Models of species' population trends and climate change accounting for weather–related observation bias

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Understanding the impact of climate change on species' populations is important for conservation planning and understanding ecosystem service delivery. Establishing the true impacts of long term climate change on species population demographics requires sophisticated statistical methodology and careful interpretation. In this project, we will build on recent work by the project team that has developed distributed lag models to establish the influence of climate on species abundance indices. As many such indices are based on daily records, we propose to extend these lag models by inclusion of a detection function to account for weather-related observation bias, which could be highly significant for many species. Such bias could significantly confound the inference drawn from abundance models.

The key research questions the team will address are:

1) Can we develop methodology to assess the impacts of climate variability on species' abundance whilst controlling for potential weather-related sampling artefacts?

2) Can we use the methodology developed to investigate what the long term climatic influences have been on a range of moth species' (for which particularly high frequency data are available from the Environmental Change Network)?

3) Can we develop generic R code with potential to execute the methodology across a range of species' abundance indices, sites and taxonomic groups such that the approach could be adopted in a large research proposal?

Outcome

This project will:

1) foster continued collaboration between statisticians and environmental scientists working in a novel area of increasing environmental concern, and strengthen links between groups which will form a key research team in a larger funding application;

2) produce a peer-reviewed journal article describing the methodology, including: the derivation of population indices; inclusion of a detection function; and model of population trend against climate;

3) produce an R package or distributed R code associated with the journal article.