169

Genetic Mark-Recapture Methods for Estimating Seasonal River Run Size of Stock Populations

Genetic mark-recapture (GMR) is a statistical technique used in estimating population size in ecology. By combining genetic data on the relative abundance of species from a sample with population counts obtained for only some of the species, GMR allows the estimation of the total population size and the contributions of each species. The current method is based on the Lincoln-Petersen estimator and provides an asymptotically unbiased estimate for the total population size. However, the variance estimator does not account for the uncertainty in the sampling process of the genetics data. As a result, this approach can suffer from a significantly underestimated variance, especially when the relative proportions in the genetic sample differ from those in the population. In this work, we propose a novel Bayesian GMR framework to address this issue. The Bayesian framework can explicitly incorporate the sampling error in the genetic sample and lends itself nicely to combining additional sources of data into a single model, such as capture-recapture data or telemetry data, which are also frequently used to estimate population size. The effectiveness of the new method is investigated via simulation studies and used to estimate the abundance of Sockeye Salmon in the Taku River.