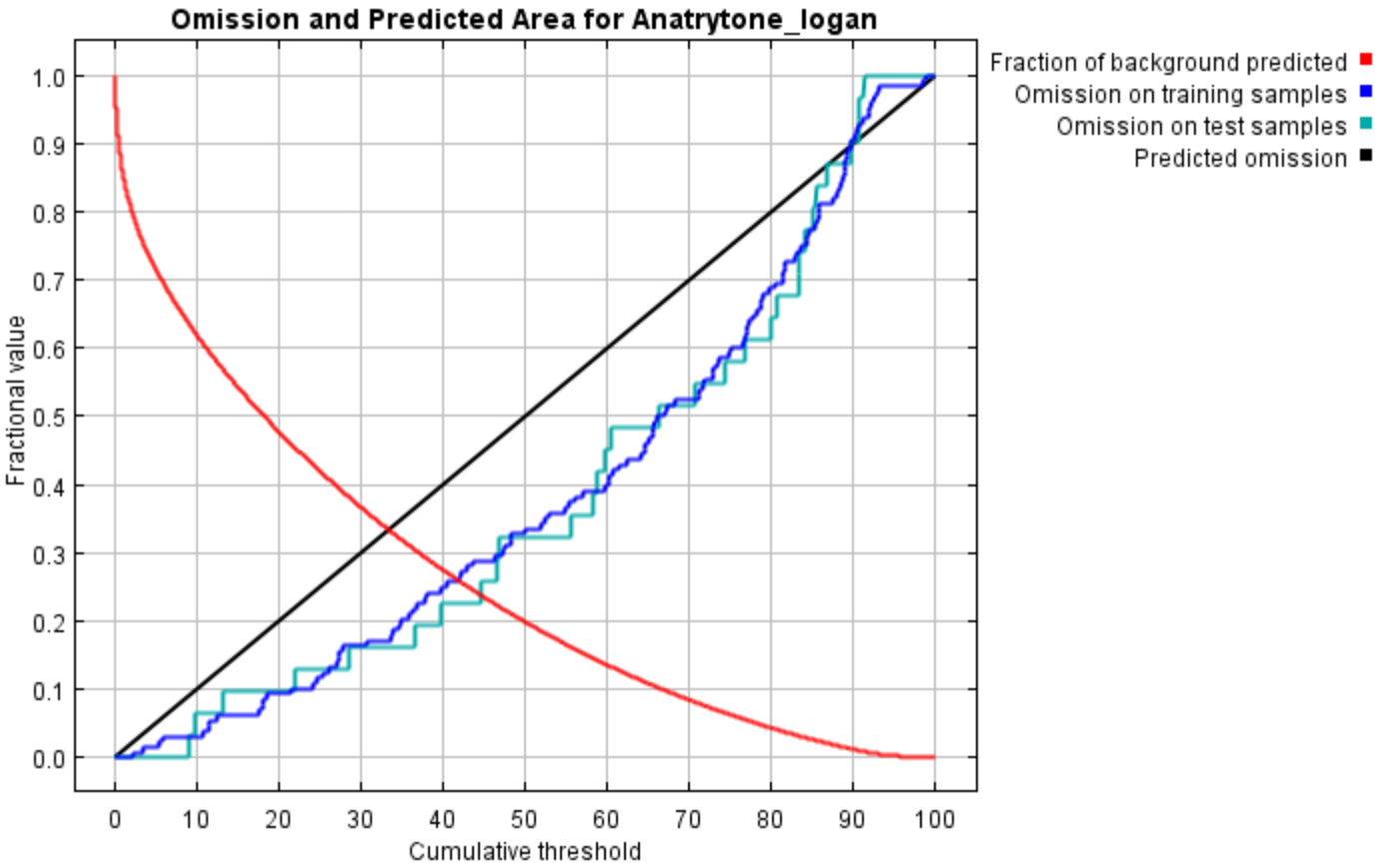
Maxent model for Anatrytone_logan

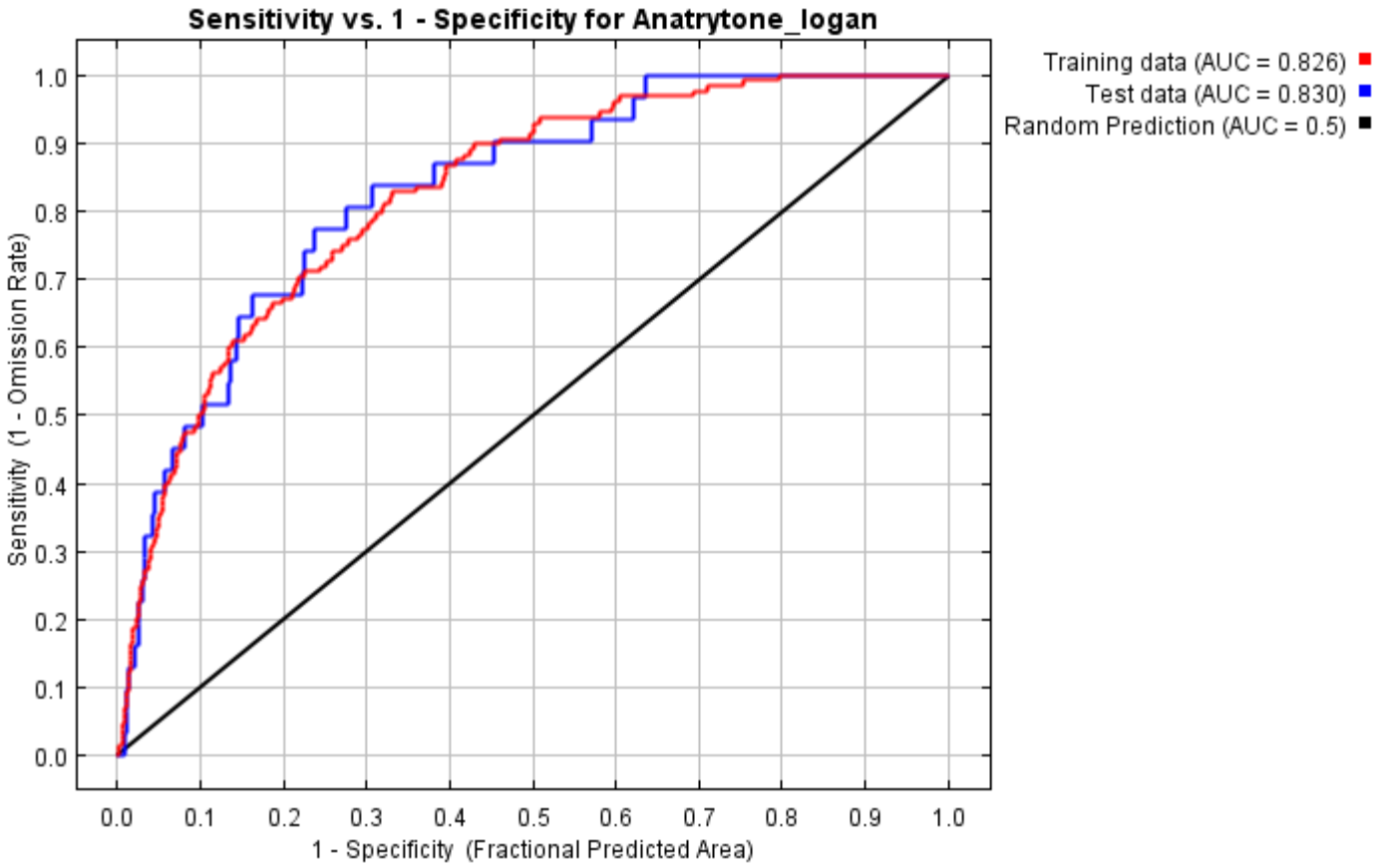
This page contains some analysis of the Maxent model for Anatrytone_logan, created Mon Jan 15 14:42:23 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.737 rather than 1; in practice the test AUC may exceed this bound.



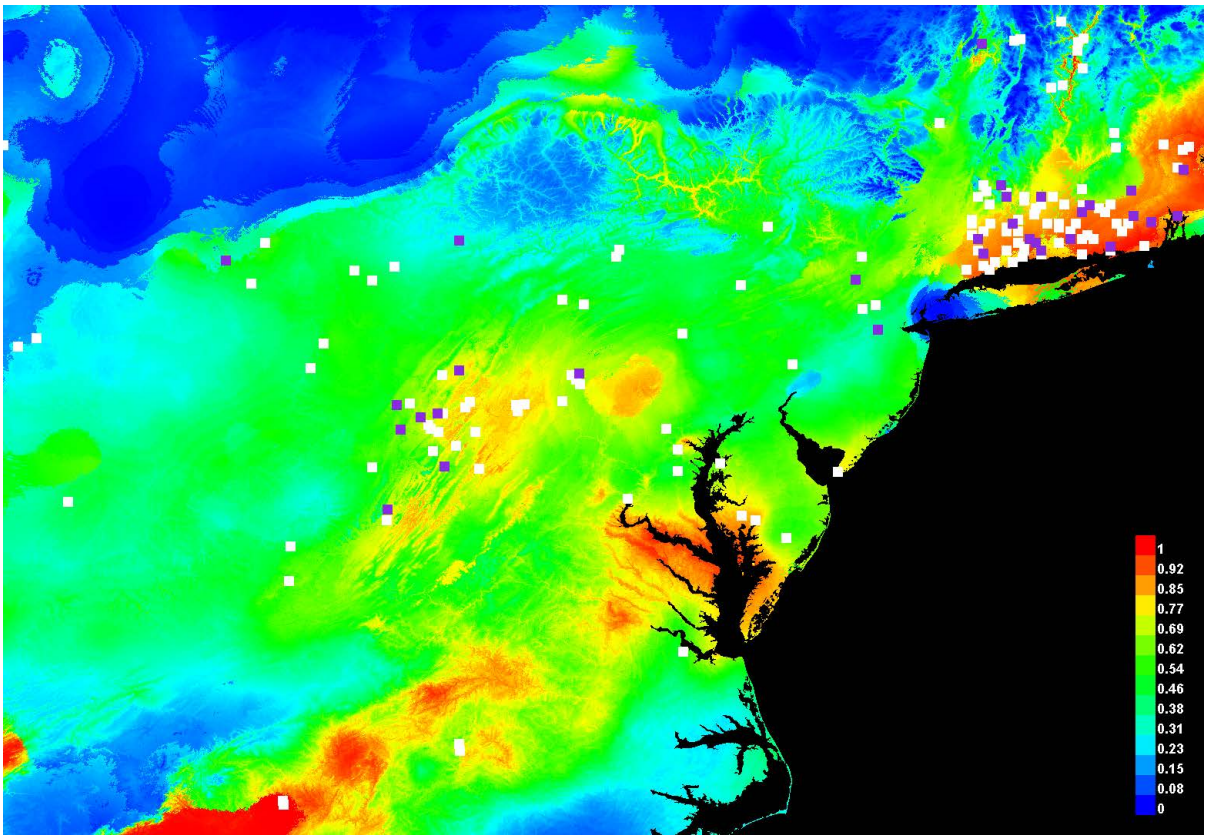
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.095	Fixed cumulative value 1	0.852	0.000	0.000	1.028E-2
5.000	0.250	Fixed cumulative value 5	0.715	0.016	0.000	2.215E-4
10.000	0.322	Fixed cumulative value 10	0.619	0.031	0.065	1.419E-4
2.174	0.152	Minimum training presence	0.796	0.000	0.000	2.406E-3
21.483	0.423	10 percentile training presence	0.460	0.094	0.097	3.642E-7
41.890	0.554	Equal training sensitivity and specificity	0.260	0.258	0.226	3.166E-11
33.677	0.499	Maximum training sensitivity plus	0.331	0.172	0.161	9.5E-10

		specificity				
44.733	0.573	Equal test sensitivity and specificity	0.237	0.289	0.226	1.069E-12
44.733	0.573	Maximum test sensitivity plus specificity	0.237	0.289	0.226	1.069E-12
2.174	0.152	Balance training omission, predicted area and threshold value	0.796	0.000	0.000	2.406E-3
8.269	0.299	Equate entropy of thresholded and original distributions	0.649	0.031	0.000	2.114E-5

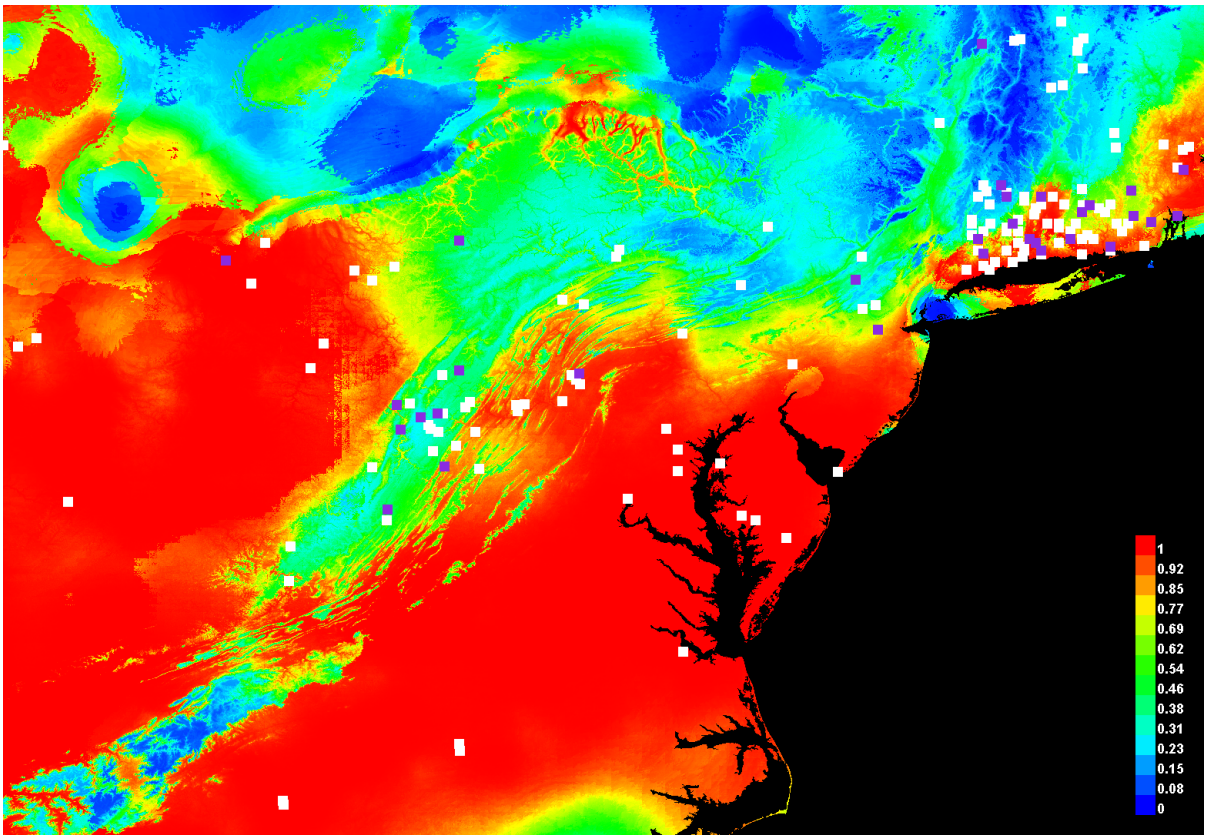
Pictures of the model

This is a representation of the Maxent model for Anatrytone_logan. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



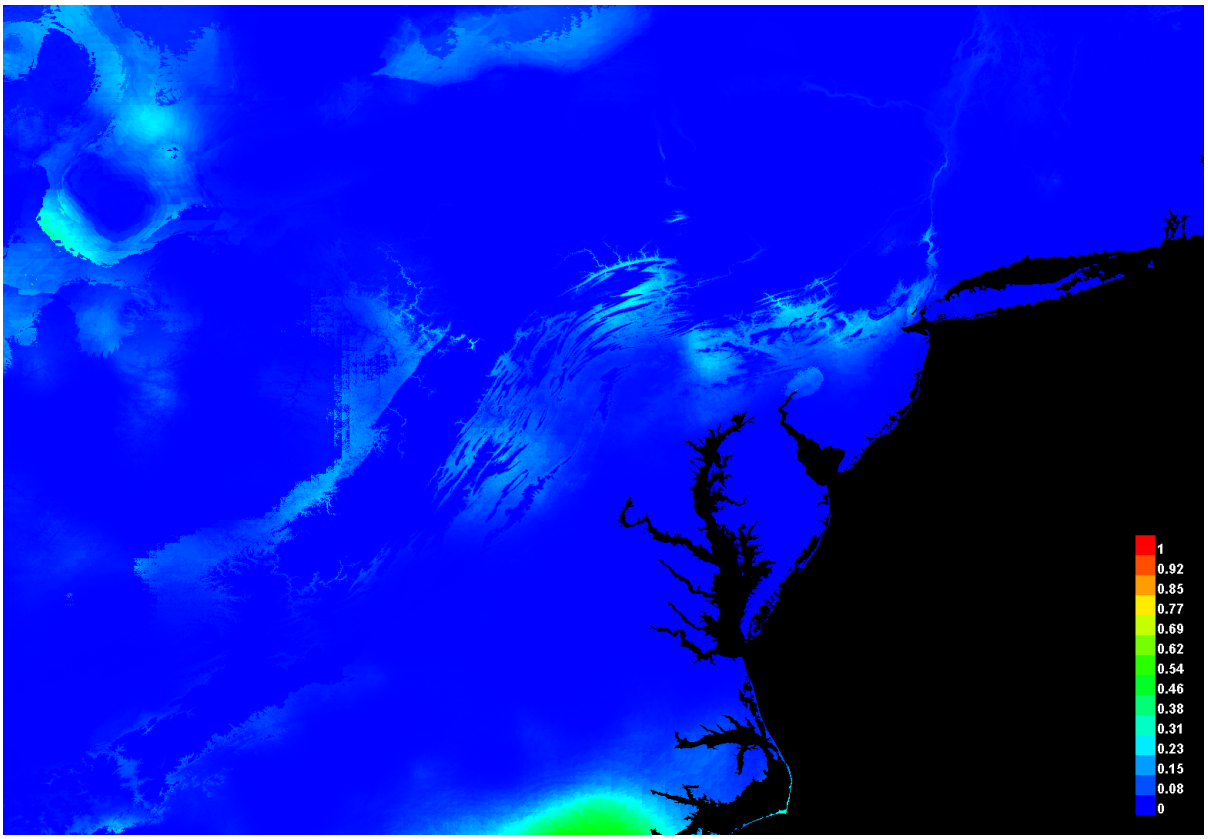
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

This is the projection of the Maxent model for Anatrytone_logan onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

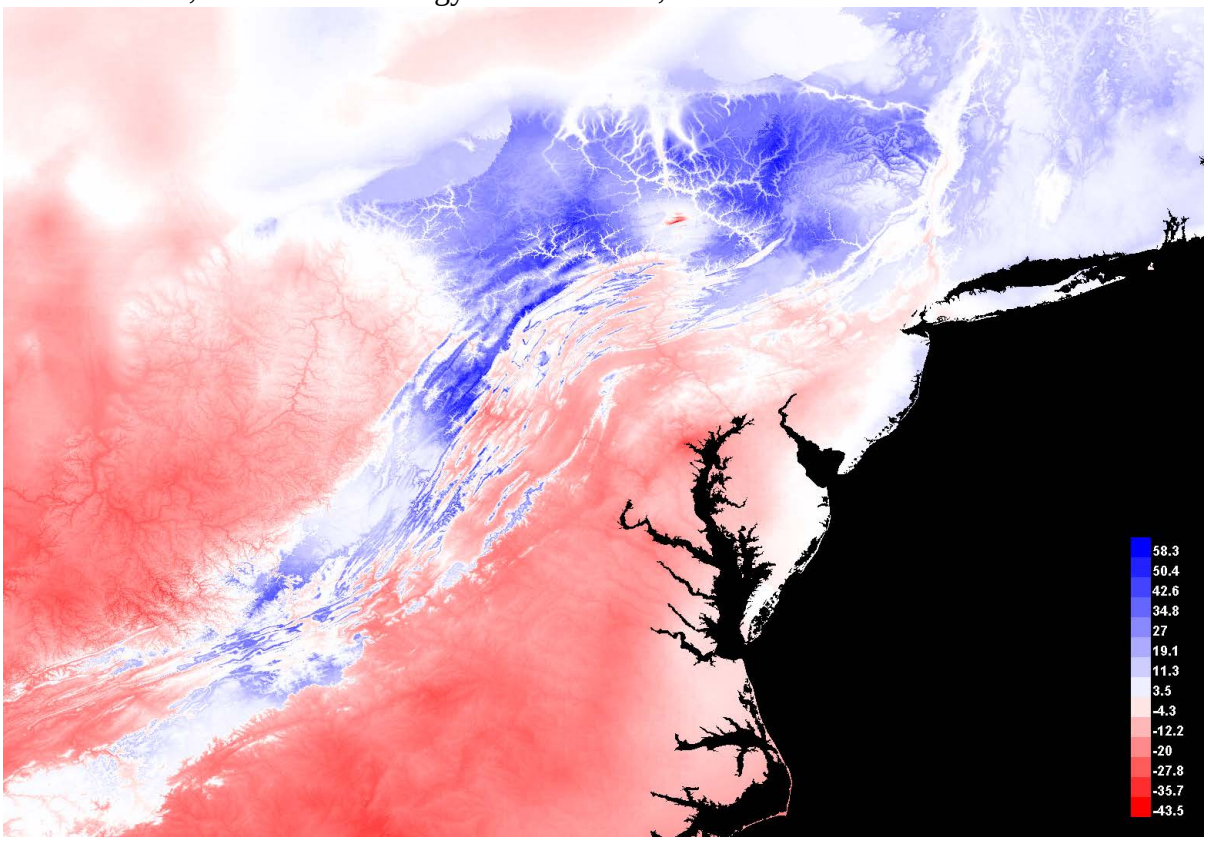


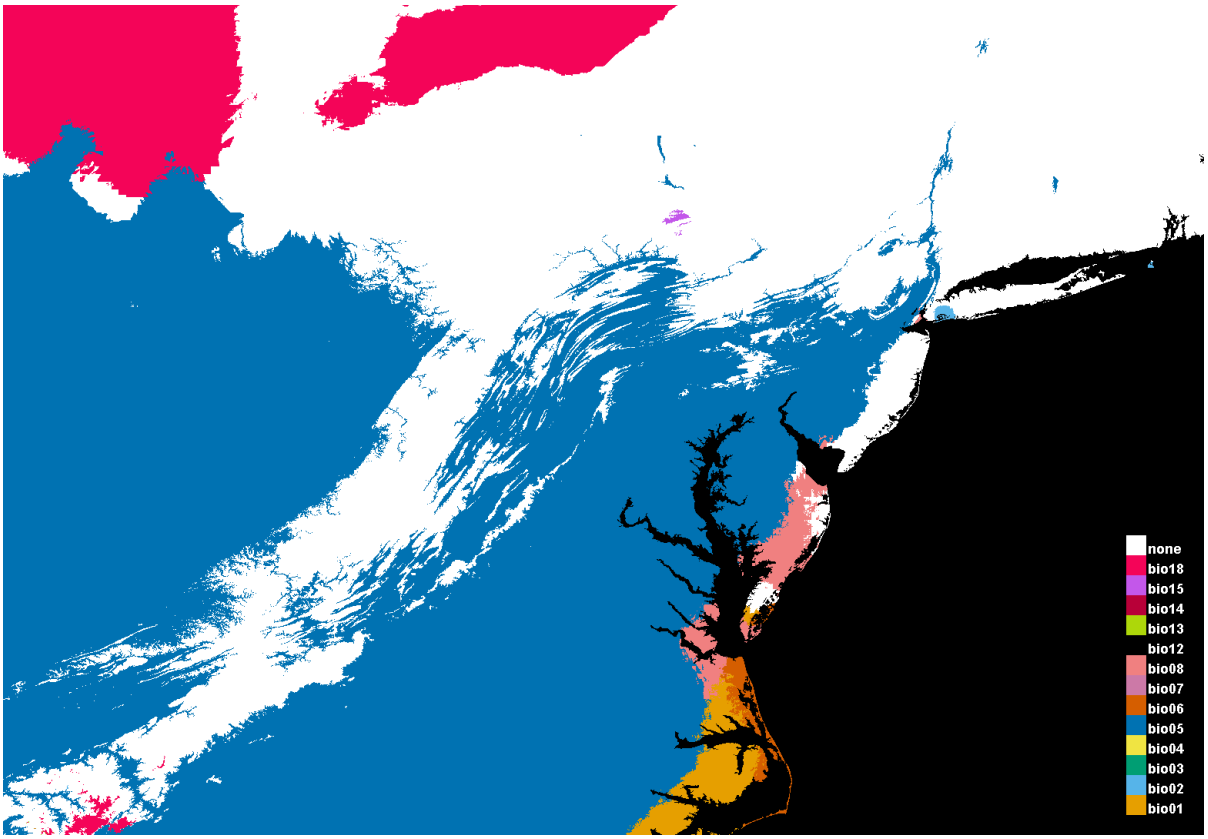
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



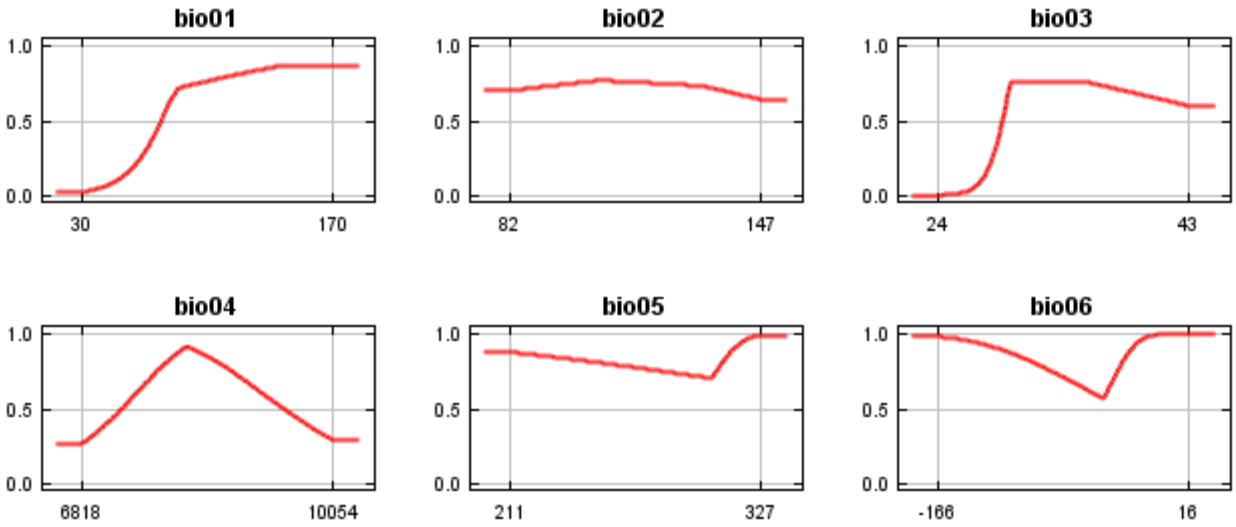
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

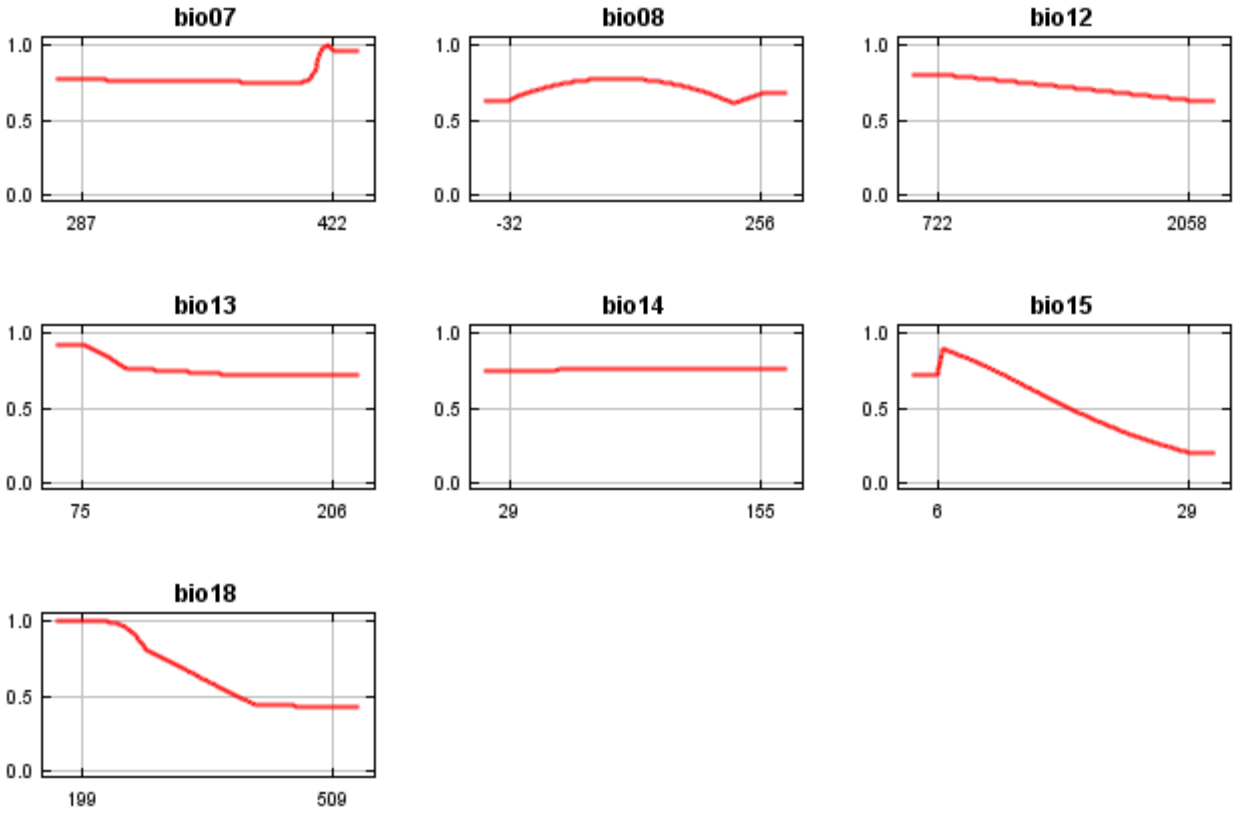




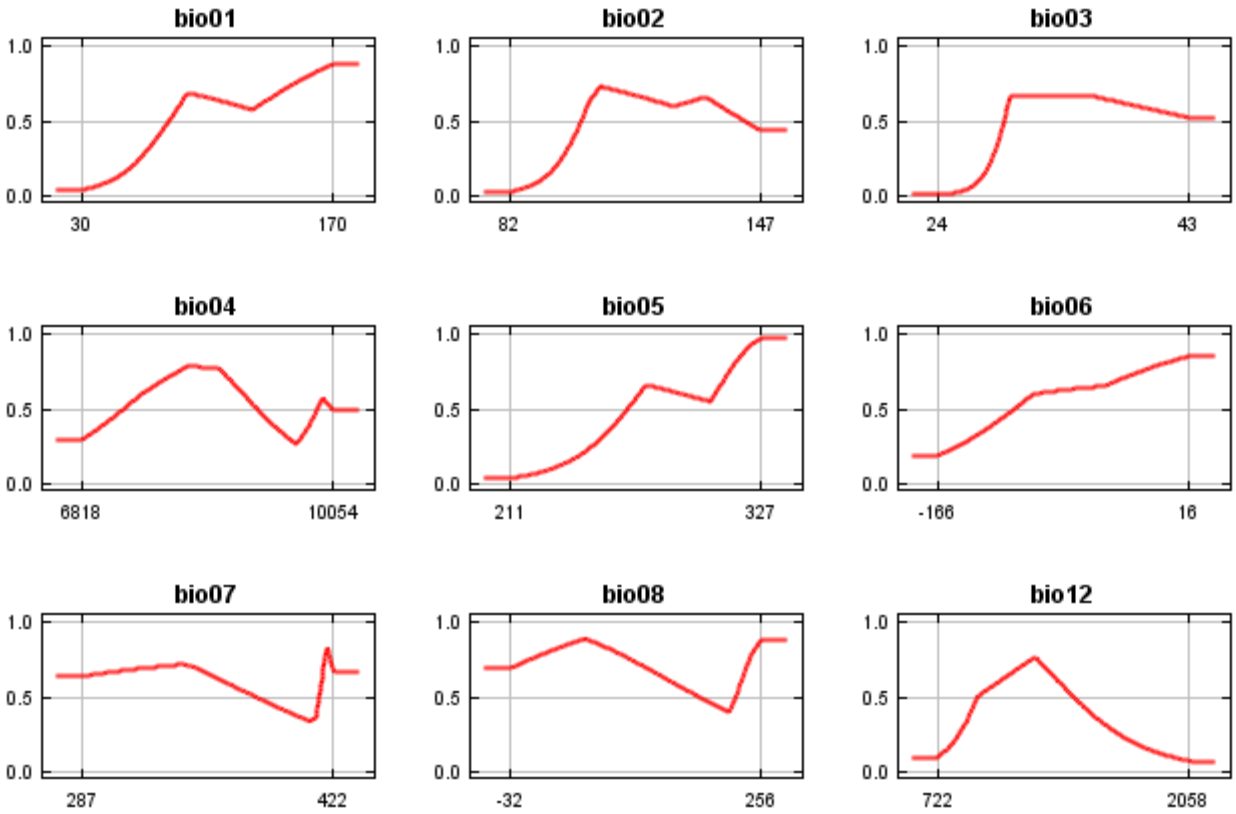
Response curves

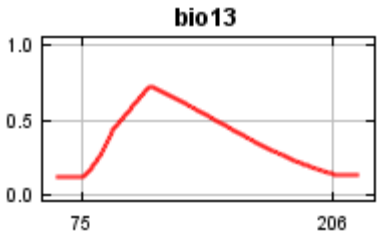
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.

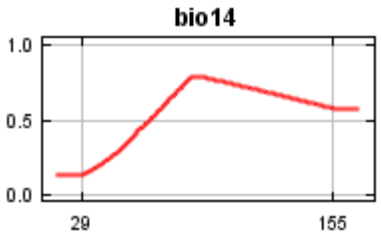


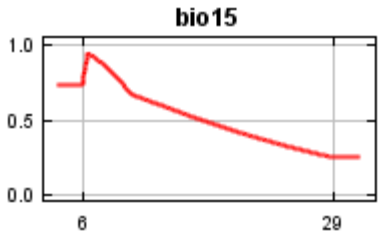


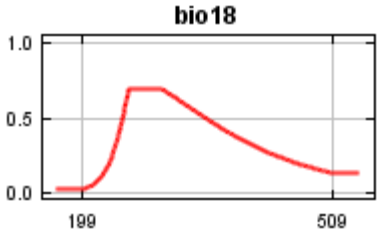
In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.











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
bio03	28.8	28
bio01	21.7	8.4
bio15	21.7	13.8
bio08	8.2	10.3
bio04	6.6	4.9
bio18	4.2	14
bio07	3.8	3.2
bio05	2.7	0.1
bio06	1.8	16.3
bio14	0.3	0
bio13	0.2	0.1
bio02	0.2	0.7
bio12	0	0.3

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.363, training AUC is 0.826, unregularized training gain is 0.490.
Unregularized test gain is 0.649.
Test AUC is 0.830, standard deviation is 0.033 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (4 seconds).

