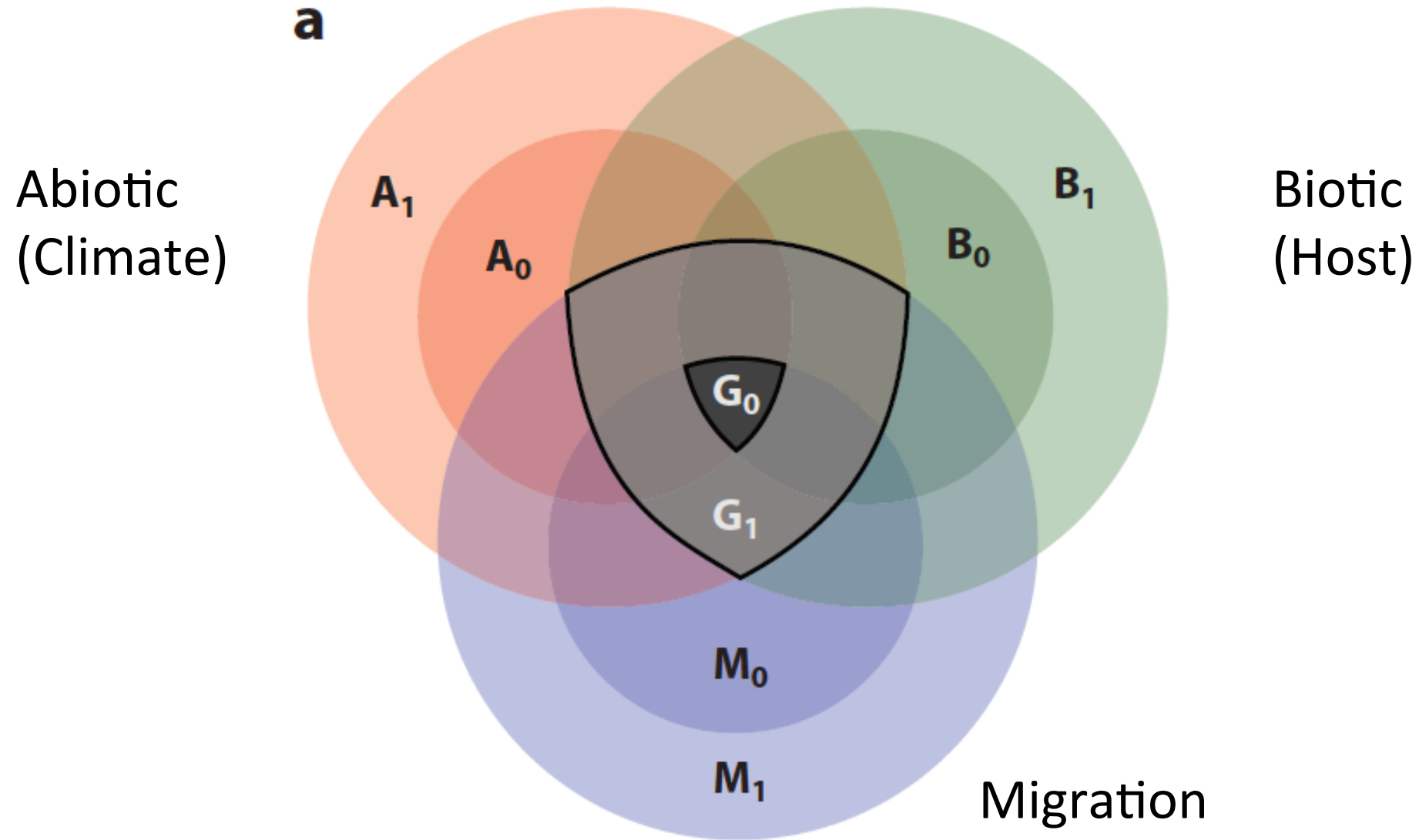
University of Exeter



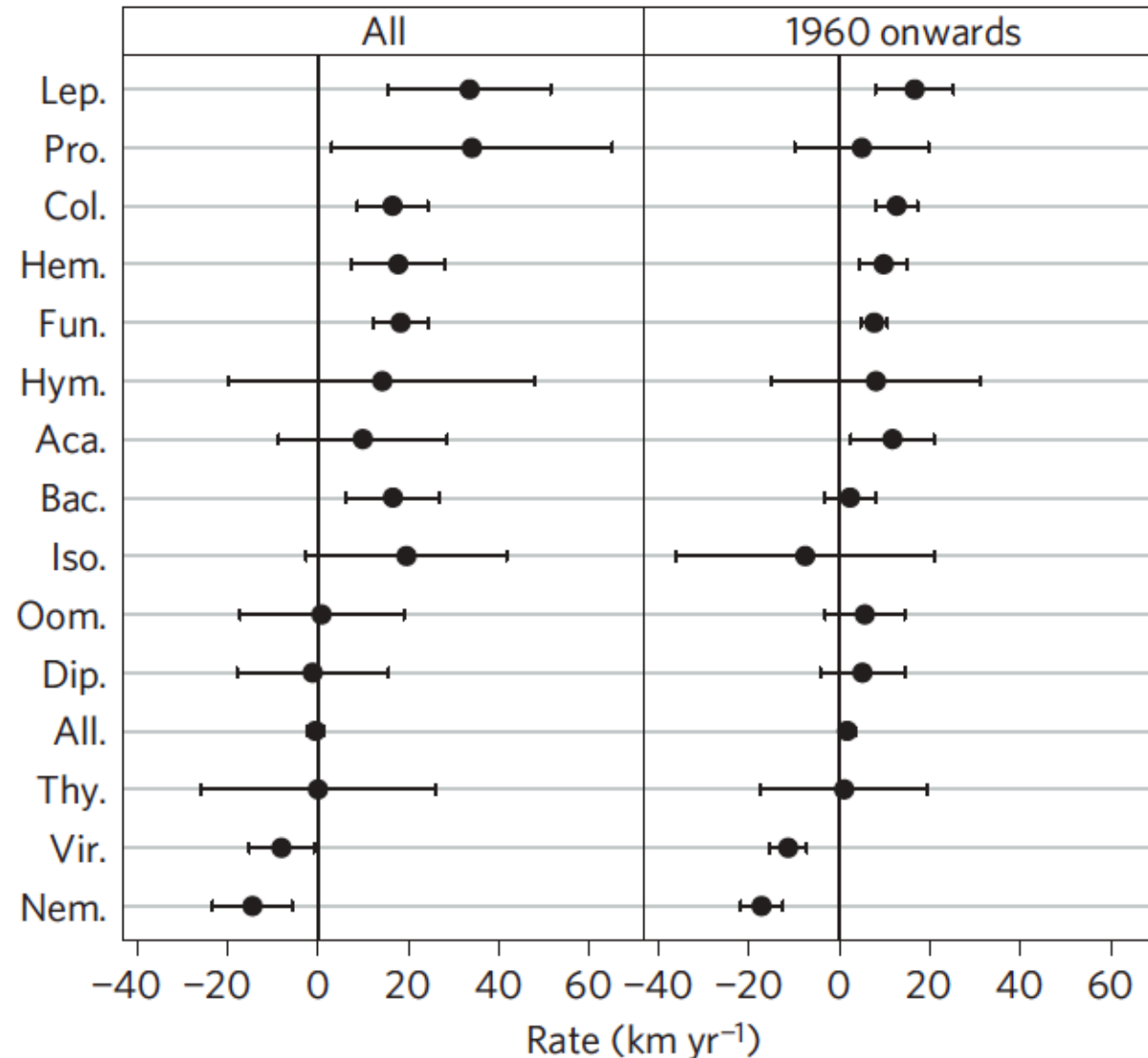
# 1. Crop pests are spreading rapidly (esp. fungi)



## 2. Niches and