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A continuous time version and a generalization of a Markov-recapture model for trapping experiments

Abstract: Wileyto et al. (1994) propose a four-state discrete time Markov process, which describes the structure of a marking–capture experiment as a method of population estimation. They propose this method primarily for estimation of closed insect populations. Their method provides a mark–recapture estimate from a single trap observation by allowing subjects to mark themselves. The estimate of the unknown population size is based on the assumption of a closed population and a simple Markov model in which the rates of marking, capture, and recapture are assumed to be equal. Using the one step transition probability matrix of their model, we illustrate how to go from an embedded discrete time Markov process to a continuous time Markov process assuming exponentially distributed holding times. We also compute the transition probabilities after time t for the continuous time case and compare the limiting behavior of the continuous and discrete time processes. Finally, we generalize their model by relaxing the assumption of equal per capita rates for marking, capture, and recapture. Other questions about how their results change when using a continuous time Markov process are examined.

References:
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