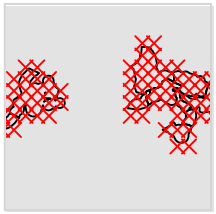
Build the dataset

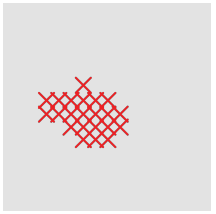
1. Cull OBIS data with less than 30 occurrences per genus. Map contemporary occurrences onto biogeographic provinces.

2. Interpolate contemporary genus occurrences within biogeographic realms by bounding box. Record the provinces assigned for each genus.

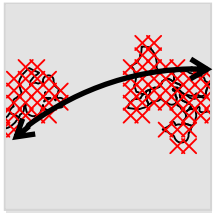
3. Overlay 45 (long.) x 14 (lat.) equal-area grid on the interpolated provinces and record centre co-ordinates for cells that overlap.



4. Overlay the same equal-area grid on the paleontological data and record centre co-ordinates for cells that overlap.



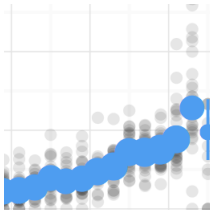
5. Measure great-circle distance (shown) and other distribution statistics for both paleontological and contemporary data using the equal-area grid centre co-ordinates.



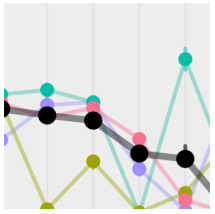
Build the model, calibrate, make predictions

6. Build GBM (machine learning) model on distribution traits and taxonomy with paleontological data.

7. Calibrate the GBM model within each taxonomic class using cross-validation.



8. Predict the modern extinction risk using the calibrated GBM model. Record the marginal effect of each predictor.



9. Assign the predicted extinction risk to biogeographic provinces based on the interpolated data. Calculate the mean by province within and across taxonomic classes.