

Interpreting Ecological Niche Models

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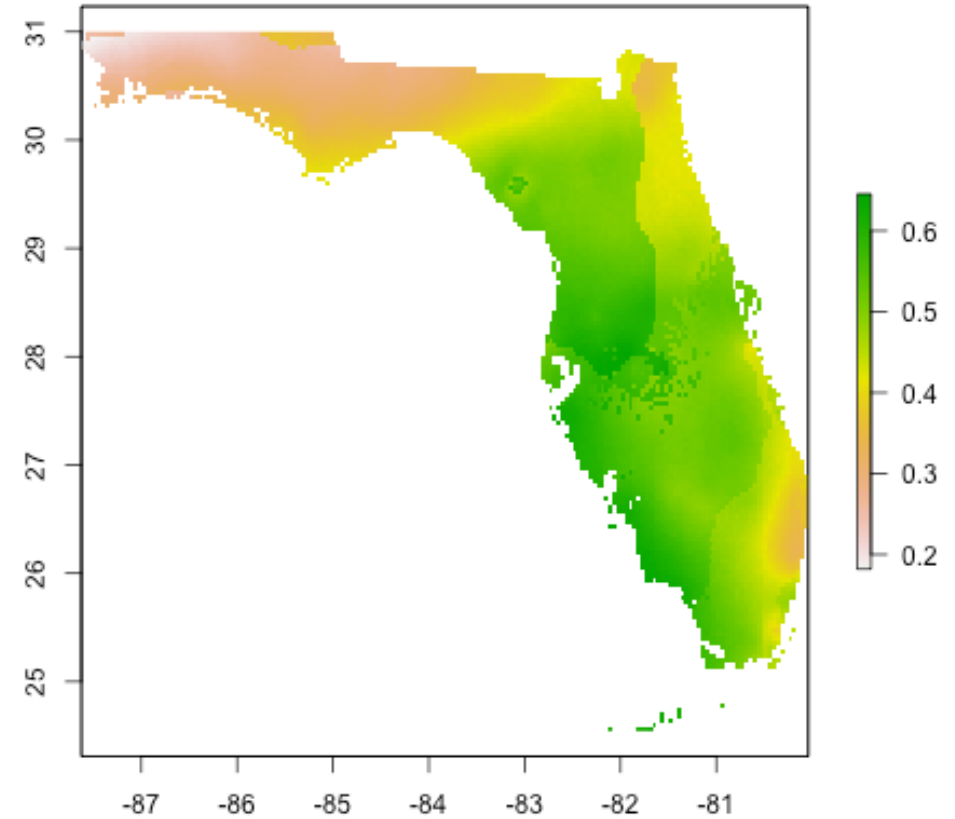
University of Florida



