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Abstracts

SPECIAL SECTION: HIERARCHICAL MODELS IN AVIAN ECOLOGY

A HIERARCHICAL MODEL FOR REGIONAL ANALYSIS OF POPULATION CHANGE USING CHRISTMAS BIRD COUNT DATA, WITH APPLICATION TO THE AMERICAN BLACK DUCK

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Abstract. Analysis of Christmas Bird Count (CBC) data is complicated by the need to account for variation in effort on counts and to provide summaries over large geographic regions. We describe a hierarchical model for analysis of population change using CBC data that addresses these needs. The effect of effort is modeled parametrically, with parameter values varying among strata as identically distributed random effects. Year and site effects are modeled hierarchically, accommodating large regional variation in number of samples and precision of estimates. The resulting model is complex, but a Bayesian analysis can be conducted using Markov chain Monte Carlo techniques. We analyze CBC data for American Black Ducks (*Anas rubripes*), a species of considerable management interest that has historically been monitored using winter surveys. Over the interval 1966–2003, Black Duck populations showed distinct regional patterns of population change. The patterns shown by CBC data are similar to those shown by the Midwinter Waterfowl Inventory for the United States.

Key words: *Anas rubripes, Bayesian, Christmas Bird Count, count data, hierarchical models, Markov chain Monte Carlo.*