INTEGRATED MODELLING OF BIRD POPULATIONS – THE VALUE OF DIRECT MEASURES OF RECRUITMENT

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ABSTRACT: Integrated Population Models allow optimal inferences about population processes where there are measurements of abundance and one or more demographic rates for the same population. However, in many such models one or more demographic components cannot be estimated directly, and must therefore be estimated by inference from other demographic rates. Such indirect estimates may reflect biases in the data sets included in the model, in addition to information on the parameter of interest.

Many of these problems can be addressed by measuring recruitment into the breeding population directly and we explore two approaches to obtaining such estimates for bird populations. First, where all birds born in the previous breeding season can be separated from older birds using plumage characteristics, it is possible to obtain a direct measure of recruitment (the inventory method). Second, where breeding season mark-recapture data are available, as in the case of Constant Effort Sites, it is possible to estimate recruitment from an analysis of reverse capture histories (the Pradel method). We use both approaches to obtain estimates of annual recruitment for European blackbirds (*Turdusmerula*) breeding in southern Britain.

We construct initial Integrated Population Models for blackbird populations incorporating estimates of relative abundance from large-scale census data (Common Birds Census/Breeding Bird Survey) with data on breeding performance from the Nest Record Scheme and age-specific survival estimates from ring recoveries. Results from these relatively standard models are compared with those from models where recruitment is estimated using either the inventory method or the Pradel method. The models are developed within a state-space framework with parameters and credible intervals being estimated using Bayesian MCMC techniques. Direct recruitment measures are expected to provide improved inferences about population processes and the potential for collecting such data should be taken into account when designing large-scale demographic monitoring schemes.