BiotaPhy

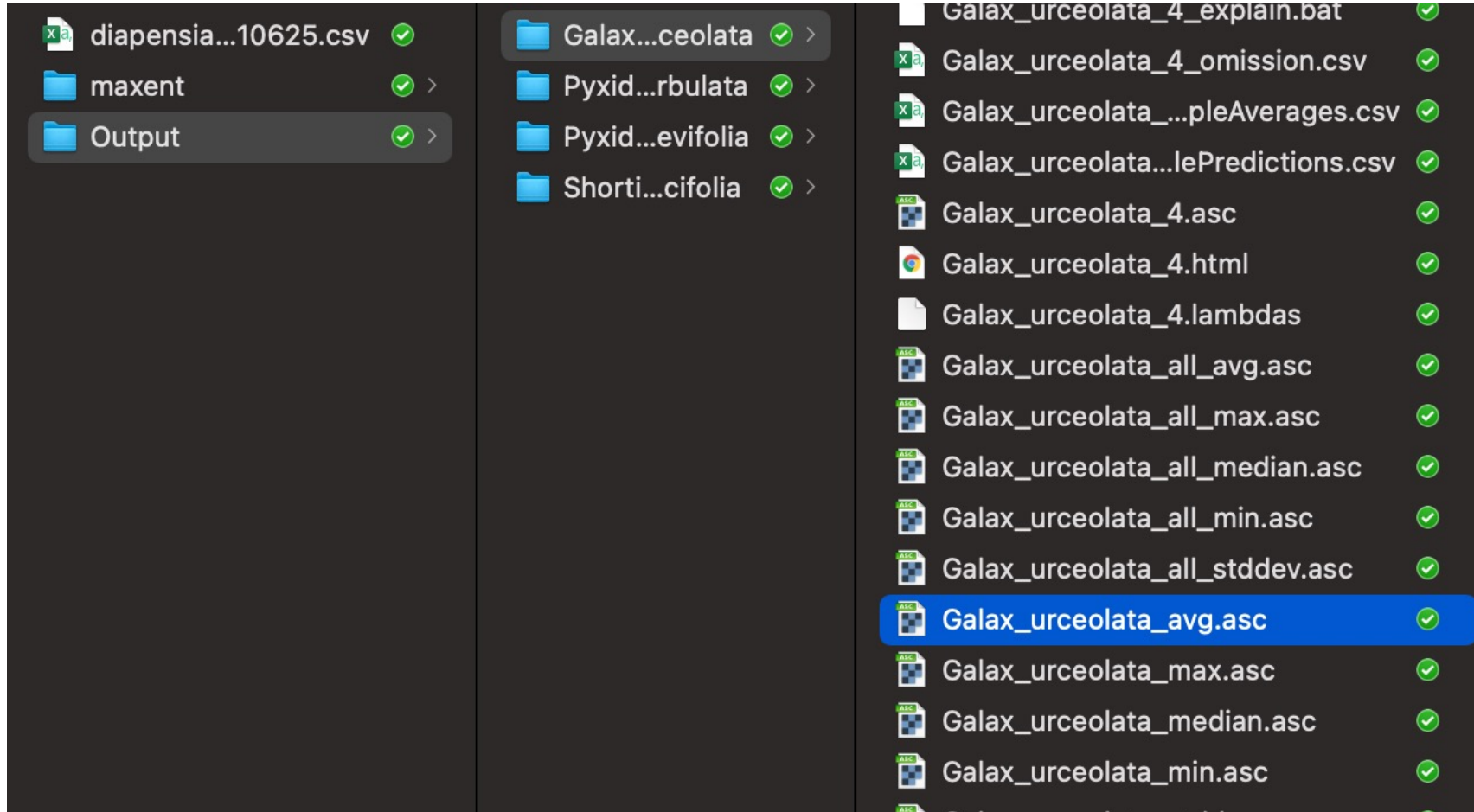
Interpreting ENMs

Step 1: Look at the output



Interpreting ENMs

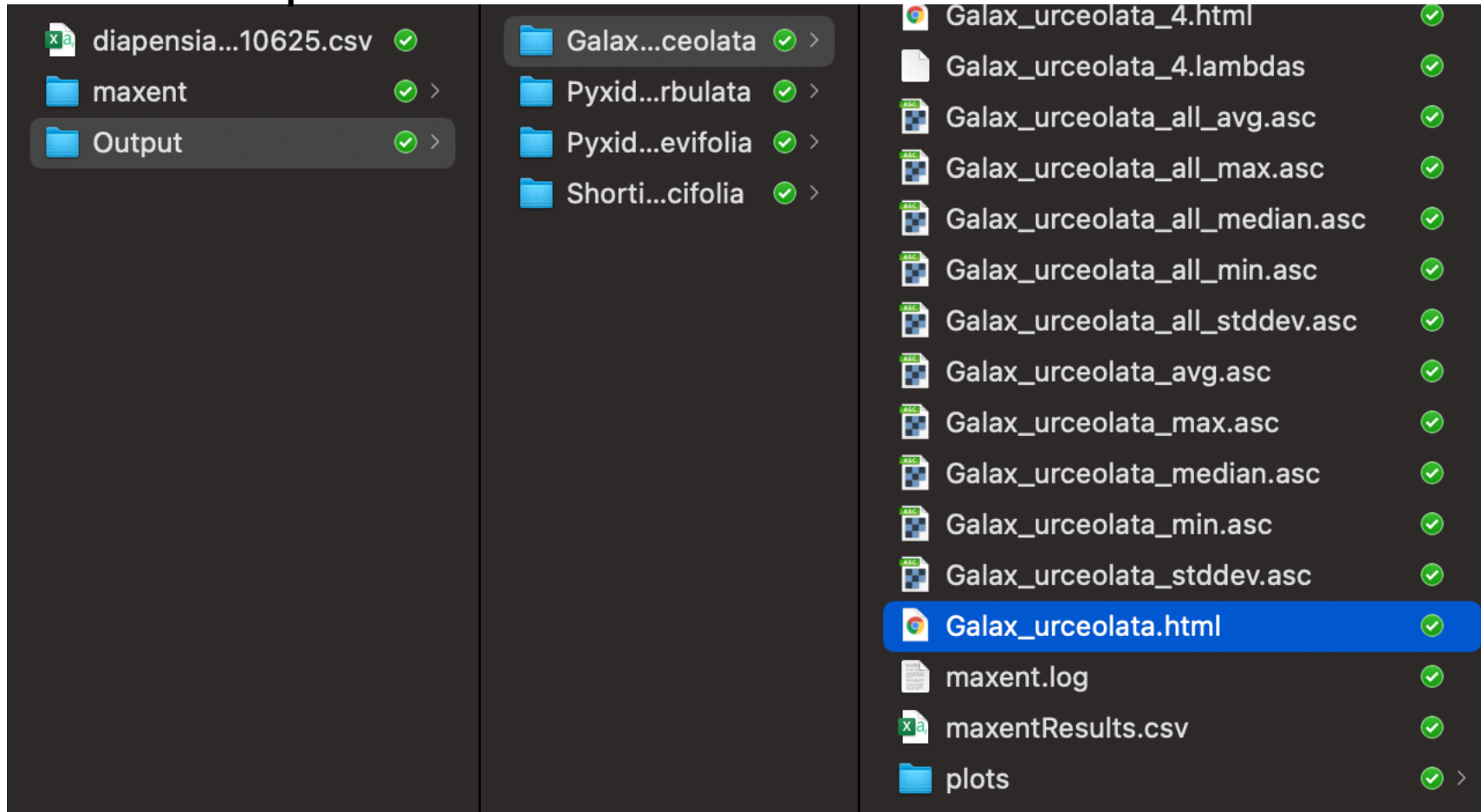
Step 1: Look at the output



