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Some Perspectives on Modeling Species Distributions (Comment on article by Gelfand et al.)

Jennifer A. Hoeting*

I'd like to congratulate the authors for their important contributions to the study of species distributions. This paper and the authors' other publications that have resulted from this research clearly demonstrate that interdisciplinary research can advance several disciplines simultaneously.

While this paper deals with the scientific problem of species richness and diversity, the authors should also be complimented for the richness and diversity of their statistical results. This paper should be assigned reading for graduate students in statistics, as an example of the range of results that can be examined via a Bayesian analysis. Similarly, students of ecology should read this paper for both the ecological insights and as motivation to take more statistics courses.

1 Modeling individual species level presence–absence

The authors make a number of contributions in the area of modeling individual species level presence–absence. I examine several of these issues below.

One of the important contributions of this work is that the authors model species level presence–absence instead of classifying the sites by some measure of species diversity. As noted by the authors in the introduction, many ecological studies model an index which is a summary over many species. In stream studies, for example, scientists use an index of biotic integrity, which quantifies a stream's ability to support and maintain a natural biological community. Scientists often relate these indices to environmental covariates. However, as noted by Gelfand et al., effects of environmental covariates may be different depending on the species. For example, the effect of minimum July temperature varies across species (see Table 2 and Figure J). Understanding the effect of environmental covariates on individual species is potentially useful and can lead to new insights into species patterns. By examining species individually, Gelfand et al. answer pertinent questions for ecologists.

While the authors can examine individual species with their models, the beauty of their approach is that the results allow for examination of effects over all the species. The authors present a number of insightful measures for this purpose (Section 6). One overall measure considered by the authors is a summary of the effect of covariate l over all species under consideration, or $\sum_{k=1}^{40} \beta_l^{(k)}$ where β_l is the posterior for coefficient

*Department of Statistics, Colorado State University, Fort Collins, CO, http://www.stat.colostate.edu/~jah/

