Ecology Appendix S2
Simulation study accompanying the paper: *Modeling abundance, distribution, movement, and space use with camera and telemetry data*

Richard B. Chandler[1,*], Daniel A. Crawford[2], Elina P. Garrison[3], Karl V. Miller[1], Michael J. Cherry[2]

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[1] Warnell School of Forestry and Natural Resources, University of Georgia

[2] Caesar Kleberg Wildlife Research Institute at Texas A&M University-Kingsville

[3] Florida Fish and Wildlife Conservation Commission

[*]Corresponding author: rchandler@warnell.uga.edu

Introduction and Methods

We conducted a small simulation study to evaluate the performance of the spatial capture-recapture model with an explicit movement process described in the manuscript. The design and parameter values were chosen to resemble the estimates from the deer example in the manuscript. A uniform capture process was simulated to resemble aerial capture and transmitter deployment. The camera design in the simulation study was the same as in the deer example, with 60 cameras spaced by 200–500 m. We simulated 90 occasions and used a fix rate of 1 location every 3 occasions. Parameters (defined in the manuscript) were $N = 100$, $p^{\text{cap}} = 0.25$, $\lambda_0 = 2$, $\sigma^{\text{det}} = 50$, $\sigma^{\text{move}} = 600$. We considered 5 scenarios in which the autocorrelation parameter (ρ) of the Ornstein-Uhlenbeck movement model was assigned values: 0.55, 0.65, 0.75, 0.85, and 0.95.

For each scenario, we simulated 100 datasets and fit both the data generating model (SCR-move) and a mis-specified SCR model (SCR0) with no movement process. Inference was made using 10,000 MCMC samples from the joint posterior following a 2,000 iteration burn-in. Code to reproduce the simulation study can be found at `https://github.com/rbchan/scr-move/R/sims`.

Results and Discussion

The number of individuals captured and outfitted with telemetry devices ranged from 13–35 in the simulated datasets. As with the deer example, only a small fraction (ranging from 0–10) were detected by cameras.

Bias was reduced in all 5 cases when switching from the SCR0 model to the SCR-move model (Figure S1). Improvement in bias ranged from 2–6%. Bias of the SCR+move model was $\leq 2\%$ for the first two scenarios. For the other three scenarios (with $\rho =$0.75, 0.85, and 0.95), bias of the SCR+move model was 5–8%, although some of this was likely attributable to Monte Carlo error resulting from the small number of simulated datasets. Coverage of 95% credible intervals was close to 0.95 for the SCR+move model in all scenarios and was better than the SCR0 model (Figure S1). Variance of the estimator was greater for the SCR+move model than for the mis-specified SCR0 model.

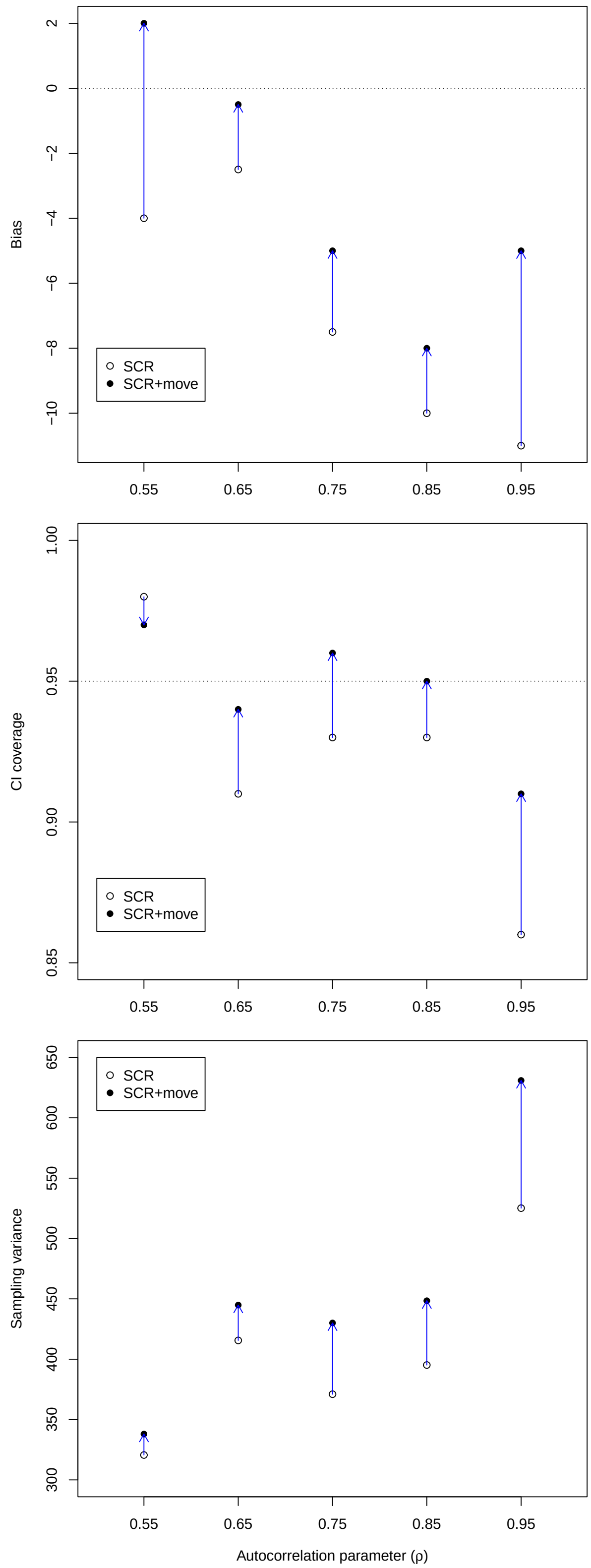

Figure S1. Bias, 95% CI coverage, and variance of the posterior mode as a point estimator of population size (N) under five values of the parameter ρ controlling autocorrelation in movement. The data generating value of abundance was $N = 100$.