We will use this average file for all other analysis

Interpreting ENMs

Step 1: Look at the output

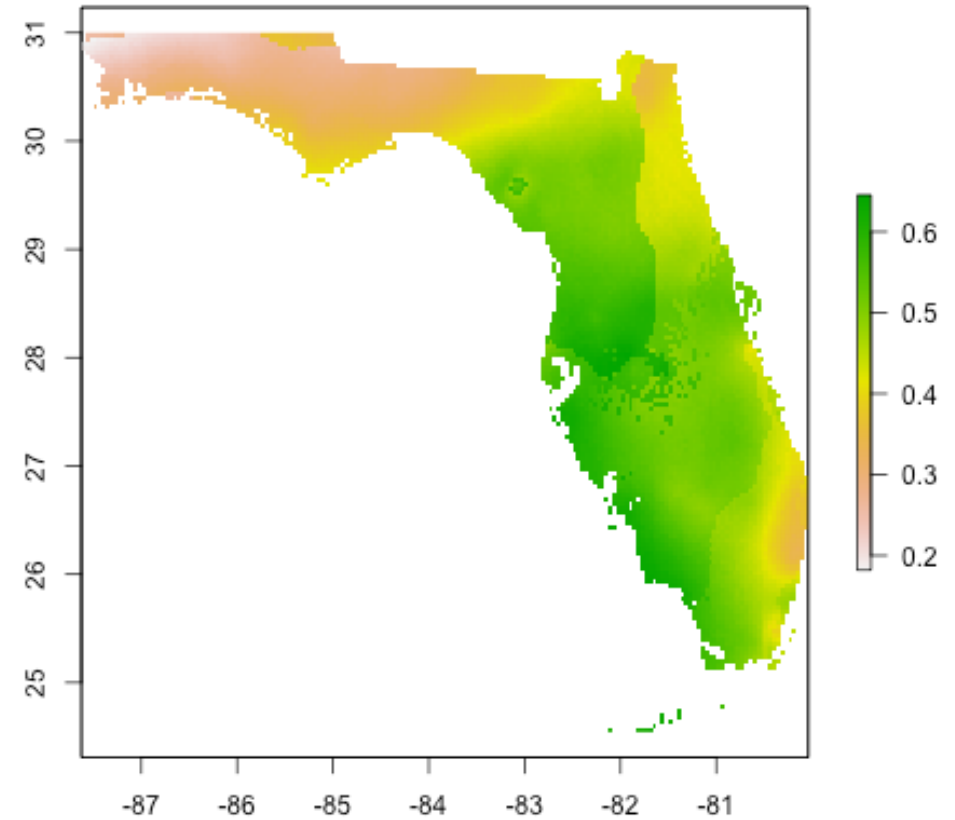


But first, lets make sure the model is good!

