Integrated population modeling of American black bears: An application of robust-design spatial capture-recapture combined with mark-recovery and recruitment

D.W. Linden[a] and **S.T. McKinney**[b]

[a]Maine Cooperative Fish and Wildlife Research Unit,
Department of Wildlife Ecology,
University of Maine
Orono, ME 04469, USA
daniel.linden@maine.edu

[b]U.S. Geological Survey,
Maine Cooperative Fish and Wildlife Research Unit,
Department of Wildlife Ecology,
University of Maine
Orono, ME 04469, USA
shawn.mckinney@maine.edu

Abstract: Since 1975, a monitoring program for American black bears (*Ursus americanus*) in Maine, USA, has closely followed several local populations with summer live trapping and winter den visits of radio-collared females. The various field efforts, in conjunction with tag returns from hunter harvest, produce data that can be used to jointly estimate demographic parameters and population dynamics with an integrated modeling approach. We present an integrated population model that combines robust-design spatial capture-recapture and mark-recovery data with individual offspring production and survival to take full advantage of the information available from the bear monitoring program. Our model takes a Bayesian approach to parameter estimation and uses data augmentation to facilitate incorporation of individual covariates such as sex and age. We use data simulations to explore model limitations under realistic sample sizes. We discuss challenges associated with a sampling rotation between study locations for some surveys and the handling of orphaned young in the estimation of population recruitment.