migration determine distributions



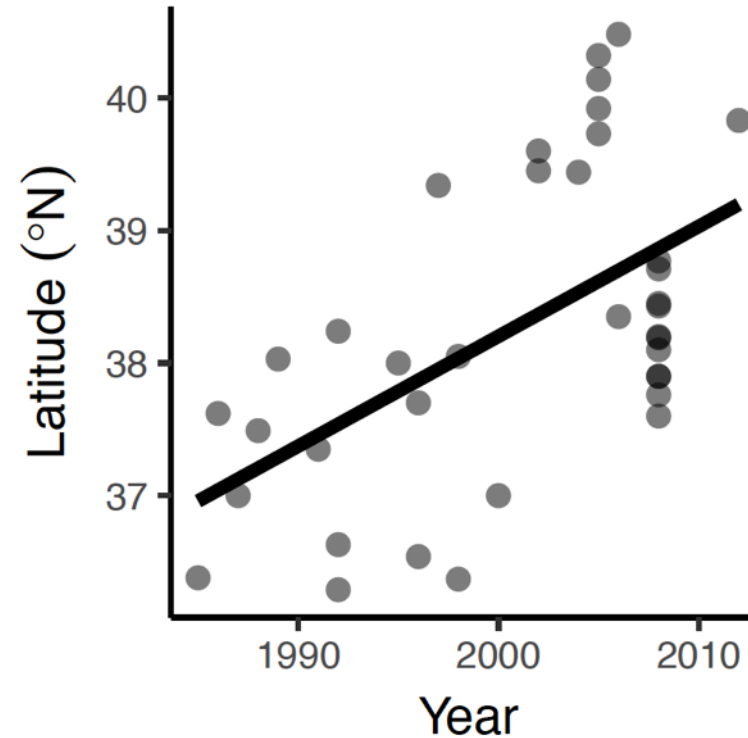
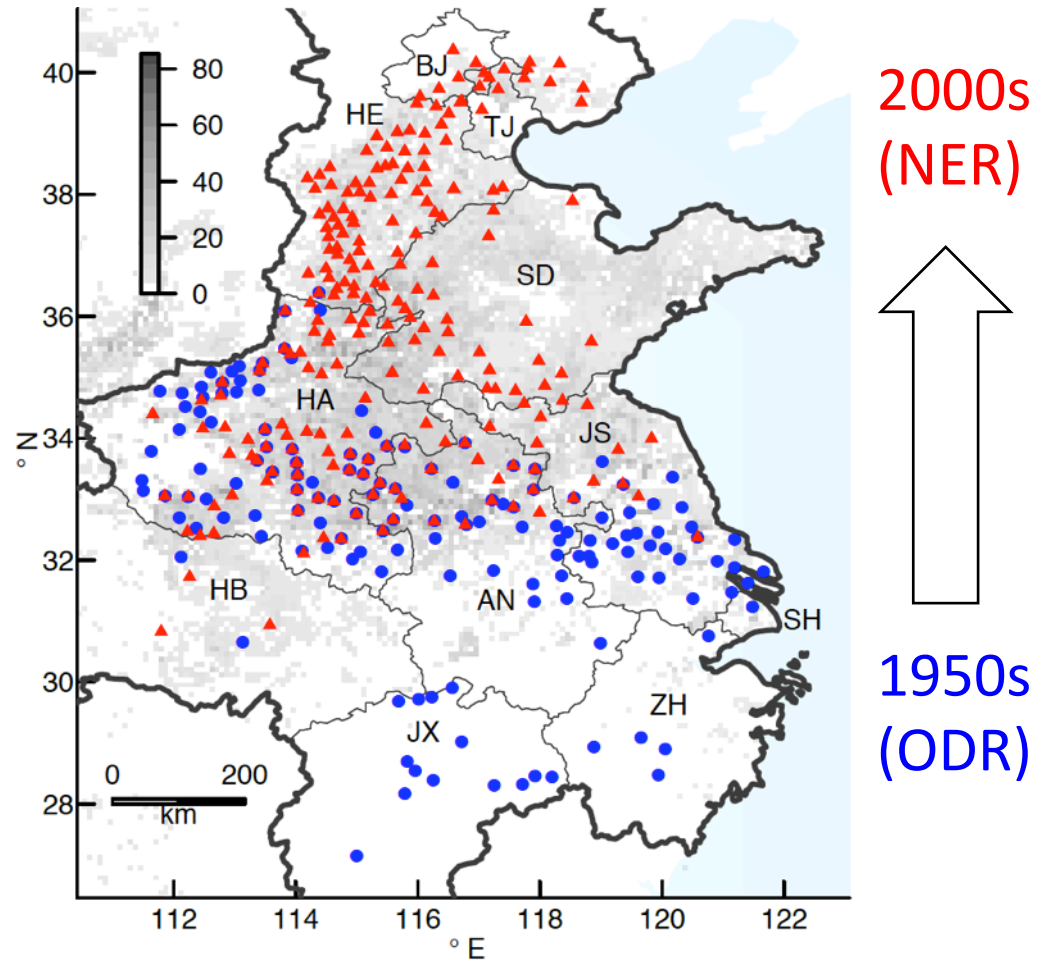
### 3. Ranges should move poleward and mostly they do



