

A new N-mixture model for estimating population sizes of interacting species

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Abstract: Among the factors involved in the decline of endangered species, competition with alien species was rarely studied in natural environments, probably because investigating co-occurrence patterns of species is difficult. Potential problems of empirical approaches include the reliance on population estimates at a single time point, the difficulty to properly account for imperfect detection and for habitat changes over time. Recently, however, some authors proposed promising methods to study species occurrence and co-occurrence patterns based on site-occupancy models using presence-absence data (Miller et al. 2012, Cayuela et al. 2013). In our study, we took those methods one step further by including population counts of interacting species. Based on N-mixture models, we developed an approach to estimate true population sizes of interacting species. In our model, the population size of one species is assumed to depend on the true population of a second species, but the population size of the second species is not assumed to depend on the population size of the first species. In contrast, detection probabilities for both species are assumed to depend on the true population size of the other species. We demonstrate the performance of our method using simulated data and applied it to data from a long-term monitoring program on amphibians from Switzerland.

References

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