On the efficiency and heterogeneity of time-to-detection occupancy models

Time-to-detection data contains information on the observation process and is usually regarded to lead to better inference about occupancy. We explore the gain in efficiency obtained from time-to-detection data and show that the time-to-detection occupancy model has a significant benefit for estimating the parameters related to the detection probability. However, for the estimation of the occupancy probability parameter, the efficiency improvement is generally very minor.

We further extend the standard used exponential time-to-detection model to account for detection heterogeneity.

We propose a mixed exponential time-to-detection occupancy model that can be viewed as the result of a mixed Poisson process. The model takes analogous flexibility of the negative binomial regression model for count data analysis. Moreover, the results obtained by analyzing 63 bird species data from the Karoo region of South Africa show it is generally more suitable than conventional methods. Finally, we also investigate the effects of ignoring the heterogeneity of detection intensity in the time-to-detection model. This is a joint work with Dinusha Priyadarshani, Res Altwegg, and Alan T.K. Lee.