

New models for reptile and amphibian removal data

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Abstract: Removal experiments involve successively sampling a closed area for particular animal species and each time removing those individuals found. The objective is to estimate the number of animals in the area, and probability models date from Moran (1951) and Zippin (1956). These removal models result in geometric declines of expected numbers of individuals in the area as time progresses and the removals take place. When removals are conducted on cryptic species, such as reptiles and amphibians, the animals removed on one sampling occasion may be replaced by other individuals which might have previously remained undetected below ground. In these cases more complex models are needed to account for the apparent appearance of new animals in the study area.

We are motivated by removal data on slow worms, *Anguis fragilis*, common lizards, *Zootoca vivipara*, and Great crested newts, *Triturus cristatus*. These protected species are frequently removed from the path of development. In some cases there are known reductions to the site area available following removals. In others such information is not available, and stop-over models are instead employed; see Matechou et al (2013). In all illustrations it is possible to undertake model selection, and much improved descriptions of data are obtained, with associated estimates of population size. The use of both classical and Bayesian methods of inference will be illustrated, in the latter case using RJMCMC.

References

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