Fully-spatial capture-recapture models

In this chapter we investigate the basic spatial capture-recapture model, which we refer to as “model SCR0”. The model is a hierarchical model composed of two conditionally-related components: (1) a spatial point process describing the number and location of animal activity centers and (2) an observation model specifying capture or encounter probability as a function of the distance between activity centers and traps. As with all models, it includes several assumptions that must be understood and critically evaluated. The assumptions of a model and its properties can be studied by simulating data, and we provide some basic tools for doing so in **R**. The chapter also focuses on practical issues such as basic sampling designs and how to format the resulting data. For inference, we focus on Bayesian methods using Markov chain Monte Carlo and cover likelihood methods in the next chapter. To conduct the Bayesian analysis, we rely heavily on data augmentation, which is explained in some detail. An example analysis is presented using wolverine data collected in southern Alaska. This example is used to demonstrate how to summarize posterior output for the purposes of producing posterior density maps and computing derived quantities such as the effective sample area.

Keywords: Bayesian inference, data format, observation model, sampling design, spatial point process,