

Heterogeneity in Integrated Population Modelling

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The recently introduced integrated population methods in ecology combine demographic and abundance information into a single analysis for improved estimates of population size and demographic rates. The methods are based on capture-recapture techniques and a state-space model that describes the abundance data and integrates the different types of survey information together. The state-space model used may be quite detailed, consisting of multiple state variables, but typically it would be based on underlying binomial and Poisson distributions to model the population transitions. These distributions however automatically imply that the population is homogeneous within each state, in terms of survival and productivity for example. We discuss how we may allow for individual heterogeneity in the modelling, by introducing heterogeneity in the state-space model, and also combining it with heterogeneity in an associated model for mark-recovery data. We illustrate the methodology by application to real data, and we draw attention to potential problems that might arise. We also investigate the performance of the methodology using simulation, and provide some general conclusions.