Towards the Development of a More Accurate Monitoring Procedure for Invertebrate Populations, in the Presence of an Unknown Spatial Pattern of Population Distribution in the Field.

Natalia Petrovskaya[1], Emily Forbes[2], Sergei Petrovskii[3], Keith FA Walters[2]

[1] School of Mathematics, University of Birmingham, Birmingham, UK
[2] Harper Adams University, Newport, Shropshire, UK
[3] Department of Mathematics, University of Leicester, Leicester, UK

Abstract

Studies addressing many ecological problems require accurate evaluation of the total population size. In this paper, we revisit a sampling procedure used for the evaluation of the abundance of an invertebrate population from assessment data collected on a spatial grid of sampling locations. We first discuss how insufficient information about the spatial population density obtained on a coarse sampling grid may affect the accuracy of an evaluation of total population size. Such information deficit in field data can arise because of inadequate spatial resolution of the population distribution (spatially variable population density) when coarse grids are used, which is especially true when a strongly heterogeneous spatial population density is sampled. We then argue that the average trap count (the quantity routinely used to quantify abundance), if obtained from a sampling grid that is too coarse, is a random variable because of the uncertainty in sampling spatial data. Finally, we show that a probabilistic approach similar to bootstrapping techniques can be an efficient tool to quantify the uncertainty in the evaluation procedure in the presence of a spatial pattern reflecting a patchy distribution of invertebrates within the sampling grid.