The follow settings were used during the run:
128 presence records used for training, 31 for testing.
10128 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.050, categorical: 0.250, threshold: 1.000, hinge: 0.500
Feature types used: hinge product linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

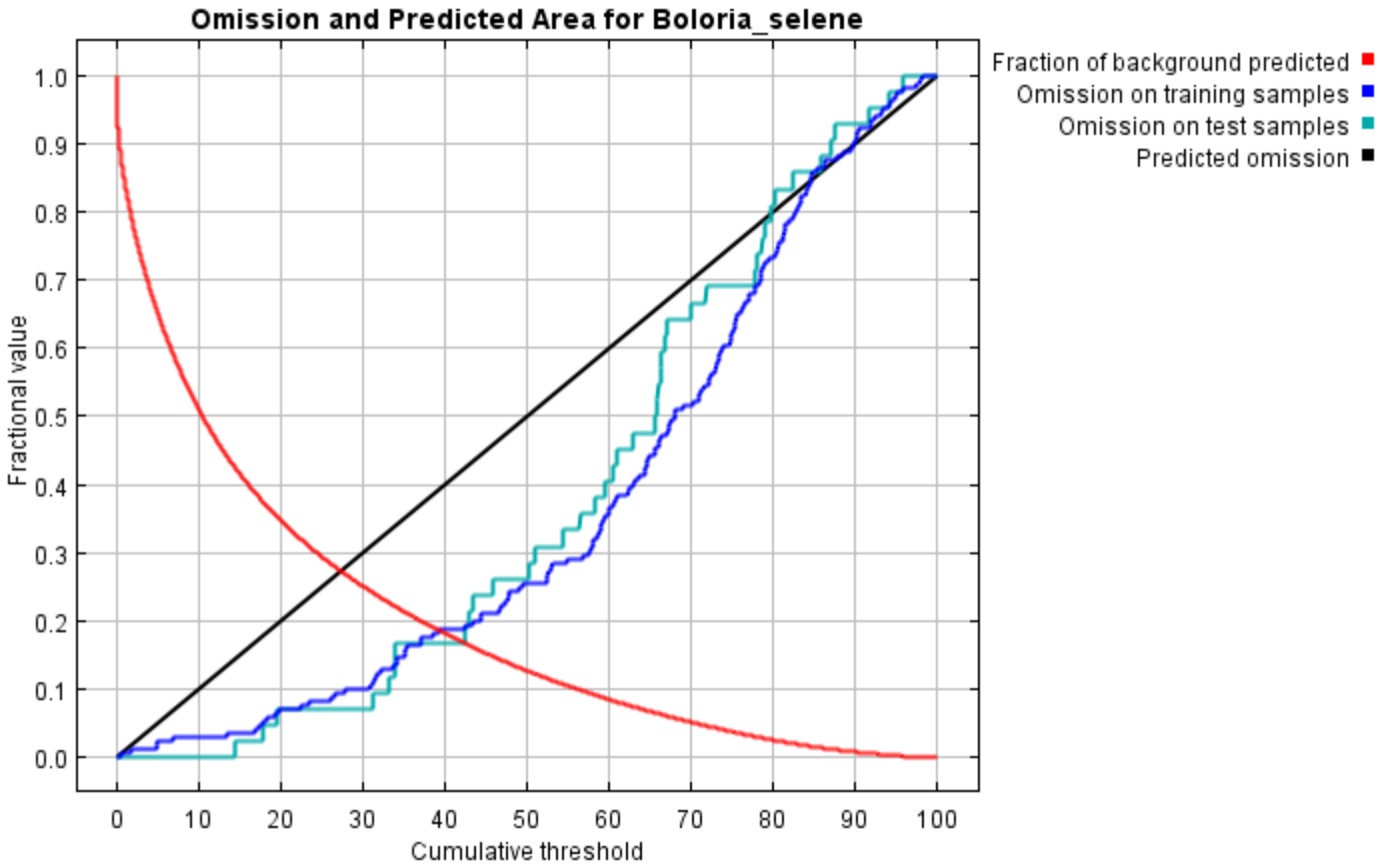
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Anatrytone_logan responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Boloria_selene

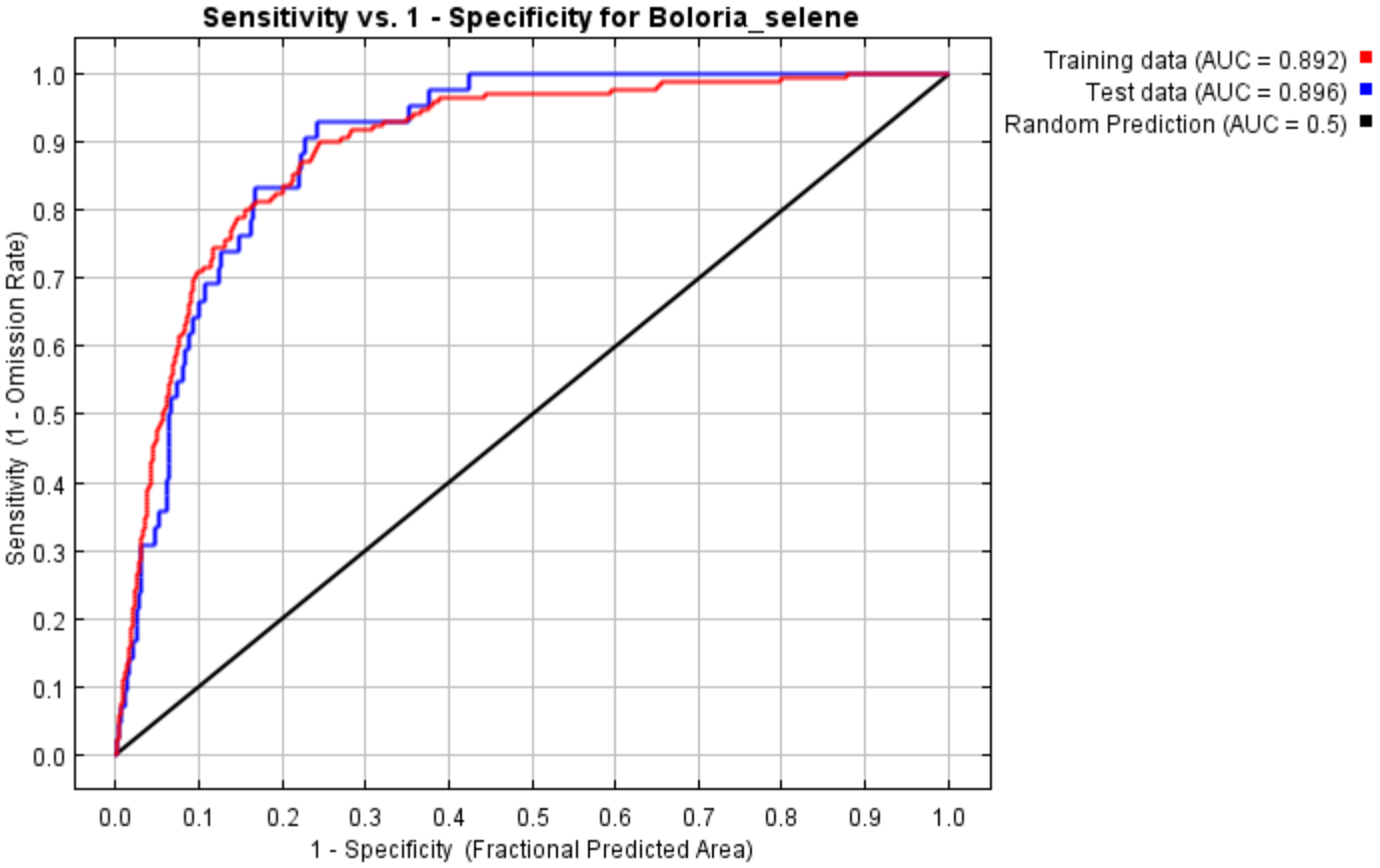
This page contains some analysis of the Maxent model for Boloria_selene, created Mon Jan 15 14:42:56 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.801 rather than 1; in practice the test AUC may exceed this bound.



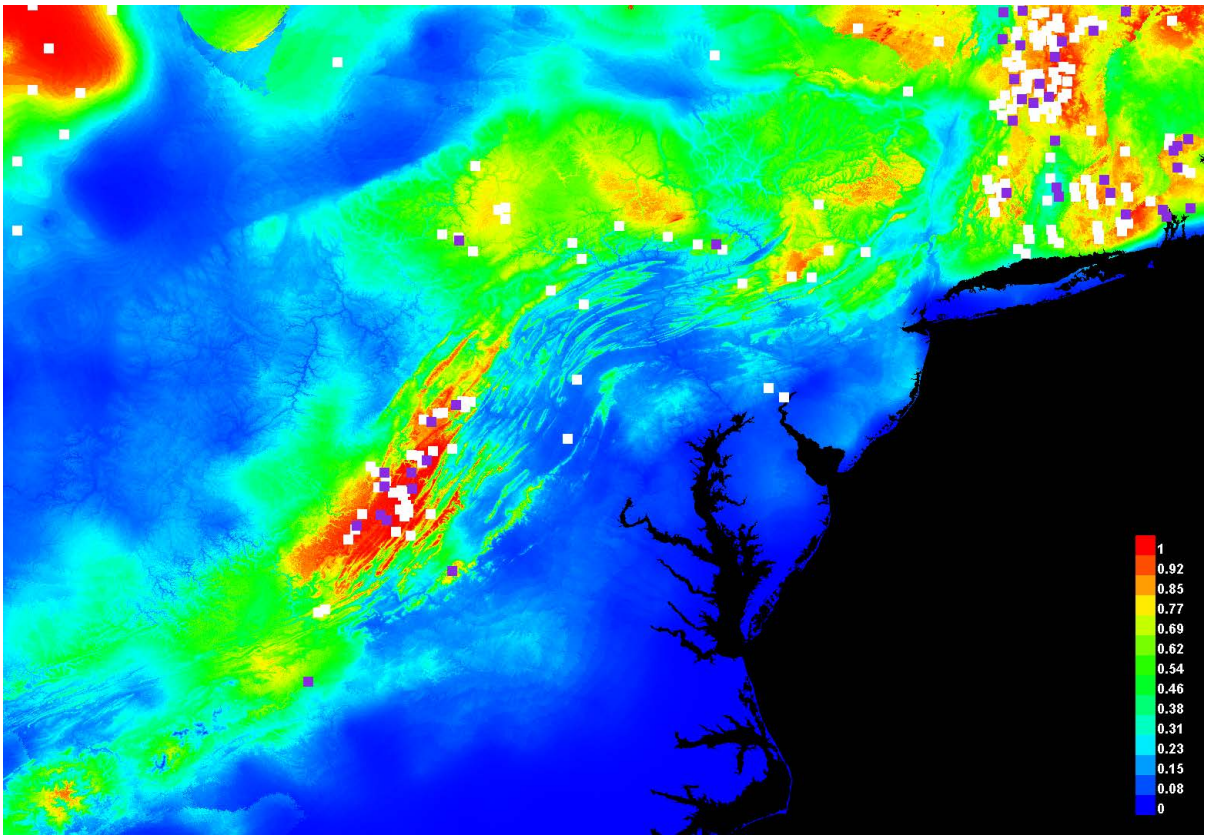
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.072	Fixed cumulative value 1	0.838	0.006	0.000	2.206E-3
5.000	0.135	Fixed cumulative value 5	0.650	0.024	0.000	1.009E-6
10.000	0.199	Fixed cumulative value 10	0.510	0.030	0.000	1.046E-10
0.486	0.054	Minimum training presence	0.878	0.000	0.000	7.935E-3
27.745	0.449	10 percentile training presence	0.270	0.095	0.071	3.306E-22
39.269	0.559	Equal training sensitivity and specificity	0.186	0.189	0.167	2.562E-27
30.852	0.483	Maximum training sensitivity plus	0.245	0.101	0.071	3.193E-

		specificity				25
42.374	0.585	Equal test sensitivity and specificity	0.168	0.195	0.167	4.218E-31
31.170	0.486	Maximum test sensitivity plus specificity	0.242	0.107	0.071	1.497E-25
4.894	0.133	Balance training omission, predicted area and threshold value	0.654	0.012	0.000	1.216E-6
10.082	0.200	Equate entropy of thresholded and original distributions	0.508	0.030	0.000	8.953E-11

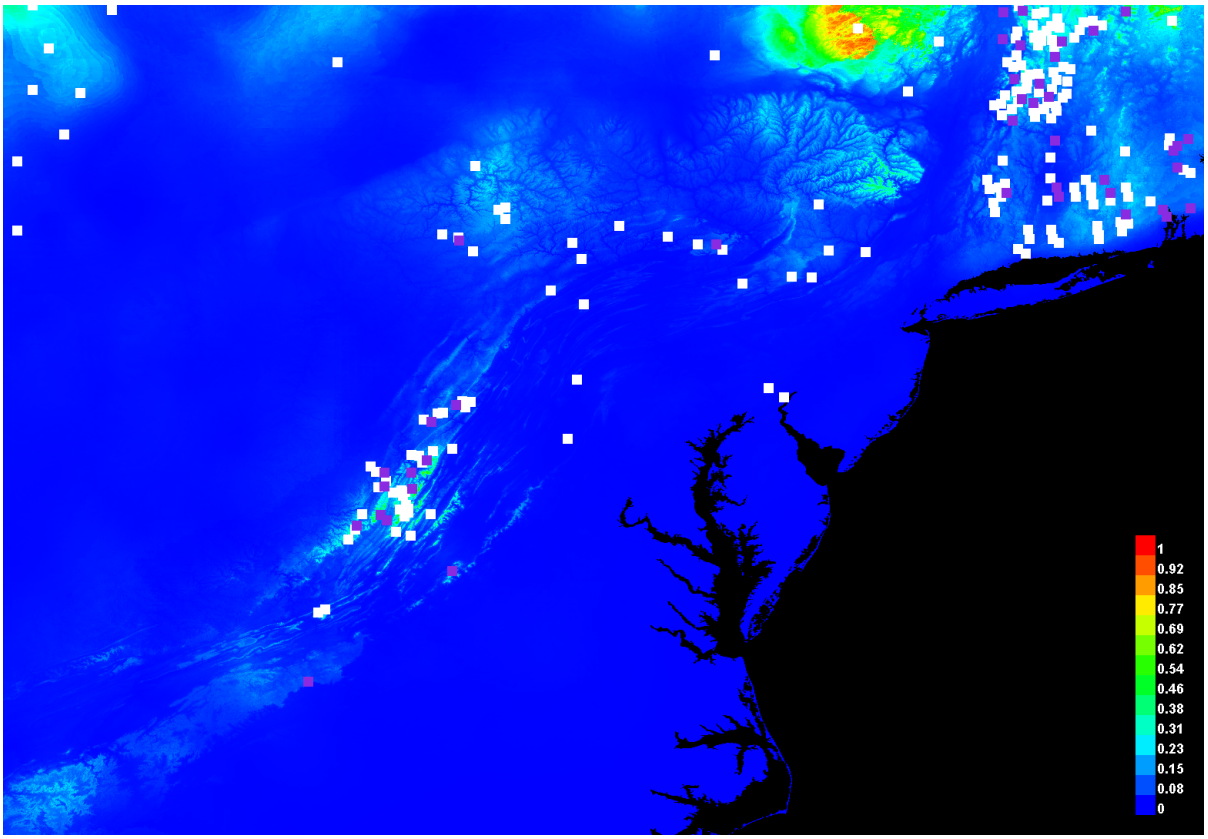
Pictures of the model

This is a representation of the Maxent model for Boloria_selene. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



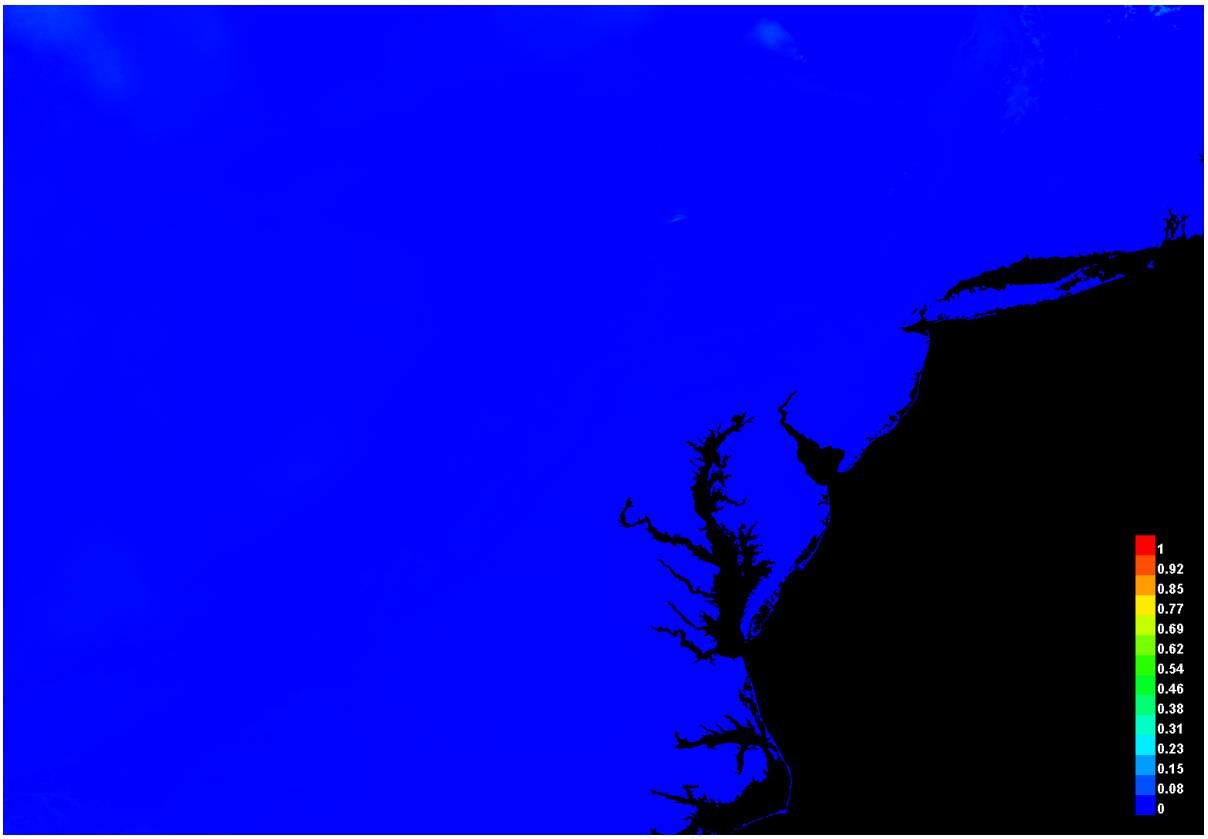
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

This is the projection of the Maxent model for Boloria_selene onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

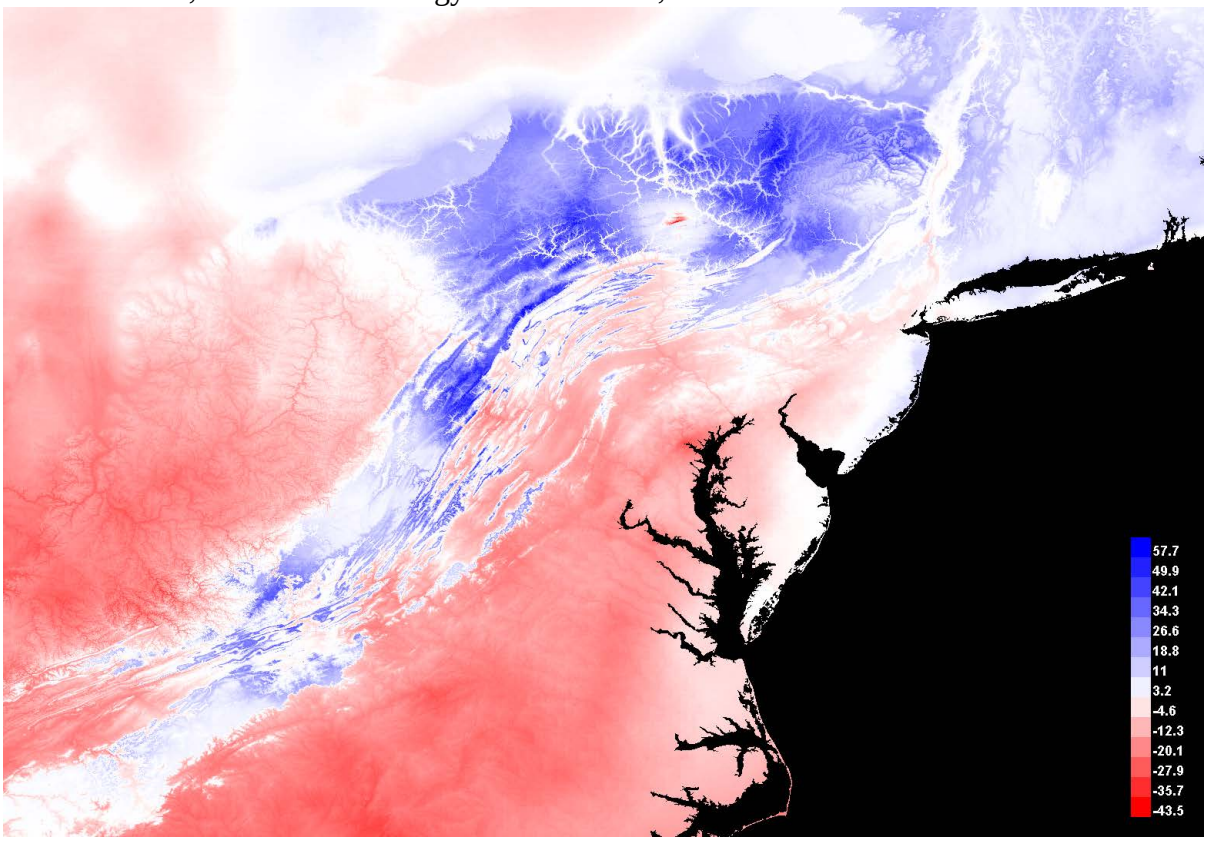


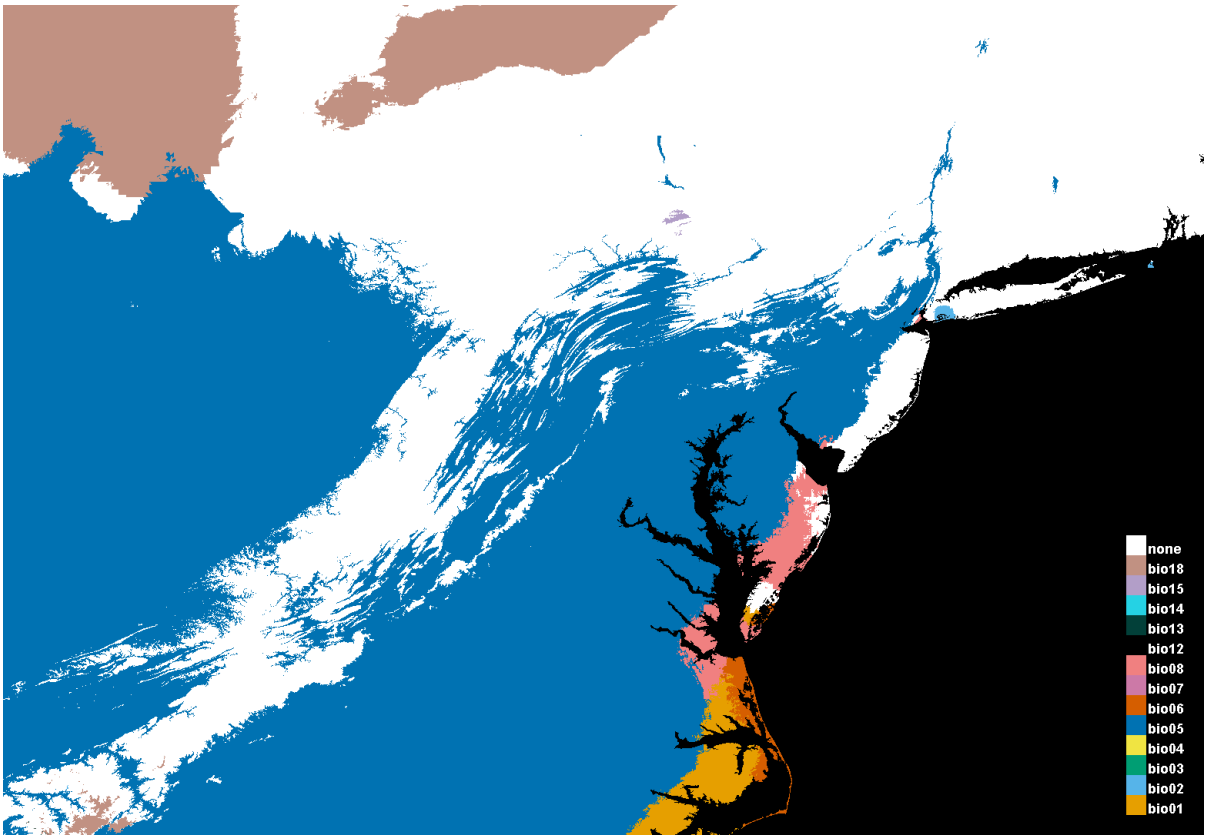
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



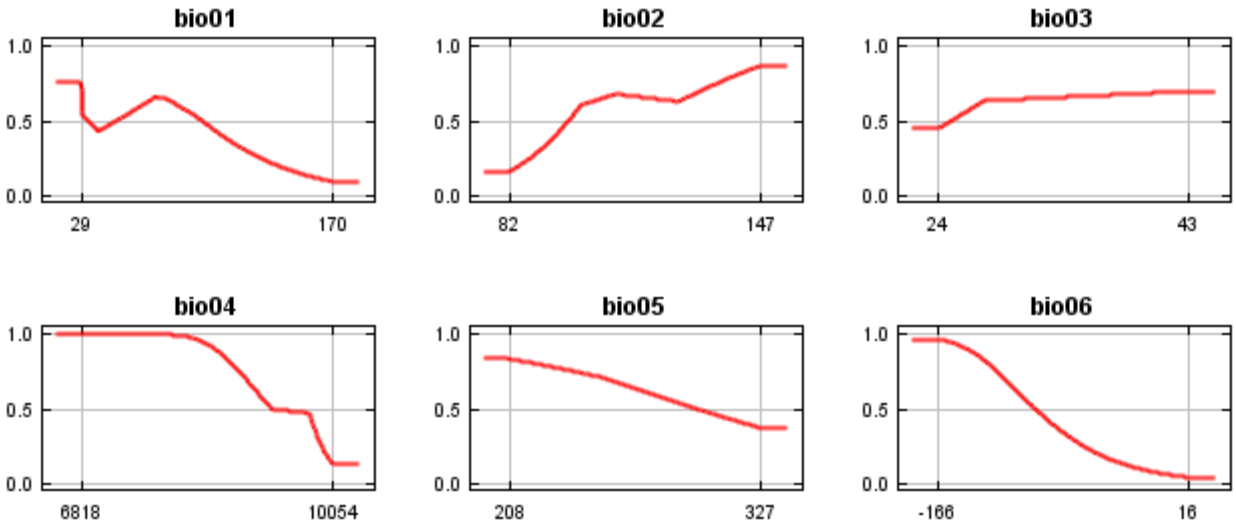
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

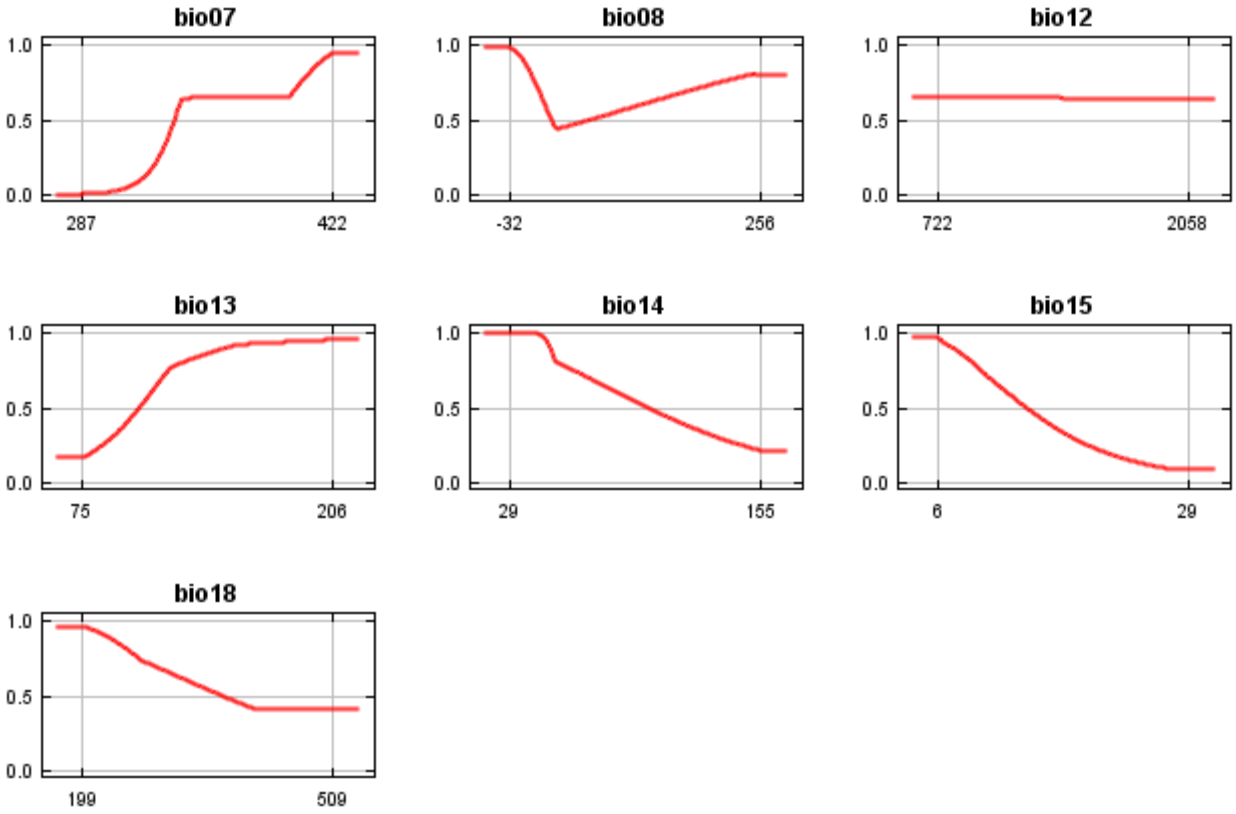




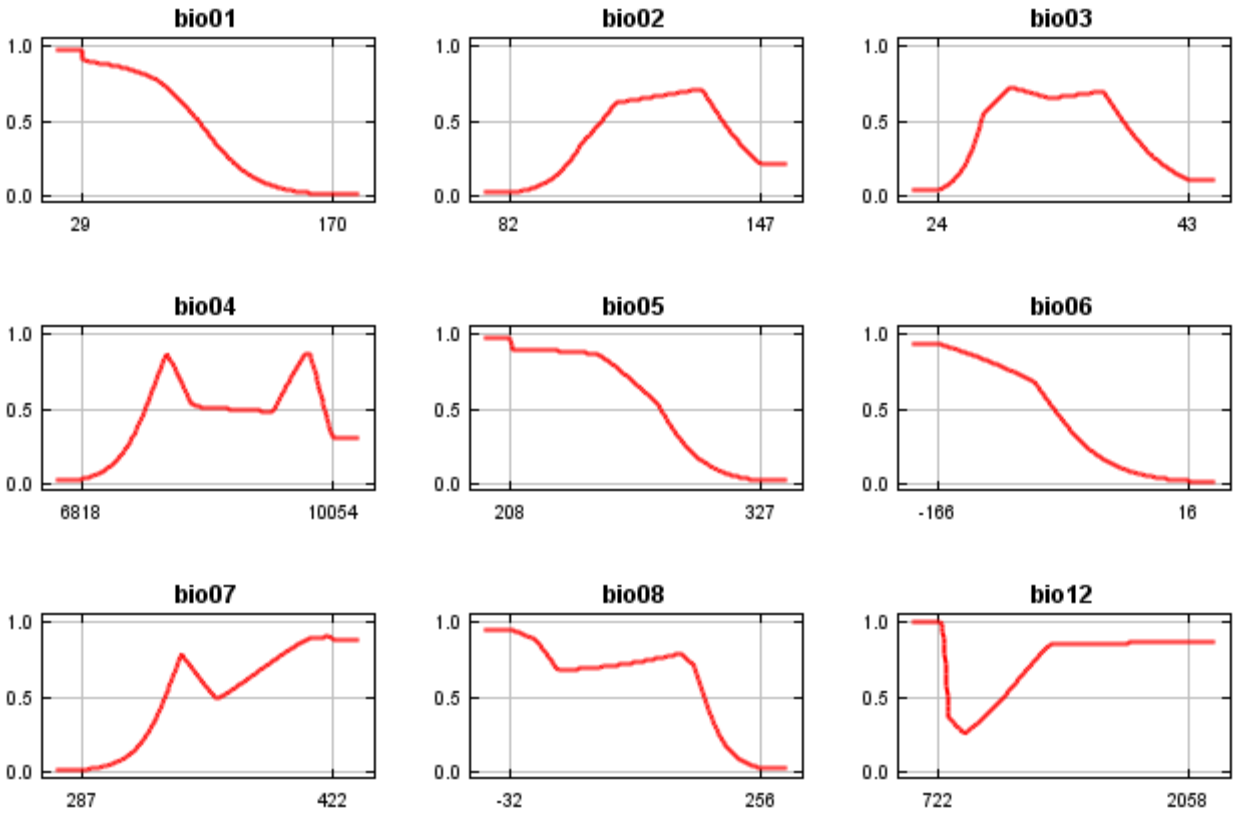
Response curves

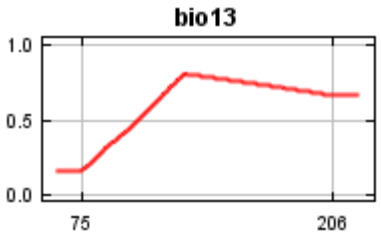
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.

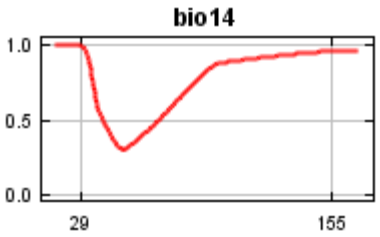


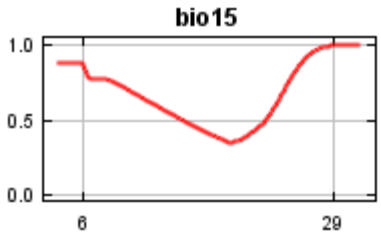


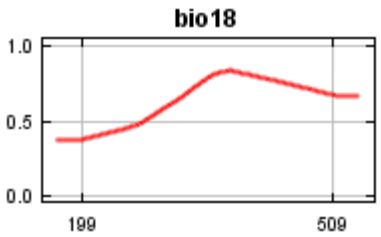
In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.











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
bio05	35.3	1.2
bio02	12.6	1.6
bio04	11	11.6
bio15	9.6	17.3
bio06	7.8	26.8
bio08	6.8	1.8
bio14	5.3	5.7
bio07	5	11
bio01	4	12.3
bio13	1.7	8.7
bio18	0.4	2.1
bio03	0.4	0
bio12	0.1	0

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.466, training AUC is 0.892, unregularized training gain is 0.597.
Unregularized test gain is 1.053.
Test AUC is 0.896, standard deviation is 0.016 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (4 seconds).

