Estimating abundance from occurrence data

W.H. Hwang[a] and **R. Huggins**[b]

[a] Institute of Statistics
National Chung Hsing University
Taichung, Taiwan
wenhan@nchu.edu.tw

[b]Department of Mathematics and Statistics
The University of Melbourne
Melbourne, Australia
rhuggins@unimelb.edu.au

Abstract

The estimation of abundance from presence absence data is an intriguing problem in applied statistics. It can be viewed as an extension of the inverse birthday problem, which makes independence and random placement assumptions about the abundances. However, when applied in practice the random placement approach generally results in underestimation. We present an alternate estimator based on a simple paired negative binomial model. The proposed estimator is shown to be consistent and asymptotically normally distributed. In addition, a quadruple negative binomial version of the model is developed, which resolves a controversial issue in the literature. We examine the performance of the estimator in a simulation study and by estimating the abundance of 44 tree species in a permanent forest plot where the actual abundance is known.