



# *Mathematical Biology Seminar*



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## **Likelihood based Population Viability Analysis in the presence of observation error**

Population viability analysis (PVA) entails calculation of extinction risk, as defined by various extinction metrics, for a study population. These calculations strongly depend on the form of the population growth model and inclusion of demographic and/or environmental stochasticity. Form of the model and its parameters are determined based on observed population time series data. A typical population time series, consisting of estimated population sizes, inevitably has some observation error and likely has missing observations. In this paper, we present a likelihood based PVA in the presence of observation error and missing data. We illustrate the importance of incorporation of observation error in PVA by reanalyzing the population time series of song sparrow (*Melospiza melodia*) on Mandarte Island, British Columbia, Canada from 1975-1998. Using Akaike information criterion we show that model with observation error fits the data better than the one without observation error. The extinction risks predicted by with and without observation error models are quite different. Further analysis of possible causes for observation error revealed that some component of the observation error might be due to unreported dispersal. A complete analysis of such data, thus, would require explicit spatial models and data on dispersal along with observation error. Our conclusions are, therefore, two-fold: i) observation errors in PVA matter and ii) integrating these errors in PVA is not always enough and can still lead to important biases in parameter estimates if other processes such as dispersal are ignored.