The follow settings were used during the run:
169 presence records used for training, 42 for testing.
10168 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.050, categorical: 0.250, threshold: 1.000, hinge: 0.500
Feature types used: hinge product linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

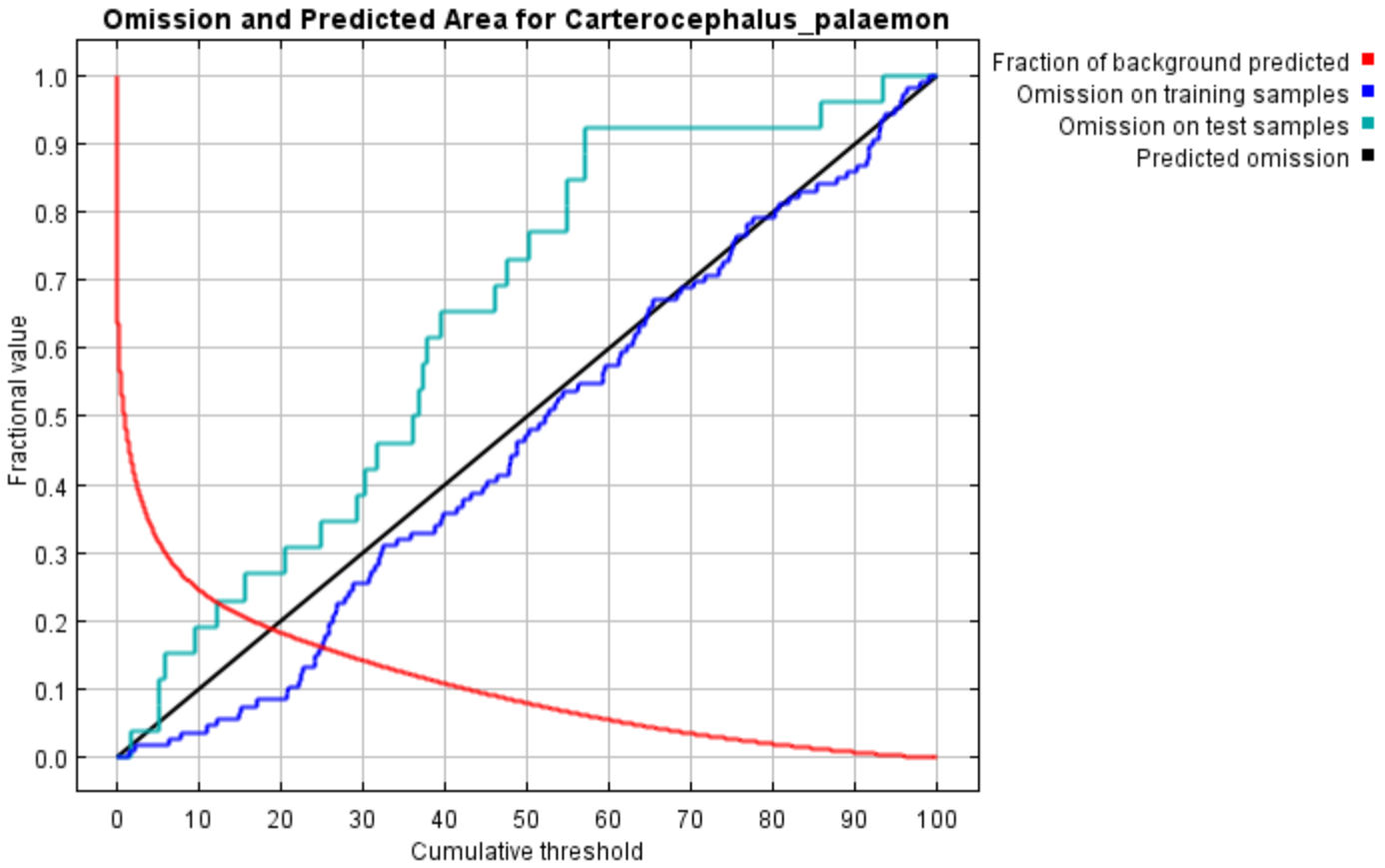
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Boloria_selene responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Carterocephalus_palaemon

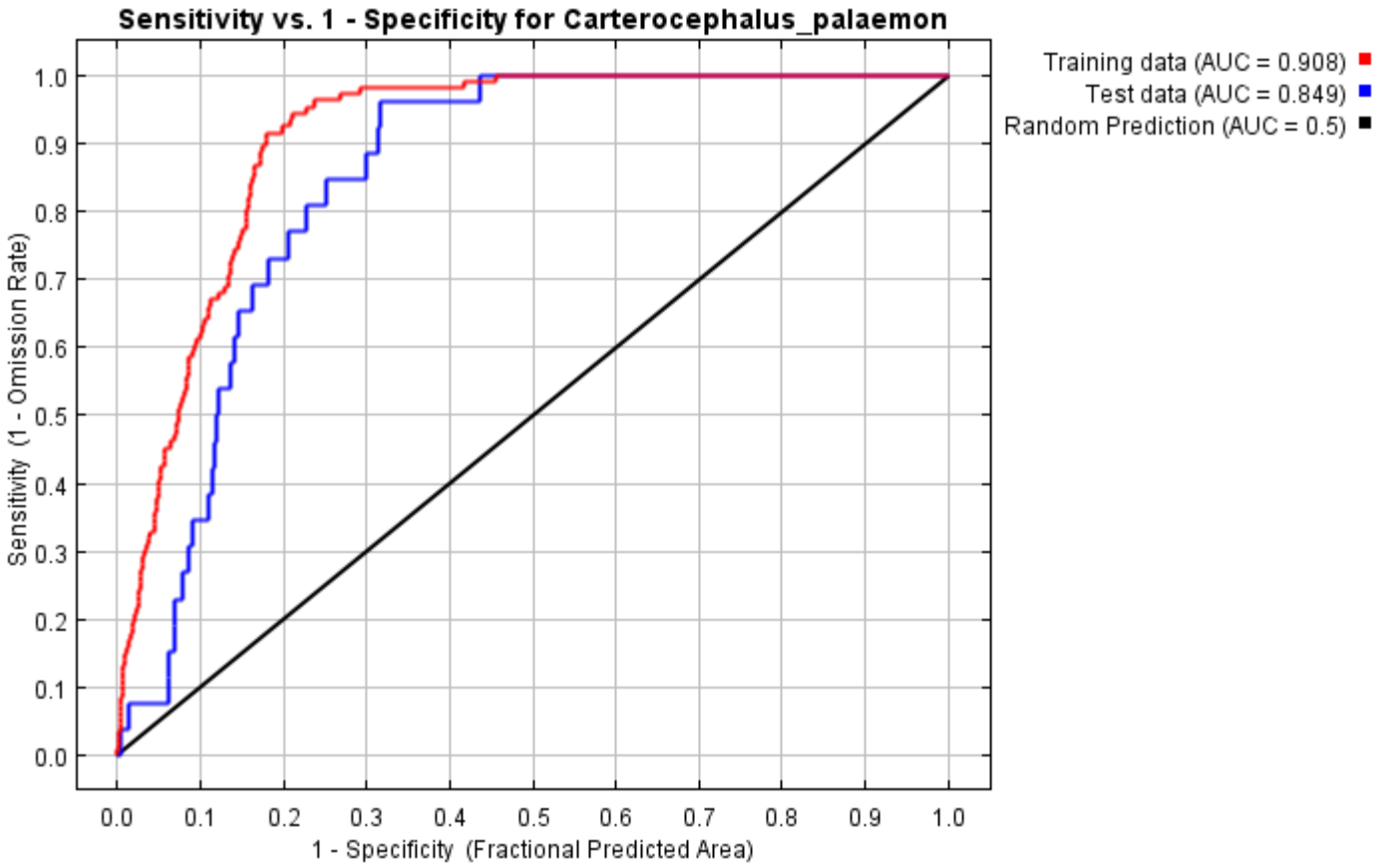
This page contains some analysis of the Maxent model for Carterocephalus_palaemon, created Mon Jan 15 14:43:39 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.889 rather than 1; in practice the test AUC may exceed this bound.



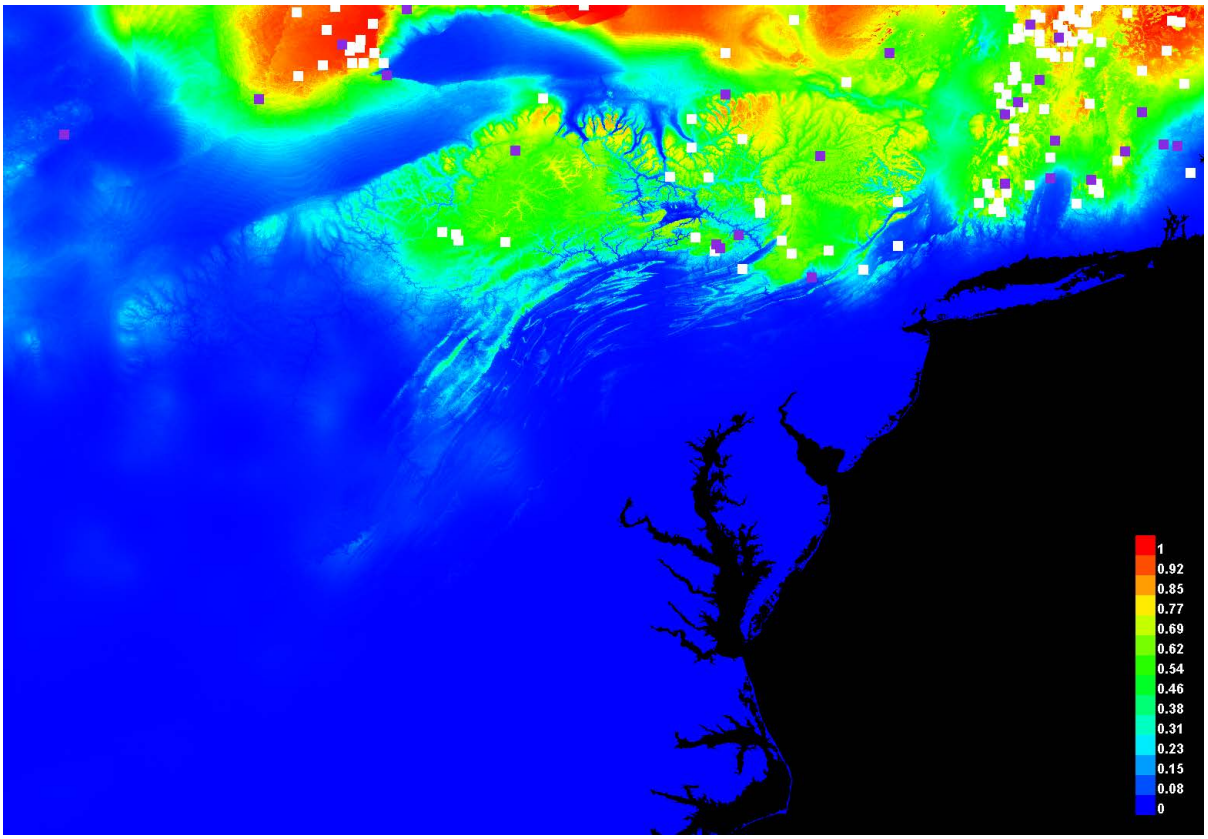
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.032	Fixed cumulative value 1	0.490	0.000	0.000	9.777E-8
5.000	0.121	Fixed cumulative value 5	0.318	0.019	0.038	9.485E-13
10.000	0.263	Fixed cumulative value 10	0.246	0.038	0.192	1.488E-11
1.429	0.042	Minimum training presence	0.456	0.000	0.000	1.304E-8
20.843	0.476	10 percentile training presence	0.180	0.094	0.308	4.777E-12
25.113	0.515	Equal training sensitivity and specificity	0.161	0.160	0.346	4.211E-12
20.624	0.475	Maximum training sensitivity plus	0.181	0.085	0.308	5.79E-

		specificity				12
12.316	0.328	Equal test sensitivity and specificity	0.227	0.057	0.231	1.965E-11
5.105	0.124	Maximum test sensitivity plus specificity	0.316	0.019	0.038	7.189E-13
1.429	0.042	Balance training omission, predicted area and threshold value	0.456	0.000	0.000	1.304E-8
6.281	0.156	Equate entropy of thresholded and original distributions	0.293	0.019	0.154	2.852E-10

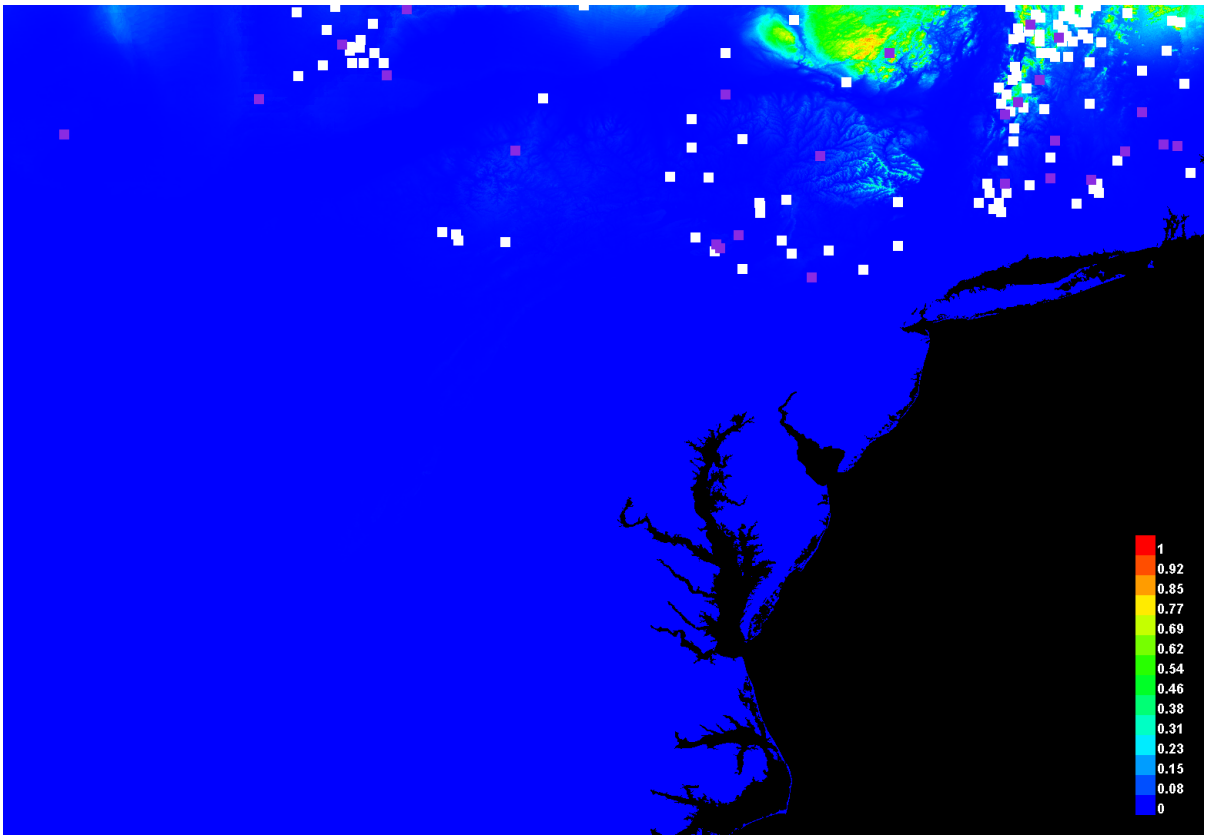
Pictures of the model

This is a representation of the Maxent model for Carterocephalus_palaemon. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



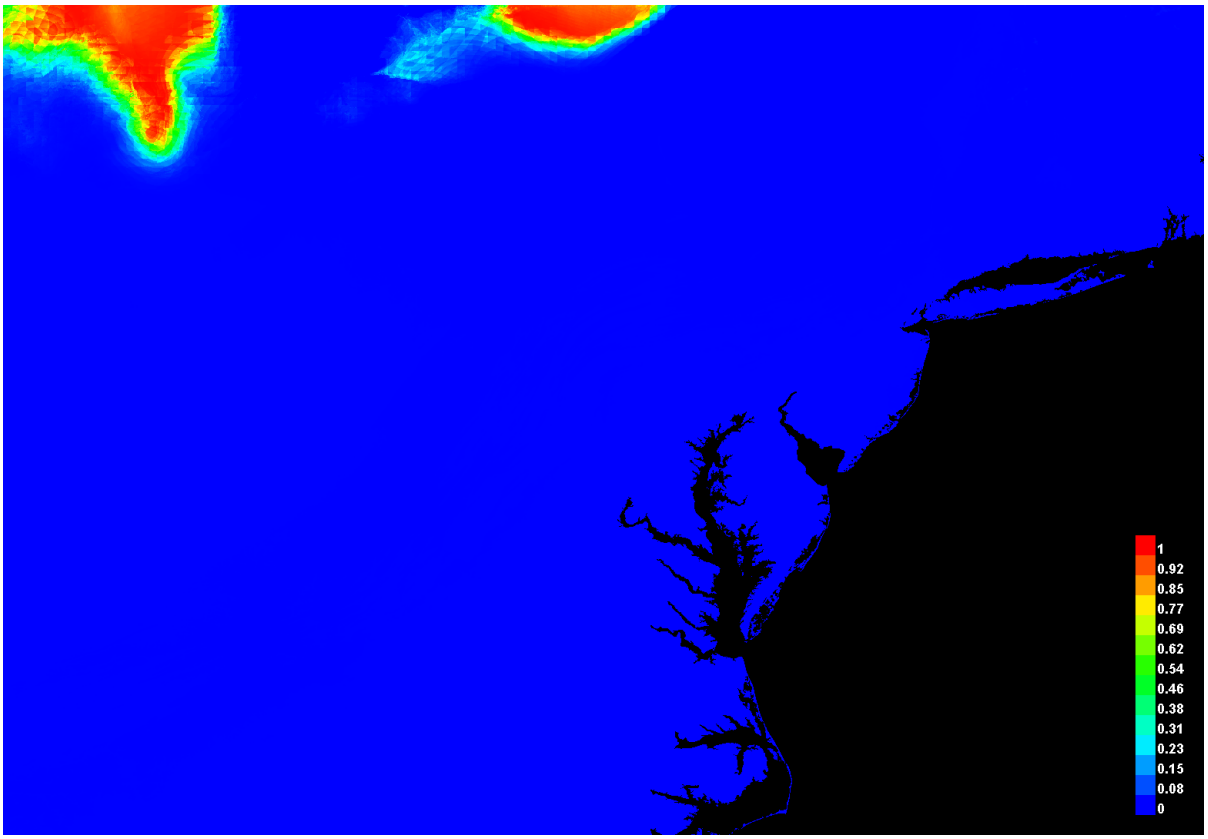
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

This is the projection of the Maxent model for Carterocephalus_palaemon onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

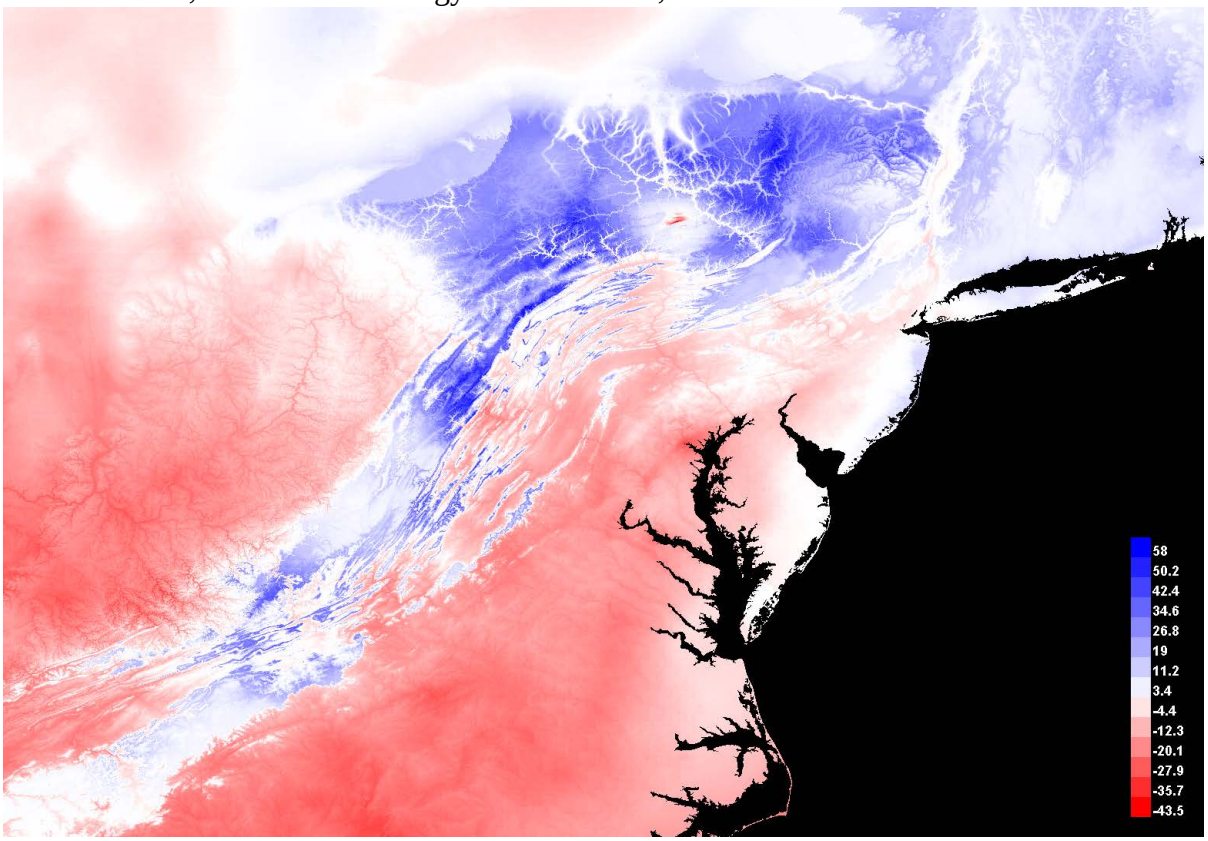


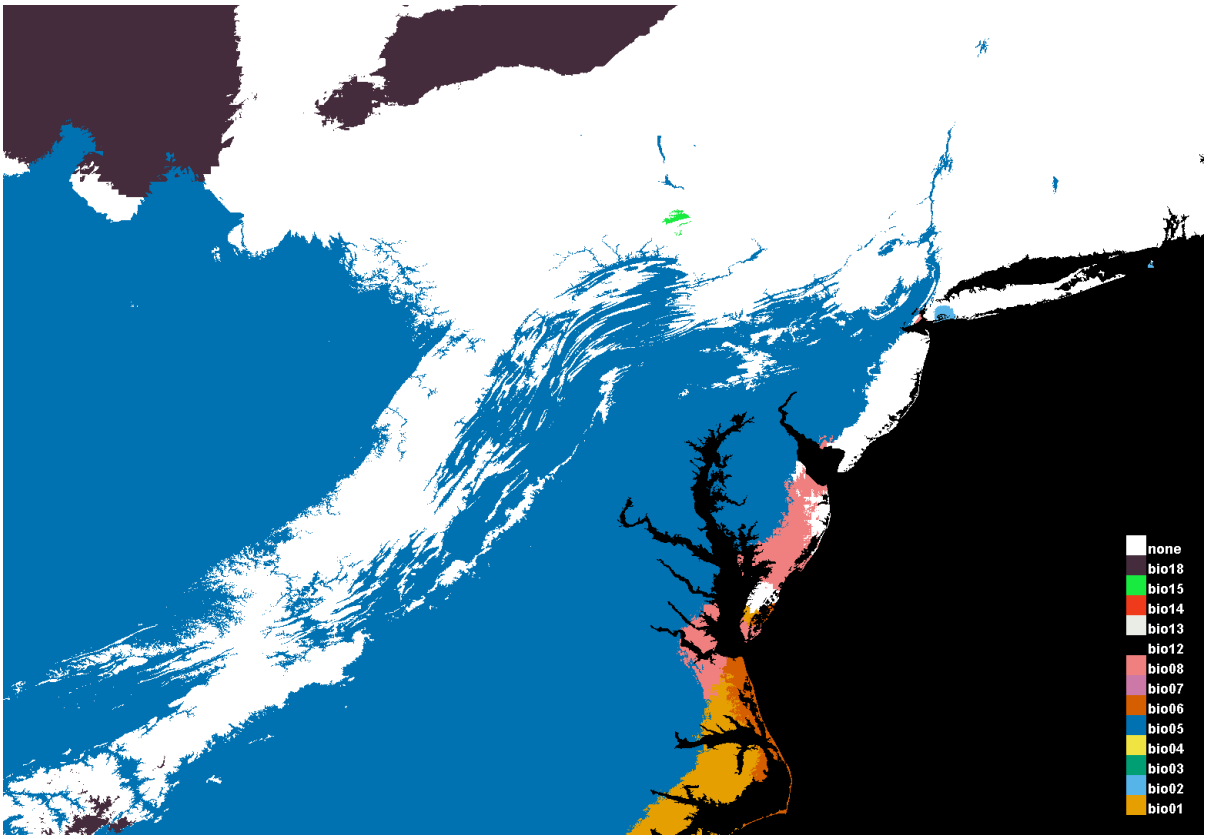
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



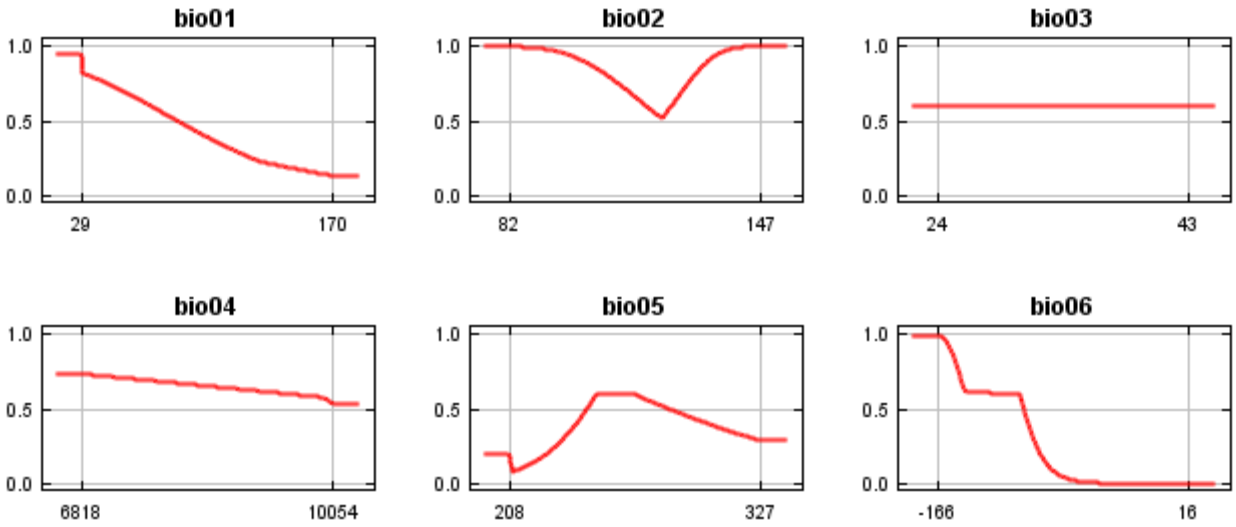
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

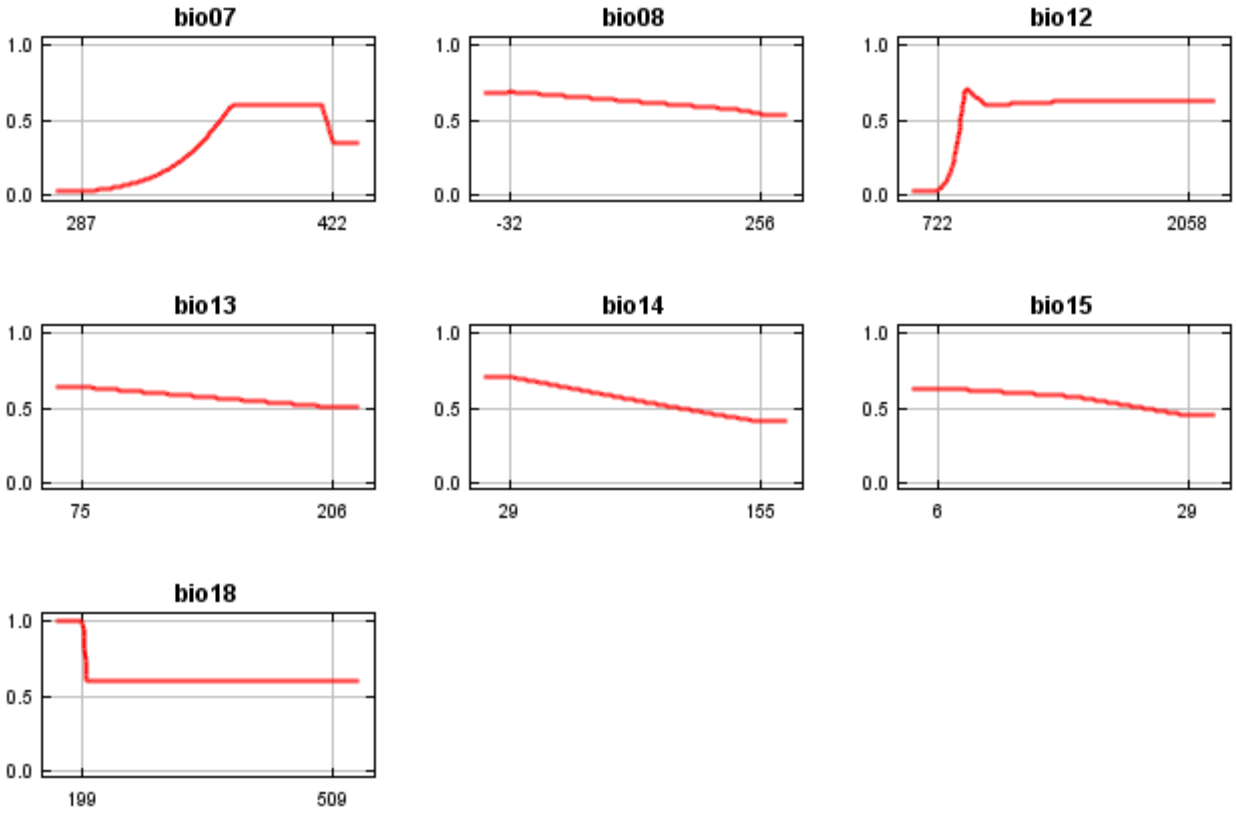




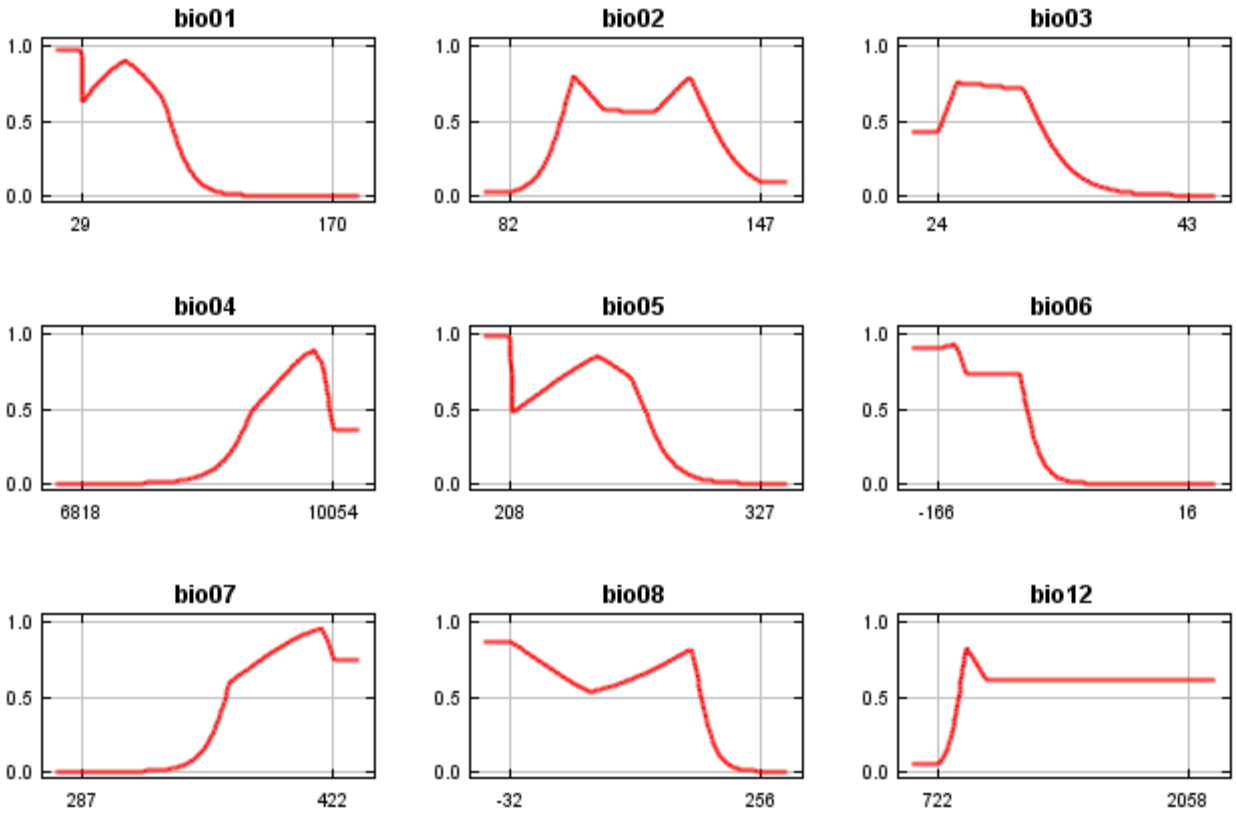
Response curves

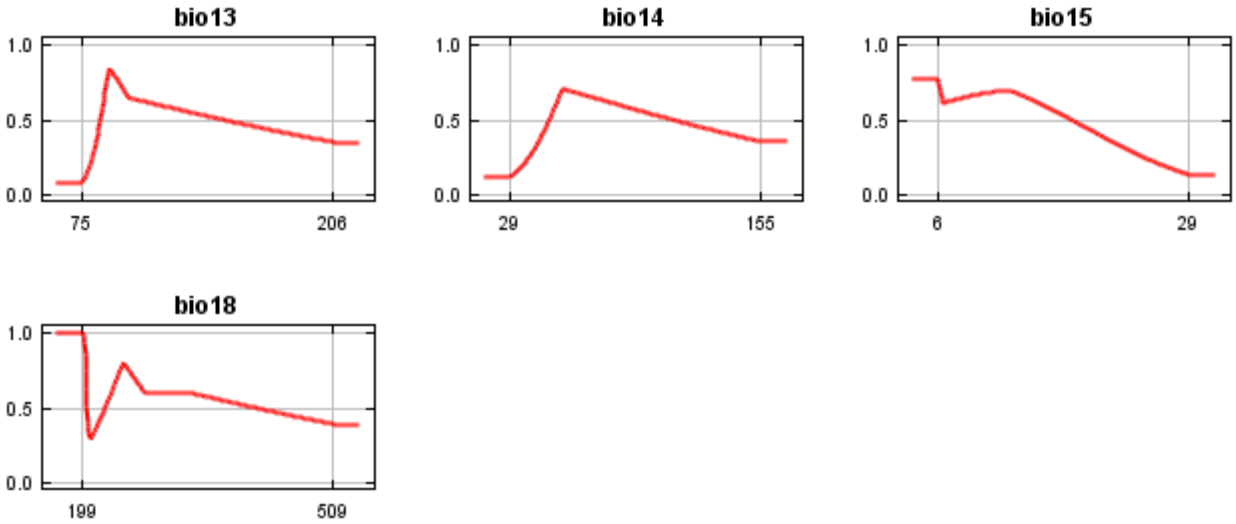
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.





In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.





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
bio06	57.4	77.2
bio01	23.8	5.1
bio05	5.2	0.4
bio12	2.6	3.7
bio02	2.6	3.7
bio03	2.2	0
bio07	2.1	8.1
bio04	1.8	0.4
bio08	1.1	0.6
bio13	0.8	0
bio18	0.3	0
bio15	0.1	0.9
bio14	0	0

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.782, training AUC is 0.908, unregularized training gain is 0.963.
Unregularized test gain is 0.819.
Test AUC is 0.849, standard deviation is 0.020 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (3 seconds).

