ESTIMATION OF BIRTHS DEATHS AND IMMIGRATION FROM MARK-RECAPTURE DATA

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The analysis of mark-recapture data is undergoing a period of development and expansion. Here we contribute to that by presenting a model which include both births and immigration, as well as the usual deaths. Data come from a long-term study of the willow tit (*Parus montanus*), where we can assume that all births are recorded, and hence immigrants can also be identified. We model the rates of immigration, birth rare per parent, and death rates of juveniles and adults. Using a hierarchical model allows us to incorporate annual variation in these parameters. The model is fitted to the data using MCMC, as a Bayesian analysis.

In addition to the model fitting, we also check several aspects of the model fit, in particular whether survival varies with age or immigrant status, and whether capture probability is affected by previous capture history. The latter check is important, as independence of capture histories is a key assumption that simplifies the model considerably. Here we find that the capture probability depends strongly on whether the individual was captured in the previous year.

Our work moves MRR modelling closer to a description of the dynamics of the whole population, with the obvious potential for prediction, and use in making decisions about population management.