Bebber, D.P., Ramotowski, M.A.T. & Gurr, S.J. (2013) Crop pests and pathogens move polewards in a warming world. *Nature Climate Change*, **3**, 985–988.

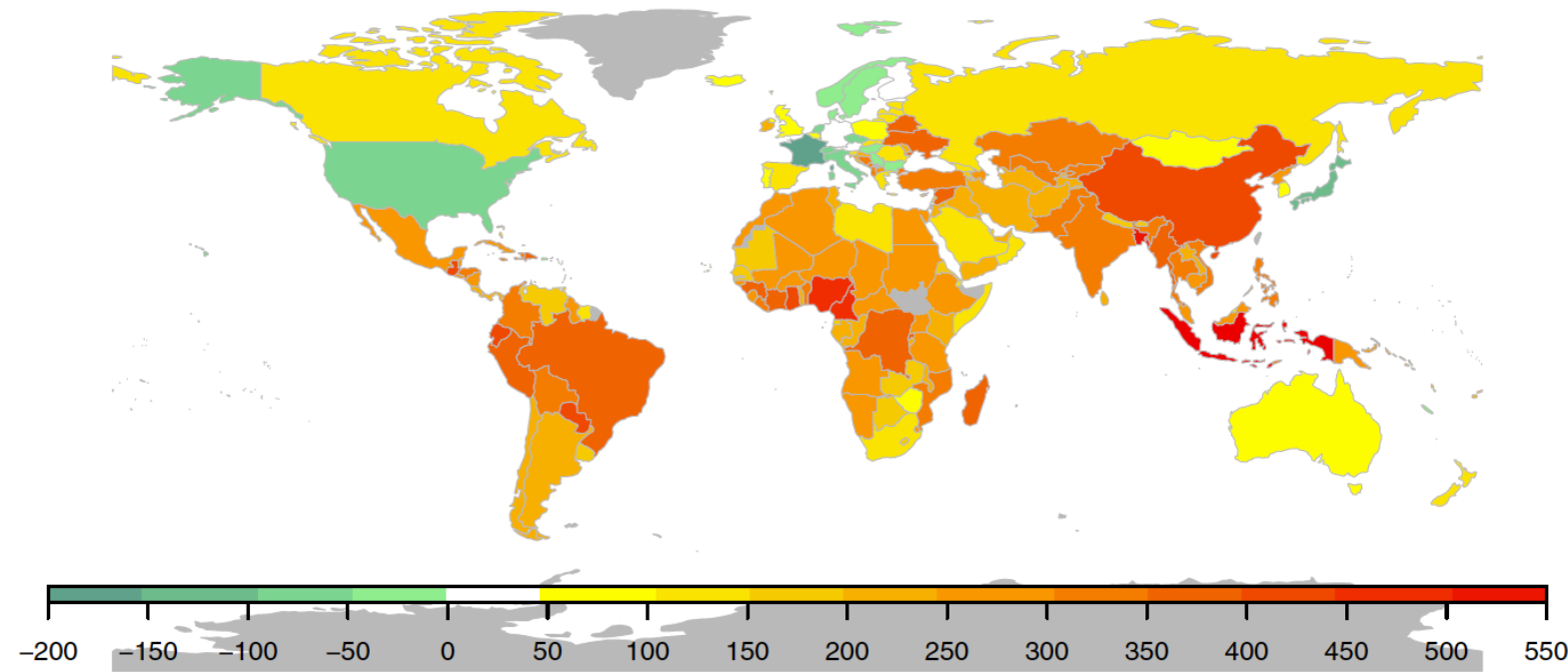
# 4. Clear examples of range shifts are rare