The follow settings were used during the run:
106 presence records used for training, 26 for testing.
10105 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.050, categorical: 0.250, threshold: 1.000, hinge: 0.500
Feature types used: hinge product linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

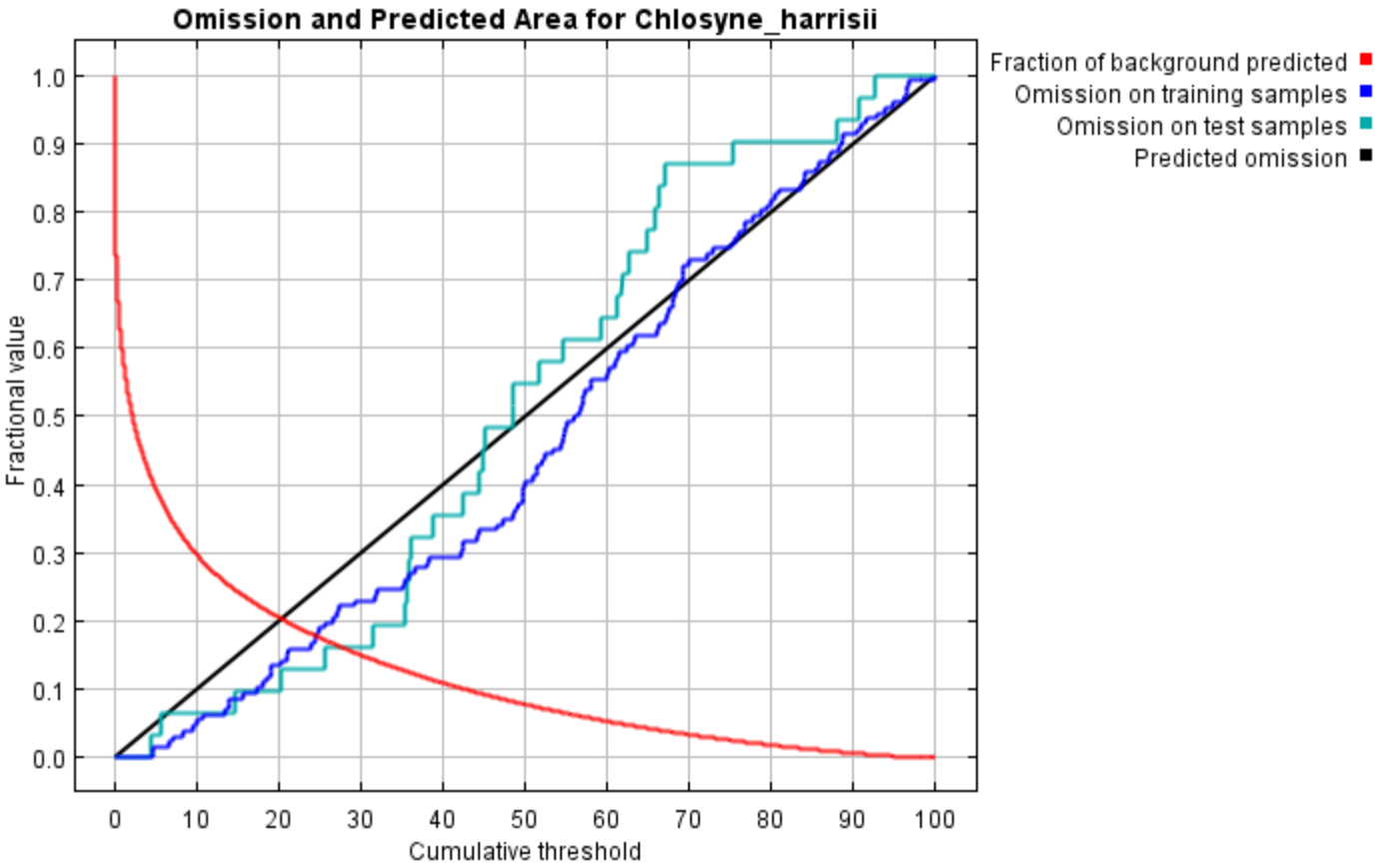
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Carterocephalus_palaemon responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Chlosyne_harrisii

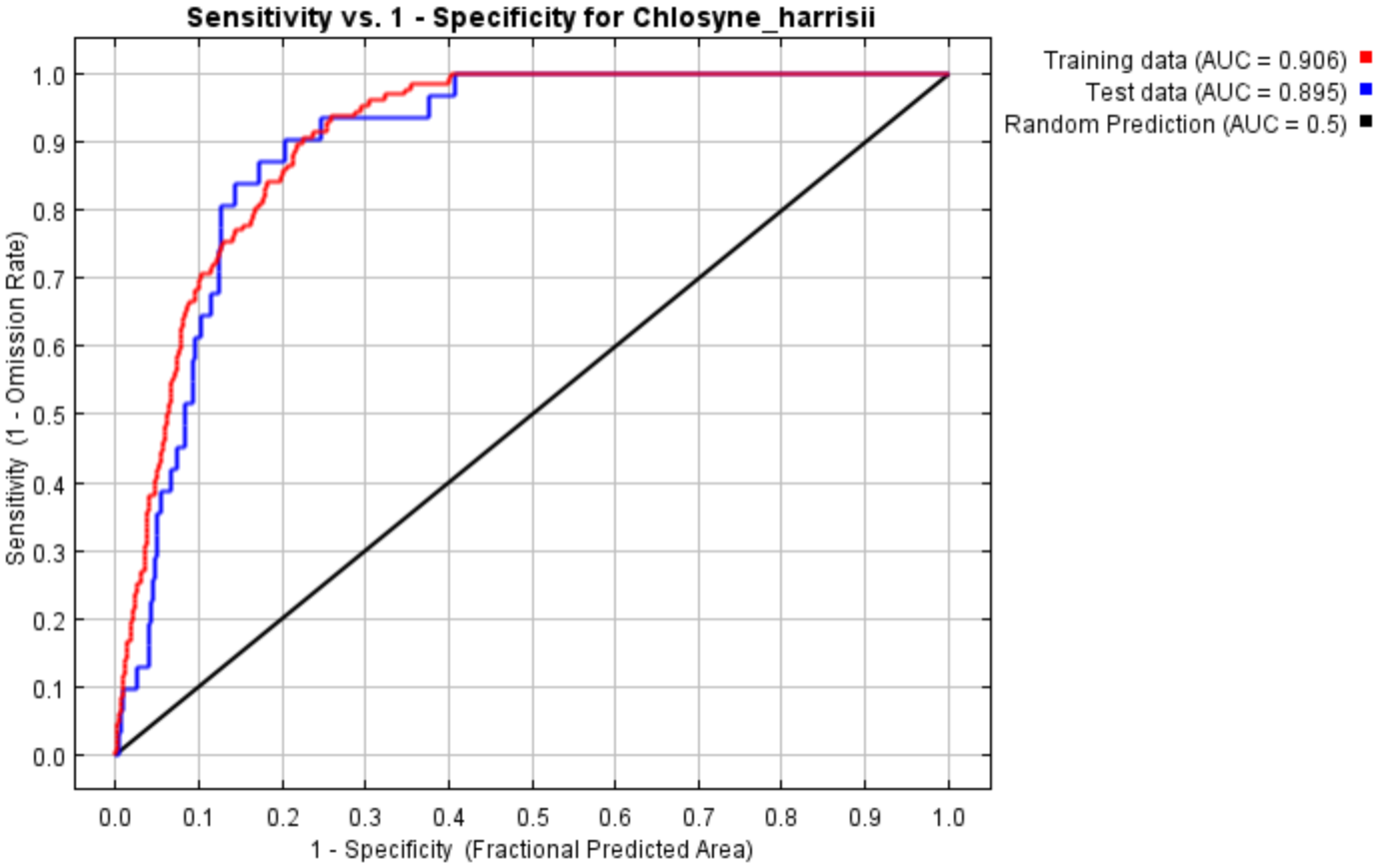
This page contains some analysis of the Maxent model for Chlosyne_harrisii, created Mon Jan 15 14:44:13 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.877 rather than 1; in practice the test AUC may exceed this bound.



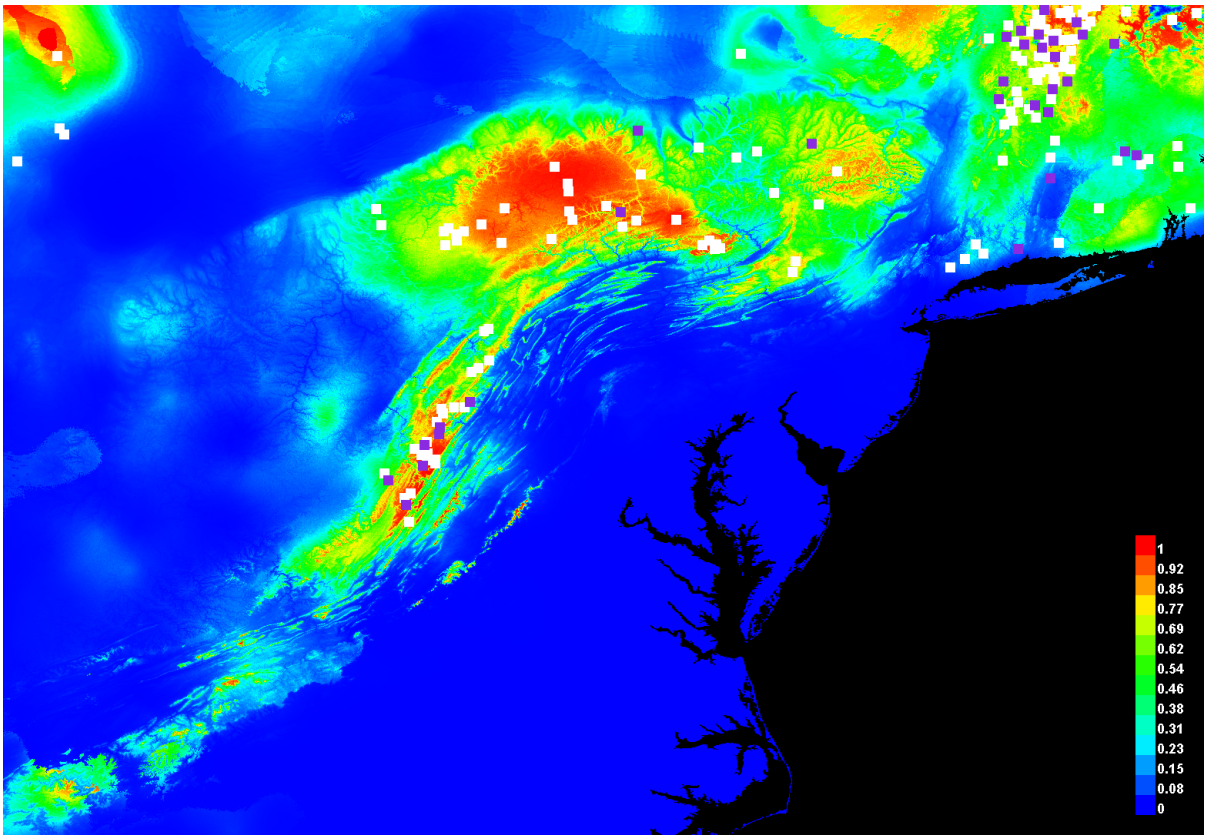
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.032	Fixed cumulative value 1	0.583	0.000	0.000	1.226E-6
5.000	0.111	Fixed cumulative value 5	0.393	0.016	0.032	2.937E-11
10.000	0.206	Fixed cumulative value 10	0.297	0.048	0.065	3.718E-15
4.648	0.105	Minimum training presence	0.403	0.000	0.032	7.333E-11
17.212	0.343	10 percentile training presence	0.225	0.095	0.097	8.141E-20
24.504	0.440	Equal training sensitivity and specificity	0.178	0.175	0.129	3.745E-24
17.212	0.343	Maximum training sensitivity plus	0.225	0.095	0.097	8.141E-

		specificity				20
27.802	0.471	Equal test sensitivity and specificity	0.161	0.222	0.161	5.576E-25
20.322	0.389	Maximum test sensitivity plus specificity	0.203	0.143	0.097	1.855E-22
4.648	0.105	Balance training omission, predicted area and threshold value	0.403	0.000	0.032	7.333E-11
8.516	0.177	Equate entropy of thresholded and original distributions	0.320	0.040	0.065	9.619E-14

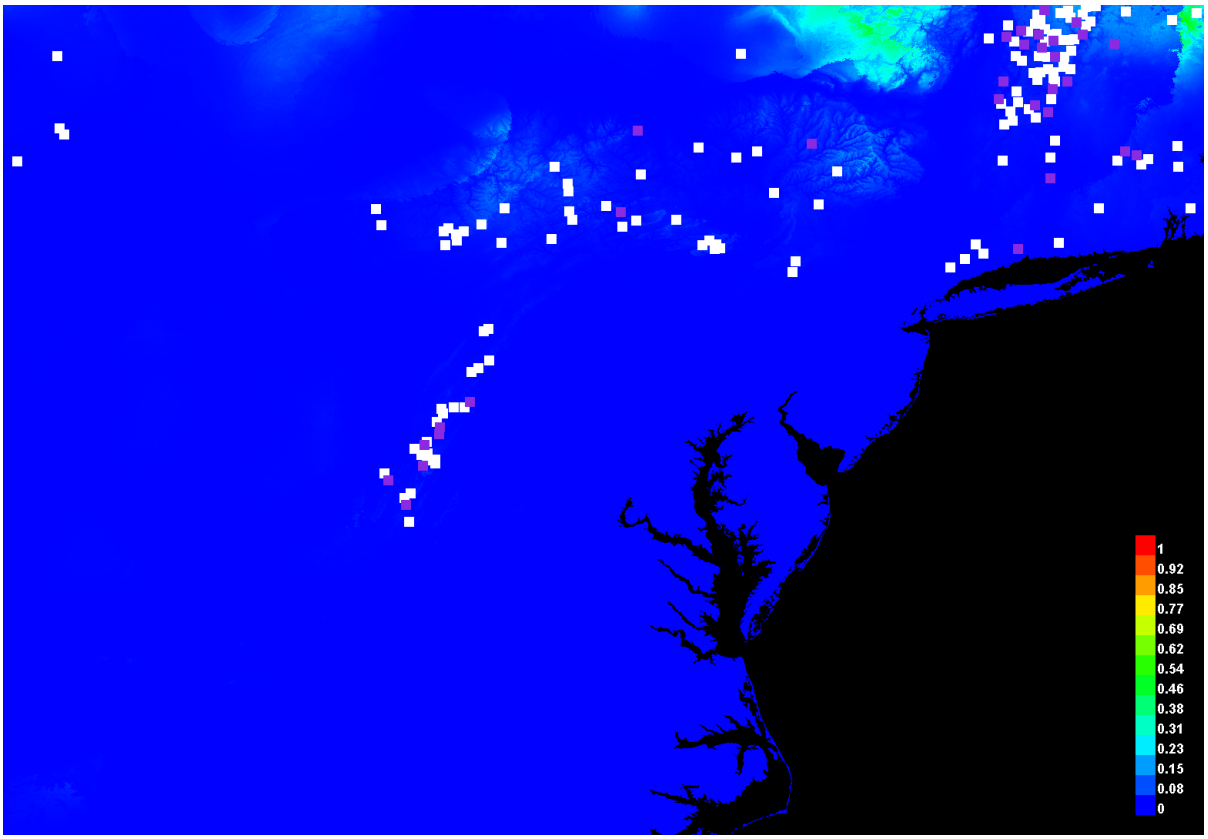
Pictures of the model

This is a representation of the Maxent model for Chlosyne_harrisii. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



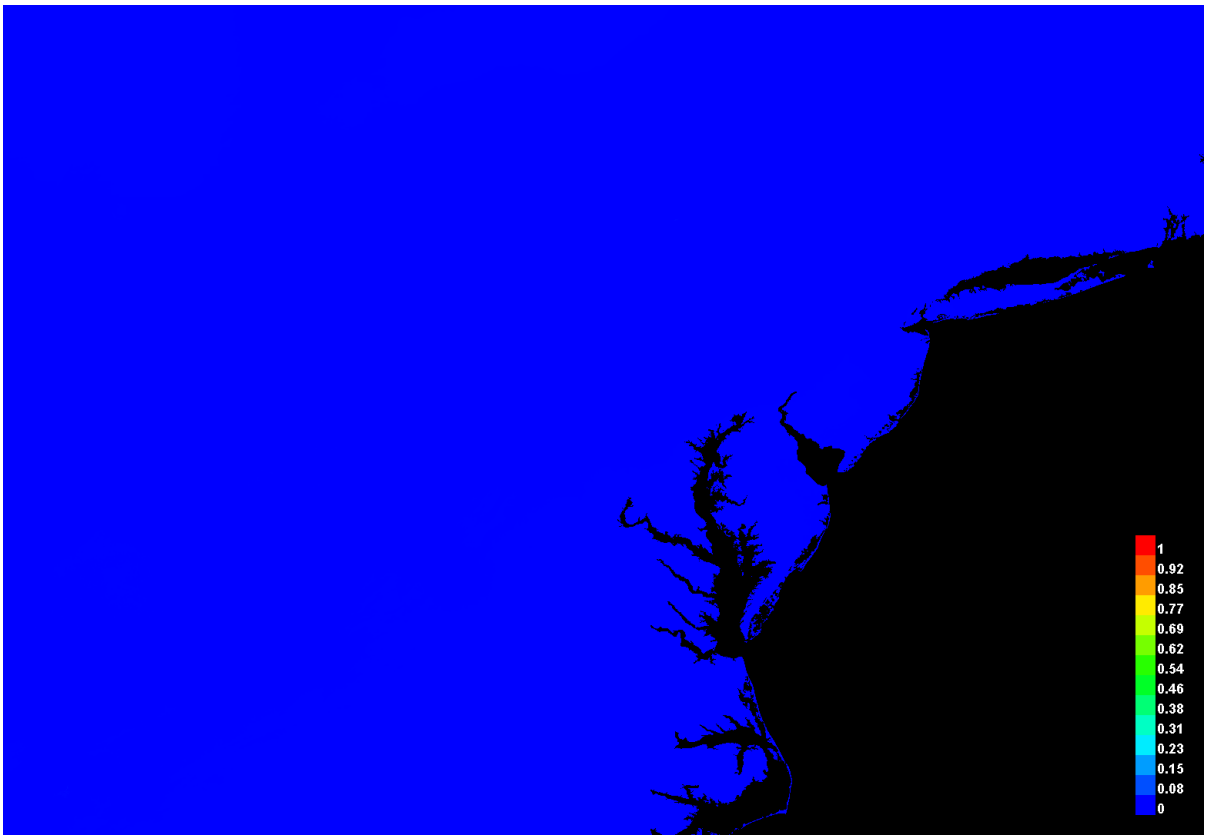
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

This is the projection of the Maxent model for Chlosyne_harrisii onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

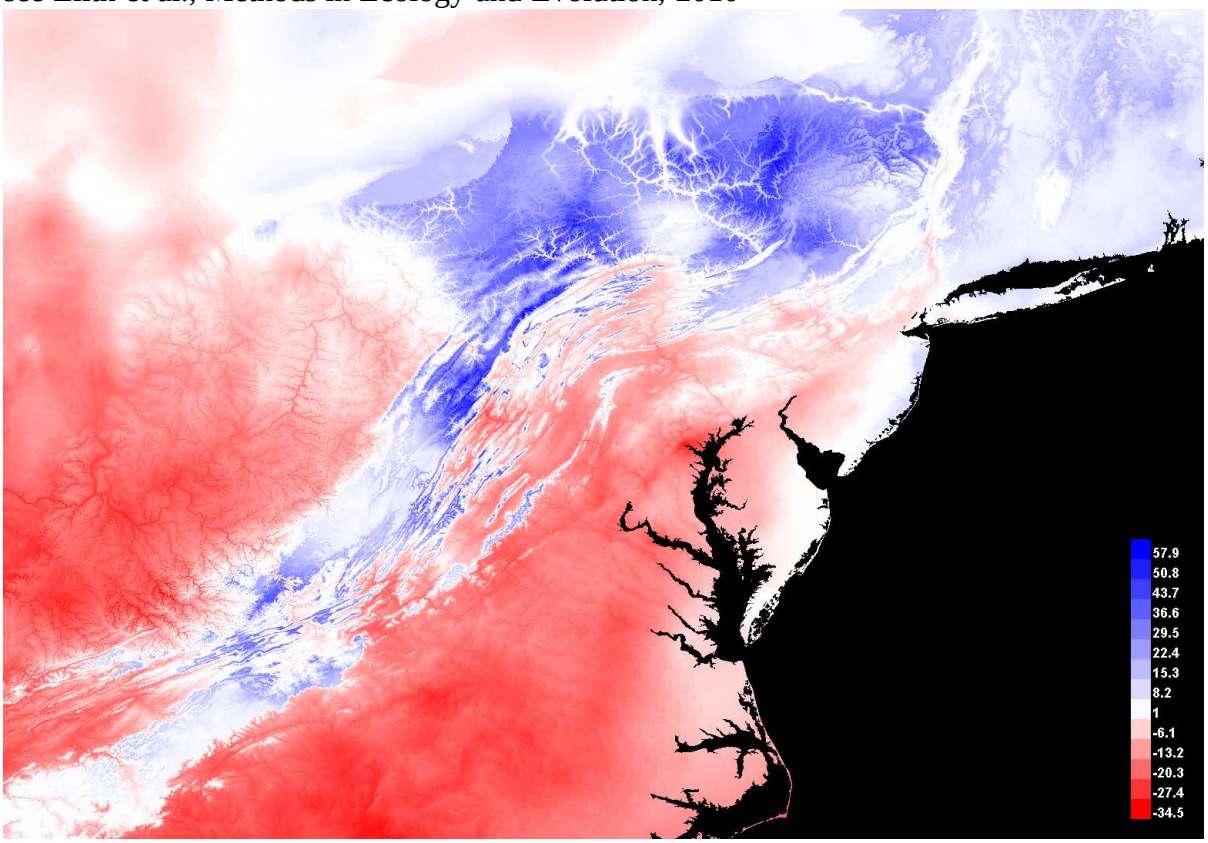


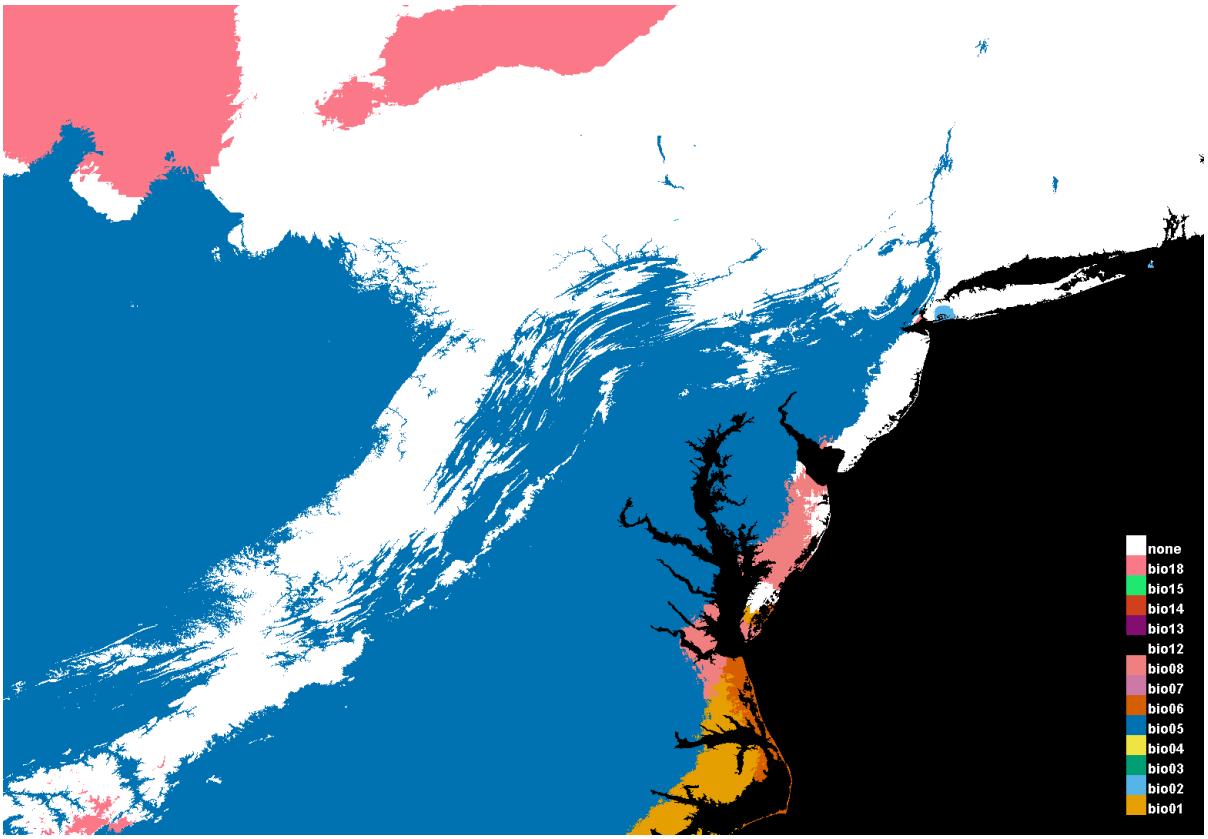
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



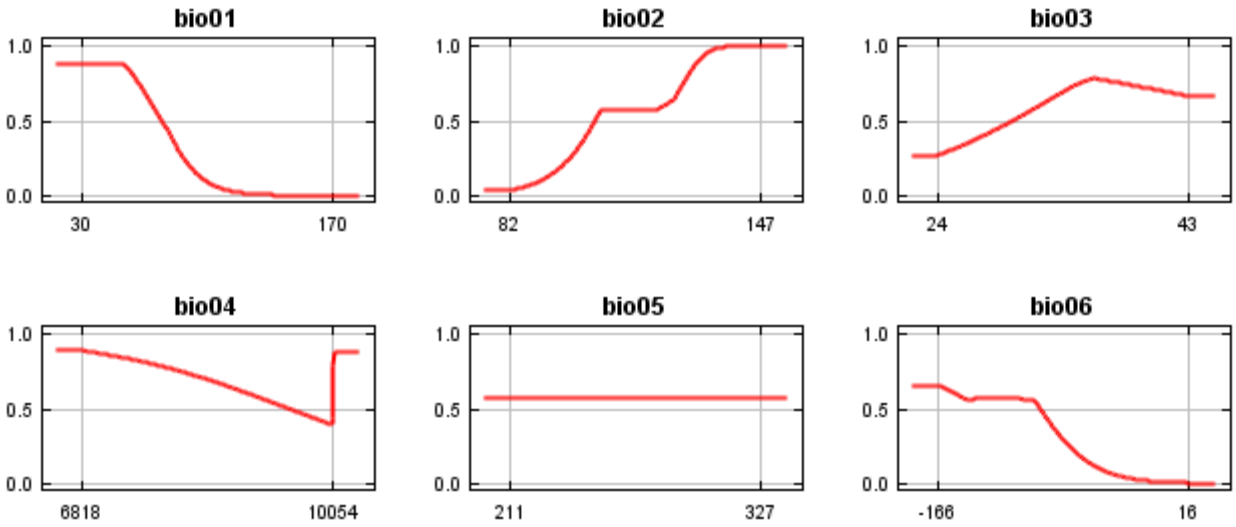
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

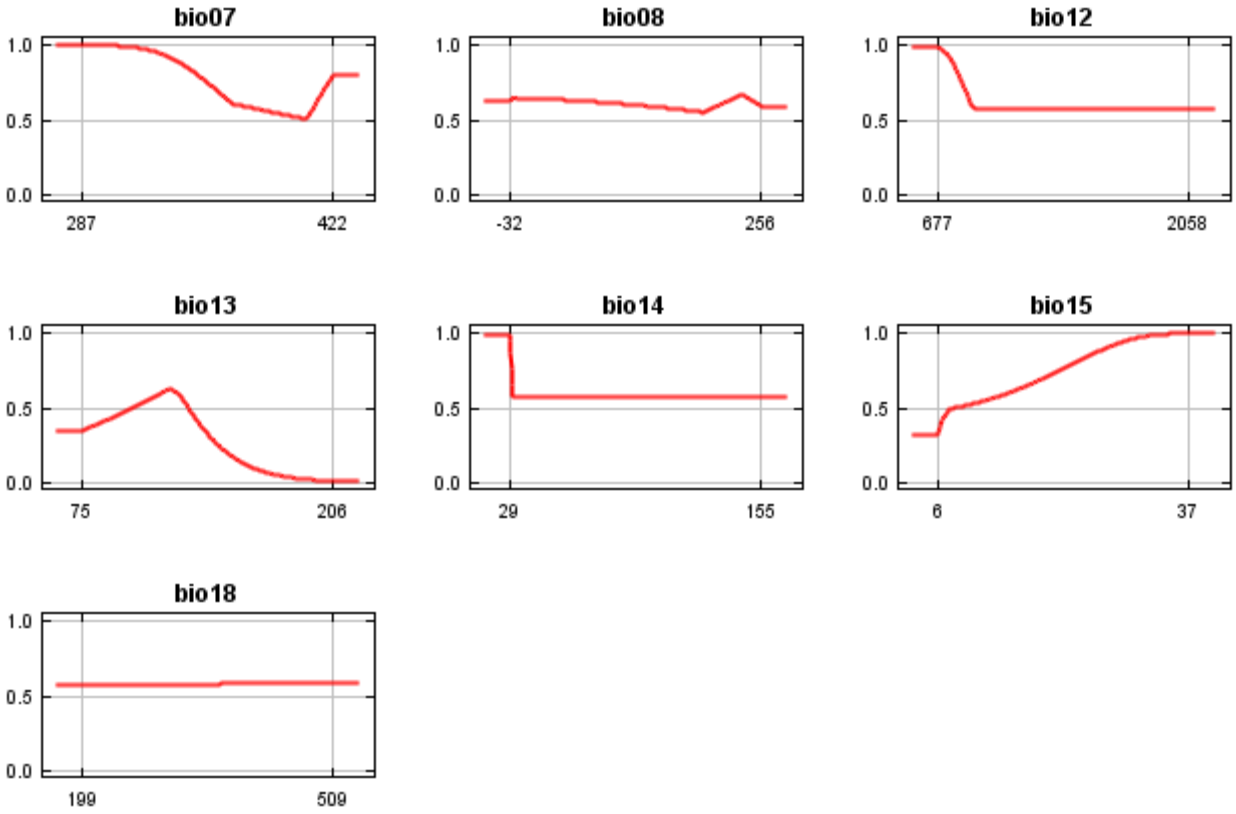




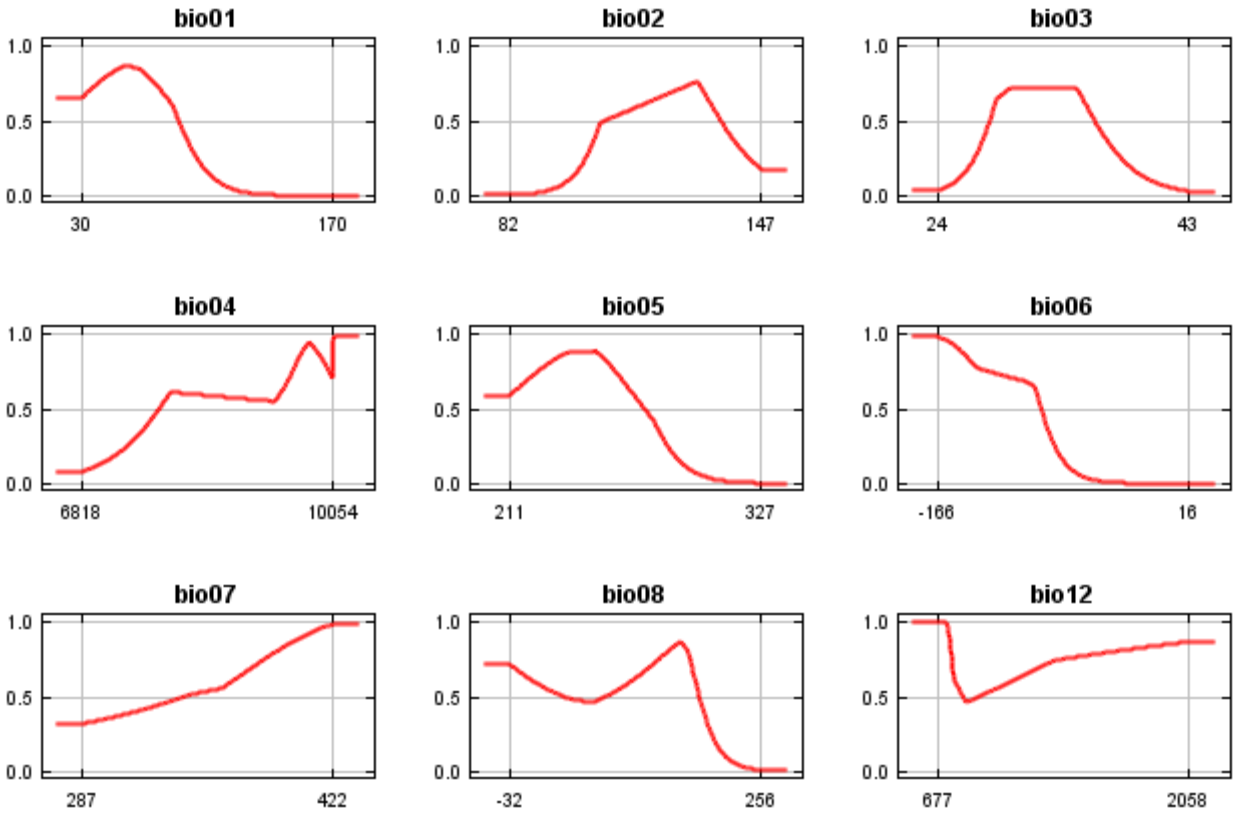
Response curves

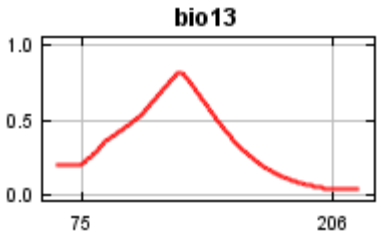
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.

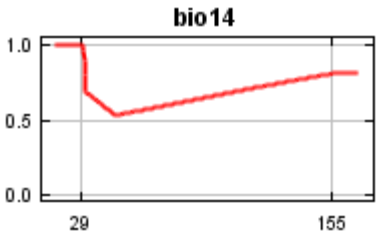


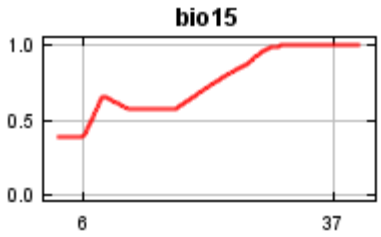


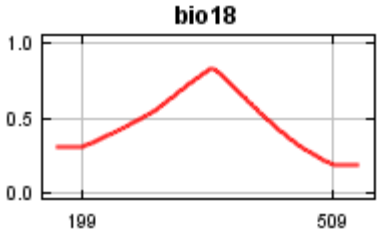
In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.











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
bio01	50.8	59.4
bio02	11.5	13.8
bio06	7.5	16.2
bio05	7.5	0
bio04	4.3	0.4
bio13	3.9	4
bio15	3.5	0
bio03	3	0.3
bio07	2.7	1.1
bio08	2.6	4.8
bio18	1.3	0
bio14	1.2	0
bio12	0.2	0

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.697, training AUC is 0.906, unregularized training gain is 0.859.
Unregularized test gain is 1.166.
Test AUC is 0.895, standard deviation is 0.017 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (3 seconds).

The follow settings were used during the run:
126 presence records used for training, 31 for testing.
10126 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.050, categorical: 0.250, threshold: 1.000, hinge: 0.500
Feature types used: hinge product linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

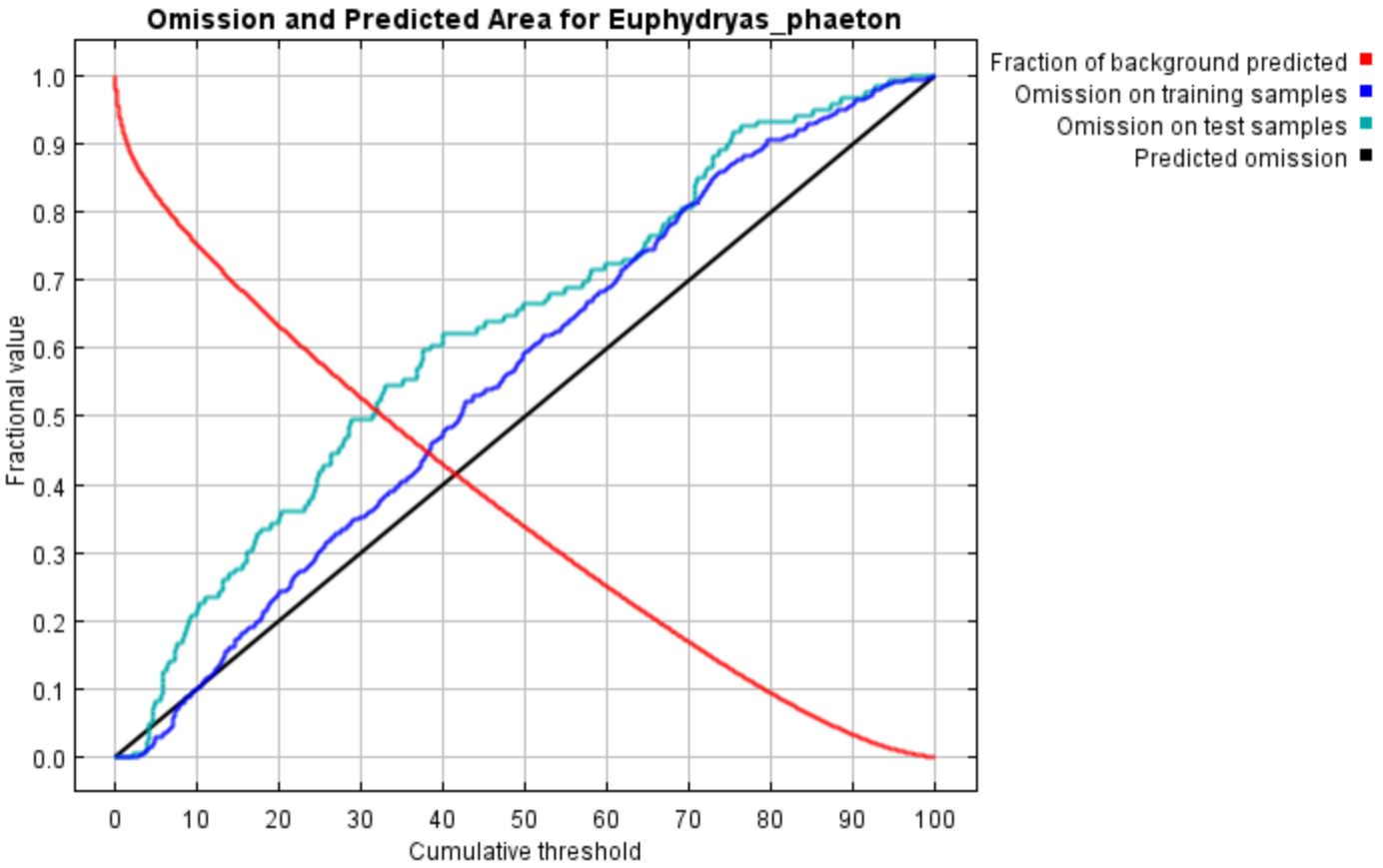
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Chlosyne_harrisii responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Euphydryas_phaeton

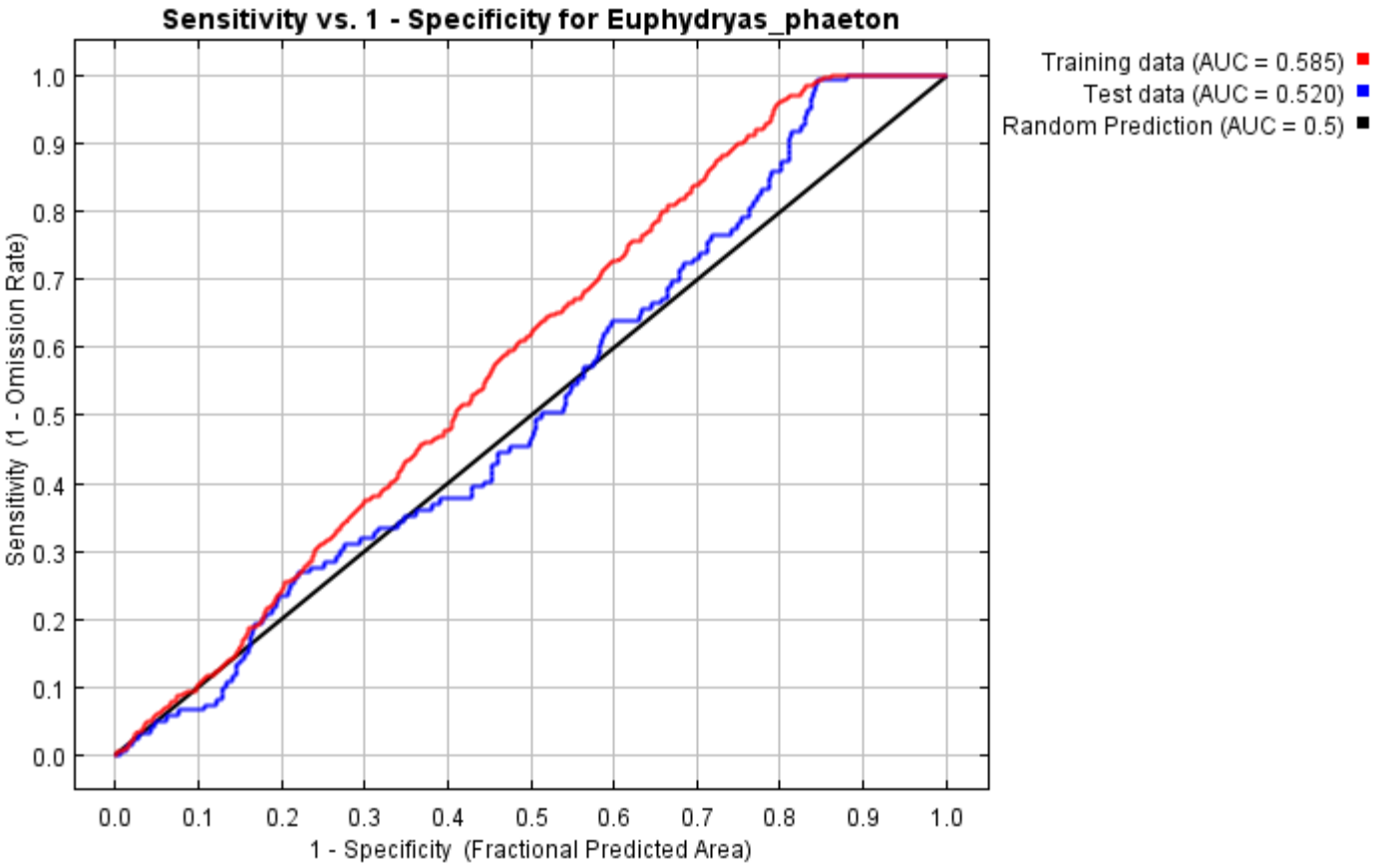
This page contains some analysis of the Maxent model for Euphydryas_phaeton, created Mon Jan 15 14:45:27 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.632 rather than 1; in practice the test AUC may exceed this bound.



