Ch15: Search-encounter models

In search-encounter surveys, space is not sampled using fixed devices such as camera traps, but instead, space is actively searched, for example along randomly placed linear transects, or by systematically searching a plot. Such surveys allow us to observe individual locations independent of detector locations, thus allowing us to separate the animal movement component from the observation-by-distance component of the observation process.

For searches along fixed search paths, the probability of detecting an individual will depend on some distance metric between the animal’s location during sampling and the search path. Because detections do not occur at a point but along a line, the detection model has to describe the total encounter probability induced by the line, also referred to as the ‘total hazard to encounter’. Separately from the detection model, we need a model that describes the locations of individuals as movement outcomes, for example, conditional on their activity centers. Other variations of this design, such as unstructured sampling where survey paths have not been defined a priori, are briefly discussed.

A second common design is that of uniform search intensity over some quadrat. In that case, the probability of encounter of an individual is constant if the individual is within the polygon during sampling.

For both design types, we present how to simulate and analyze data and present some example analyses. Additionally, we discuss some alternative individual movement models and discuss some consideration of how to analyze search-encounter designs with partial information, for example, when the search path was not recorded.

Considering the constant improvement of noninvasive genetic sampling techniques the importance of search-encounter methods for population monitoring is bound to increase.

Key words: distance sampling, noninvasive genetic sampling, fixed search path, area search, total hazard, movement model, unstructured spatial survey