

# Impacts of climate change on wetland birds; from individual behaviour to population change

## Supervisors

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## Project description

Despite the wealth of studies describing how individual behaviour, ecology or life history is affected by climate variation, we still have a very limited understanding of how such individual phenotypic responses ultimately result in population change. This has largely been due to the lack of a theoretical framework for integrating individual responses to climate and linking these with demographic processes and population growth. Such a framework has recently been developed (Integral Projection Models -IPMs, Coulson & Smallegange 2013) which enables the impacts of climate change on populations to be predicted from the associations between environmental variables and a suite of individual parameters such as breeding phenology, fecundity, offspring growth and non-breeding behaviour. So far, IPMs have been applied to a few purely observational datasets in which animal populations have been perturbed by recent climate variations (e.g. Coulson 2012). However, a much more powerful approach would be to apply IPMs to systems that can also be perturbed by experimental manipulation of aspects of the environment (e.g. food availability) that we know to be strongly affected by climate. This experimental approach allows a wider range of environmental conditions to be investigated (beyond the current natural range of variability) and more clearly disentangles phenotypic plasticity from micro-evolutionary (selection-driven) responses. This project will use insectivorous wetland warblers as a highly tractable case-study system for which we already have extensive datasets (from a recently completed PhD, long-term bird ringing datasets, and ongoing work). This work has investigated how individuals respond to current conditions, including experimentally manipulated food availability as well as recent climate variability and natural fluctuations in food supply. The focus of this new PhD will be to combine further experimental and observational fieldwork, with modelling the data using the IPM framework, to understand the processes by which climate change drives behavioural, demographic and population change.

## References

Smallegange, I. M., & Coulson, T. 2013. Towards a general, population-level understanding of eco-evolutionary change. *TREE* 28: 1438.

Coulson, T. 2012. Integral projections models, their construction and use in posing hypotheses in ecology. *Oikos* 121: 1337-1350.