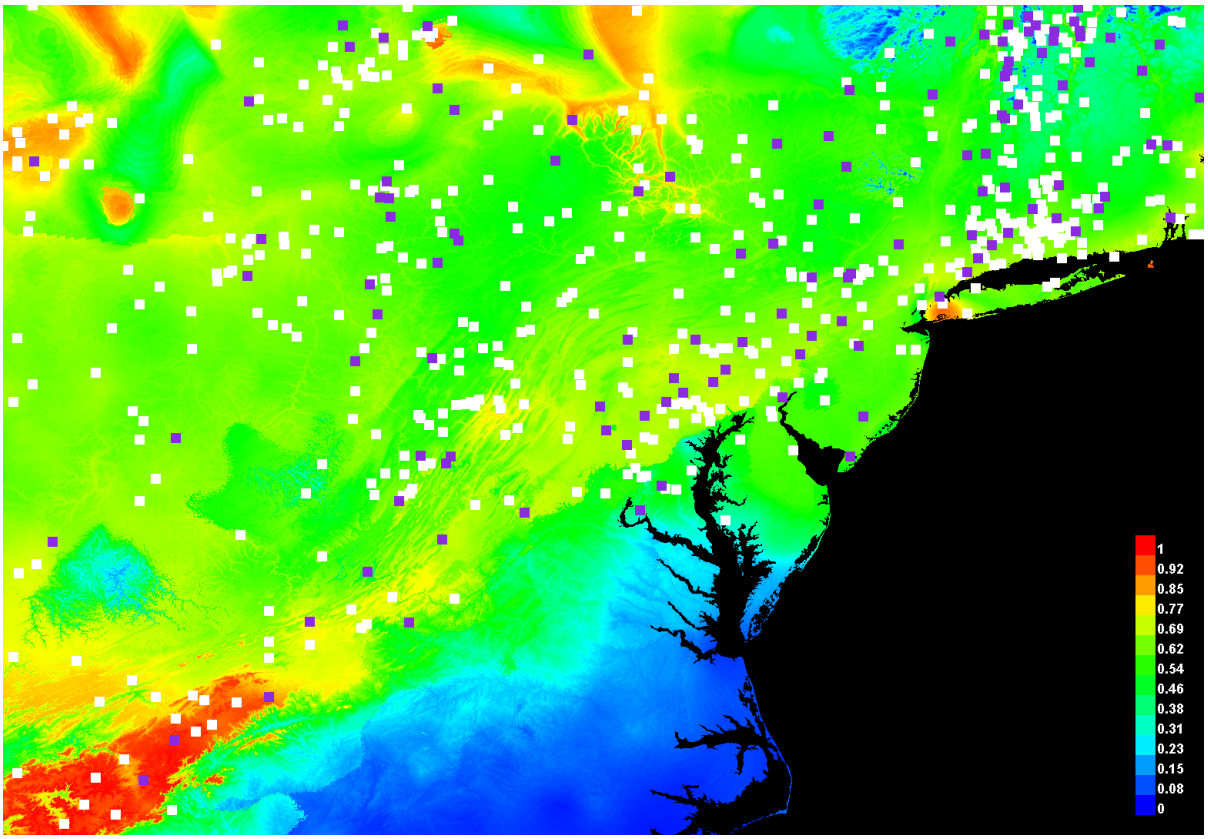
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.186	Fixed cumulative value 1	0.918	0.000	0.000	5.479E-4
5.000	0.407	Fixed cumulative value 5	0.825	0.029	0.084	4.391E-3
10.000	0.483	Fixed cumulative value 10	0.752	0.100	0.218	2.291E-1
2.323	0.302	Minimum training presence	0.875	0.000	0.008	6.017E-5
9.668	0.481	10 percentile training presence	0.757	0.098	0.210	1.981E-1
38.219	0.596	Equal training sensitivity and specificity	0.447	0.446	0.597	8.288E-1
6.658	0.438	Maximum training sensitivity plus	0.799	0.040	0.143	5.551E-

		specificity				2
32.013	0.581	Equal test sensitivity and specificity	0.507	0.370	0.504	5.971E-1
3.828	0.382	Maximum test sensitivity plus specificity	0.845	0.010	0.008	4.861E-6
2.237	0.292	Balance training omission, predicted area and threshold value	0.877	0.000	0.008	7.126E-5
2.753	0.339	Equate entropy of thresholded and original distributions	0.865	0.002	0.008	2.764E-5

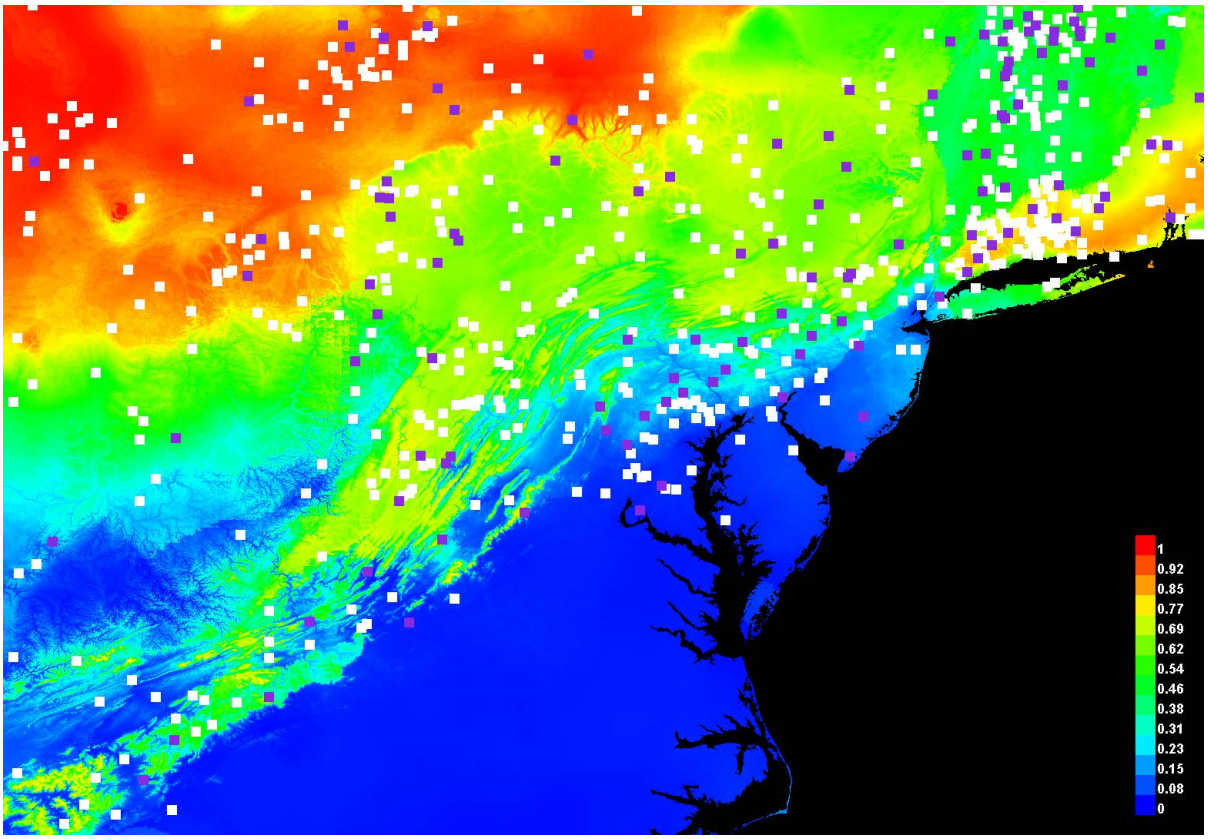
Pictures of the model

This is a representation of the Maxent model for Euphydryas_phaeton. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



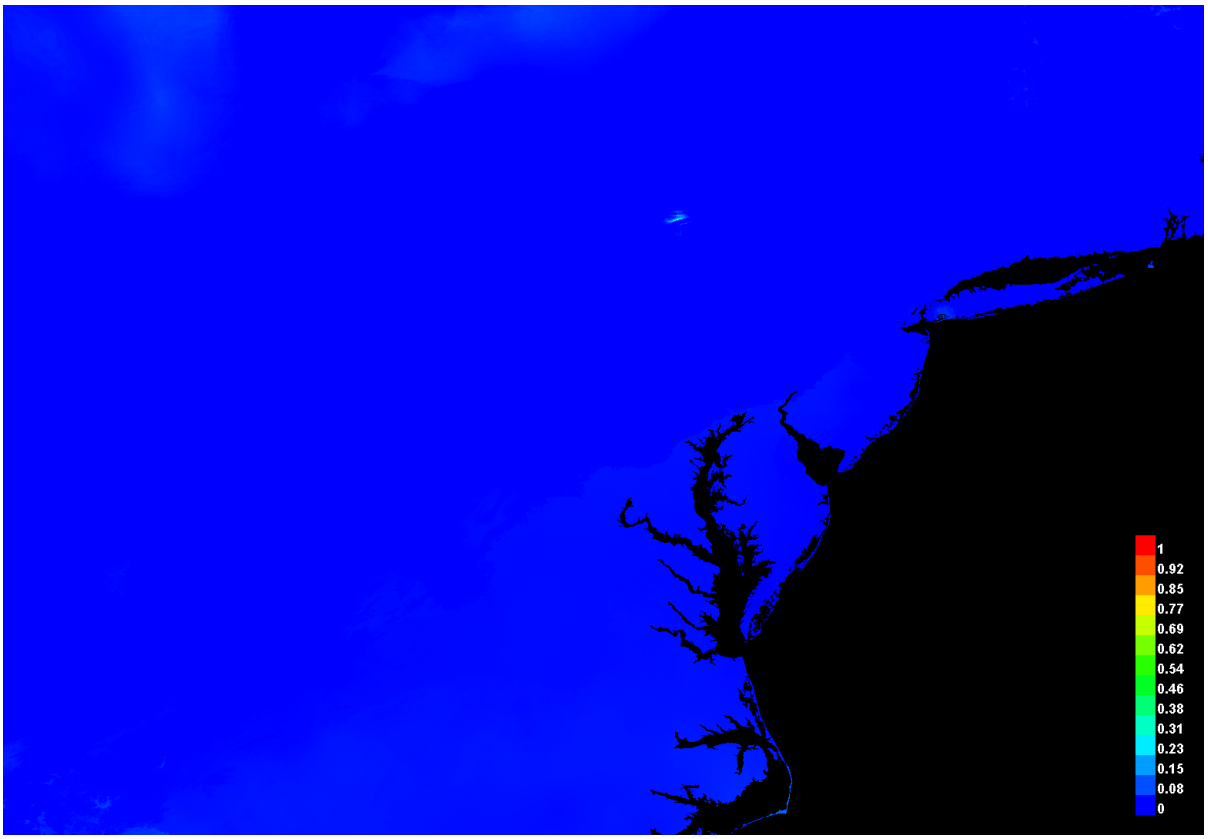
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

This is the projection of the Maxent model for Euphydryas_phaeton onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

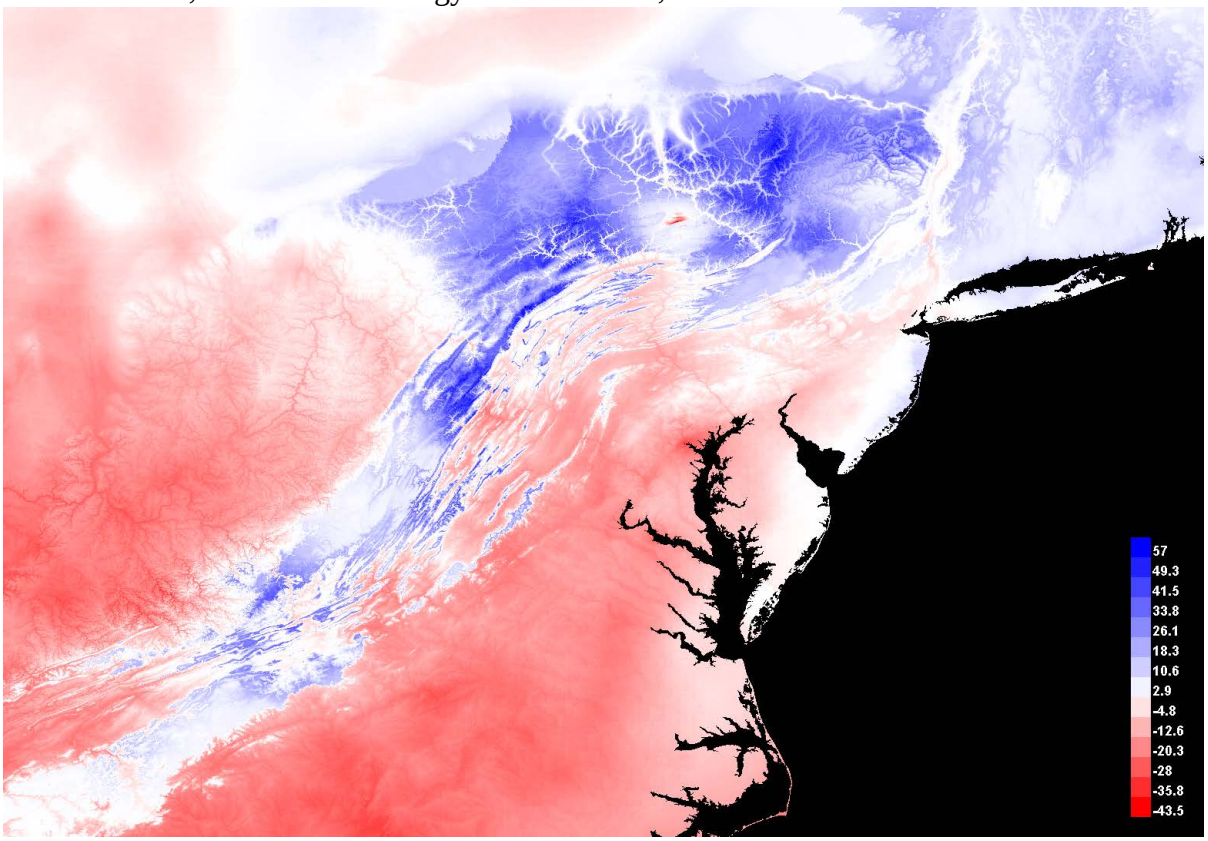


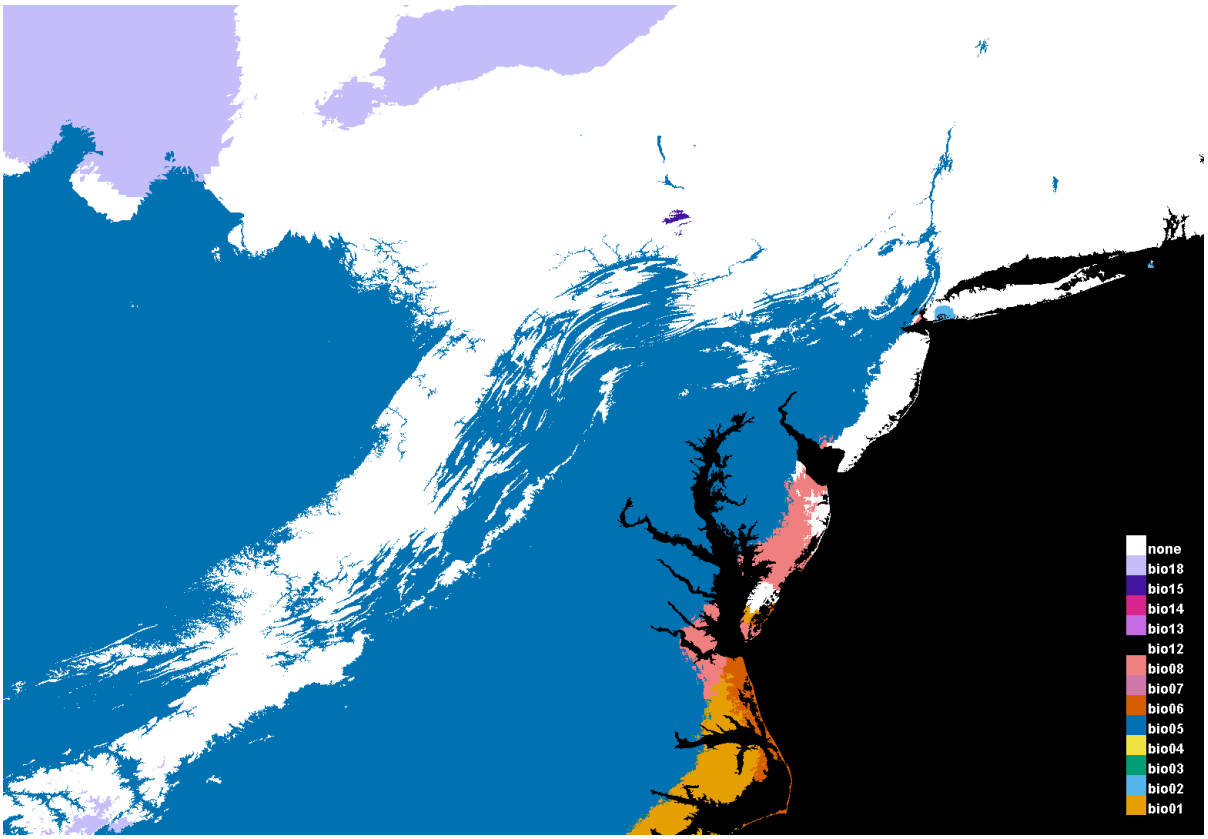
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



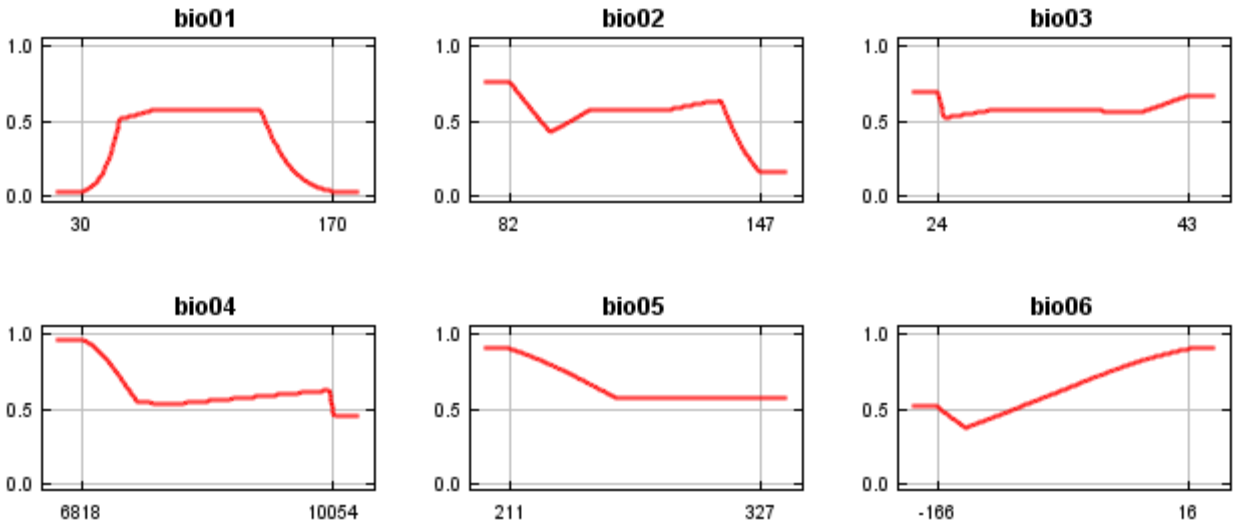
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

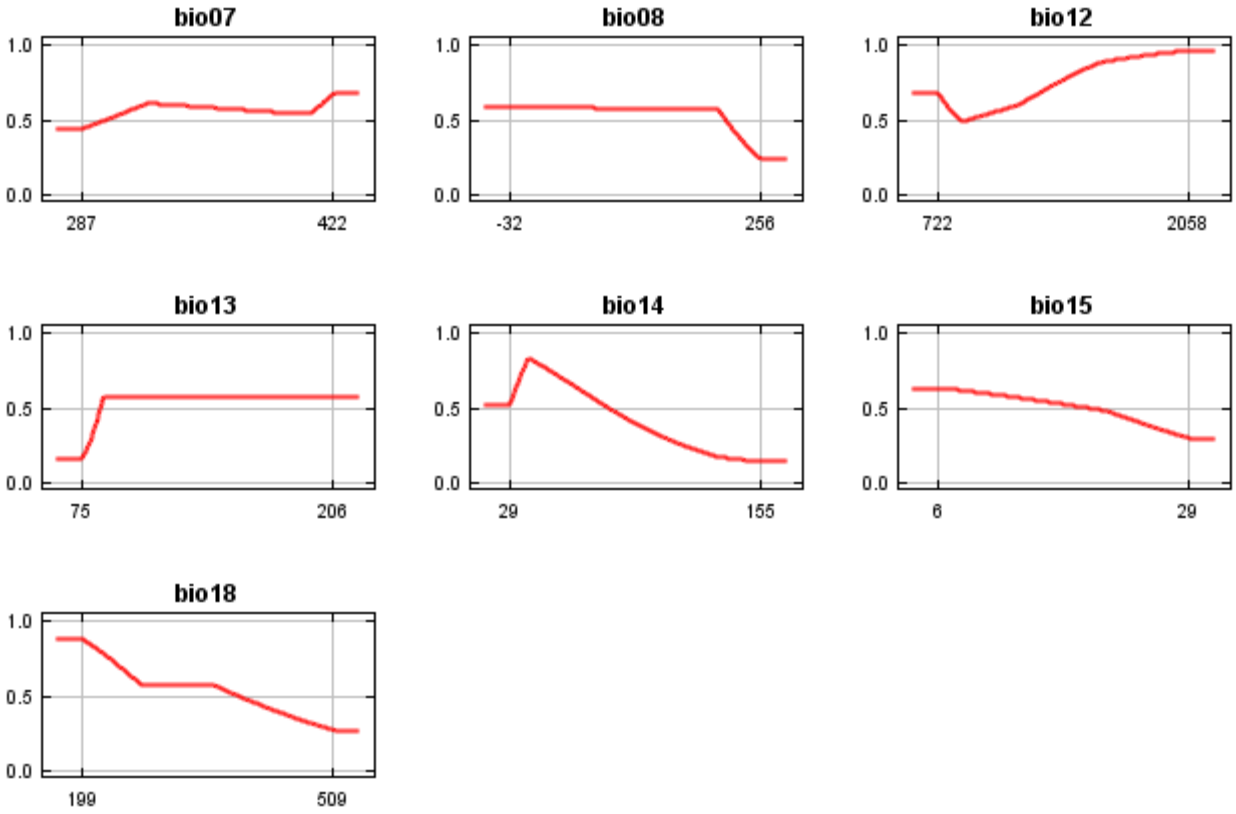




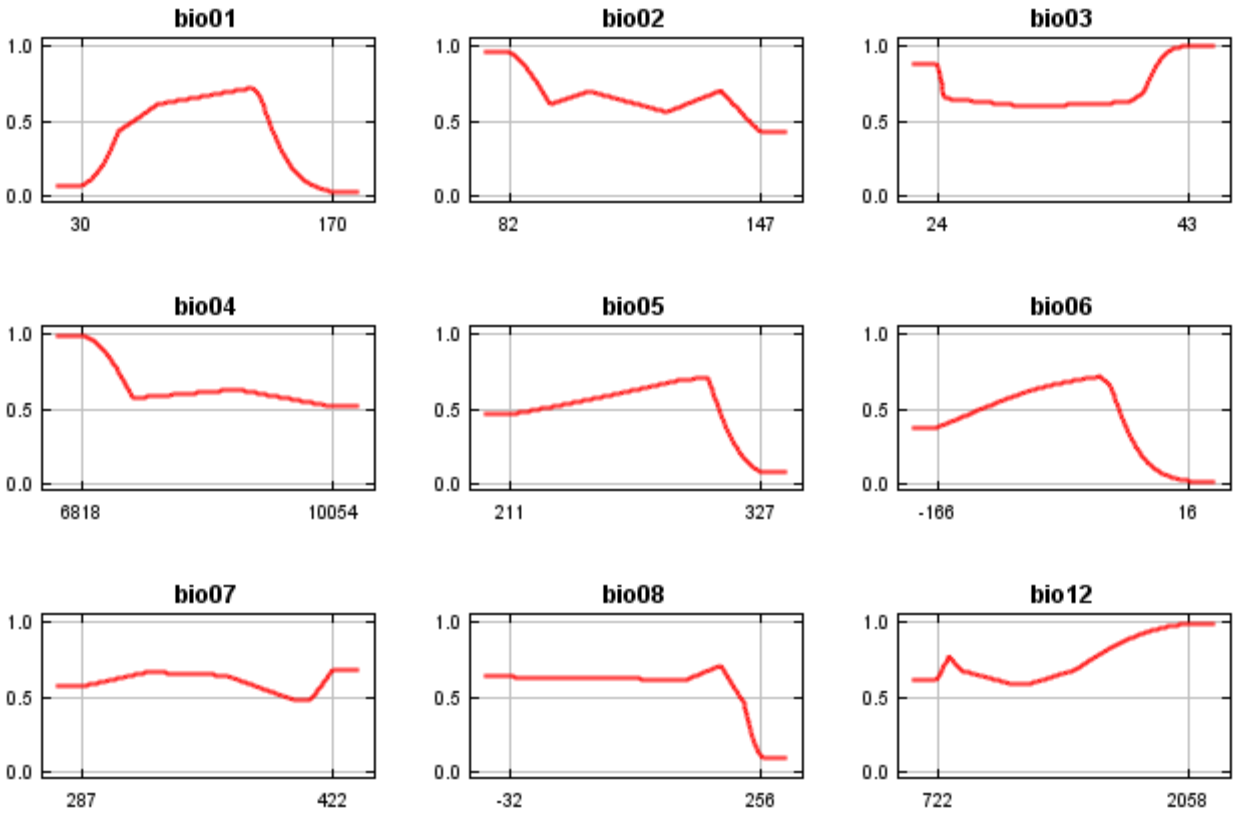
Response curves

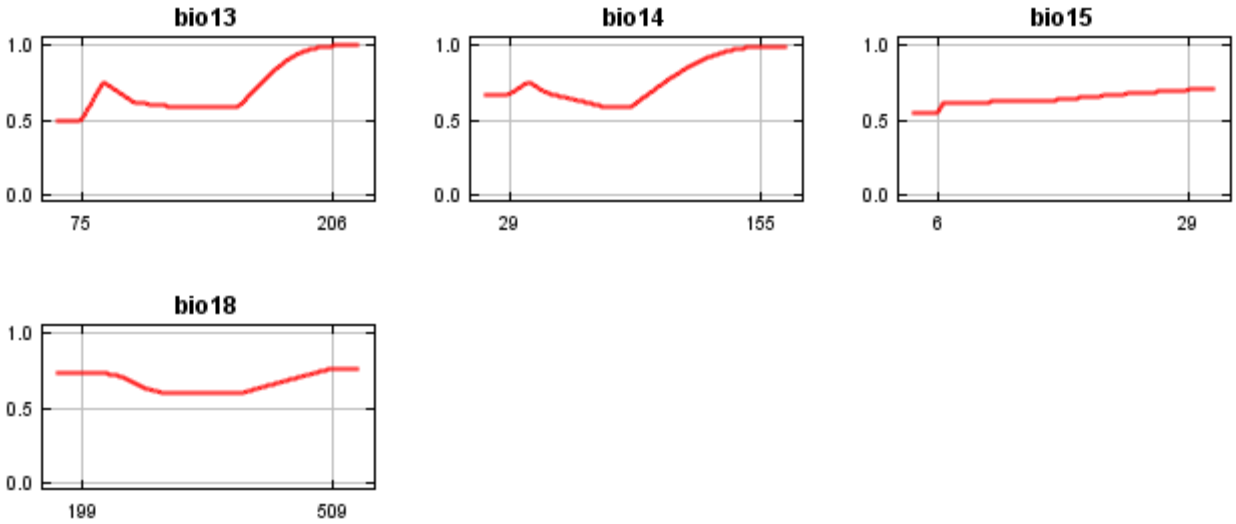
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.





In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.





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
bio06	27.2	0
bio01	26.3	27.4
bio04	14.6	8.6
bio08	7.7	14.7
bio18	6.6	0
bio02	3.6	4.2
bio13	3.3	8.6
bio07	3.1	0.2
bio05	2.1	3
bio14	1.7	0
bio12	1.5	11.1
bio03	1.2	2.8
bio15	1.1	19.3

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.058, training AUC is 0.585, unregularized training gain is 0.103.
Unregularized test gain is -0.011.
Test AUC is 0.520, standard deviation is 0.024 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (5 seconds).

The follow settings were used during the run:
478 presence records used for training, 119 for testing.
10474 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.050, categorical: 0.250, threshold: 1.000, hinge: 0.500
Feature types used: hinge product linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

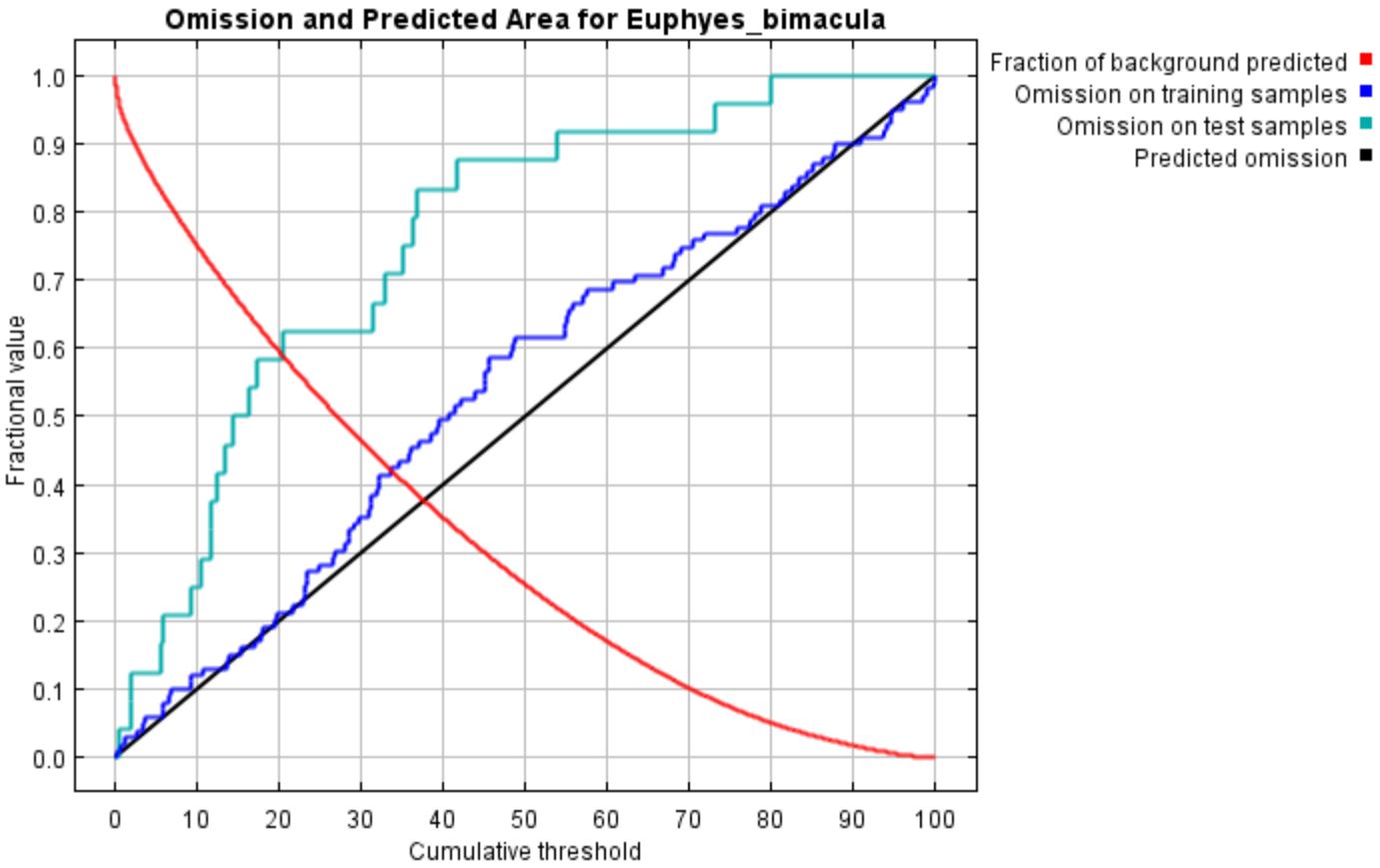
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Euphydryas_phaeton responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Euphyes_bimacula

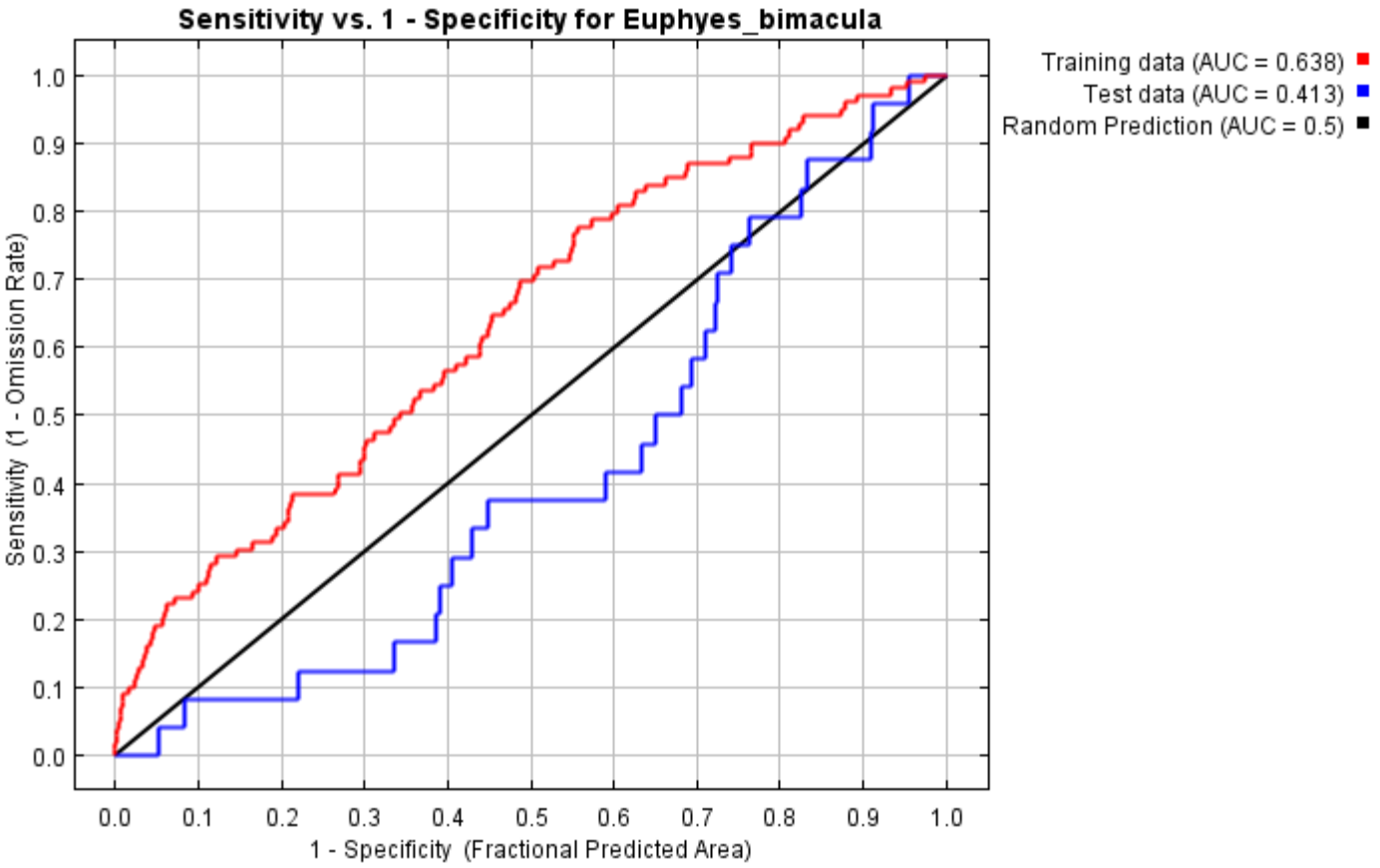
This page contains some analysis of the Maxent model for Euphyes_bimacula, created Mon Jan 15 14:46:06 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.678 rather than 1; in practice the test AUC may exceed this bound.