Orange wheat blossom midge (*Sitodiplosis mosellana*) in China

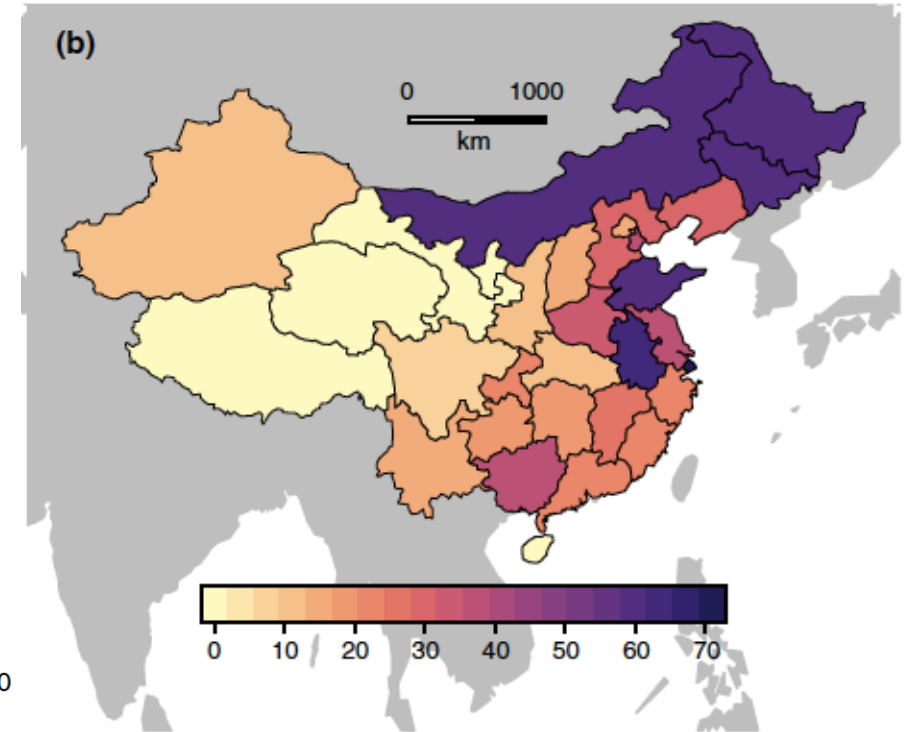


First detection of WM larvae in NER

# 5. Pest distributions are a known unknown

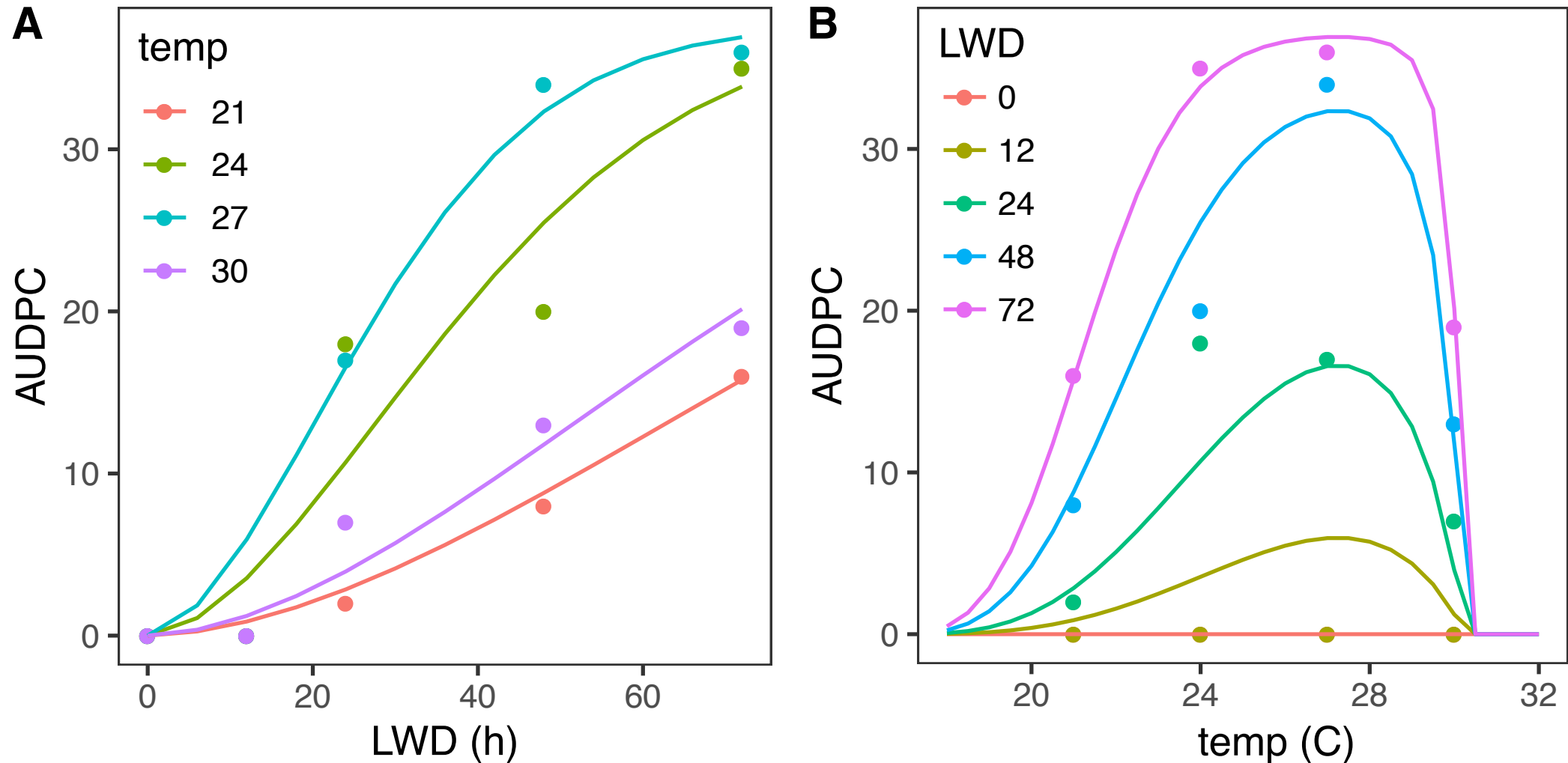


Bebber, D.P., Holmes, T., Smith, D. & Gurr, S.J. (2014) Economic and physical determinants of