On Numerical Uncertainty in Evaluation of Pest Population Size

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Abstract

Obtaining reliable estimates of pest insect species abundance is an essential part of ecological monitoring programs. It is often the case that data available for obtaining such estimates are sparse which in turn makes achieving an accurate evaluation difficult. This is especially true for strongly heterogeneous pest population density distributions. In our paper we discuss the accuracy of a mean density estimate when a certain class of high aggregation density distributions is considered and a standard statistical method is employed to handle sparse sampled data. It will be shown in the paper that conventional conclusions about the accuracy of the pest population size evaluation do not work when the data are sparse and a new approach is required. Namely, if the number of traps is small, an estimate of the mean density becomes a random variable with a high magnitude and we have to compute the probability of an accurate estimate rather than computing the estimate itself. We have obtained a probability of an accurate estimate based on the assumption that only one trap falls within a sub-domain where the pest population density is different from zero. The probability has been calculated for the one-dimensional and the two-dimensional problem.

Keywords: pest monitoring, sparse data, mean density, single peak

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