Abstract:

Population estimation is essential for the conservation and management of fish and wildlife, but accurate estimates are often difficult or expensive to obtain for cryptic species across large geographical scales. Accurate statistical models with manageable financial costs and field efforts are needed for hunted populations and using age-at-harvest data may be the most practical foundation for these models. Several rigorous statistical approaches that use age-at-harvest and other data to accurately estimate populations have recently been developed, but these are often dependent on (a) accurate prior knowledge about demographic parameters of the population, (b) auxiliary data, and (c) initial population size. We developed a two-stage state-space Bayesian model for a black bear (*Ursus americanus*) population with age-at-harvest data, but little demographic data and no auxiliary data available, to create a statewide population estimate and test the sensitivity of the model to bias in the prior distributions of parameters and initial population size. The posterior abundance estimate from our model was similar to an independent capture-recapture estimate from tetracycline sampling and the population trend was similar to the catch-per-unit-effort for the state. Our model was also robust to bias in the prior distributions for all parameters, including initial population size, except for reporting rate. Our state-space model created a precise estimate of the black bear population in Wisconsin based on age-at-harvest data and potentially improves on previous models by using little demographic data, no auxiliary data, and not being sensitive to initial population size.

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