

Is heterogeneity of catchability in capture–recapture studies a mere sampling artifact or a biologically relevant feature of the population?

Laurent Crespin, Rémi Choquet, Mauricio Lima, Joseph Merritt, Roger Pradel

Abstract

The heterogeneity of catchability (HC) among the individuals encountered during a capture–recapture study has long been regarded as a liability. However, heterogeneous capture probabilities may reflect interesting but hidden features of the population, such as social status. The difficulty is to distinguish between this intrinsic heterogeneity and the extrinsic heterogeneity induced by the study itself. So far, population ecologists have not been able to distinguish between these two sources of variation in capture heterogeneity because, in the presence of heterogeneity of capture in the data, they have frequently used a too simple approach. This traditional approach, which consists of incorporating two common sources of lack of fit (transience and trap-dependence), does not directly model the HC and thus cannot investigate its biological meaning. In this context, we propose, for open populations, to directly model the HC by employing multievent models. Multievent models make it possible to break HC into two classes of catchability viewed as uncertain states. With the introduction of a coefficient of heterogeneity to model proportional probabilities of capture over time in the two classes, our approach allows the investigation of HC in a parsimonious way. In this paper, we apply both this new approach and the traditional approach to a long-term data set of male deer mice *Peromyscus maniculatus*. We then compare 13 candidate models separately for each approach. Our results indicate that the new approach is superior to the traditional approach.