

Large-scale monitoring of rare and elusive species combining capture-recapture with detection/non-detection data

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Abstract: In the context of global species decline, the set-up of robust large scale monitoring is a central matter for any conservation or management purpose. The well-known problem of imperfect detection of a species which results in biased estimates of population parameters has been intensively studied over the last decades. However, while flexible and powerful statistical methods have recently been proposed for common and/or easily detectable species, they are of limited use when facing rare species with low and heterogeneous detection probability among sites. Here we introduce a double sampling strategy to estimate local abundance at a large number of sites. The method is based on two types of information: capture-recapture data at a particular site that is used to estimate the individual detection probability r ; and repeated detection/non-detection data at any other site i to estimate the conditional – on abundance – probability of detecting the species at this site, noted p_i . The abundance N_i at any site i is given by the relation $p_i = 1 - (1 - r)^{N_i}$ (Royle and Nichols, 2003) and is easily calculated. We assessed the relevance of our approach using a regional scale monitoring dataset of the Orsini's viper, an extremely rare and elusive species. Using a large number of simulations we also explored how this approach performed compared to Royle N-mixture model (2004) for very low values of individual detection probability. The method and codes were developed in both frequentist and bayesian framework. We eventually sketched two examples of field protocols that could easily be applied to other situation such as monitoring of large mammals or birds.

References

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