the global distributions of crop pests and pathogens. *New Phytologist*, **202**, 901–910.

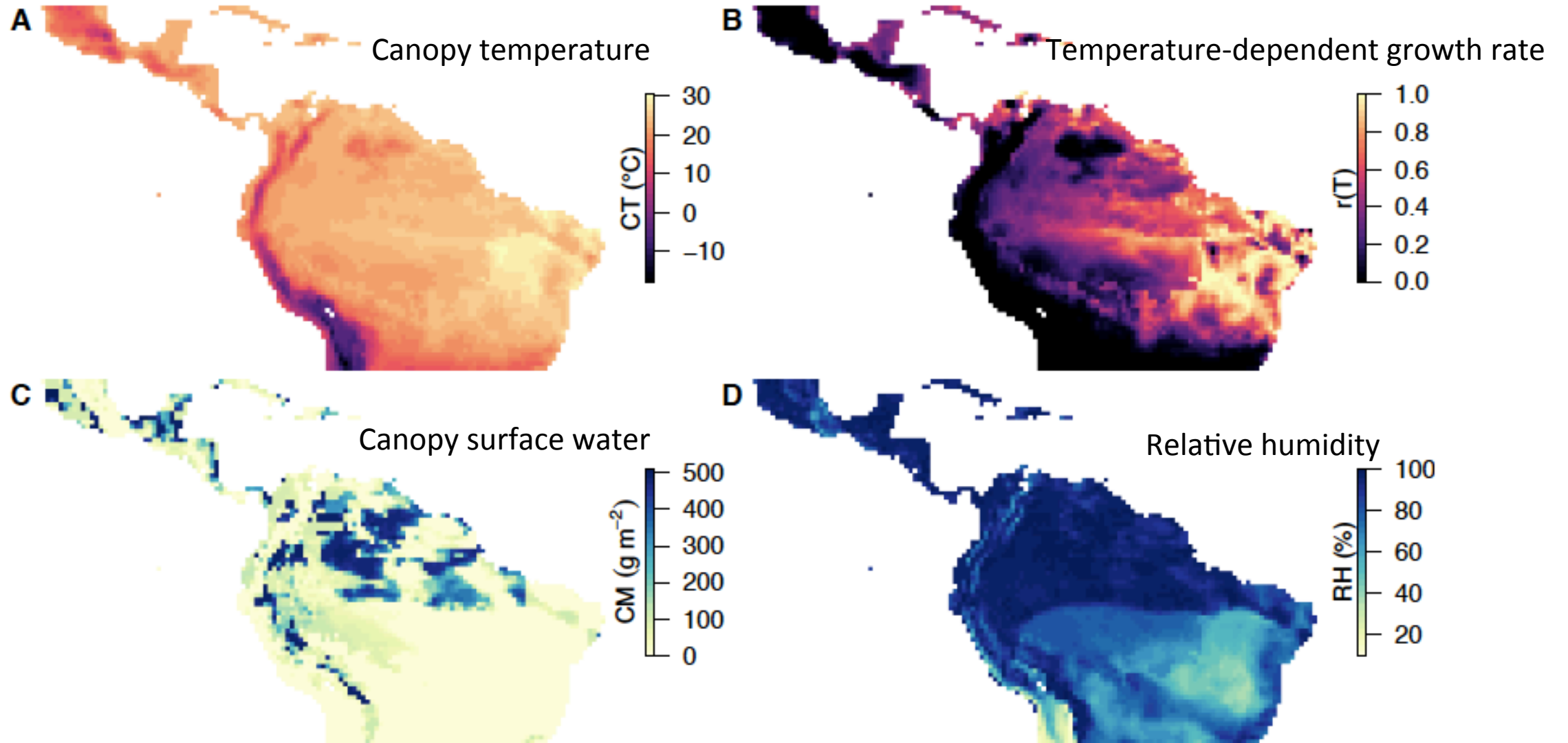


Bebber, D.P., Field, E., Gui, H., Mortimer, P., Holmes, T. & Gurr, S.J. (2019) Many unreported crop pests and pathogens are probably already present. *Global Change Biology*, **25**, 2703–2713.