Interpreting ENMs

Step 1: Look at the output

Step 2: Evaluate the models

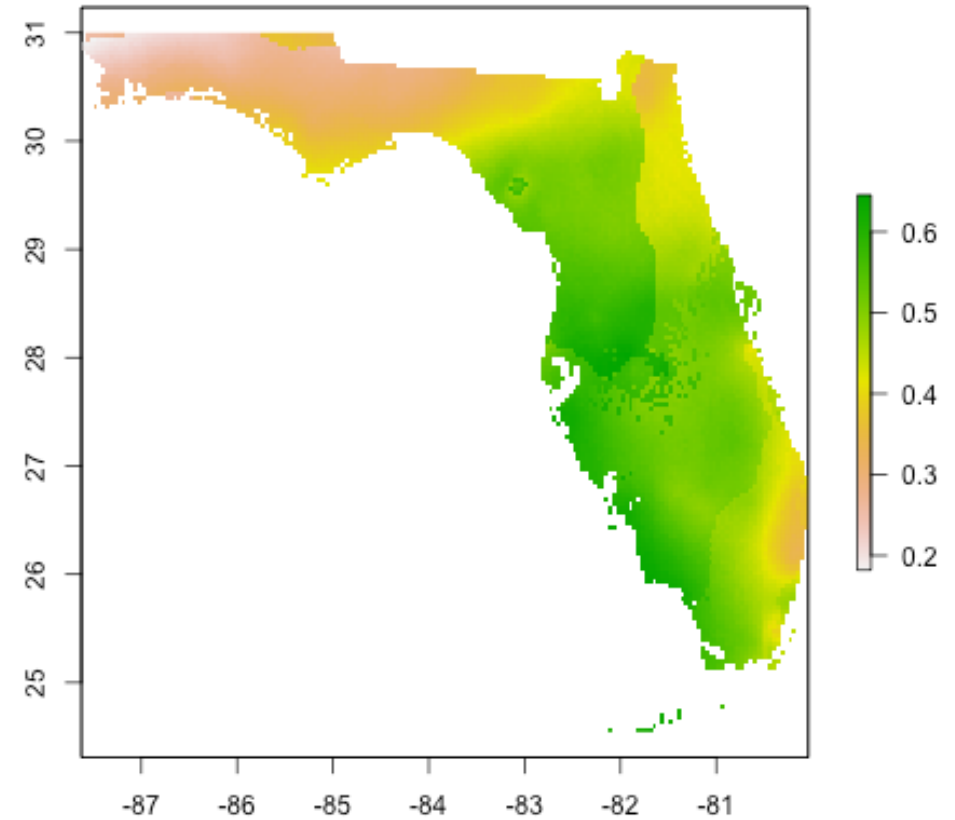


Interpreting ENMs

Step 1: Look at the output

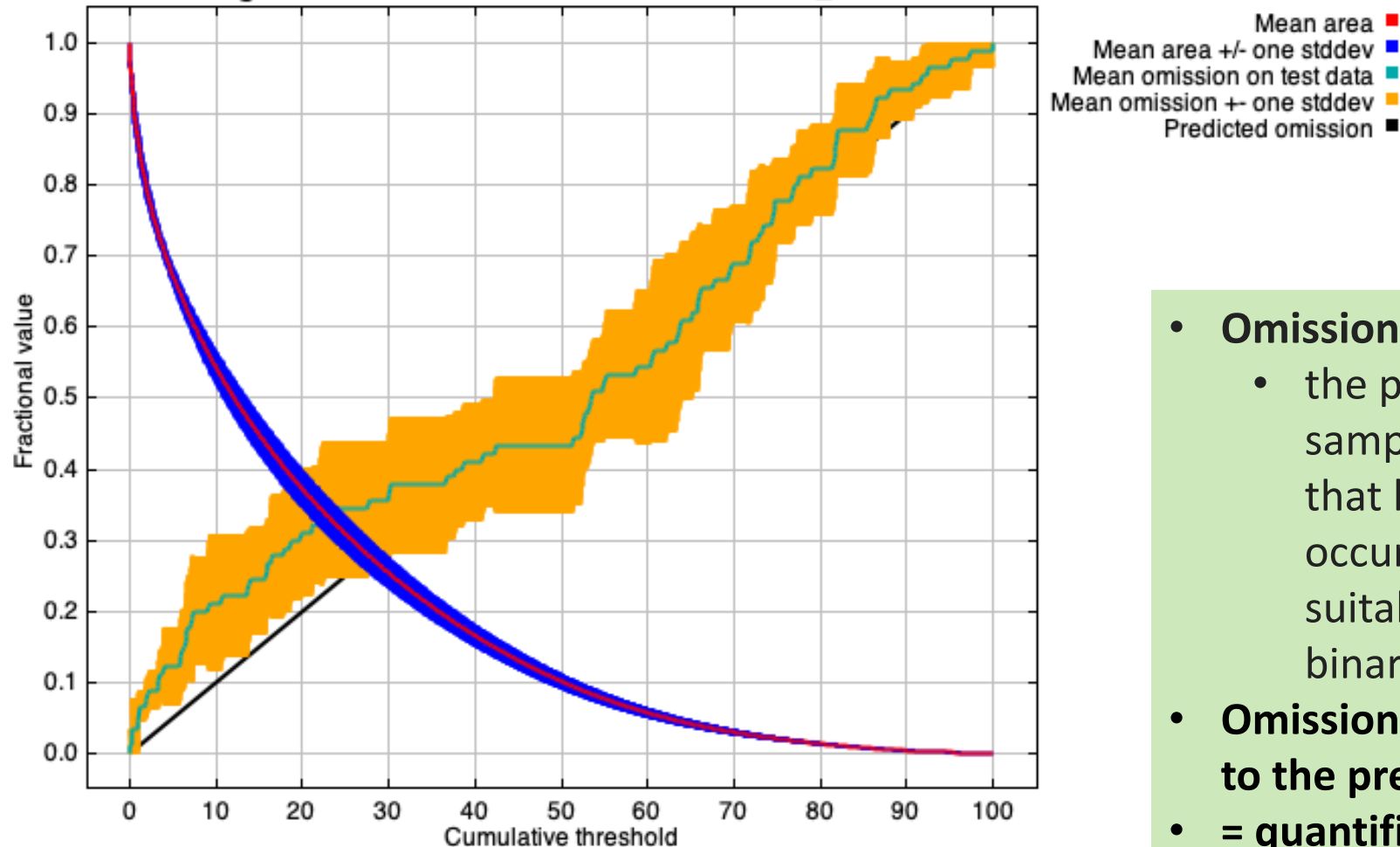
Step 2: Evaluate the models

- How well can the model discriminate between occurrence points and background points? e.g., AUC



