



Original Articles

Suggestions for future directions for studies of marked migratory landbirds from the perspective of a practitioner in population management and conservation

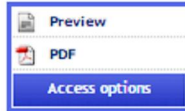
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Significant population declines in landbird species have been documented recently from many areas of the earth, including Europe and North America. Identification of the major causes of these declines and effective management actions to reverse them is difficult, especially for populations of long-distance migrants that winter in tropical areas. Key-factor and sensitivity analyses of critical population parameters in the context of integrated population models provide one promising approach to solving these problems. Key population factors may include breeding productivity, first-year survival, recruitment of young, adult survival and permanent emigration of adults; each of these can be indexed or estimated using data from cooperative ringing programmes, but the usefulness of the indices or estimates is limited by deficiencies in the available data and limitations of the available models. Future methodological directions for ringing studies should include efforts to: (1) develop and implement techniques to distinguish young from adult birds through the first breeding season of the young birds; (2) implement radio-tracking to determine characteristics of dispersal of young birds and transient adults; and (3) implement increased ringing, DNA fingerprinting and stable-isotope analysis to determine correspondence of breeding and winter ranges. Future programme-related directions should include efforts to: (1) integrate multiple methods at individual sites to compare and validate the indices and estimates produced by the different methods; (2) develop cooperative programmes of winter-season mist-netting to generate mark-recapture data to estimate the seasonal components of survival; and (3) develop mutually compatible banding programmes in tropical countries. Future theoretical and analytical directions should include efforts to continue to develop, refine and utilize: (1) key-factor and sensitivity analyses to determine the major causes of population changes; (2) models for dispersal of young birds and transient adults to improve the usefulness of indices of the number of hatch-year and second-year birds; (3) models to determine the proportions of transients in Cormack-Jolly-Seber (CJS) mark-recapture analyses and to eliminate their effects on estimates of survival rate, population size and recruitment of residents; (4) integrated models of population processes that utilize data from multiple methods to provide estimates of first-year survival, recruitment rate of young and permanent emigration rate of adults, parameters that are difficult to obtain from a single method; (5) models to estimate seasonal components of survival to provide insights into the timing and causes of mortality; (6) models incorporating environmental variables and species-specific characteristics as covariates in CJS mark-recapture and key-factor analyses; (7) models for pooling and weighting data obtained from multiple sites in cooperative ringing projects; (8) models for identifying long-term trends in demographic parameters; and (9) techniques for selection of appropriate models. Finally, assumptions implicit in the use of indices of various demographic parameters need to be tested and field techniques need to be improved to increase the numbers of individuals marked and recaptured in order to allow more precise parameter estimation; this will increase the ability to test competing hypotheses of population dynamics from data gathered in ringing programmes.