

SOME USES FOR MIXED MODELS IN ECOLOGY

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Careful modelling of unexplained variation (the so-called random effects) is a pre-requisite to making valid inferences about the deterministic components (the so-called fixed effects) of any model. In ecology, we encounter a wide range of random effect models, depending on whether correlations are induced by space, time or other aspects of population structure. The features of interest are usually the fixed effects themselves, but this is not always so: for example, it is the variances of random effects that are central to power calculations, whilst some ecological hypotheses are expressed in terms of variances. I will describe a number of applications I have been involved in developing with statistical and ecological collaborators, and discuss some of the issues raised. The applications I intend focussing on involve: partitioning of overdispersion in a generalised linear mixed model for overdispersed counts of ticks on grouse chicks; modelling variance-diversity relationships to test the hypothesis that increased diversity leads to increased stability (and hence lower variance); smoothing sequences of regression coefficients that arise when relationships with weather variables are not constrained to be constant across time; comparing power calculations performed using competing models for unexplained variation, and assessing the consequences of treating variance estimates as known in power calculations.