Model Statistics

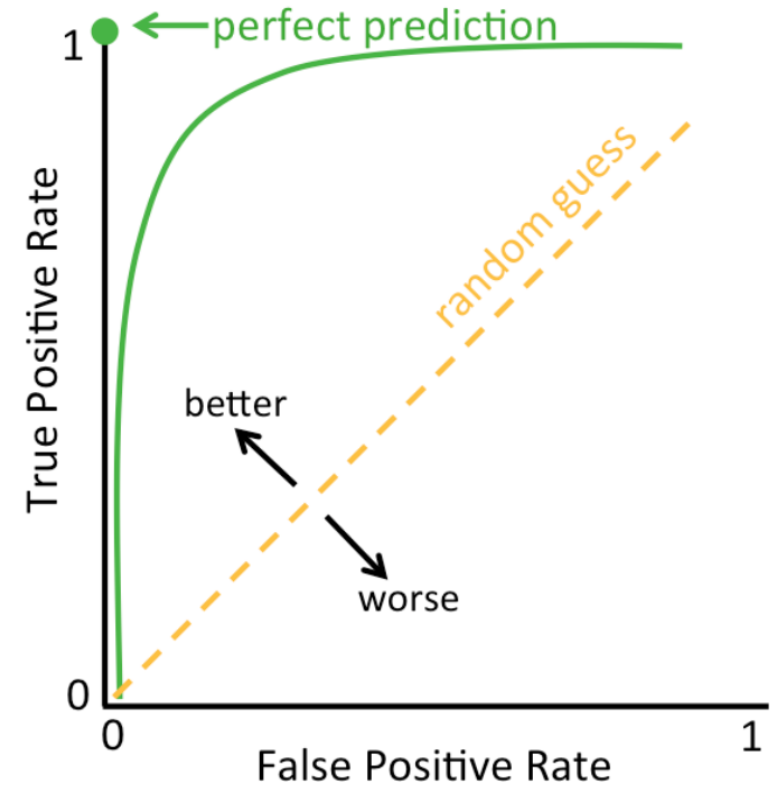
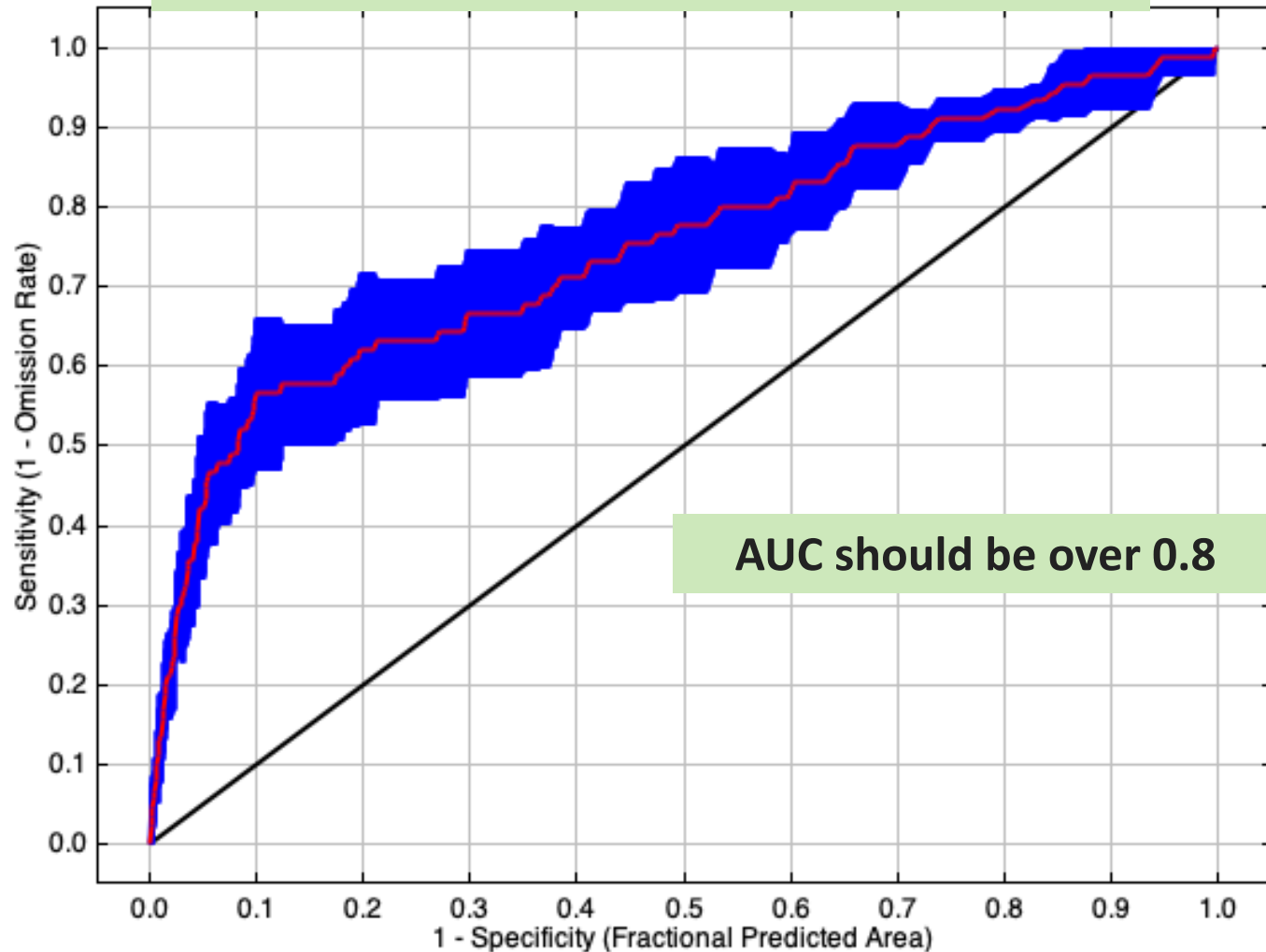
The test omission rate and predicted area as a function of the cumulative threshold



- **Omission:**
 - the proportion of a given sample of actual presences that have probabilities of occurrence (or habitat suitability values) below a binarization threshold.
- **Omission rate should be close to the predicted omission**
- **= quantifies overfitting**

Model Statistics

Area under the curve (AUC) of the Receiver Operating Characteristic (ROC) curve



Model Statistics

Methods in Ecology and Evolution



RESEARCH ARTICLE |  Full Access

Leaving the area under the receiving operating characteristic curve behind: An evaluation method for species distribution modelling applications based on presence-only data

Laura Jiménez , Jorge Soberón

First published: 30 August 2020 | <https://doi.org/10.1111/2041-210X.13479> | Citations: 1

Model Statistics

	Method		Citation
How significant is the model?	Partial ROC, AUC	higher > 0.80	Peterson, Papes, & Soberón. 2008.
How well models created with training data predict test occurrence	Omission Rate	lower ≤5%	Anderson, Lew & Peterson, 2003
How complex is the model?	AICc, delta AICc, and AICc weights	lower ≤2	Warren, Glor & Turelli, 2010

ROC = receiver operating characteristic

AUC = area under the curve

AIC = Akaike information criterion

AICc = AIC for a small sample size

Model Statistics

	Method		Citation
How significant is the model?	Partial ROC, AUC	higher > 0.80	Peterson, Papes, & Soberón. 2008.

