Climate change impacts on pollinators – risks in space and time

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Key messages

- Europe will undergo severe losses of many bee species by 2050.
- Bee shifts are likely to be more rapid than wildflower shifts – many flowers may lose their pollinators.
- Flowering plants and bee phenology may be diverging with major risks for perennial crops (e.g. orchards).

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Pollinators - key to world agriculture

Pollinators are essential for terrestrial ecosystem integrity with 80% of wild flowers and 75% of global crops dependent upon biotic pollination. The estimated value of pollination services to world agriculture is ~£120 billion p.a.

We are quantifying shifts in bee distributions under climate change and assessing whether recent climate change has resulted in phenological shifts in bee flight periods.

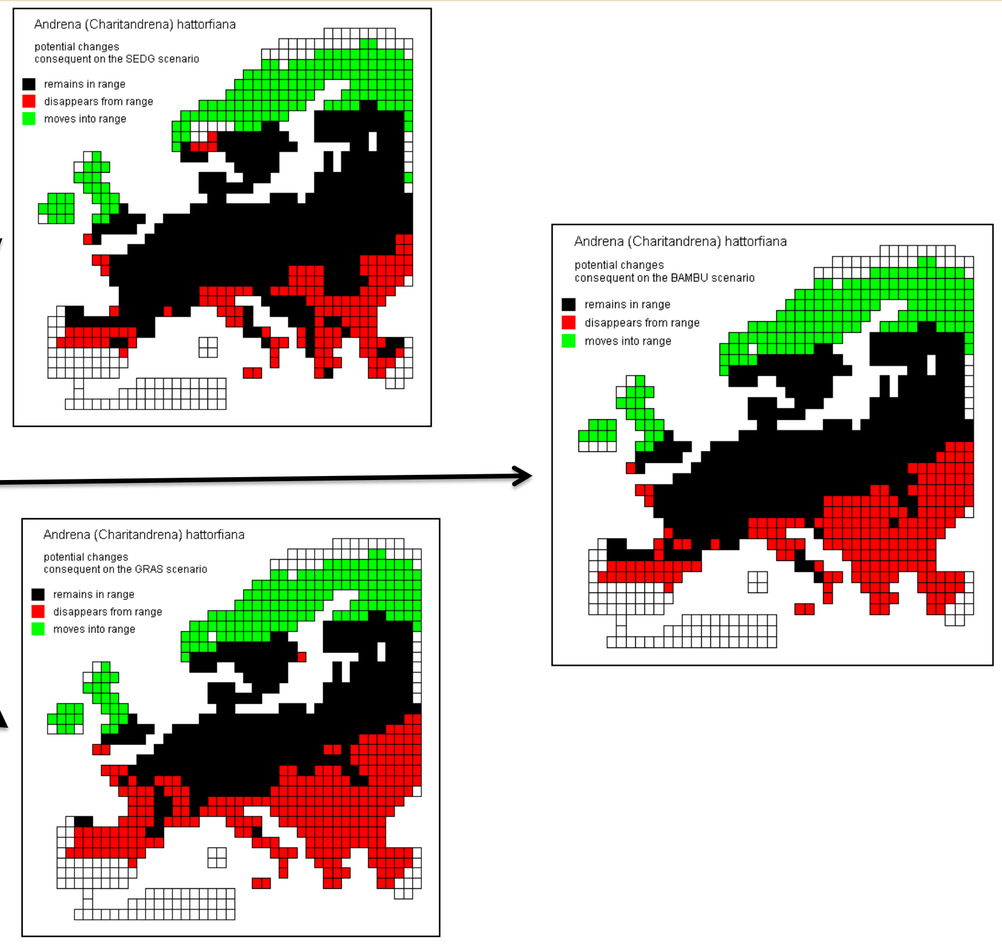
Andrena hattorfiana

Spatial shifts in pollinators

Using existing observational data we reconstructed the current distributions of 527 (~25%) of European bee species using Bayesian techniques. Future distributions (2050) were then modelled under three ALARM climate change scenarios:

- **SEDG**: Sustainable European Development Goal scenario. Focus on environmental, social and economic sustainability.
- **BAMBU**: Business-As-Might-Be-Usual scenario. Continuation of current socioeconomic and policies.
- **GRAS**: GRowth Applied Strategy scenario. Focus on economic growth driven by (neo-)liberal policies.

We calculated the net changes in the number of 1º x 1º grid cells occupied between current reconstructed and modelled distributions under each scenario. We classified changes in the number of cells for each species as: winners (net gain); losers (net loss); and extinct (total loss)



Temporal shifts in pollinators

For six UK bee species that pollinate a range of fruit crops, we estimated the start of the flight season and calculated the shift in phenology between 1970 to 2007. For blackcurrants we assessed the change in flowering phenology and that of an important pollinating bee for the same time period.

All bee six species showed a significant shift towards an **earlier start to activity of 6 to 10 days per decade** between 1970 and 2007. The flowering of blackcurrant and one of its pollinators has diverged by a month since 1970.