

A Bayesian Study of Ornithological Surveys

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Over recent years, there has been increasing concern relating to many wildlife species leading to surveys being undertaken to study many of these populations. We will focus on data typically collected on UK bird populations: survey data and ring-recovery data. Interest lies in estimating and quantifying population changes via easily interpretable statistics and identifying the factors that contribute to this changing population.

We consider a state-space approach to take into account that the survey data are only estimates of the population size and incorporate an underlying system process to describe the changing population size over time. We demonstrate the increased precision that can be obtained when jointly analysing survey data with ring-recovery data often available. In addition, we wish to discriminate between competing biological hypotheses, in order to explain the changes in population size over time. We consider a Bayesian approach and use reversible jump MCMC to simultaneously explore model and parameter space to obtain both parameter estimates and posterior model probabilities. The methods are applied to a real data set relating to the UK lapwing population and a variety of interesting results presented, including interpretable status estimates. Finally, we highlight a potential danger in the use of marginal posterior estimates.