



MONARCH

The MONARCH (Modelling Natural Resource Responses to Climate Change) project has assessed the impacts of projected climate change on wildlife in the UK using a Climate Envelope Modelling approach (Walmsley et al., 2007). The variables used to define the current 'envelope'—and thus predict future changes in range—were soil water availability, growing degree-day, and temperature indices.

A cross-taxonomic approach was used and 32 species were analysed—all were Biodiversity Action Plan species (Section 11.4.2). These were selected to give a range of different ecological traits (diurnal/nocturnal, *r/K* strategist, etc.), as well as representing different taxa, as shown in Figure A. Of the 32 study species:

- **Six species (19%) were predicted to shift their entire range northwards:** all the species were rapidly dispersing species. Example: barbastelle bat *Barbastella barbastellus*.
- **15 species (47%) were predicted to gain in range through northward expansion:** all these species were primarily species currently in the south of the UK with

geographical scope to move northwards. Example: Adonis blue butterfly *Polyommatus bellargus*.

- **Eight species (25%) were predicted to contract in range due to southern contraction:** all these species were northern or upland species with little opportunity for northward expansion to compensate for southern contraction. Example: black grouse *Tetrao tetrix*.
- **Remaining three species (9%) were predicted not to change in range size or extent:** all these species had large climatic envelopes. Example: shepherd's-needle plant *Scandix pecten-veneris*.

REFERENCES

Walmsley, C.A., Smithers, R.J., Berry, P.M., Harley, M., Stevenson, M.J., & Catchpole, R. (Eds) (2007) *MONARCH: Modelling Natural Resource Responses to Climate Change—a Synthesis for Biodiversity Conservation*. Oxford: UKCIP.



Online Case Study 7 Figure A Example MONARCH species showing different responses to change. In order from left to right: barbastelle bat *Barbastella barbastellus*, Adonis blue butterfly *Polyommatus bellargus*, black grouse *Tetrao tetrix*, and shepherd's-needle plant *Scandix pecten-veneris*.

Source: Image of *Barbastella barbastellus* courtesy of C. Robiller/ Naturlichter.de/ CC BY-SA 3.0. Photograph of *Polyommatus bellargus* by Bernard Dupont, used under Creative Commons Attribution Licence CC BY-SA 2.0. Photograph of *Tetrao tetrix* by Francesco Veronesi, used under Creative Commons Attribution Licence CC BY-SA 2.0. Photograph of *Scandix pecten-veneris* by Don Loarie, used under Creative Commons Attribution Licence CC BY 2.0.