

The role of habitat heterogeneity in climate-proofing conservation: integrating effects of microclimate on population dynamics and local adaptation

Supervisors

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Project description

There is an urgent need to understand and predict where species will persist under climate change. Conventional bioclimate models neglect the capacity of local variation in habitat (topography and vegetation structure) to drive the regional dynamics and distributions of species through their effects on local adaptation and population dynamics. This project will combine empirical databases and modelling with field and experimental work to test the importance of habitat heterogeneity for the conservation of an exemplar system, butterfly species breeding in fragmented habitats in Britain. Remotely-sensed and ground-truthed vegetation information will be combined with fine-resolution microclimate models to develop composite maps of habitat and microclimate for the Brown Argus *Aricia agestis* and Silver-studded blue *Plebejus argus* in South-West England. Existing population monitoring databases will be used to test effects of modelled spatial and temporal variation in habitat and microclimate on the population dynamics of these species for the past three decades (see Bennie et al. 2013). The consequences for habitat use and local adaptation will be inferred using field sampling of egg-laying sites, and genome scans combined with association-based (Isolation-By-Adaptation) statistical approaches to identify signatures of evolutionary change (see Buckley et al. 2012). The ultimate aim will be to combine the information on habitat, population dynamics and local adaptation to model metapopulation dynamics for each species in the region (see Bennie et al. 2013) under scenarios of regional climate change, and thus to identify priority sites, habitat types, or landscapes for conservation. The supervisory team and project content will provide a new benchmark in terms of synthesis from fine-resolution biometeorological, ecological and evolutionary information to broad, regional extent species distributions, dynamics and conservation. The project will build on and contribute to collaborations among the Research Organisations and external partners in conservation organisations, providing a wide range of training opportunities both academically and in the field of conservation practice.

Bennie J, Hodgson JA, Lawson CR, Holloway CT, Roy DB, Brereton T, Thomas CD, Wilson RJ (2013) Range expansion through fragmented landscapes under a variable climate. *Ecology Letters* 16, 921-929.

Buckley J, Butlin R, Bridle J (2012) Evidence for evolutionary change associated with the recent range expansion of the British butterfly, *Aricia agestis*, in response to climate change. *Molecular Ecology* 21,267-280.