

Does Incorporating Habitat Selection Improve Viewshed Density Estimates Using Camera Traps?

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Camera traps have great potential as a data collection tool to estimate population size of unmarked wildlife populations. Different methods have been developed for unmarked population size estimation, but their performance depends on meeting design requirements and model assumptions. If spatial variation in local abundance is captured by collective viewshed of camera traps, theoretically density estimates can be obtained by relating animal detections to the space sampled by each camera's viewable area. To obtain reliable estimates across the total sampling area, camera locations need to be representative of the study area, so that extrapolating viewshed estimates to the total sampling area is justifiable. This assumption can be met with stratified random sampling, where the full range of population density or the underlying habitats that drive it is sampled proportional to their use. However, random placement of cameras is not favored by practitioners or may be even prohibited in hard-to-access locations. We used simulations and conducted a multi-season camera trapping and GPS telemetry study of a fenced population of white-tailed deer in Wisconsin to demonstrate and evaluate a new approach to account for unmodeled spatial variation in local abundance using the instantaneous sampling estimator. We showed negligible gains by incorporating predicted habitat use into viewshed density estimates. Specifically, weighting density estimates by habitat selection analysis did not reduce bias, but it reduced precision. We discuss our findings and focus on tradeoffs in following randomized sampling designs versus calibration of the estimates using auxiliary information in camera-based abundance studies of unmarked populations.