

A multi-method multi-species occupancy study with adaptive sampling of a small mammal assemblage

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Abstract: In multi-species occupancy studies one often has a choice of methods to detect the presence of different species at distinct sites. Some methods may be inexpensive in terms of effort, but may not give unambiguous information about what species is being detected. Other methods may require more effort but give precise information about the species. Some methods may yield false positives, while other methods will not. Detection probabilities for given methods may also vary greatly among species.

We here present a multi-method occupancy study with adaptive sampling on an alpine assemblage of small mammals (6 species) that shows large fluctuations in community structure, abundances and distributions among seasons and years. At the first sampling-stage we employed surveys by the use of dogs and tracking slides at all sampling sites. These relatively inexpensive methods have a high detection rate, but seldom yield information about the species being detected. At the second sampling-stage, we used live-traps and camera-traps which usually give unambiguous species information. As these methods are more costly, we prioritized sampling the sites where occupancy was confirmed in the first sampling stage. In addition to gaining efficiency by adaptive sampling, we gain information about the occupancy probability of all species by using several methods, compared to single-method approaches. For example, lemmings, unlike the other small mammals, seldom enter live-traps, but are readily detected by the general methods. Hence, a site where an unspecified mammal has been detected, but no mammals were caught in the live-traps, is likely occupied by lemmings. In addition, our multi-species approach enables us to account for the possibility of false positives by some methods (detections by dogs were classified as either a certain detection of a certain species, a certain detection of an uncertain species, or an uncertain detection of an uncertain species).