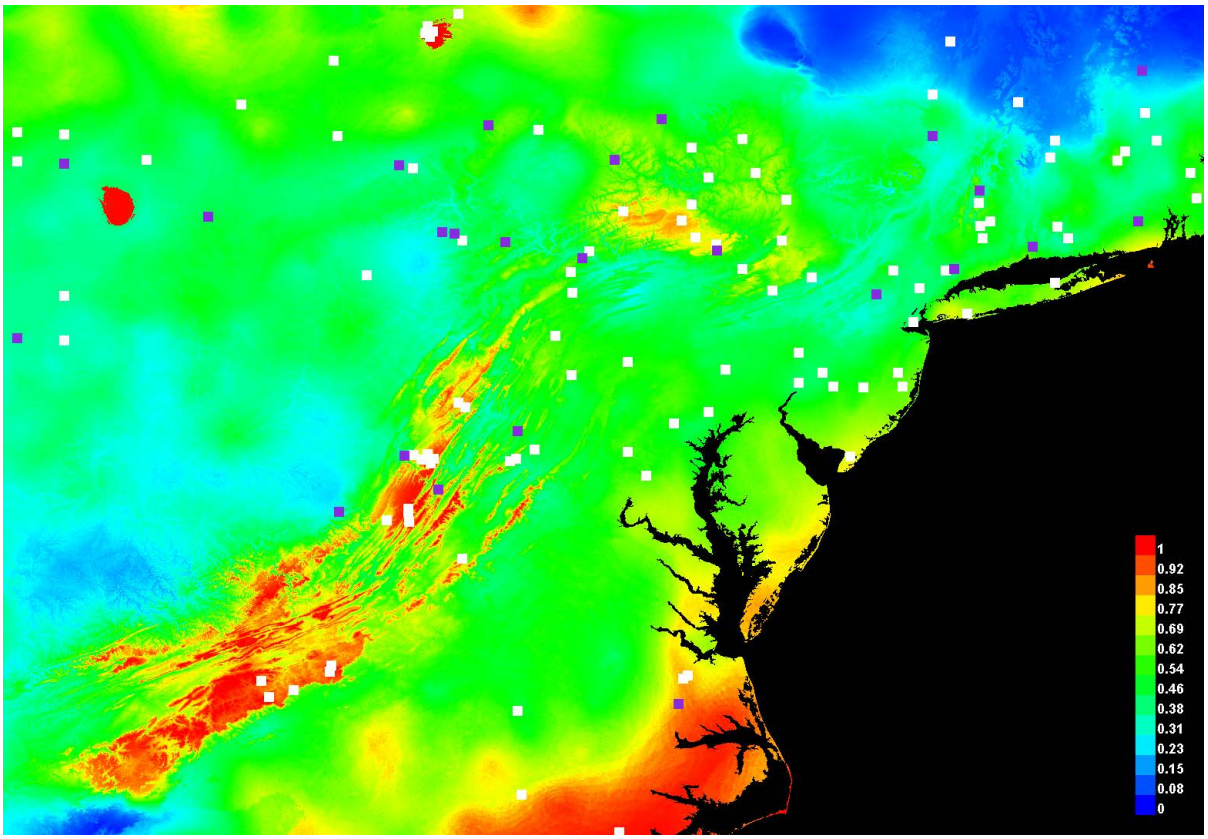
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.209	Fixed cumulative value 1	0.938	0.020	0.042	5.6E-1
5.000	0.319	Fixed cumulative value 5	0.842	0.061	0.125	4.619E-1
10.000	0.365	Fixed cumulative value 10	0.750	0.121	0.250	6.09E-1
0.258	0.100	Minimum training presence	0.973	0.000	0.000	5.218E-1
6.798	0.341	10 percentile training presence	0.807	0.091	0.208	6.895E-1
33.686	0.493	Equal training sensitivity and specificity	0.421	0.424	0.708	9.348E-1
22.888	0.437	Maximum training sensitivity plus specificity	0.555	0.222	0.625	9.762E-1
		Equal test sensitivity and				9.722E-

20.402	0.424	specificity	0.590	0.212	0.583	1
1.910	0.257	Maximum test sensitivity plus specificity	0.912	0.030	0.042	3.645E-1
0.258	0.100	Balance training omission, predicted area and threshold value	0.973	0.000	0.000	5.218E-1
8.459	0.354	Equate entropy of thresholded and original distributions	0.777	0.101	0.208	5.485E-1

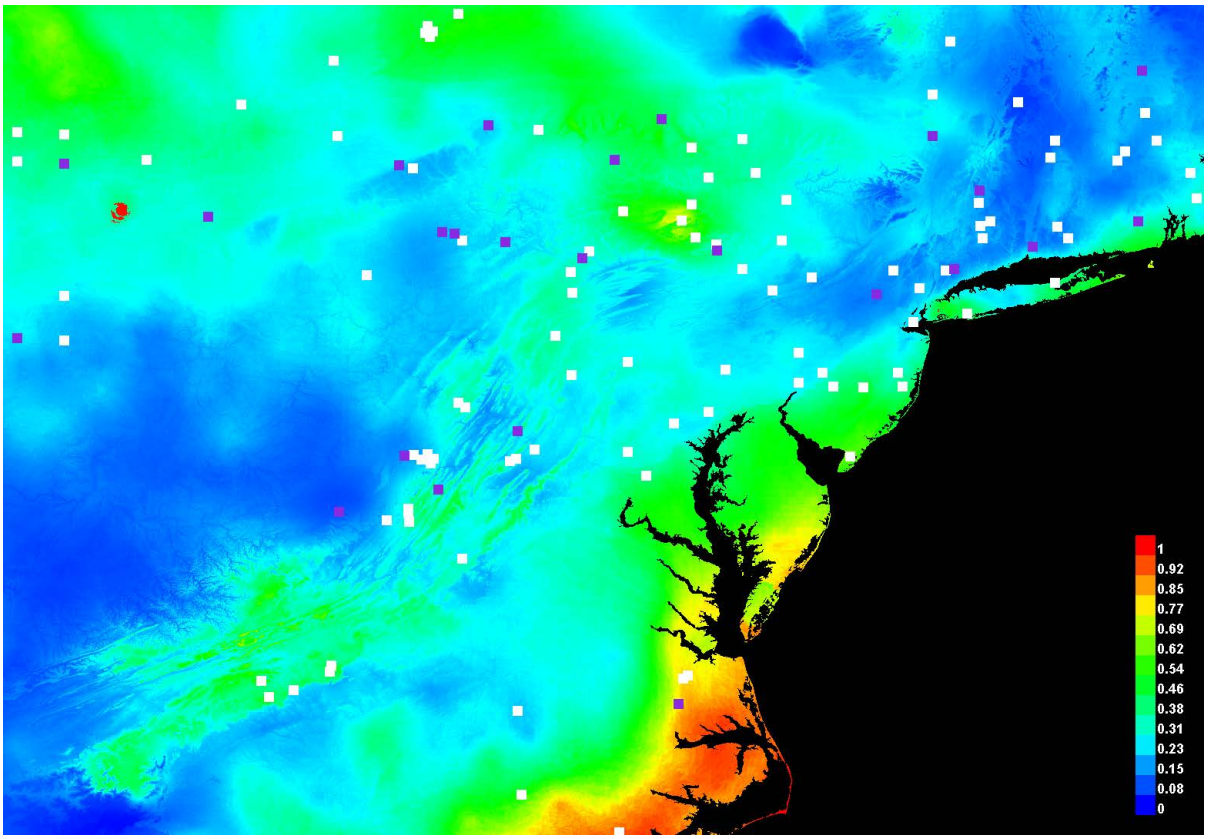
Pictures of the model

This is a representation of the Maxent model for Euphyes_bimacula. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



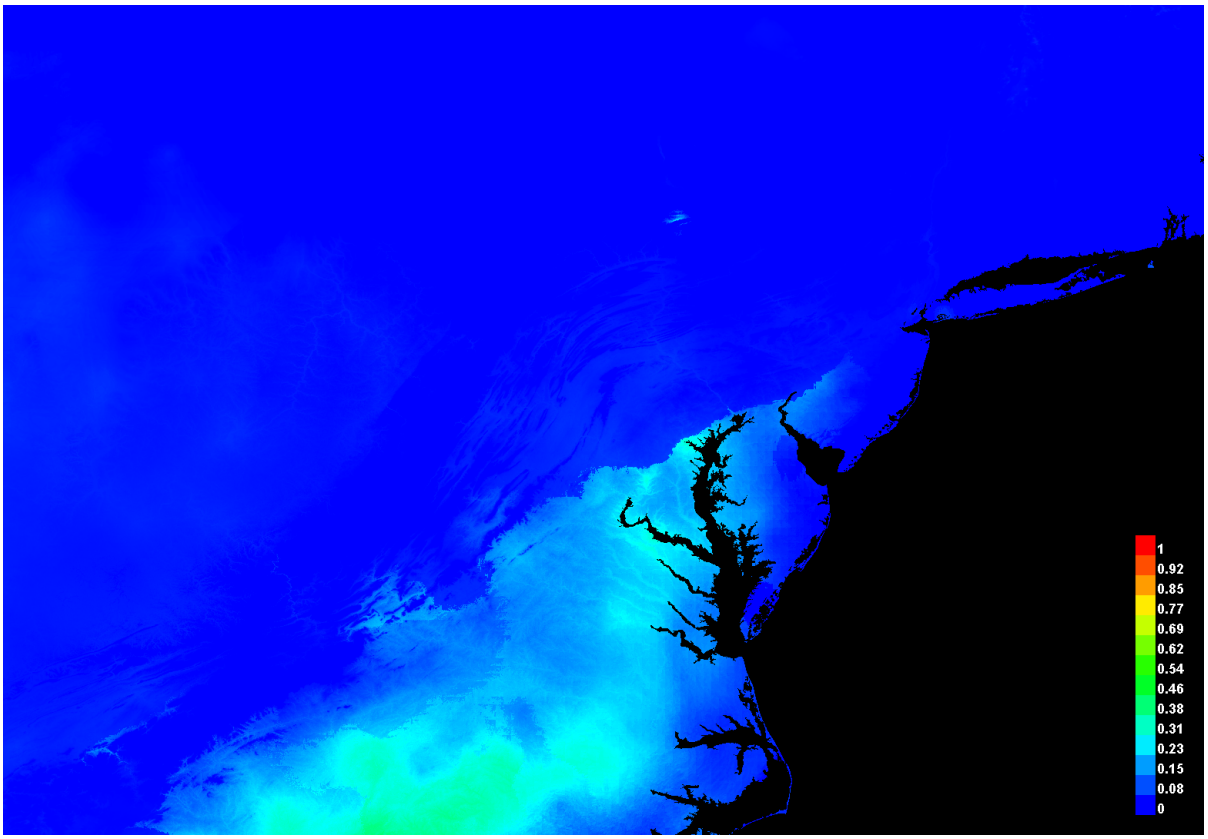
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

This is the projection of the Maxent model for Euphyes_bimacula onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

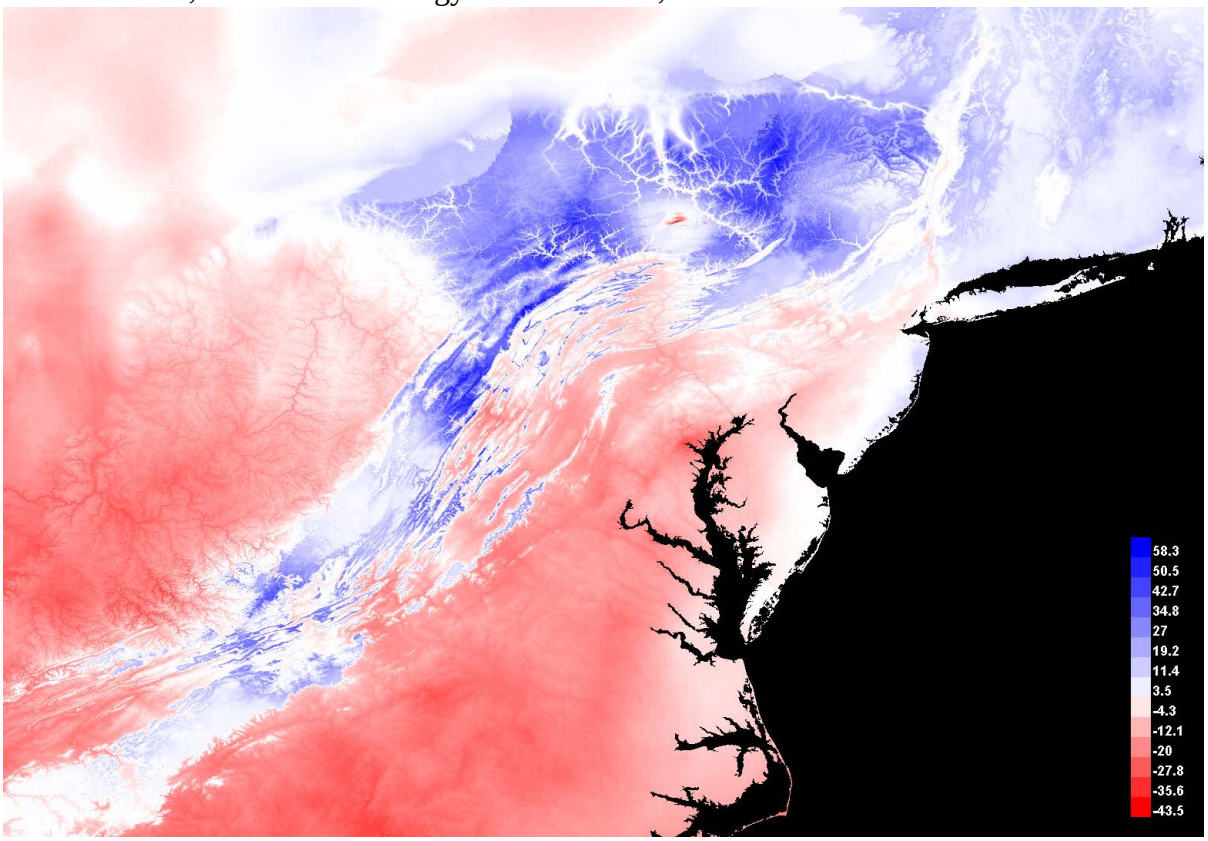


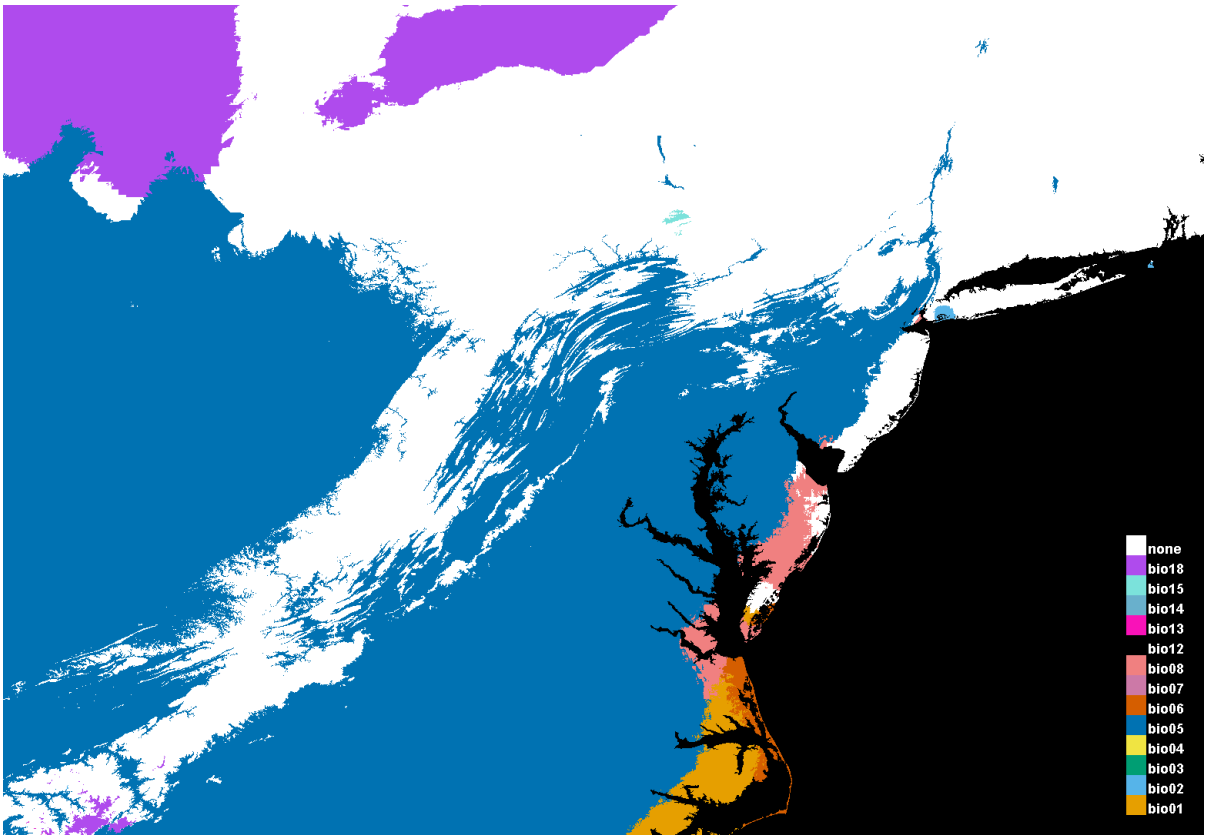
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



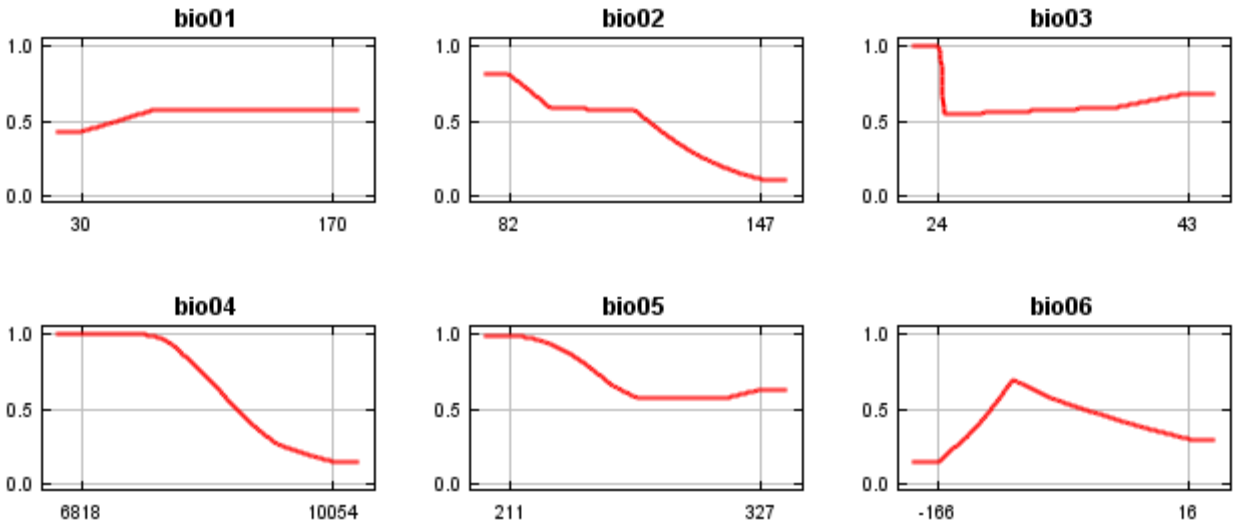
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

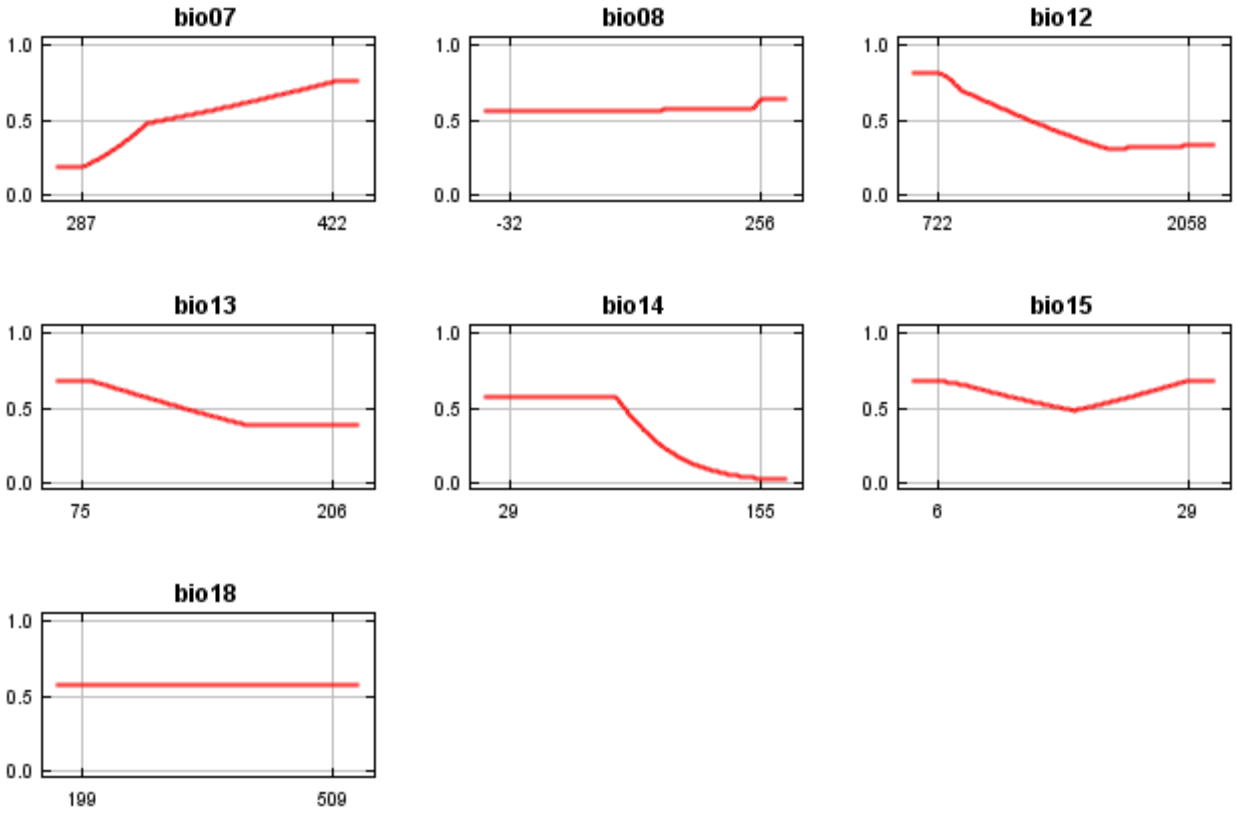




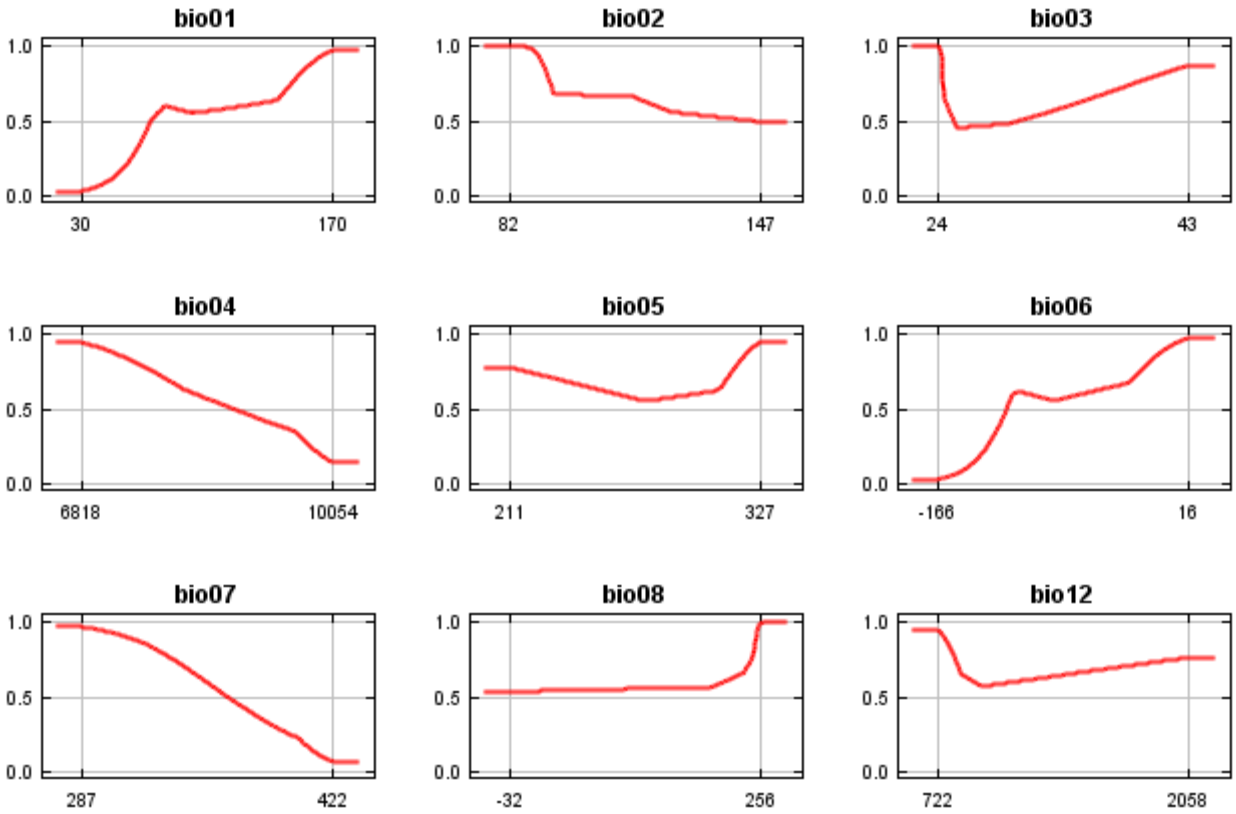
Response curves

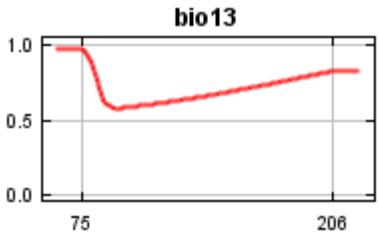
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.

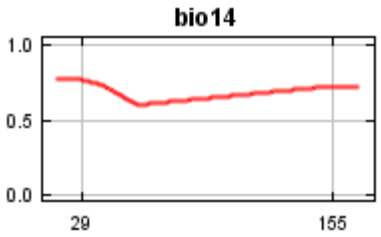


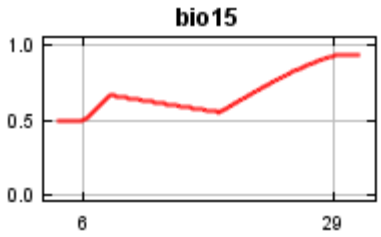


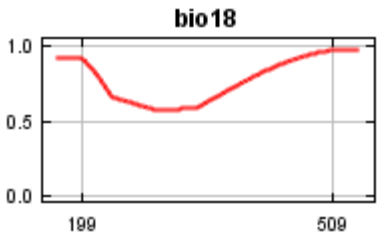
In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.











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
bio06	36.8	16.3
bio03	19.9	4.7
bio04	19.5	14.2
bio05	10.9	3.3
bio14	4.7	9.7
bio02	3.1	30.2
bio07	1.4	6.6
bio15	1.1	8.5
bio18	1	0
bio13	0.8	5.9
bio12	0.3	0.3
bio08	0.3	0
bio01	0.2	0.2

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.261, training AUC is 0.638, unregularized training gain is 0.390.
Unregularized test gain is -0.351.
Test AUC is 0.413, standard deviation is 0.051 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (5 seconds).

The follow settings were used during the run:
99 presence records used for training, 24 for testing.
10098 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.057, categorical: 0.250, threshold: 1.010, hinge: 0.500
Feature types used: hinge product linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

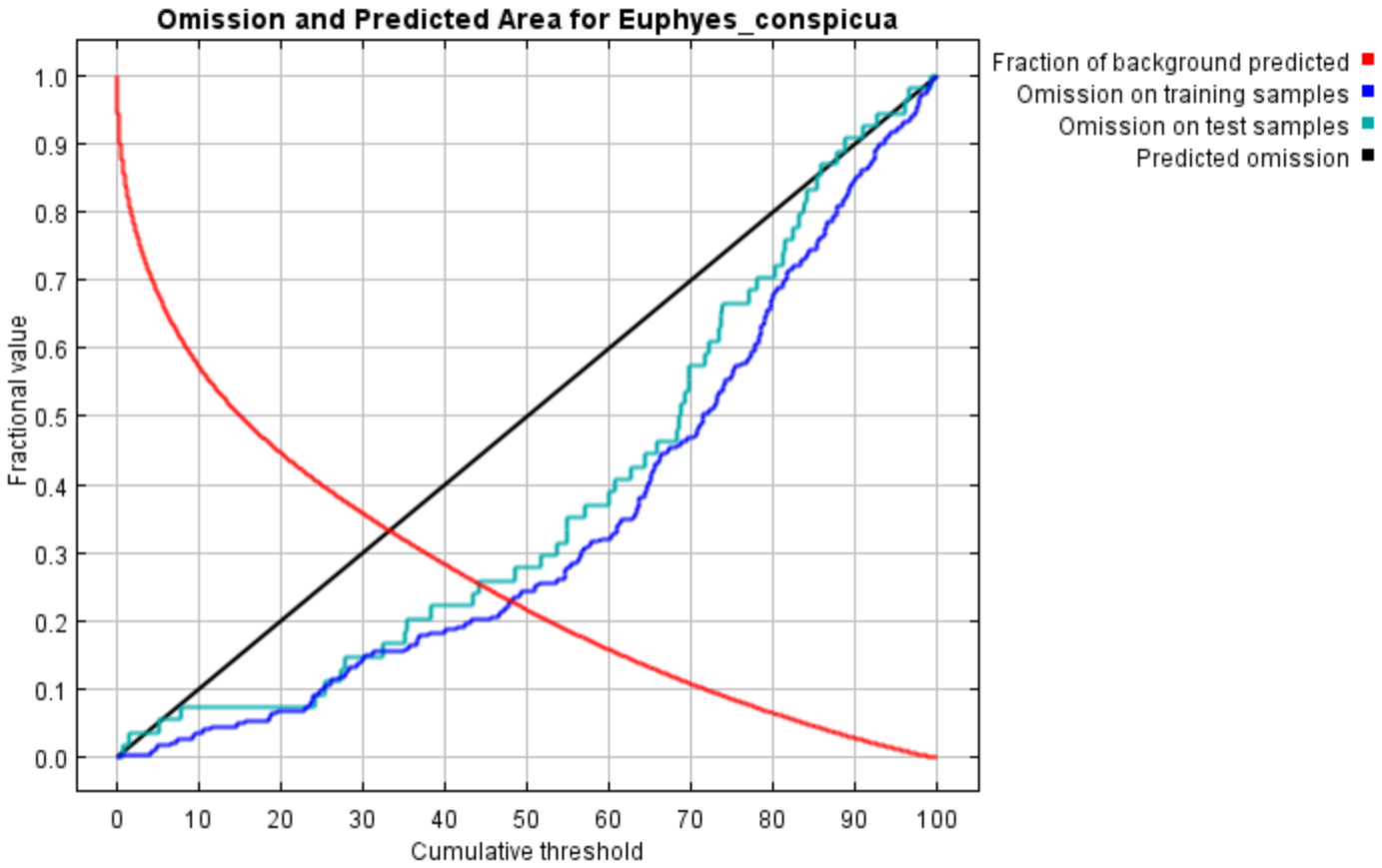
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Euphyes_bimacula responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Euphyes_conspicua

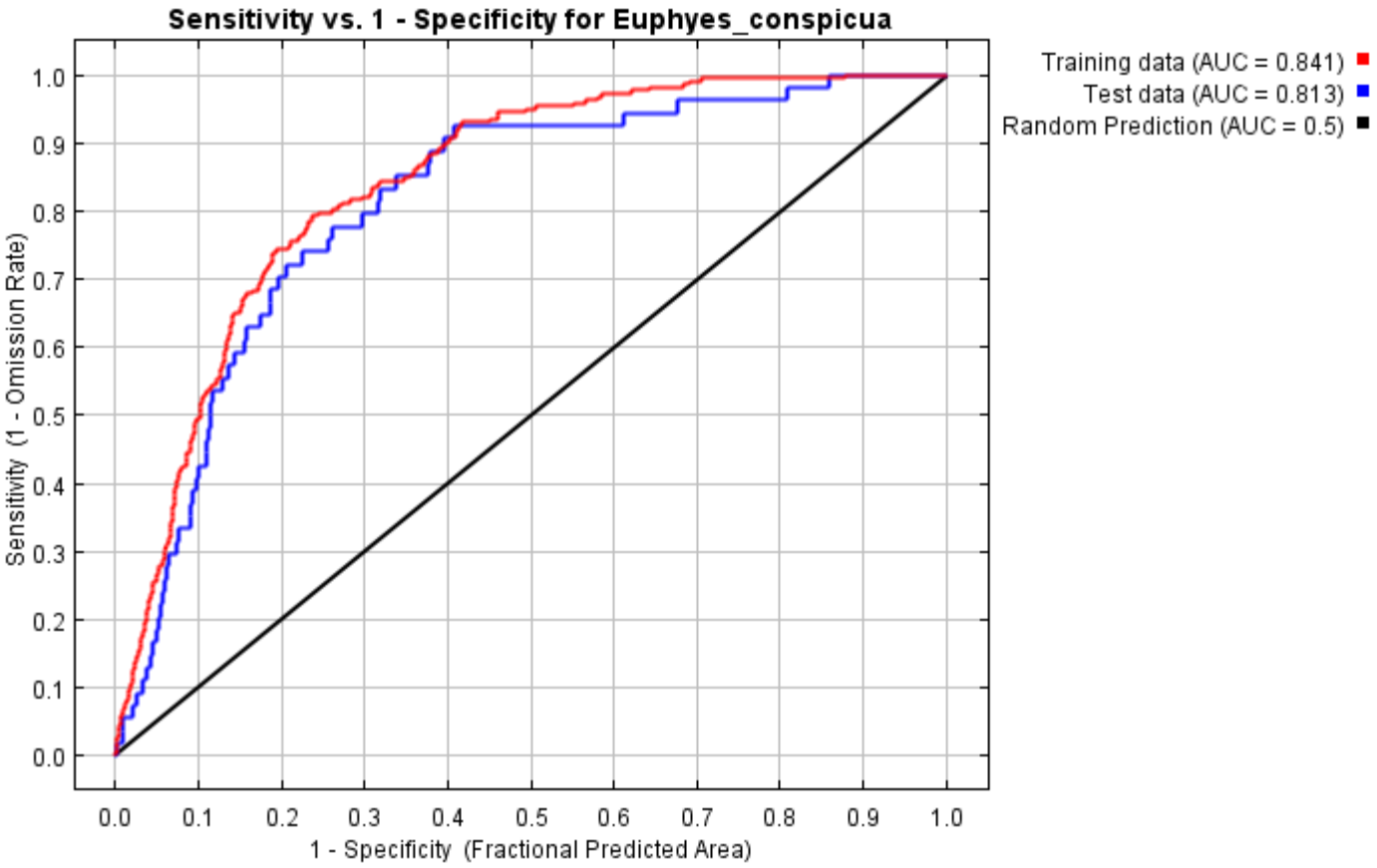
This page contains some analysis of the Maxent model for Euphyes_conspicua, created Mon Jan 15 14:46:39 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.736 rather than 1; in practice the test AUC may exceed this bound.



