A clean, crafty, rapid approach to cluster capture-recapture

Cluster capture-recapture (CCR) describes a new suite of models for capture-recapture scenarios in which animal detections can be conceptualised as a point process in time or space. Instead of organising detections into capture histories, which can be a laborious and error-prone process, the CCR approach is to model the stream of detections as a clustered point process. Although repeated detections of the same individual will tend to cluster together, there is no need to decide upon an explicit clustering in order to estimate process-level parameters such as abundance. CCR is a promising method for estimating abundance from camera traps, acoustic recorders, and mark-recapture distance sampling surveys.

Up until now, CCR models have been fitted using an ad-hoc approach called the Palm likelihood method. This is not a true likelihood but simply a convenient objective function for fitting a parametric curve to the histogram of all pairwise distances between detections. The Palm method can be cumbersome to formulate and apply, and lacks the modelling flexibility that a true likelihood framework would offer.

Although the exact likelihood is intractable, recent work has turned up a promising approximation to the true likelihood. A genuine likelihood approach would greatly enhance the CCR framework, eliminating the need for awkward tuning parameters and enabling much greater flexibility in modelling and model selection. I will discuss the potential for reinventing CCR as a clean, crafty, rapid method based on a close approximation to the true likelihood.