## 6. Experiments can determine climate response



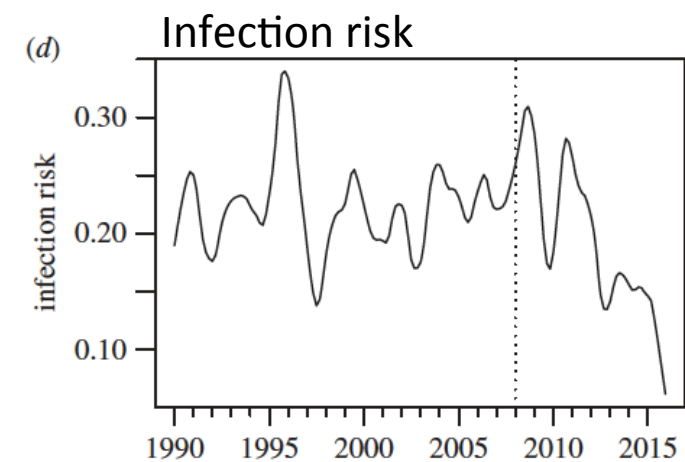
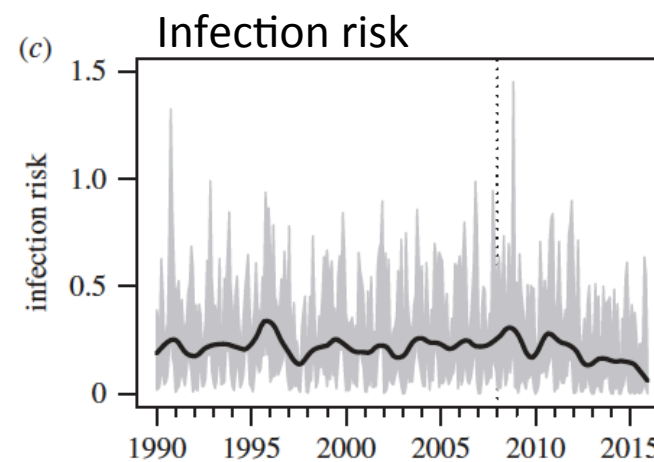
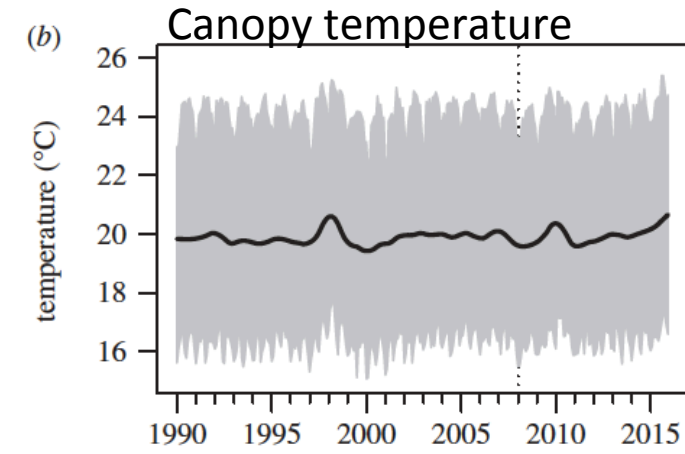
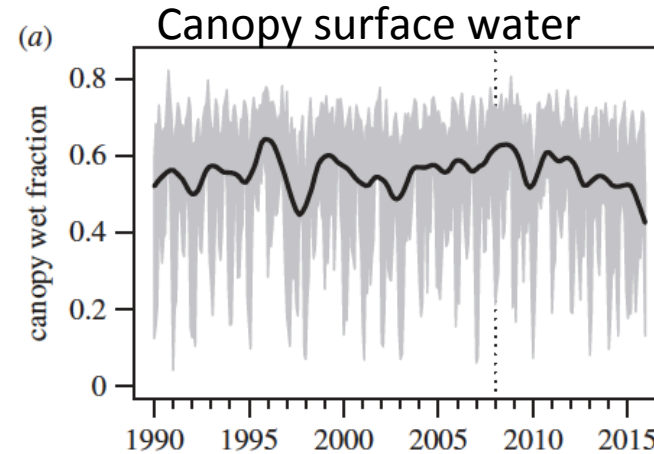
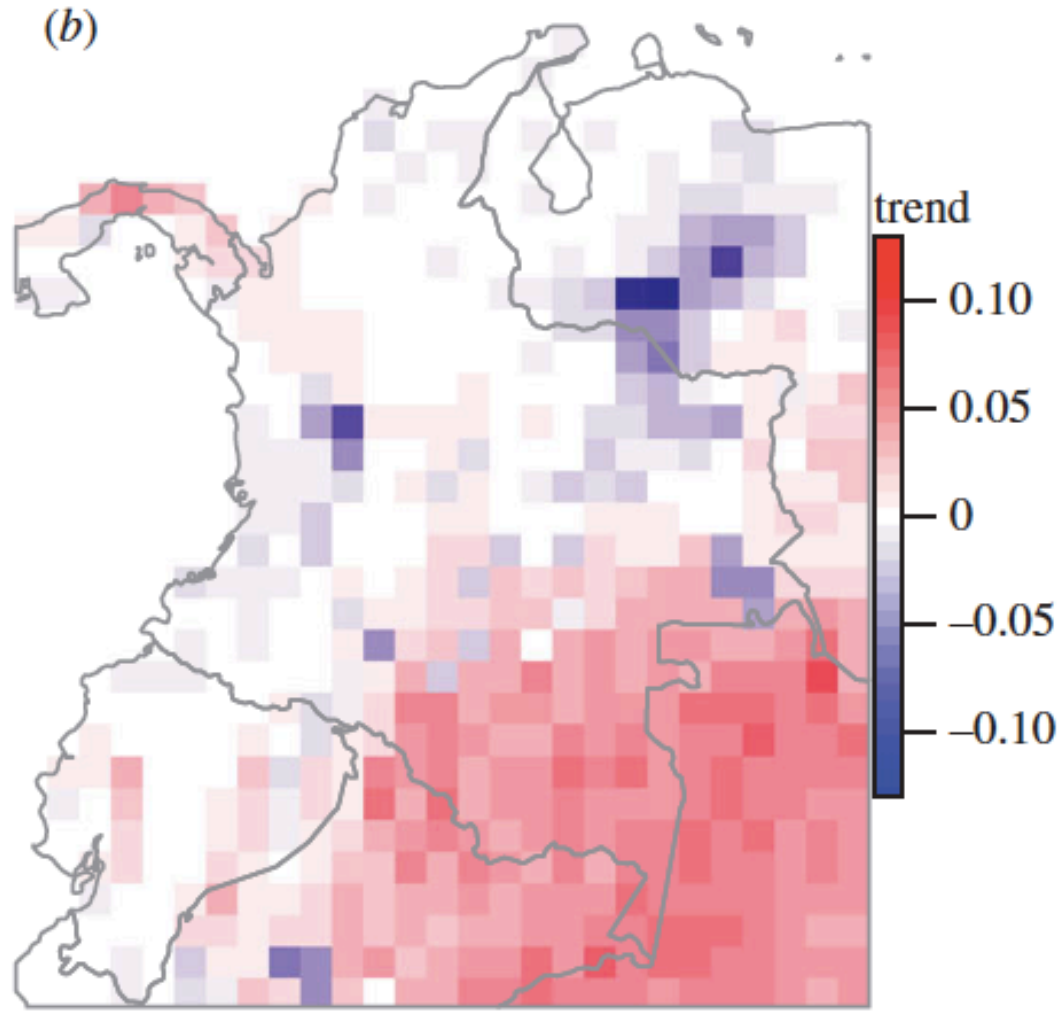
# 7. Climate data drive models



