

Data from: Disentangling elevational richness: a multi-scale hierarchical Bayesian occupancy model of Colorado ant communities

Szewczyk, Tim M., University of New Hampshire

McCain, Christy M., University of Colorado Boulder

Publication date: November 27, 2018

Publisher: Dryad

<https://doi.org/10.5061/dryad.rt679ng>

Citation

Szewczyk, Tim M.; McCain, Christy M. (2018), Data from: Disentangling elevational richness: a multi-scale hierarchical Bayesian occupancy model of Colorado ant communities, Dataset, <https://doi.org/10.5061/dryad.rt679ng>

Abstract

Understanding the forces that shape the distribution of biodiversity across spatial scales is central in ecology and critical to effective conservation. To assess effects of possible richness drivers, we sampled ant communities on four elevational transects across two mountain ranges in Colorado, USA, with seven or eight sites on each transect and twenty repeatedly sampled pitfall trap pairs at each site each for a total of 90 days. With a multi-scale hierarchical Bayesian community occupancy model, we simultaneously evaluated the effects of temperature, productivity, area, habitat diversity, vegetation structure, and temperature variability on ant richness at two spatial scales, quantifying detection error and genus-level phylogenetic effects. We fit the model with data from one mountain range and tested predictive ability with data from the other mountain range. In total, we detected 105 ant species, and richness peaked at intermediate elevations on each transect. Species-specific thermal preferences drove richness at each elevation with marginal effects of site-scale productivity. Trap-scale richness was primarily influenced by elevation-scale variables along with a negative impact of canopy cover. Soil diversity had a marginal negative effect while daily temperature variation had a marginal positive effect. We detected no impact of area,

land cover diversity, trap-scale productivity, or tree density. While phylogenetic relationships among genera had little influence, congeners tended to respond similarly. The hierarchical model, trained on data from the first mountain range, predicted the trends on the second mountain range better than multiple regression, reducing root mean squared error up to 65%. Compared to a more standard approach, this modeling framework better predicts patterns on a novel mountain range and provides a nuanced, detailed evaluation of ant communities at two spatial scales.

Usage Notes

Data list for JAGS model: SJ transects

List (R data structure) of data required to parameterize the Bayesian model detailed in Appendix A2 with the San Juans elevational transects. Includes species occurrences, trap-level covariates, site-level covariates, and other objects in Appendix A2. Loading the file in R with ``SJ.ls <- readRDS("SJ_data_for_JAGS.rds")`` will load a named list with all necessary objects. See Appendix A2 for the model code and descriptions of objects contained in the list.

SJ_data_for_JAGS.rds

Data list for JAGS model: Front Range transects, shared species

List (R data structure) of data required to predict occurrences and richness along the two Front Range transects with only species detected in both the Front Range and the San Juan range, using a model parameterized with the San Juan range. Loading the file in R with ``FR.shared.ls <- readRDS("FR-shared_data_for_JAGS.rds")`` will load a named list with all necessary objects. See Appendix A2 for the model code and descriptions of objects contained in the list.

FR-shared_data_for_JAGS.rds

Data list for JAGS model: Front Range transects, all species

List (R data structure) of data required to predict occurrences and richness along the two Front Range transects with all species detected in the Front Range, using a model parameterized with the San Juan range. This requires generating species-specific responses from the parameterized genus-level or family-level distributions. Loading the file in R with ``FR.all.ls <- readRDS("FR-all_data_for_JAGS.rds")`` will load a named list with all necessary objects. See Appendix A2 for the model code and descriptions of objects contained in the list.

FR-all_data_for_JAGS.rds

Funding

National Science Foundation, Award: DEB-0949601

References

This dataset is supplement to <https://doi.org/10.1111/ecog.04115>

Location

 USA

 Colorado

Keywords

diversity, Formicidae, Predictive model, elevational gradient, community

Files

3 files for this dataset

FR-all_data_for_JAGS.rds	6.65 kB	application/octet-stream
FR-shared_data_for_JAGS.rds	5.73 kB	application/octet-stream
SJ_data_for_JAGS.rds	13.92 kB	application/octet-stream

License

This work is licensed under a [CC0 1.0 Universal \(CC0 1.0\) Public Domain Dedication](https://creativecommons.org/licenses/by/4.0/) license.



This releases your work to the public domain for any use.