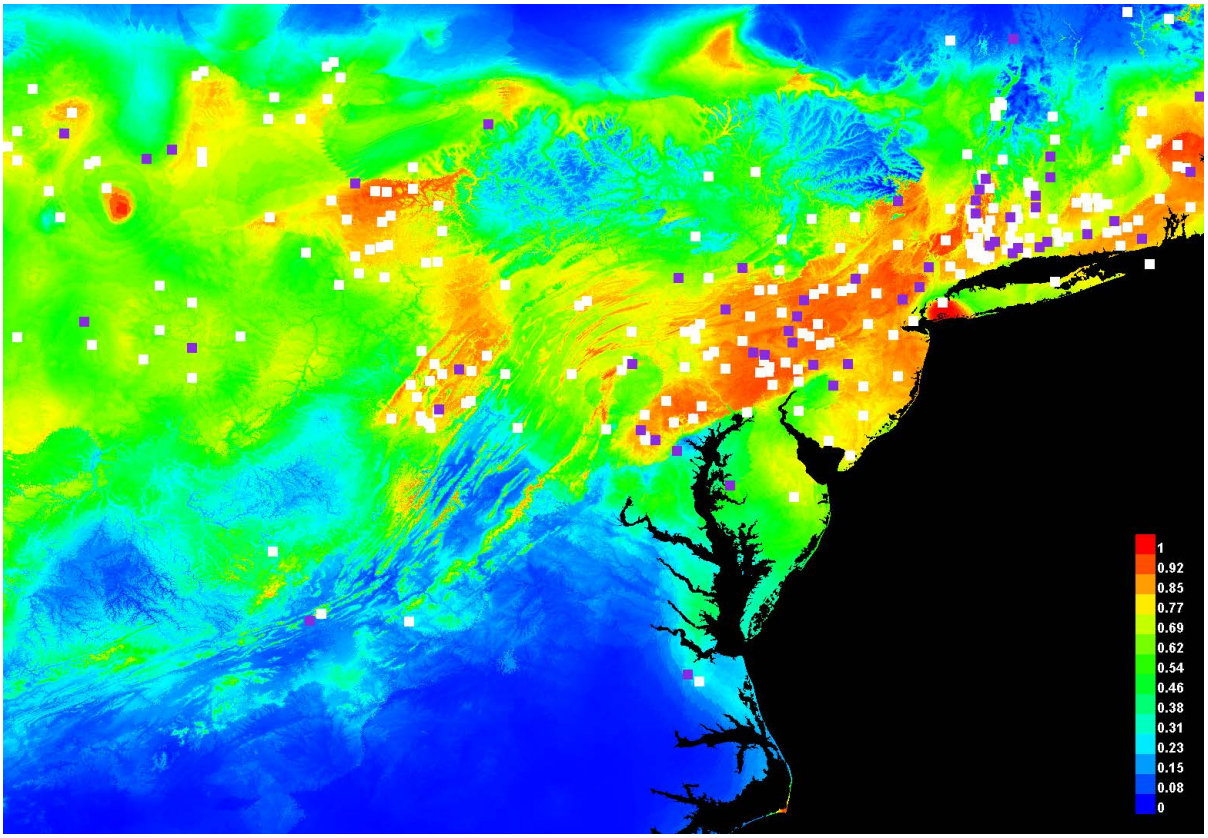
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.091	Fixed cumulative value 1	0.843	0.005	0.019	2.607E-3
5.000	0.221	Fixed cumulative value 5	0.680	0.018	0.037	4.125E-6
10.000	0.334	Fixed cumulative value 10	0.573	0.037	0.074	8.02E-8
0.569	0.070	Minimum training presence	0.879	0.000	0.000	3.166E-3
24.894	0.543	10 percentile training presence	0.401	0.096	0.093	1.467E-14
48.008	0.658	Equal training sensitivity and specificity	0.229	0.229	0.259	1.968E-19
46.703	0.651	Maximum training sensitivity plus specificity	0.238	0.206	0.259	1.942E-18

44.049	0.638	Equal test sensitivity and specificity	0.255	0.202	0.259	1.432E-16
24.064	0.536	Maximum test sensitivity plus specificity	0.408	0.092	0.074	4.737E-15
4.107	0.200	Balance training omission, predicted area and threshold value	0.706	0.005	0.037	1.688E-5
4.797	0.217	Equate entropy of thresholded and original distributions	0.686	0.014	0.037	5.664E-6

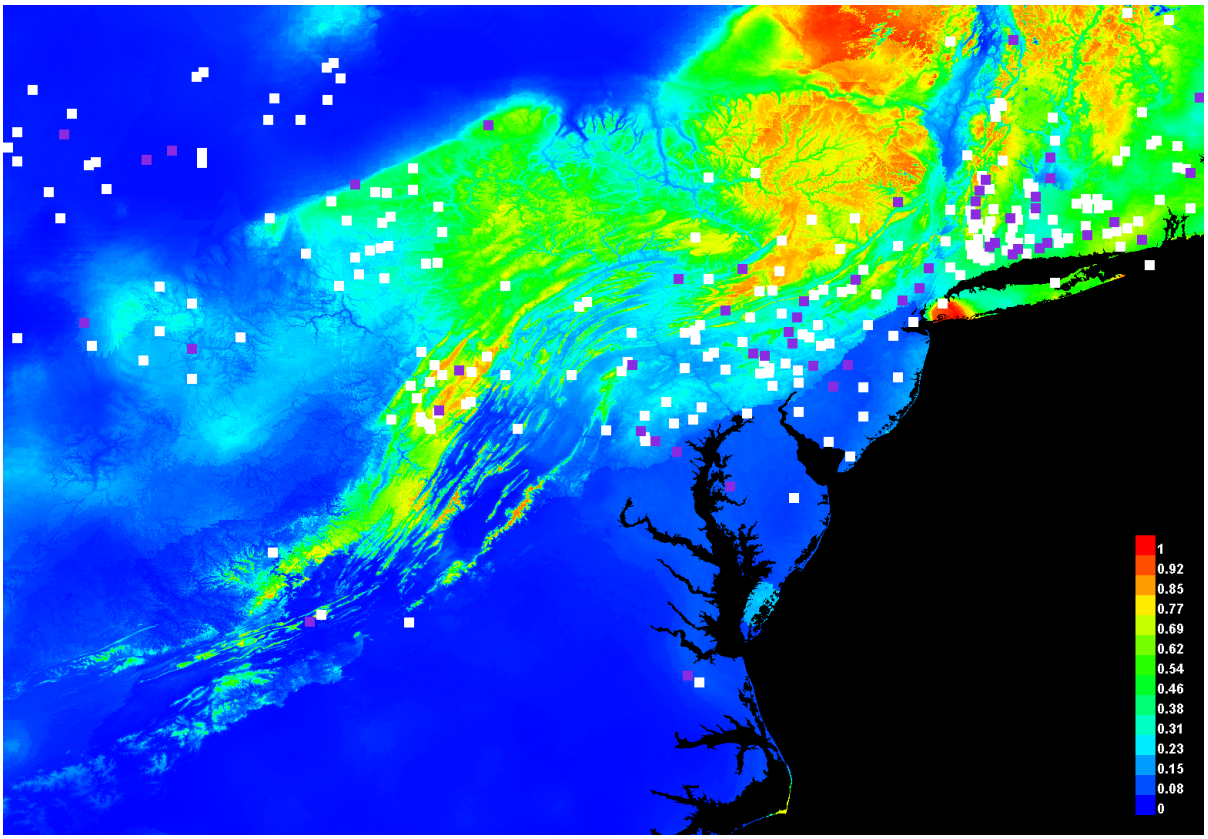
Pictures of the model

This is a representation of the Maxent model for Euphyes_conspicua. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



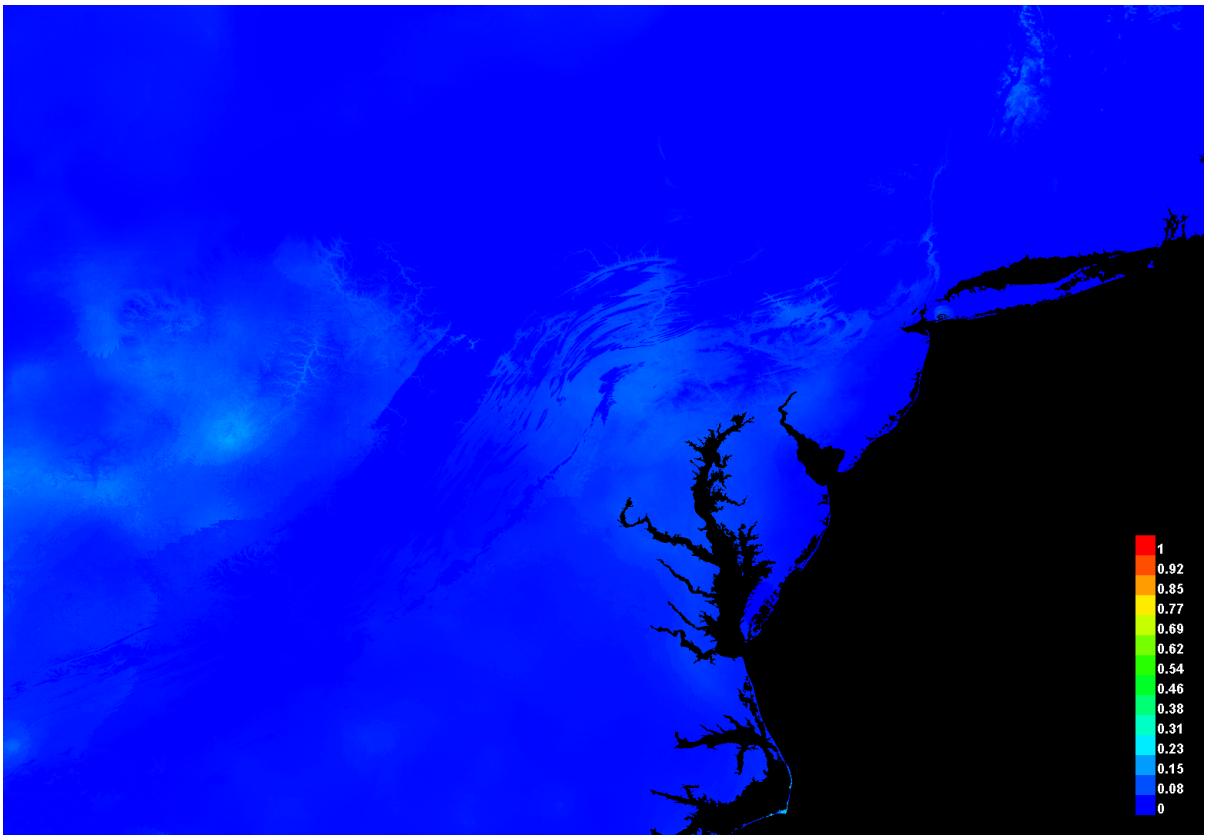
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

This is the projection of the Maxent model for Euphyes_conspicua onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

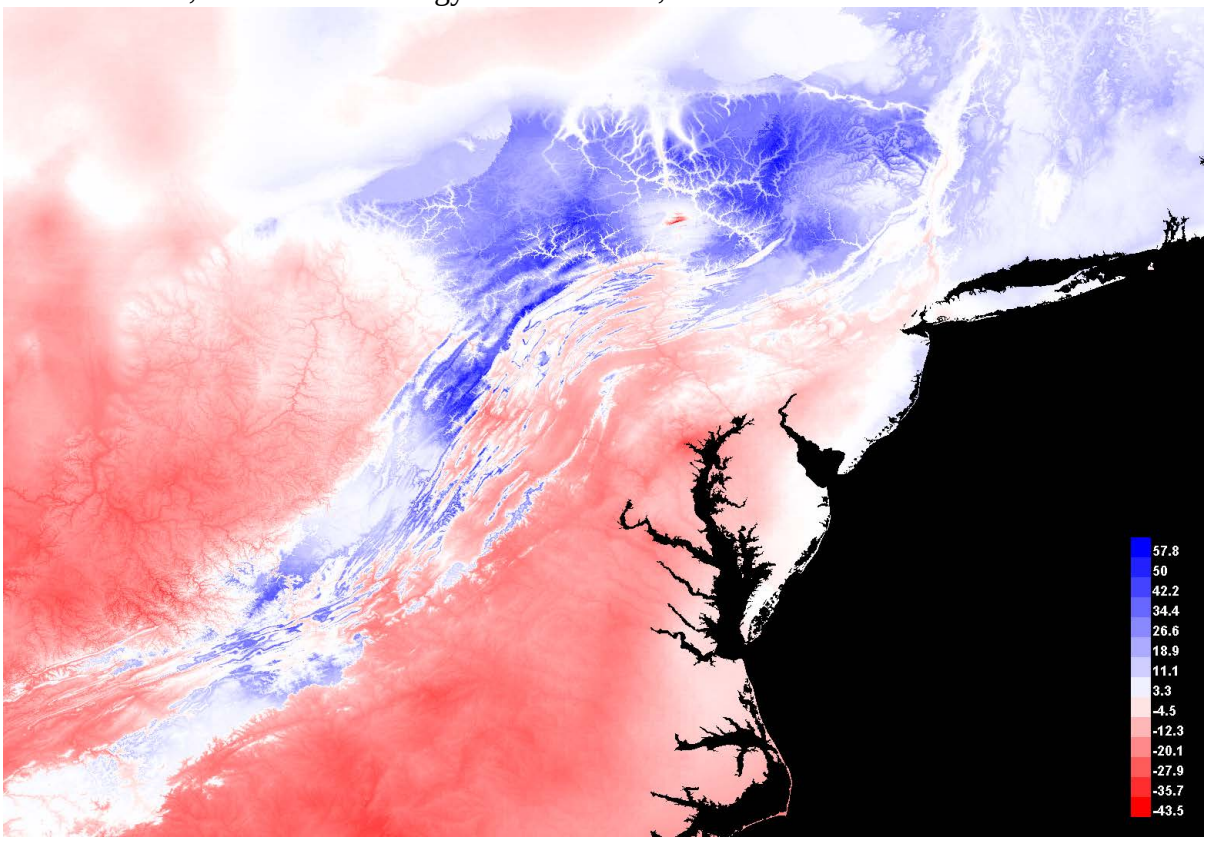


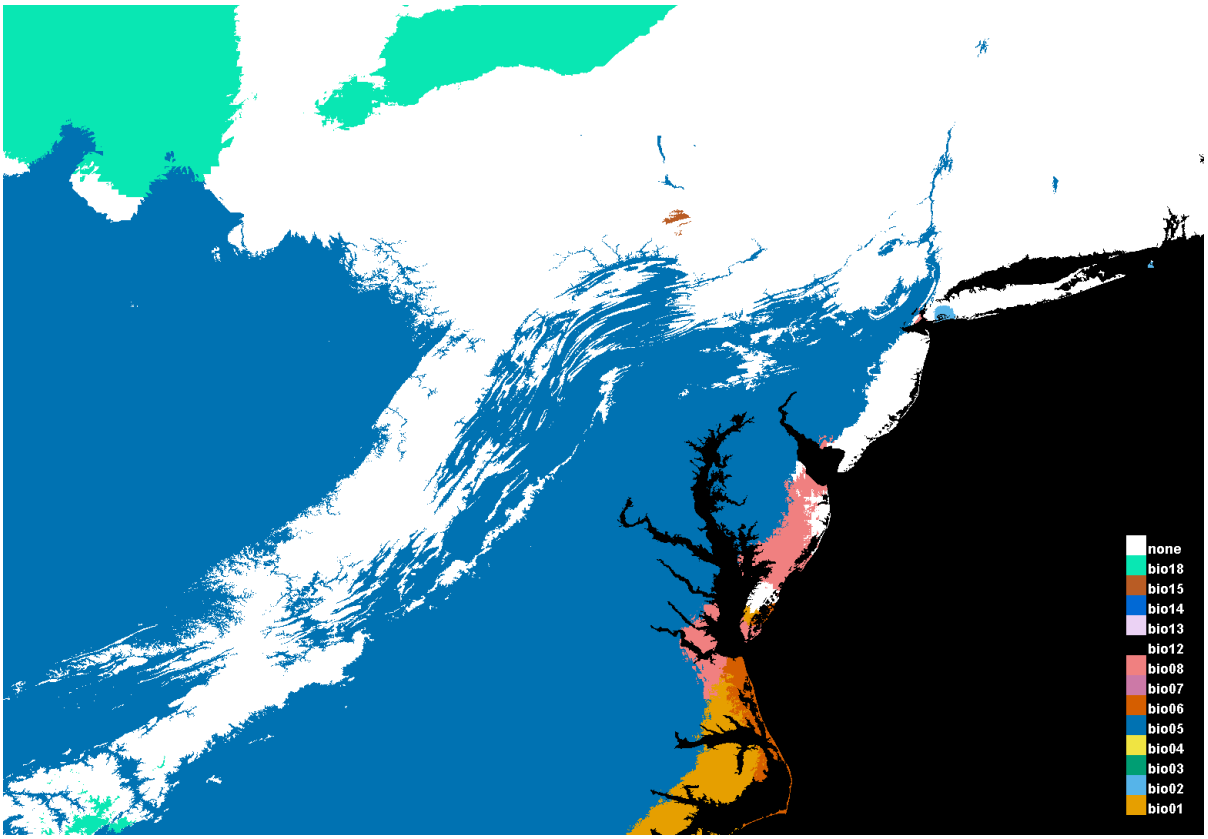
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



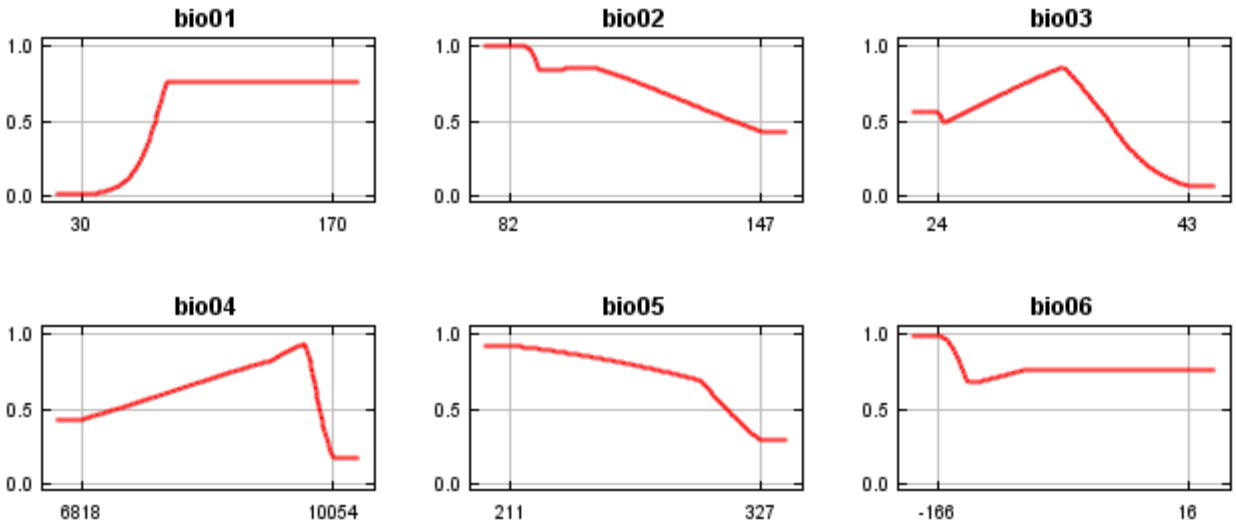
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

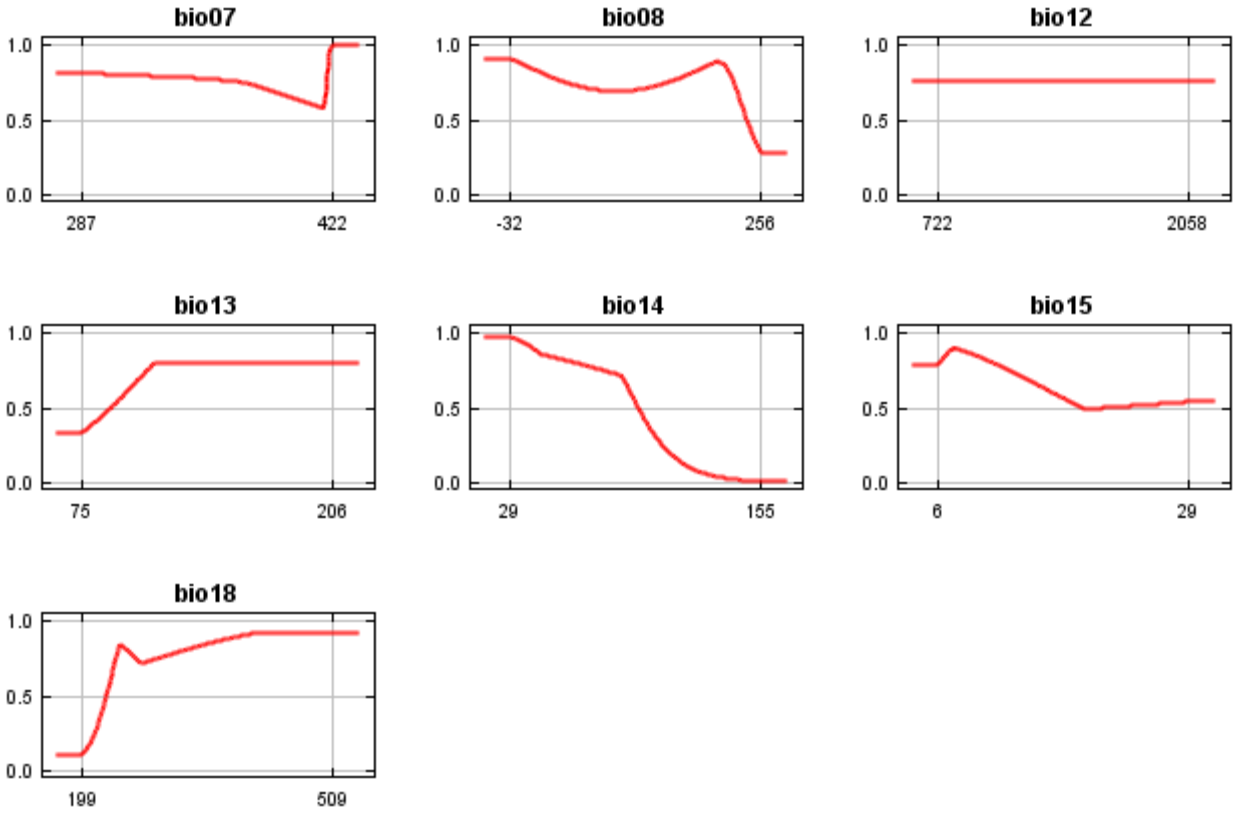




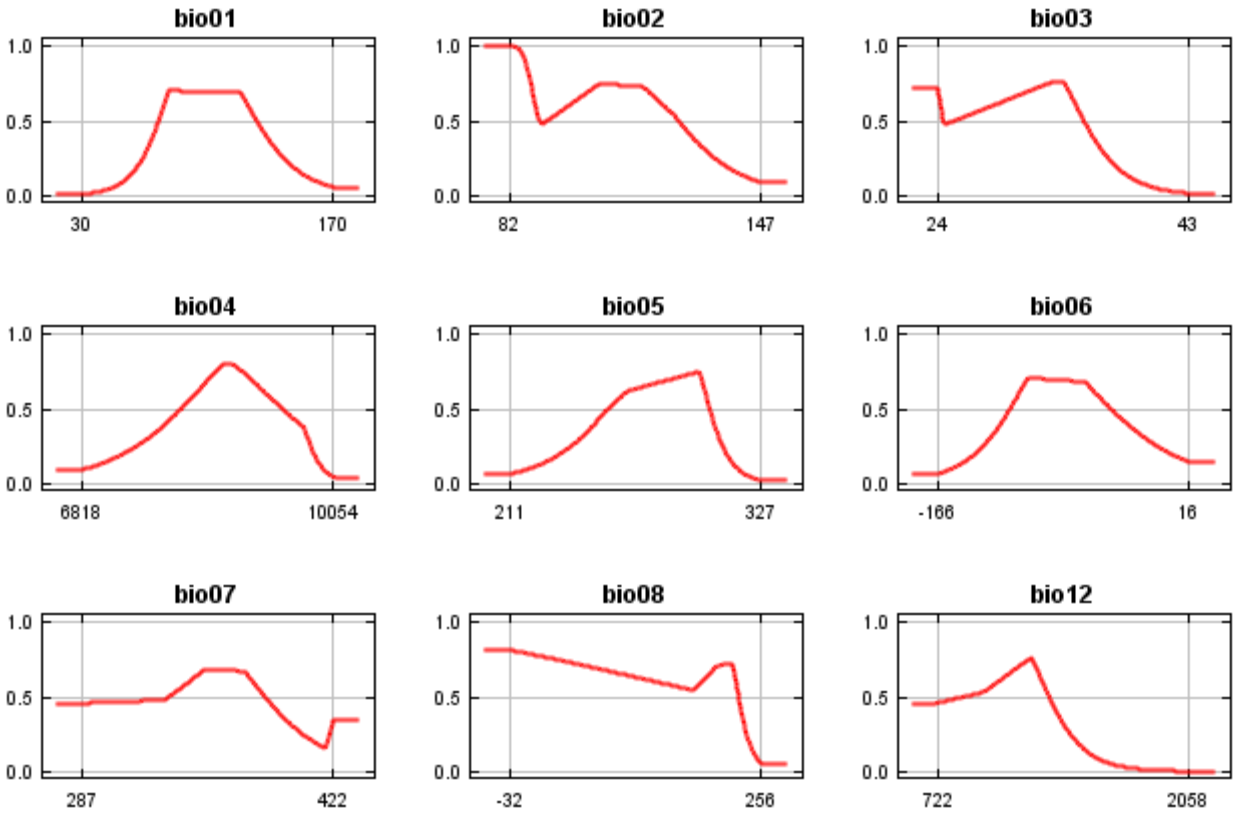
Response curves

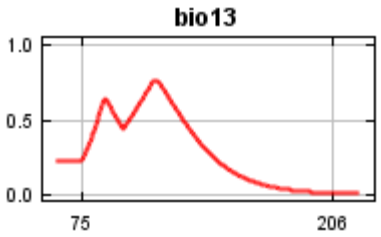
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.

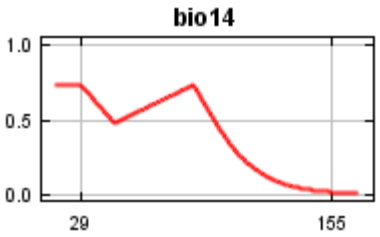


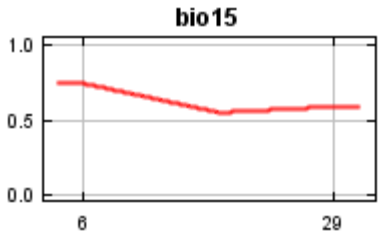


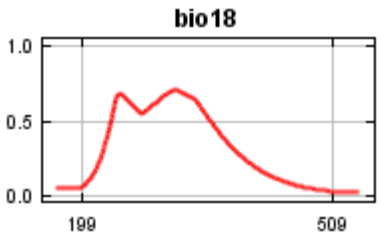
In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.











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
bio06	35.6	0.1
bio03	21.4	16.7
bio12	11	0
bio01	10.8	13.2
bio08	8.8	7
bio18	2.6	5.3
bio02	2.2	7.1
bio13	1.7	12.9
bio05	1.4	6.9
bio15	1.4	19.7
bio14	1.2	2.7
bio04	1.1	8
bio07	0.9	0.3

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.252, training AUC is 0.841, unregularized training gain is 0.371.
Unregularized test gain is 0.573.
Test AUC is 0.813, standard deviation is 0.026 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (4 seconds).

The follow settings were used during the run:
218 presence records used for training, 54 for testing.
10216 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.050, categorical: 0.250, threshold: 1.000, hinge: 0.500
Feature types used: hinge product linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

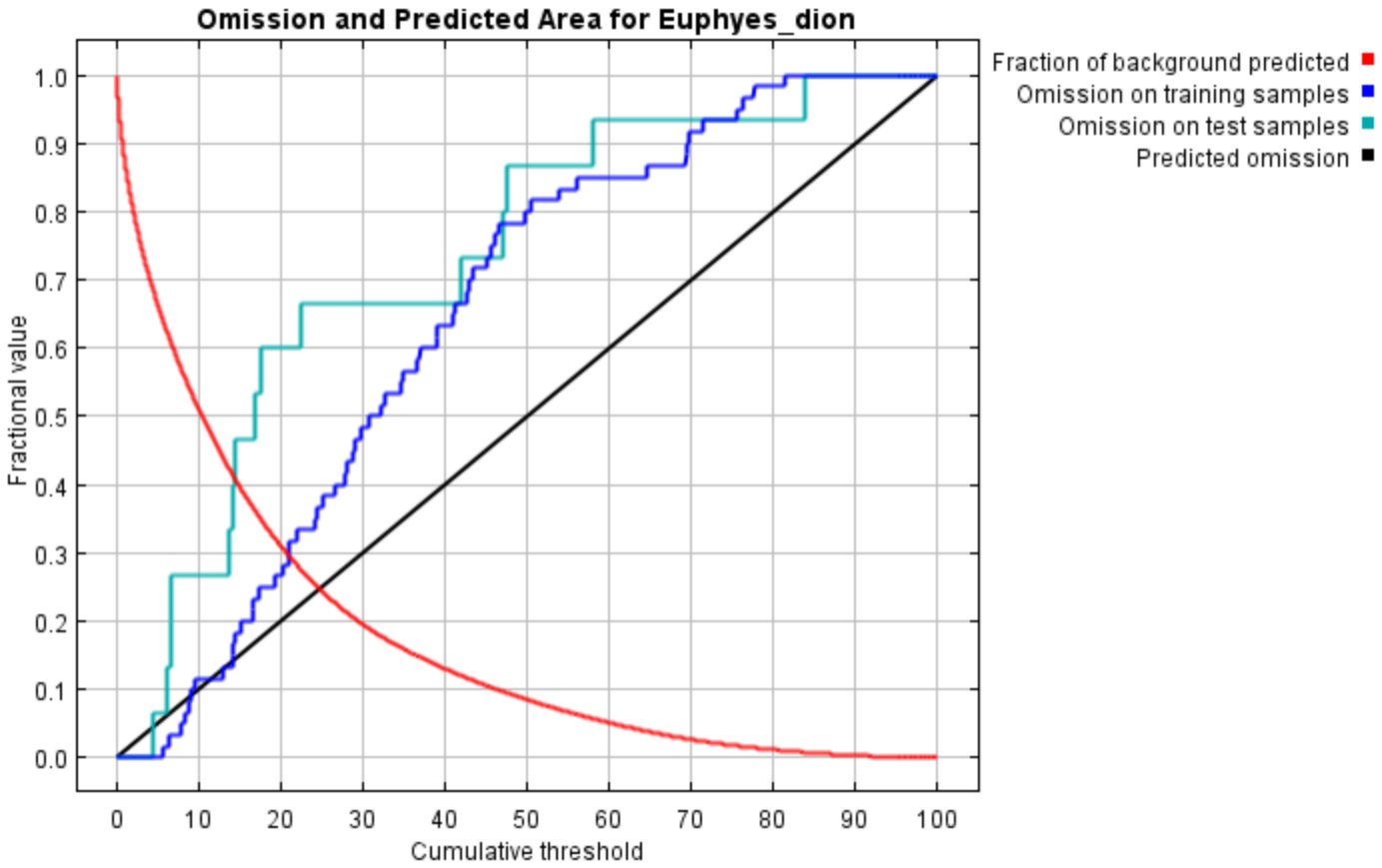
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Euphyes_conspicua responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Euphyes_dion

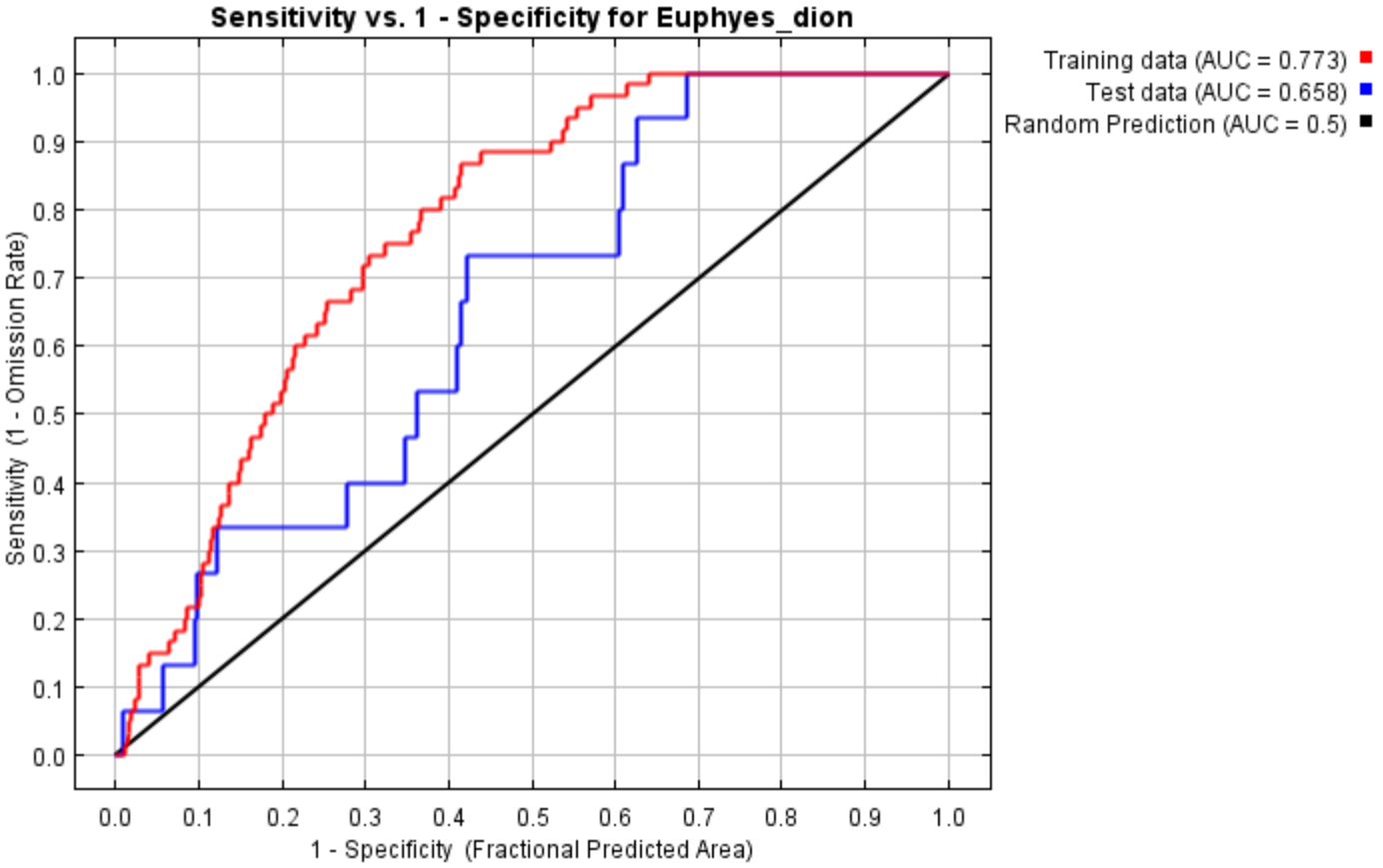
This page contains some analysis of the Maxent model for Euphyes_dion, created Mon Jan 15 14:47:16 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.825 rather than 1; in practice the test AUC may exceed this bound.