Bebber Daniel P. (2019) Climate change effects on Black Sigatoka disease of banana. Philosophical Transactions of the Royal Society B: Biological Sciences, 374, 20180269.

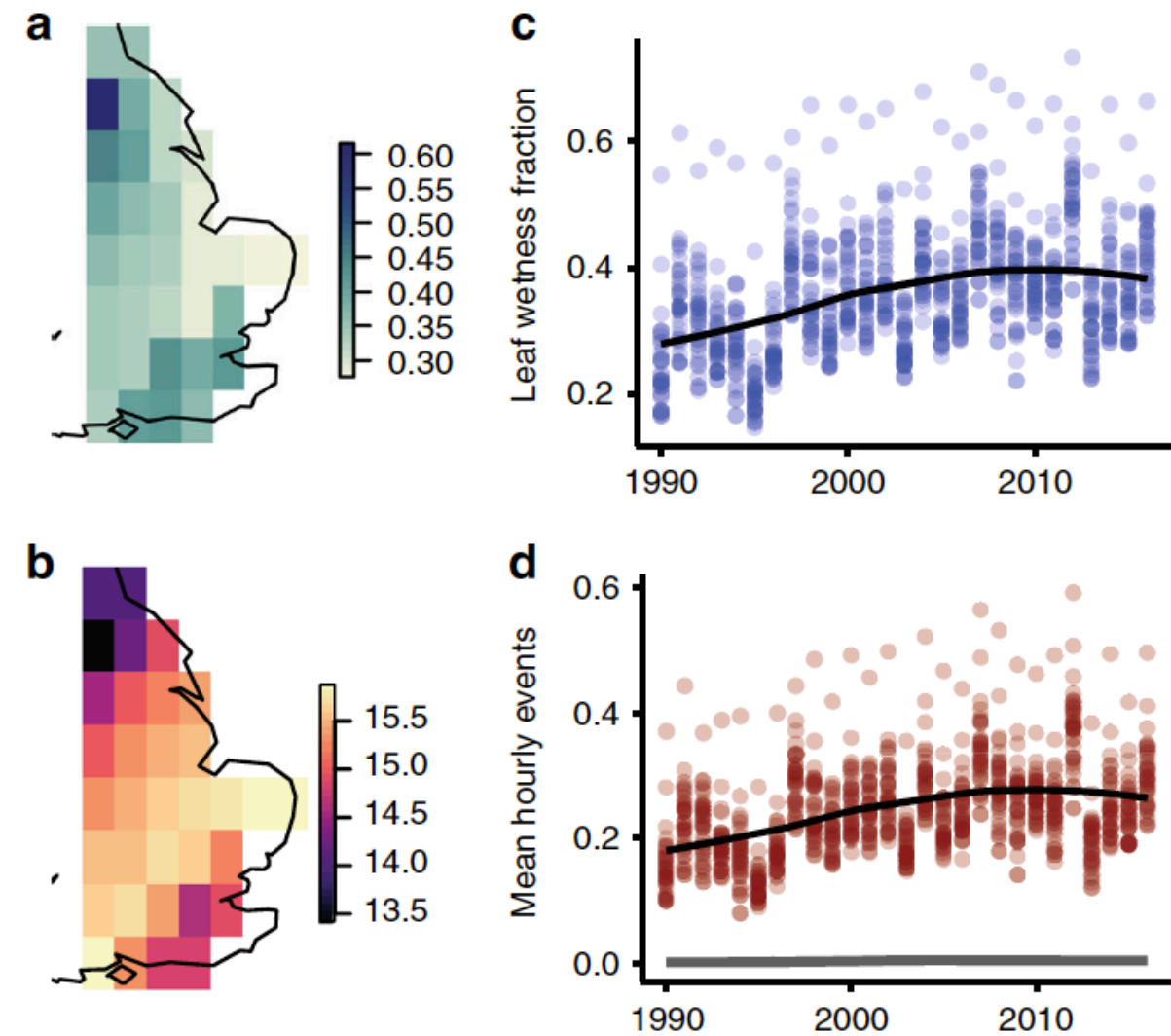


## 8. It's not always climate change



Bebber, D.P., Castillo, Á.D. & Gurr, S.J. (2016) Modelling coffee leaf rust risk in Colombia with climate reanalysis data. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 371, 20150458.

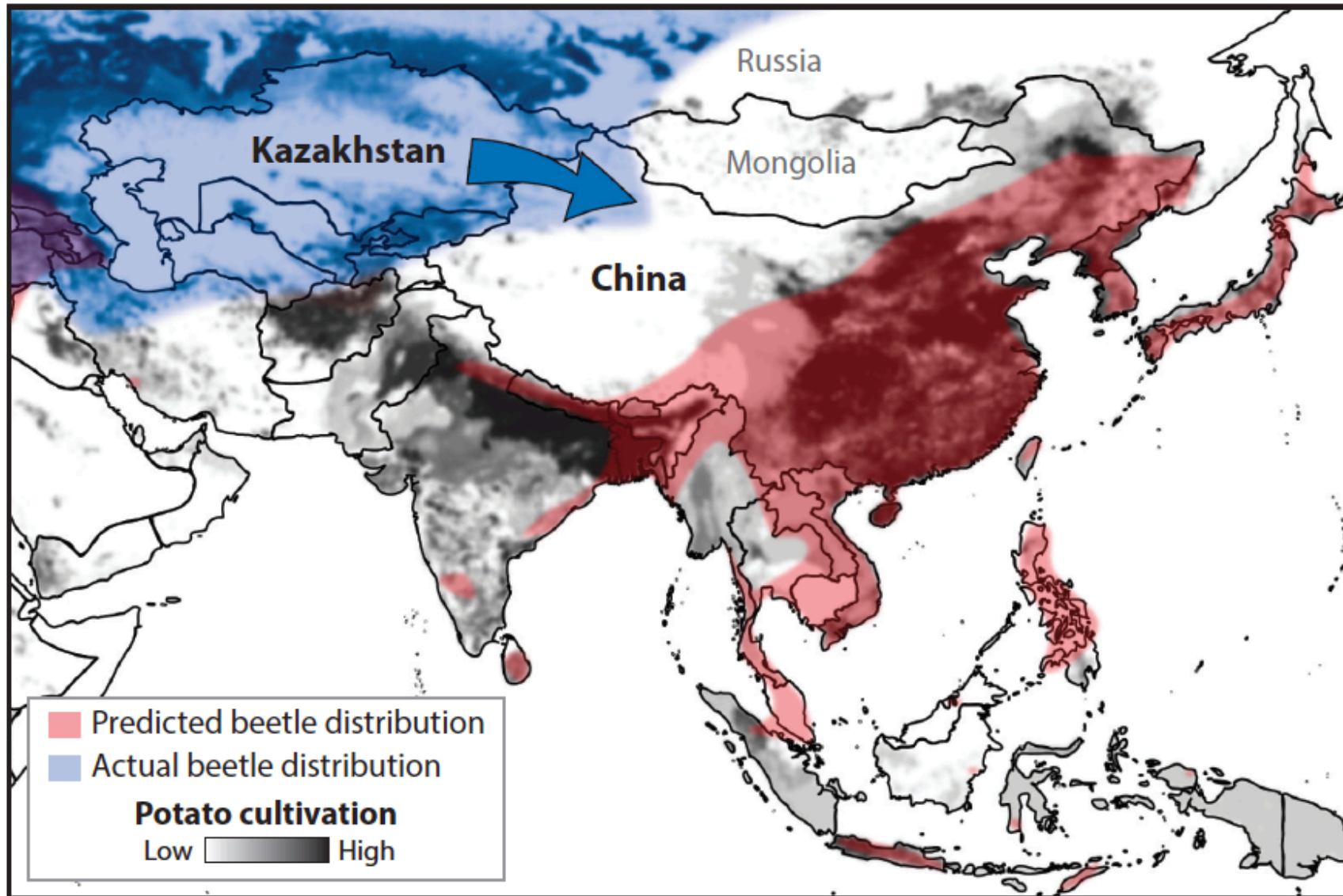
# 9. Don't forget the biotic niche



Barberry: alternative host for stem rust



# 10. Expect surprises



# Summary

1. Crop pests are spreading rapidly, especially fungi
2. Abiotic niche, biotic niche and migration determine distributions
3. Ranges should move polewards and mostly they do
4. Clear examples of poleward range shifts are rare
5. Pest distributions are a known unknown
6. Experiments can determine climate response
7. Climate data drive models
8. It's not always climate change
9. Environmental change also important
10. Expect surprises!