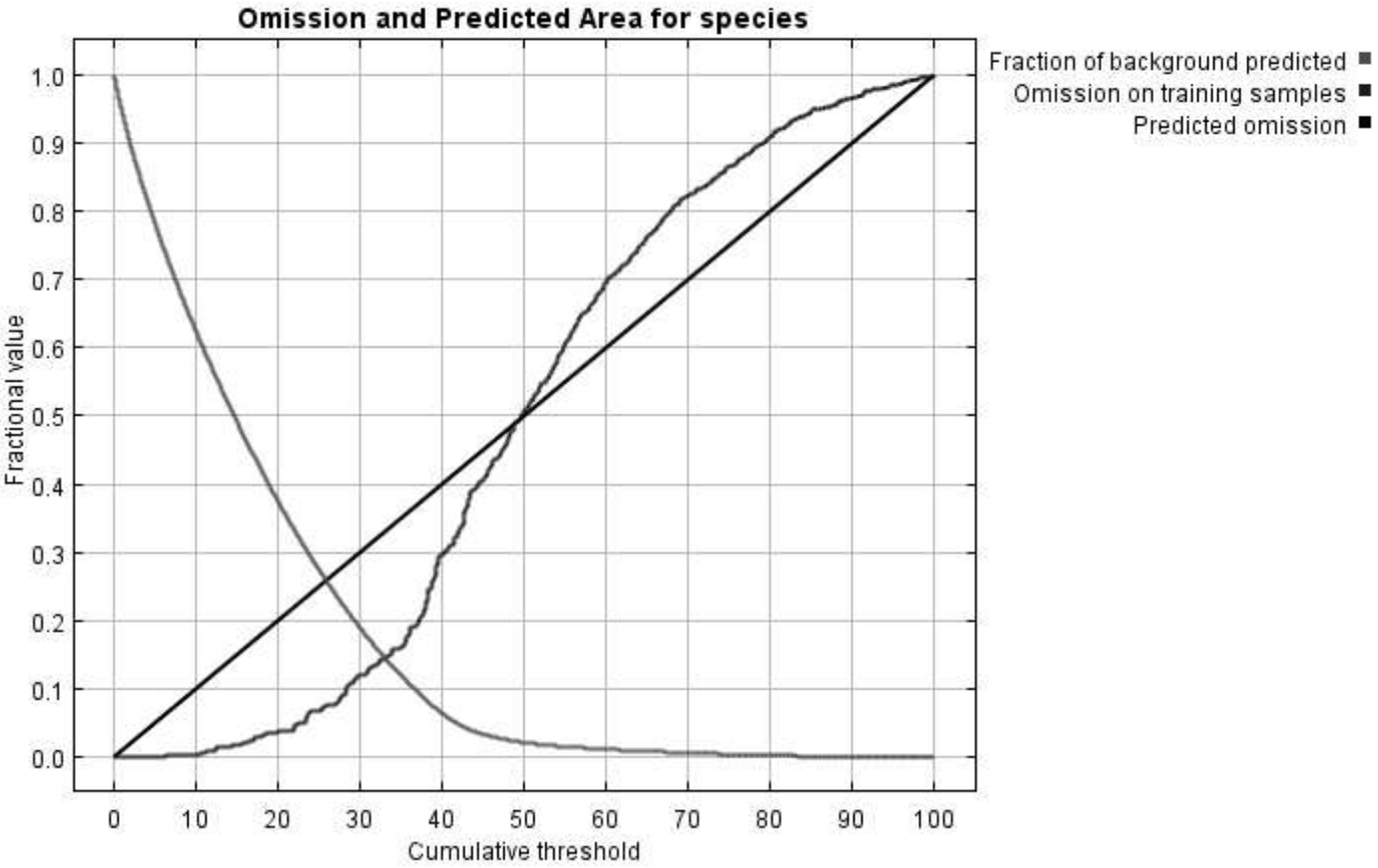
Maxent model

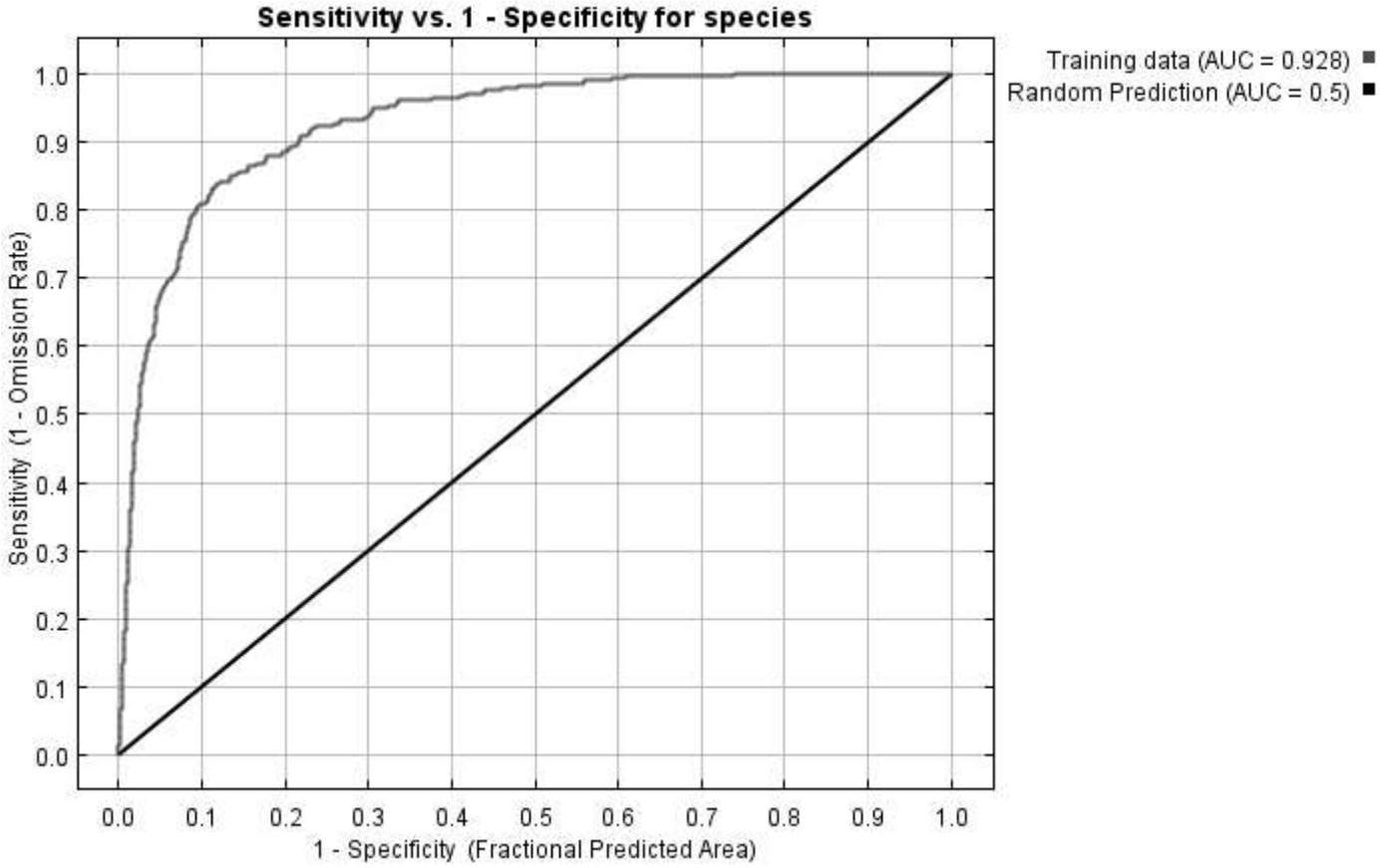
This page contains some analysis of the Maxent model result, created Tue May 14 22:15:58 MDT 2024 using 'dismo' version 1.3-14 & Maxent version 3.4.3. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

Analysis of omission/commission

The following picture shows the omission rate and predicted area as a function of the cumulative threshold. The omission rate is is calculated both on the training presence records, and (if test data are used) on the test records. The omission rate should be close to the predicted omission, because of the definition of the cumulative threshold.



The next picture is the receiver operating characteristic (ROC) curve for the same data. Note that the specificity is defined using predicted area, rather than true commission (see the paper by Phillips, Anderson and Schapire cited on the help page for discussion of what this means). This implies that the maximum achievable AUC is less than 1. If test data is drawn from the Maxent distribution itself, then the maximum possible test AUC would be 0.820 rather than 1; in practice the test AUC may exceed this bound.



Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that test points are predicted no better than by a random prediction with the same fractional predicted area. The "Balance" threshold minimizes 6 * training omission rate + .04 * cumulative threshold + 1.6 * fractional predicted area.

Cumulative threshold	Cloglog threshold	Description	Fractional predicted area	Training omission rate
1.000	0.045	Fixed cumulative value 1	0.944	0.000
5.000	0.062	Fixed cumulative value 5	0.782	0.000
10.000	0.076	Fixed cumulative value 10	0.624	0.004
6.288	0.066	Minimum training presence	0.738	0.000
28.373	0.129	10 percentile training presence	0.216	0.099
33.127	0.152	Equal training sensitivity and specificity	0.145	0.143
35.272	0.166	Maximum training sensitivity plus specificity	0.117	0.162
10.532	0.077	Balance training omission, predicted area and threshold value	0.609	0.004
27.755	0.126	Equate entropy of thresholded and original distributions	0.226	0.088

Click here to interactively explore this prediction using the Explain tool. If clicking from your browser does not succeed in starting the tool, try running the script in C:\Users\Khum\AppData\Local\Temp\RtmpuERyiA\raster\maxent\4164727779\species_explain.bat directly. This tool requires the environmental grids to be small enough that they all fit in memory.

Analysis of variable contributions

The following table gives estimates of relative contributions of the environmental variables to the Maxent model. To determine the first estimate, in each iteration of the training algorithm, the increase in regularized gain is added to the contribution of the corresponding variable, or subtracted from it if the change to the absolute value of lambda is negative. For the second estimate, for each environmental variable in turn, the values of that variable on training presence and background data are randomly permuted. The model is reevaluated on the permuted data, and the resulting drop in training AUC is shown in the table, normalized to percentages. As with the variable jackknife, variable contributions should be interpreted with caution when the predictor variables are correlated.

Variable	Percent contribution	Permutation importance
Average_snow	86.6	71
Average_GCW	6.8	21.5
Slope	4.5	0.8
Aspect	1.3	4.7
Elevation	0.8	1.9

Raw data outputs and control parameters

The data used in the above analysis is contained in the next links. Please see the Help button for more information on these.
The model applied to the training environmental layers
The coefficients of the model
The omission and predicted area for varying cumulative and raw thresholds
The prediction strength at the training and (optionally) test presence sites
Results for all species modeled in the same Maxent run, with summary statistics and (optionally) jackknife results

Regularized training gain is 1.486, training AUC is 0.928, unregularized training gain is 1.562.
Algorithm converged after 300 iterations (1 seconds).

The follow settings were used during the run:
272 presence records used for training.

7704 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): Aspect Average_GCW Average_snow Elevation Slope
Regularization values: linear/quadratic/product: 0.050, categorical: 0.250, threshold: 1.000, hinge: 0.500
Feature types used: linear quadratic
outputdirectory: C:\Users\Khum\AppData\Local\Temp\RtmpuERyiA/raster/maxent/4164727779
samplesfile: C:\Users\Khum\AppData\Local\Temp\RtmpuERyiA/raster/maxent/4164727779/presence
environmentallayers: C:\Users\Khum\AppData\Local\Temp\RtmpuERyiA/raster/maxent/4164727779/absence
removeduplicates: false
betamultiplier: 2.0
product: false
hinge: false
autorun: true
visible: false
autofeature: false
Command line used: autorun -e
C:\Users\Khum\AppData\Local\Temp\RtmpuERyiA/raster/maxent/4164727779/absence -o
C:\Users\Khum\AppData\Local\Temp\RtmpuERyiA/raster/maxent/4164727779 -s
C:\Users\Khum\AppData\Local\Temp\RtmpuERyiA/raster/maxent/4164727779/presence -z
noremoveDuplicates noautofeature nohinge noproduct nothreshold betamultiplier=2

Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E species
outputdirectory=C:\Users\Khum\AppData\Local\Temp\RtmpuERyiA/raster/maxent/4164727779
samplesfile=C:\Users\Khum\AppData\Local\Temp\RtmpuERyiA/raster/maxent/4164727779/presence
environmentallayers=C:\Users\Khum\AppData\Local\Temp\RtmpuERyiA/raster/maxent/4164727779/absence
noremoveduplicates betamultiplier=2.0 noproduct nohinge autorun novisible noautofeature