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Likelihood Analysis of Distance Sampling Data

In distance sampling (DS), one or more observers traverse parallel transect lines placed across the region, and observe animals or plants and their perpendicular distance from the transect line. The detection rate can be modelled as a decreasing function of distance, thereby allowing estimation of the abundance N allowing for imperfect detection. The method relies on assumptions that (i) detection is perfect at zero distance, and (ii) that objects' distances to the nearest transect line are (at least approximately) uniformly distributed. The method is very used in ecology, but has been criticised for its assumptions, particularly for the claim that (ii) is induced by the use of systematic or random transect placement. This talk describes work to put DS on firmer ground, by showing that the usual DS estimator is the maximum likelihood estimator under a plausible although far from perfect model. However, simulation shows that in many cases, most of the information in the data is used to estimate the detection parameters. As a result, much simpler designs and estimators using only nearby detections do surprisingly well. The work is also interesting as it is an example of maximum likelihood analysis of survey data, applied to an ecological problem with unknown population

Bio:

Robert has been an academic at NIASRA (and predecessor) since 2004. Prior to that he was a Director in the ABS Methodology Division. He has been the advisor on sample design for the NZ Health Survey since 2006, where he has developed new sample designs for sampling Maori and other populations in NZ. His research projects include survey sample design and analysis, environmental and ecological sampling and analysis, multilevel and spatial models and small area estimation.