How macroecology affects macroevolution: the interplay between extinction intensity and trait-dependent extinction in brachiopods.

Taxon occurrence as a function of both emergent biological traits and its environmental context

Other projects

Moving forward

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History

- presented at GSA 2015
- rejected from *Evolution*
  - encouraged resubmit
  - audience issues
  - difficult and transformative reviews

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Analysis of Cenozoic mammal fossil record for NA

individual-level (genus)

- intercept term, varying by time
- locomotor type/category
  - arboreal, digitigrade, plantigrade, unguligrade, fossorial, scansorial
- dietary type/category
  - carnivore, herbivore, insectivore, omnivore
- body size (rescaled log body mass)
- phylogenetic effect

group-level (2 My time unit)

- intercept
- isotope record
  - mean and interquartile range of rescaled value
- temperature record
  - mean and interquartile range of rescaled value
- plant community phase following Graham

Model of taxon occurrence

- response is p/a of genus in NA at time t
  - Bernoulli variable
  - probability is (observation prob) times ("true" presence)
- observation probability is effect of sampling/fossil record
- true presence is multi-level logistic regression
  - individual- and group-level
- break-point model is the eventual goal

Posterior predictive checks

- simulate fossil record given only $y\_t{=}1$ and θ
  - where θ is the set of all parameters
- equivalent to leave-one-out cross-validation for time series?
  - Bayesian statement is $p(\tilde{y}_{t+1}|y_t\theta)$
- ROC as measure of performance

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How cryptic is cryptic diversity? Machine learning approaches to classifying morphological variation in the Pacific Pond Turtle (*Emys marmorata*)

- estimate which species classification is best supported by morphology
  - multiple machine learning approaches
  - focus on one turtle species complex
  - results compared against results from two other turtle datasets
  - comparison of in- and out-of-sample model performance
- collaboration with Ken, Jim Parham, and Bryan Stuart
- submitted to then rejected from Systematic Biology
- resubmitted soon

Modeling the rate at which new species are named.

- collaboration with Stewart Edie; he's lead
- I developed the statistical model
  - zero-inflated Poisson model
  - both Bernoulli and Poisson distributions are time series models
  - response is the number of species named per publication per year for each biogeographic province
  - increasing, decreasing, or level?
- draft phase
- targets seem to be PNAS or Systematic Biology

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Research statement

- Intersection of macroevolution and macroecology.
- Quantitative approaches to understanding global and regional patterns of biodiversity.
- Paleontological data.
- Non-taxon specific; with emphasis on mammals.
- More like an ecologist-modeler than an evolution-modeler
  - No one-model to fit them all; tailor-made models for question.
  - This contrasts with the field.