- Partial ROC ranges from 1 - 2 when E (amount of error) is set to 0.
 - Often, the probability of sampling an AUC is less than or equal to 1 (which results from bootstrapping) is reported. The lower the probability the better.

ROC = receiver operating characteristic

AUC = area under the curve

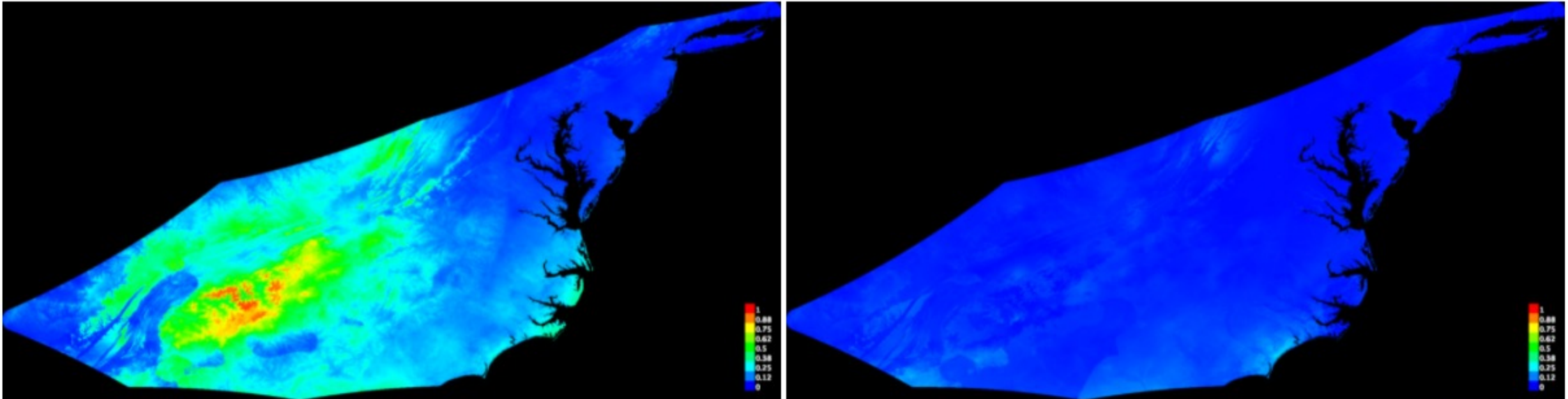
AIC = Akaike information criterion

AICc = AIC for a small sample size

Pictures of the Model

Pictures of the model

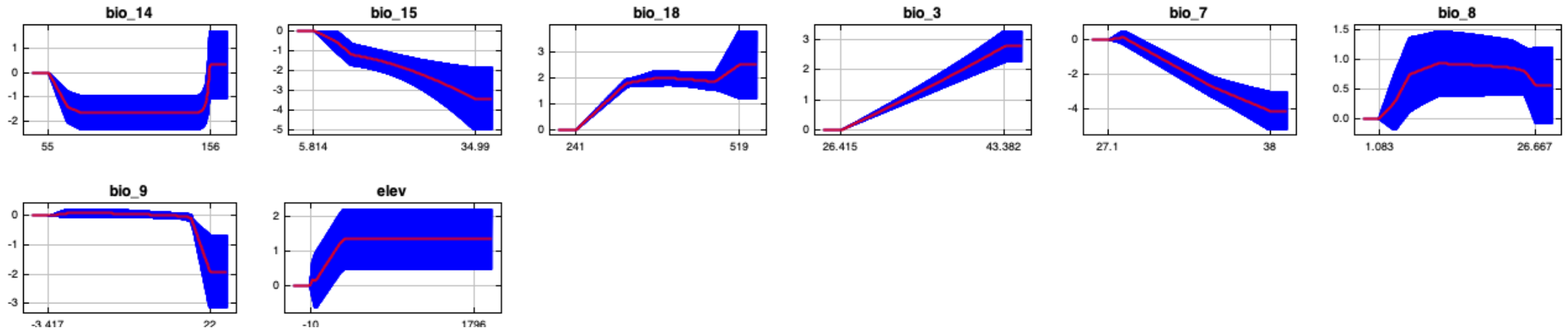
The following two pictures show the point-wise mean and standard deviation of the 5 output grids. Other available summary grids are [min](#), [max](#) and [median](#).



