Generalized linear models, generalized additive models and generalized estimating equations to capture-recapture closed population models

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Abstract: Estimation of animal population parameters is an important issue in ecological statistics. In this paper generalized linear models (GLM), generalized additive models (GAM) and generalized estimating equations (GEE) are used to account for individual heterogeneity, modelling capture probabilities as a function of individual observed covariates. The GEE also accounts for a correlation structure among capture occasions. We are interested in estimating closed population size, where only heterogeneity is considered, there is no time effect or behavioral response to capture, and the capture probabilities depend on covariates. A real example is used for illustrative purposes. Conditional arguments are used to obtain a Horvitz-Thompson-like estimator for estimating population size. A simulation study is also conducted to show the performance of the estimation procedure and for comparison between methodologies. The GEE approach performs better than GLM or GAM approaches for estimating population size. The simulation study highlight the