The following two pictures show the point-wise mean and standard deviation of the 5 models applied to the environmental layers in all. Other available summary grids are [min](#), [max](#) and [median](#).

Response Curves

PC score of suitability



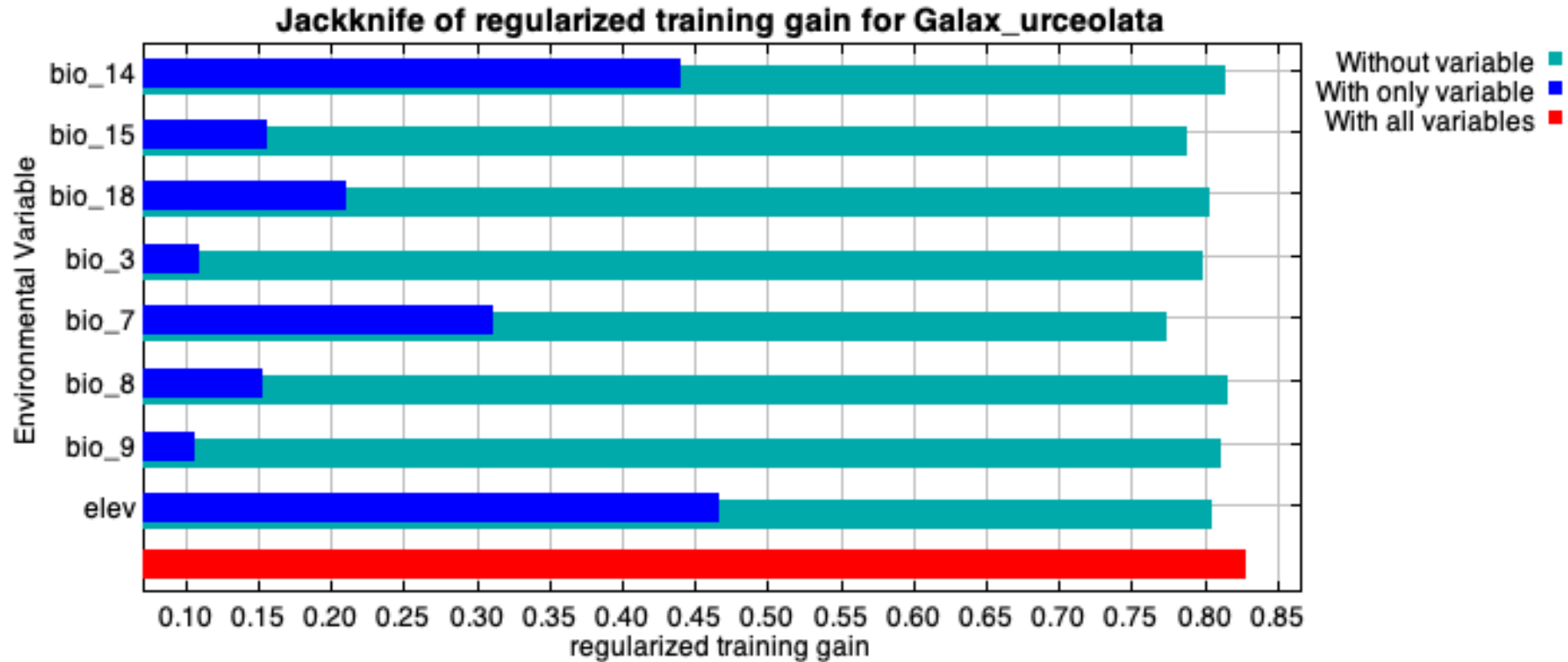
Response curves show how each environmental variable affects the Maxent prediction

Variable Contribution

Variable	Percent contribution	Permutation importance
elev	36.8	5.1
bio_14	21.4	5.1
bio_7	11.9	32.5
bio_18	11.8	15.7
bio_15	6.1	17.4
bio_9	5.9	7.9
bio_3	3.6	12.8
bio_8	2.5	3.4

For this model, we found the largest percent contribution with elevation (36.8%), followed by precipitation of driest month (21.4%) and temperature annual range (11.9%).

Variable Performance



Shows the importance of variables

Interpreting ENMs

Step 1: Look at the output

Step 2: Evaluate the models

Step 3: Additional Analysis