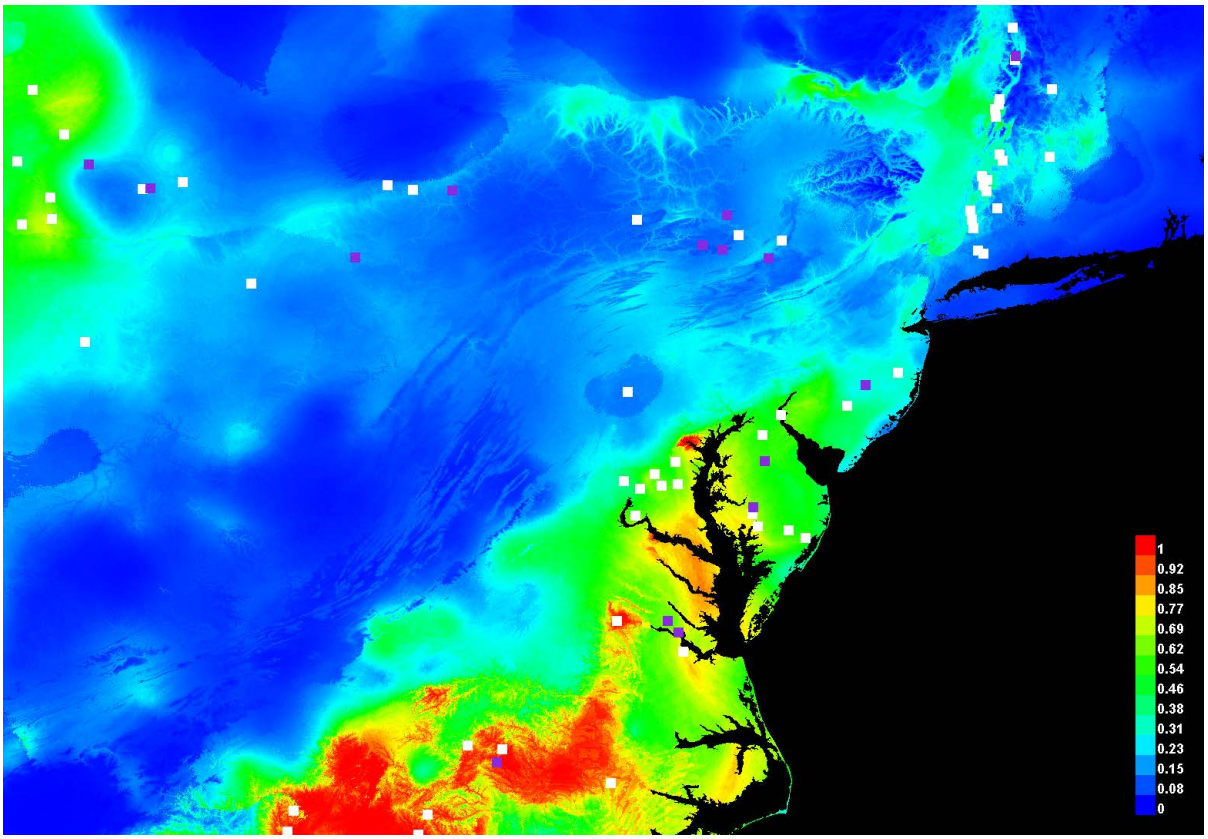
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.047	Fixed cumulative value 1	0.870	0.000	0.000	1.242E-1
5.000	0.100	Fixed cumulative value 5	0.663	0.000	0.067	1.809E-2
10.000	0.142	Fixed cumulative value 10	0.510	0.117	0.267	6.906E-2
5.623	0.106	Minimum training presence	0.640	0.000	0.067	1.176E-2
9.489	0.138	10 percentile training presence	0.523	0.100	0.267	8.387E-2
20.875	0.240	Equal training sensitivity and specificity	0.297	0.300	0.600	2.706E-1
14.105	0.172	Maximum training sensitivity plus	0.414	0.133	0.333	4.363E-

		specificity				2
14.369	0.175	Equal test sensitivity and specificity	0.409	0.167	0.400	1.081E-1
4.409	0.095	Maximum test sensitivity plus specificity	0.686	0.000	0.000	3.48E-3
5.623	0.106	Balance training omission, predicted area and threshold value	0.640	0.000	0.067	1.176E-2
15.123	0.182	Equate entropy of thresholded and original distributions	0.394	0.183	0.467	1.991E-1

Pictures of the model

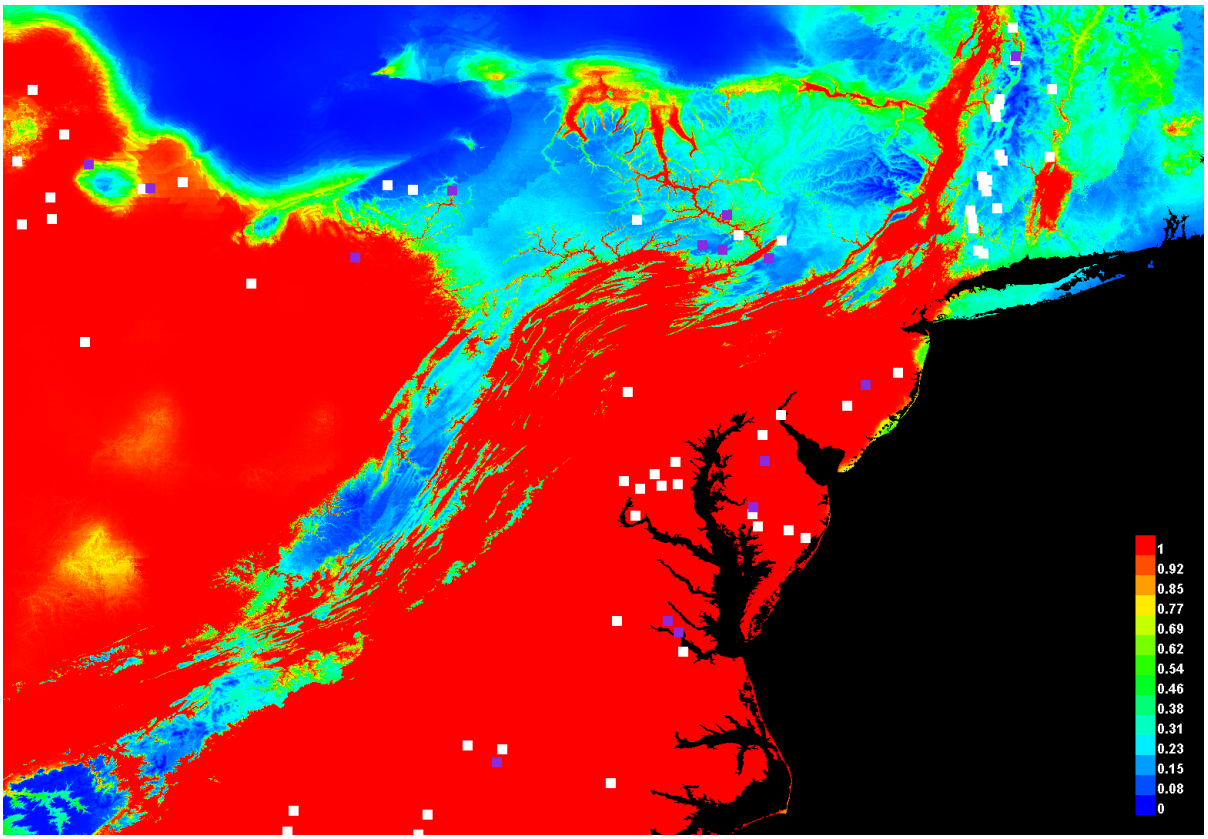
This is a representation of the Maxent model for Euphyes_dion. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



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 E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias\Euphyes_dion_explain.bat directly. This tool requires the environmental grids to be small enough that they all fit in memory.

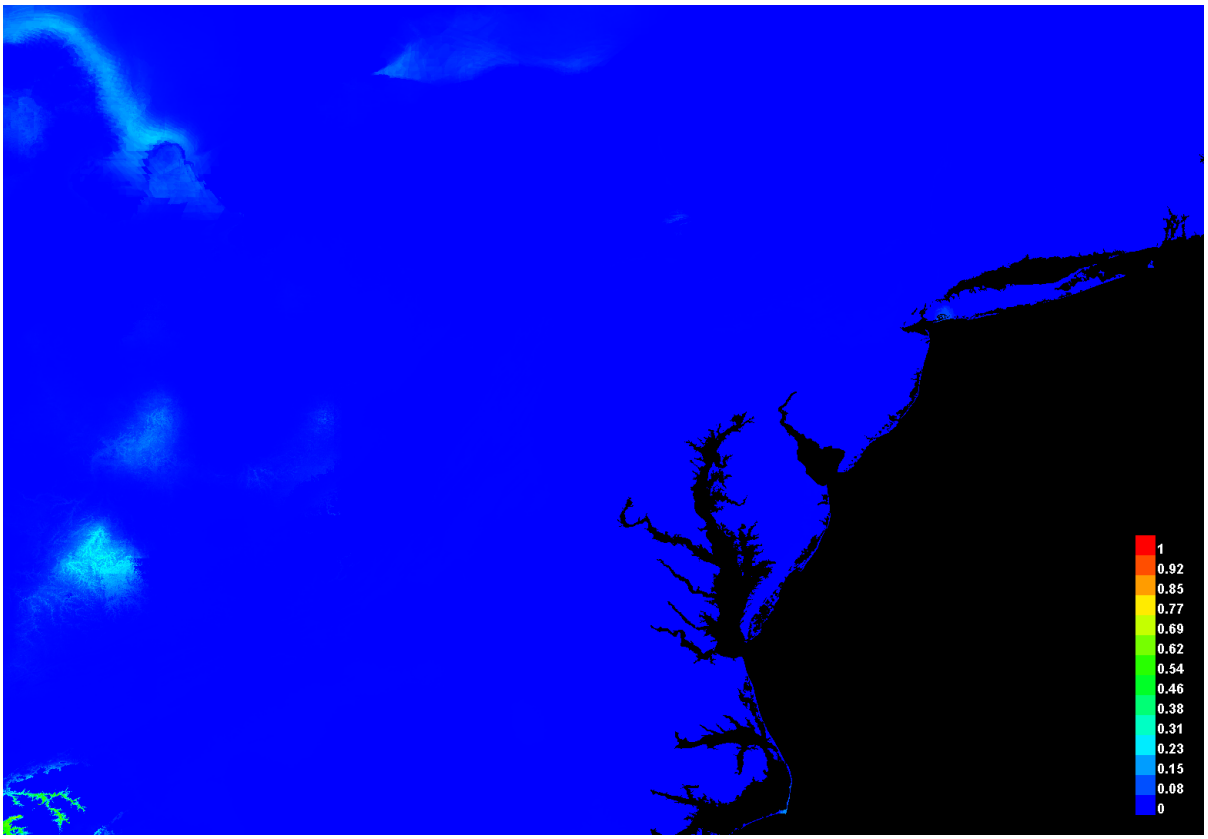
This is the projection of the Maxent model for Euphyes_dion onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-

size version.

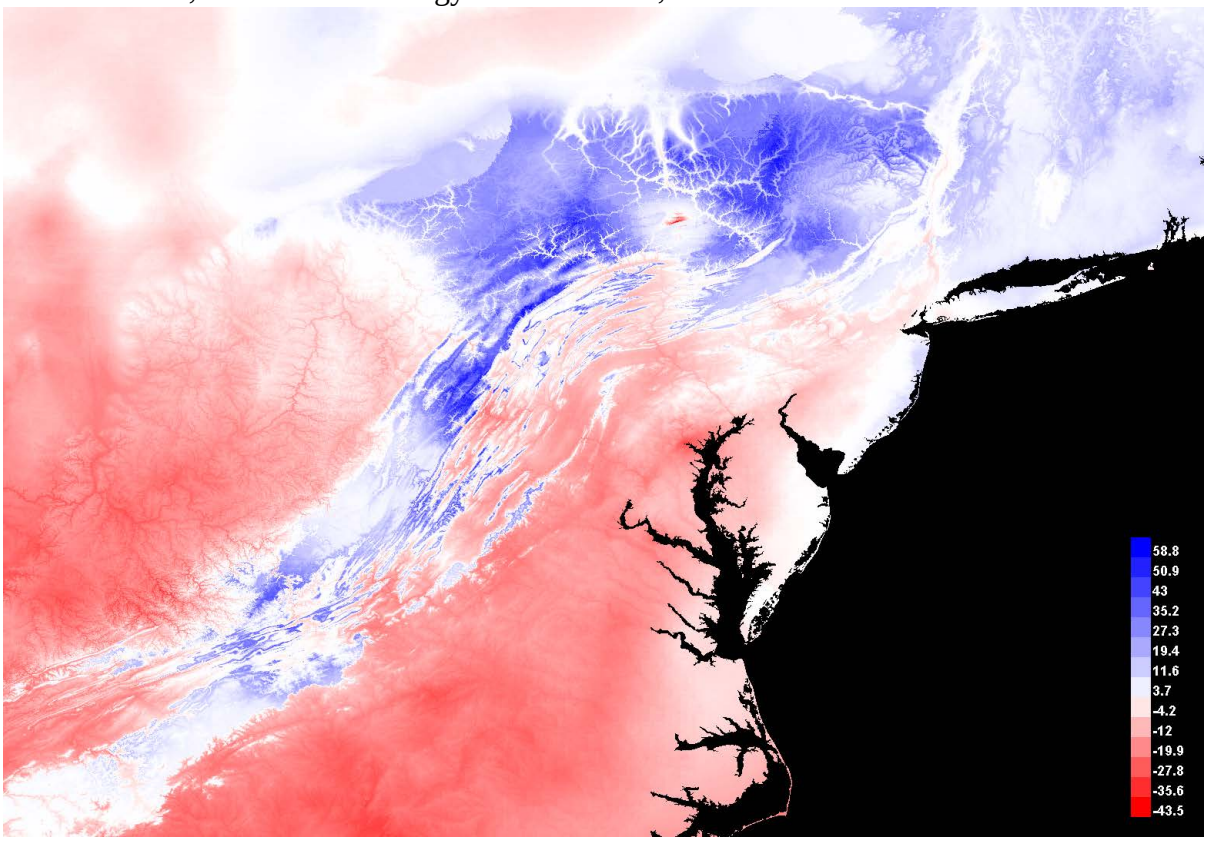


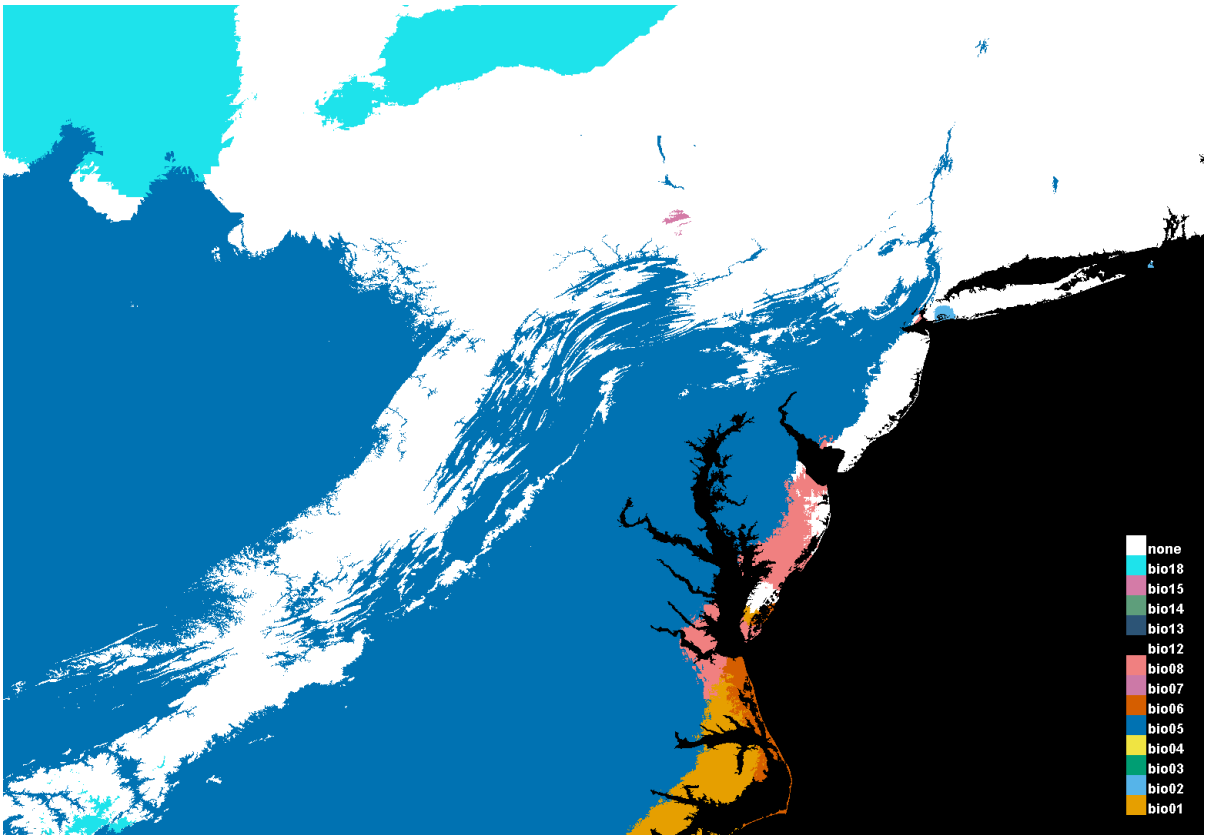
Click here to interactively explore this prediction using the Explain tool. If clicking from your browser does not succeed in starting the tool, try running the script in E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias\Euphyes_dion_he45bi50_explain.bat directly. This tool requires the environmental grids to be small enough that they all fit in memory.

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



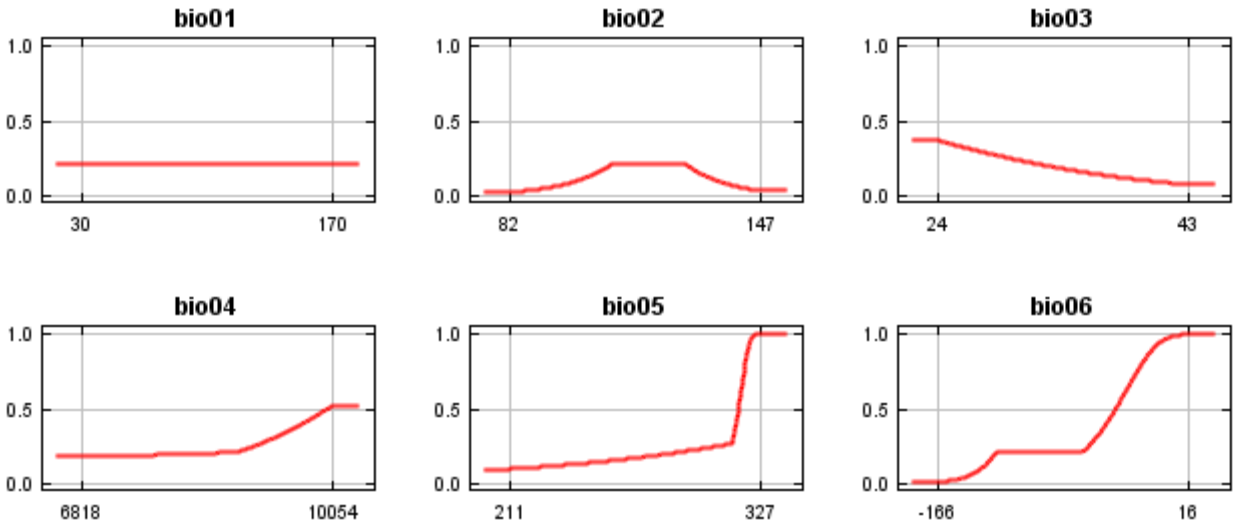
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

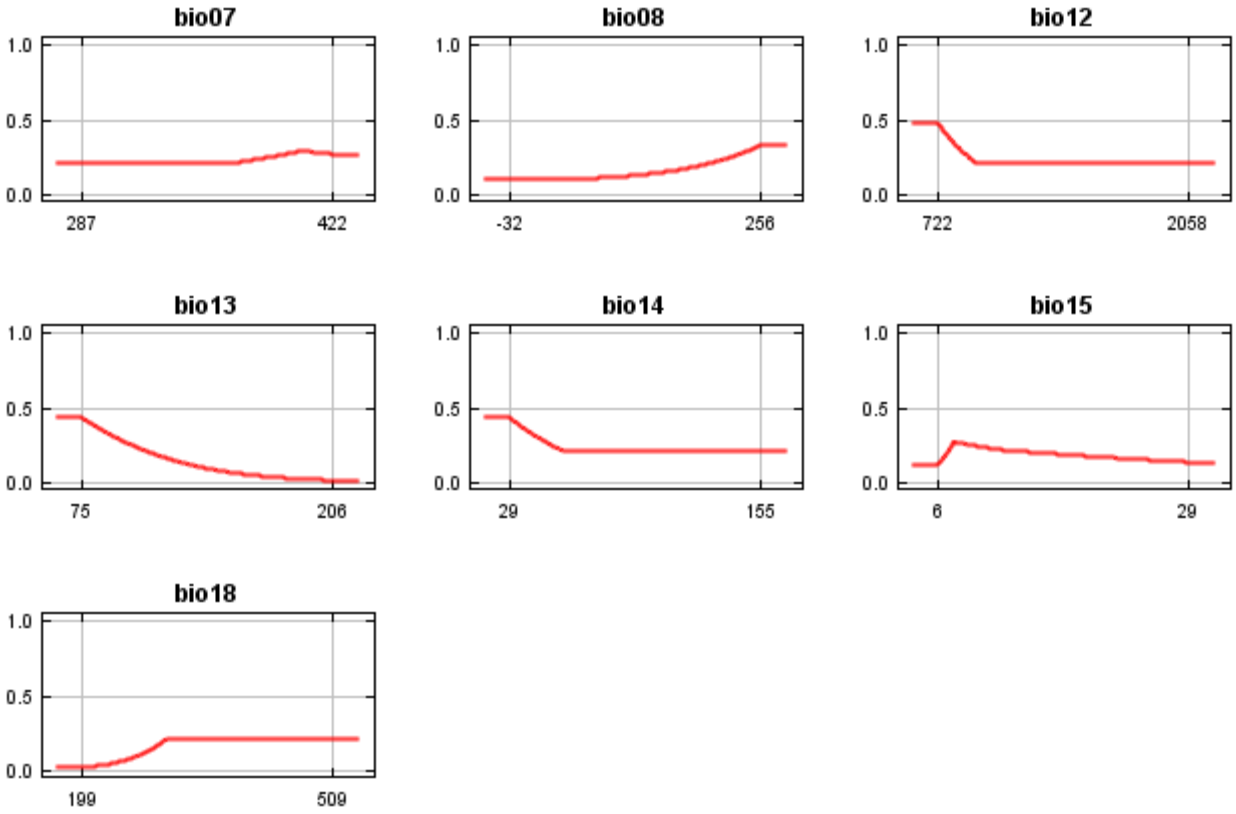




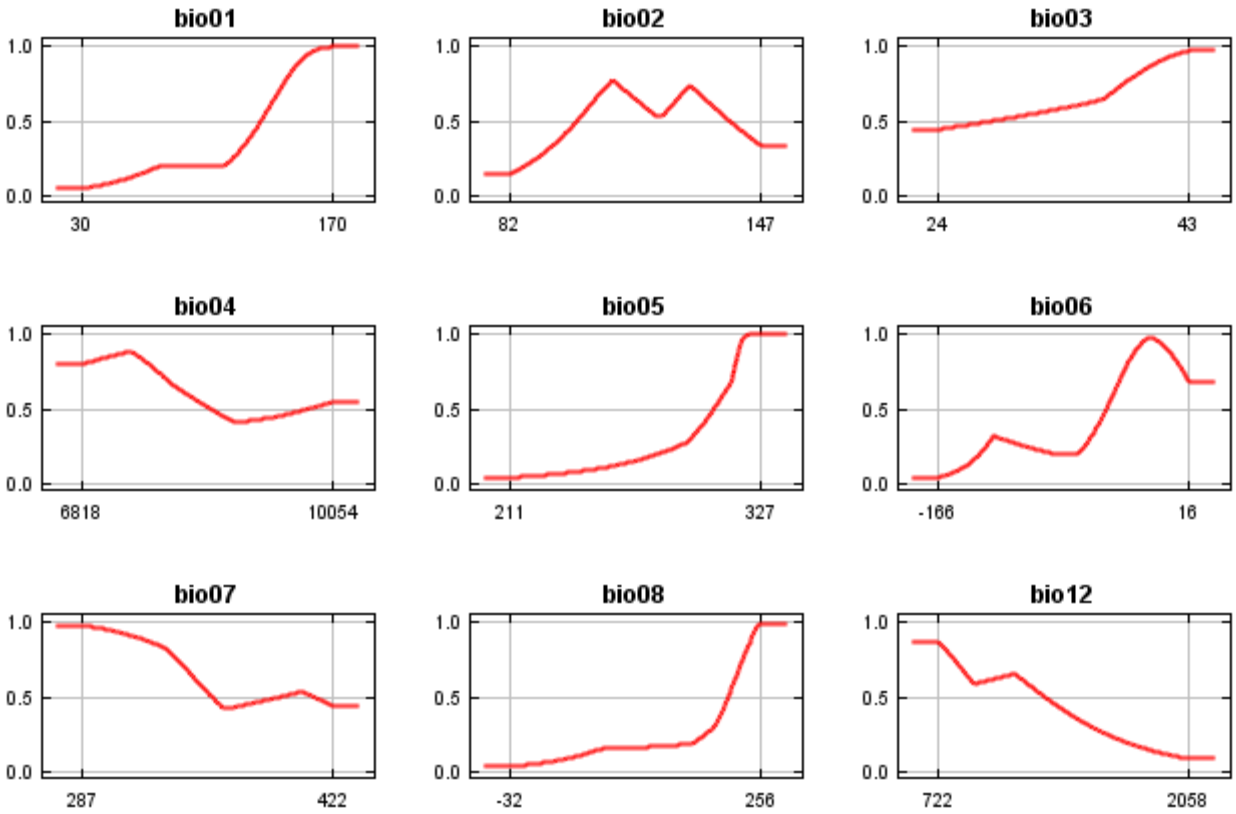
Response curves

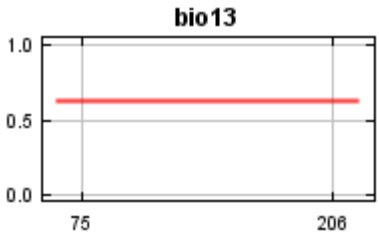
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.

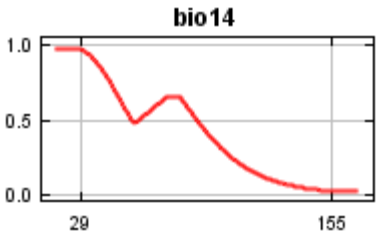


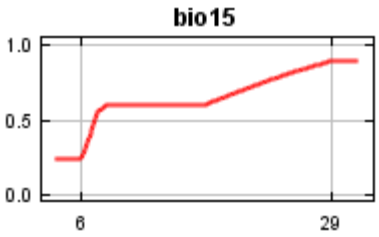


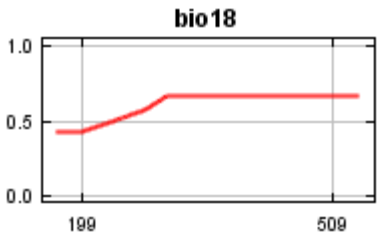
In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.











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
bio08	62.5	0
bio05	10.9	0
bio02	5.8	8.7
bio06	5.4	15.7
bio07	3.8	4.1
bio14	3.5	0
bio03	3	16
bio18	1.9	17.2
bio13	1.1	15.4
bio04	1.1	16.1
bio15	0.8	5.2
bio12	0.3	1.6
bio01	0	0

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.540, training AUC is 0.773, unregularized training gain is 0.802.
Unregularized test gain is -0.167.
Test AUC is 0.658, standard deviation is 0.057 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (3 seconds).

The follow settings were used during the run:
60 presence records used for training, 15 for testing.
10059 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.164, categorical: 0.250, threshold: 1.400, hinge: 0.500
Feature types used: hinge linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

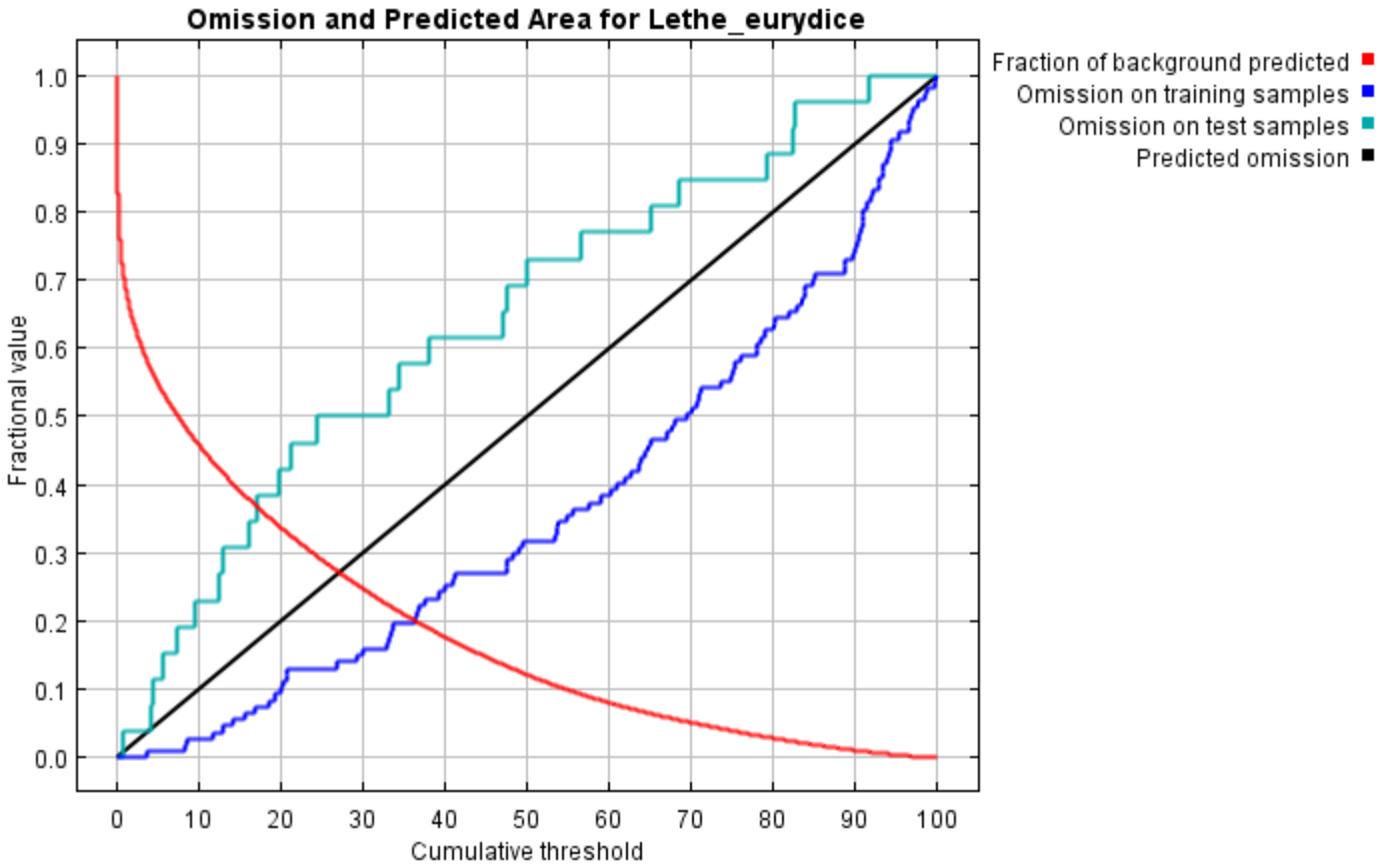
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Euphyes_dion responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Lethe_eurydice

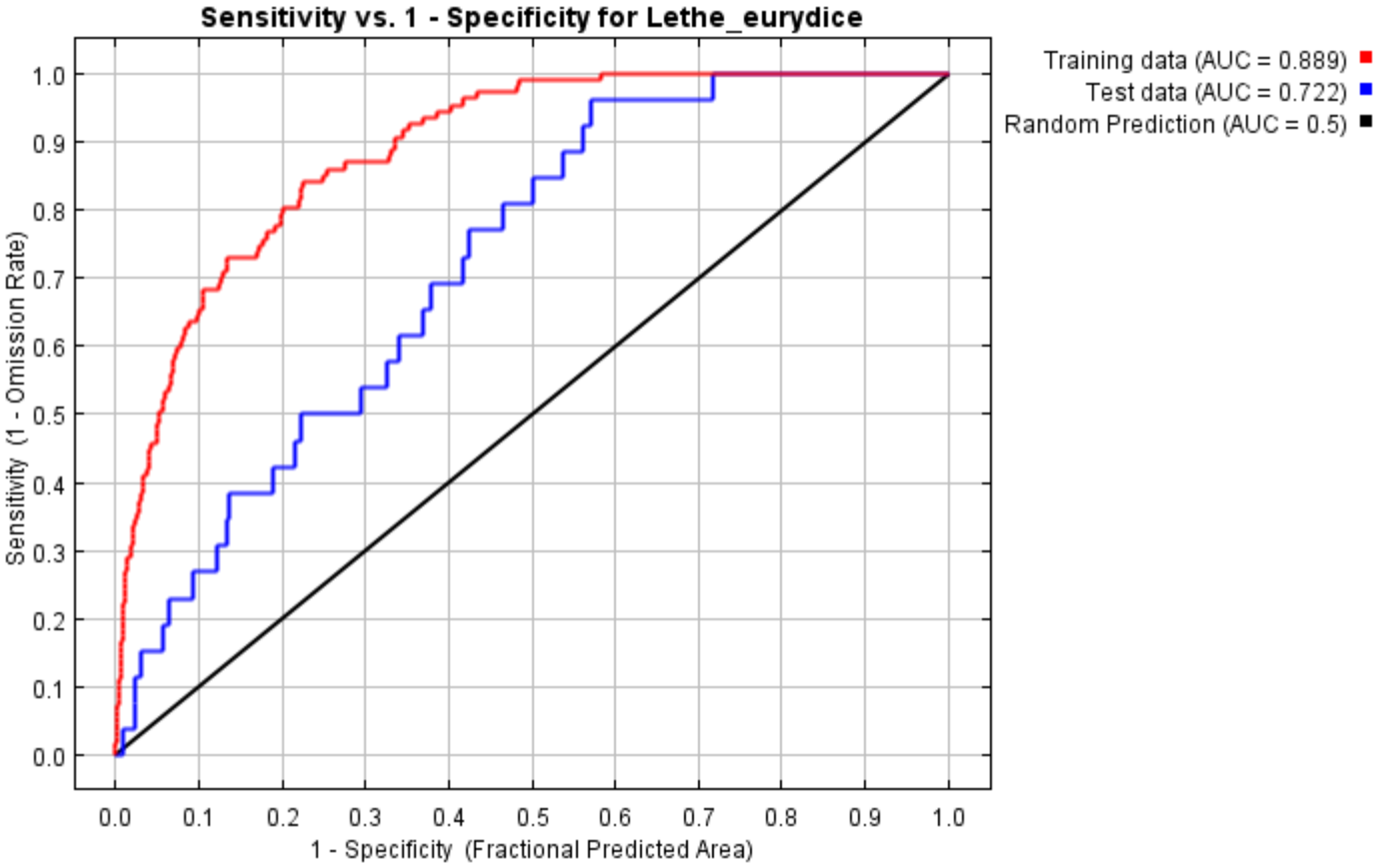
This page contains some analysis of the Maxent model for Lethe_eurydice, created Mon Jan 15 14:47:48 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.815 rather than 1; in practice the test AUC may exceed this bound.



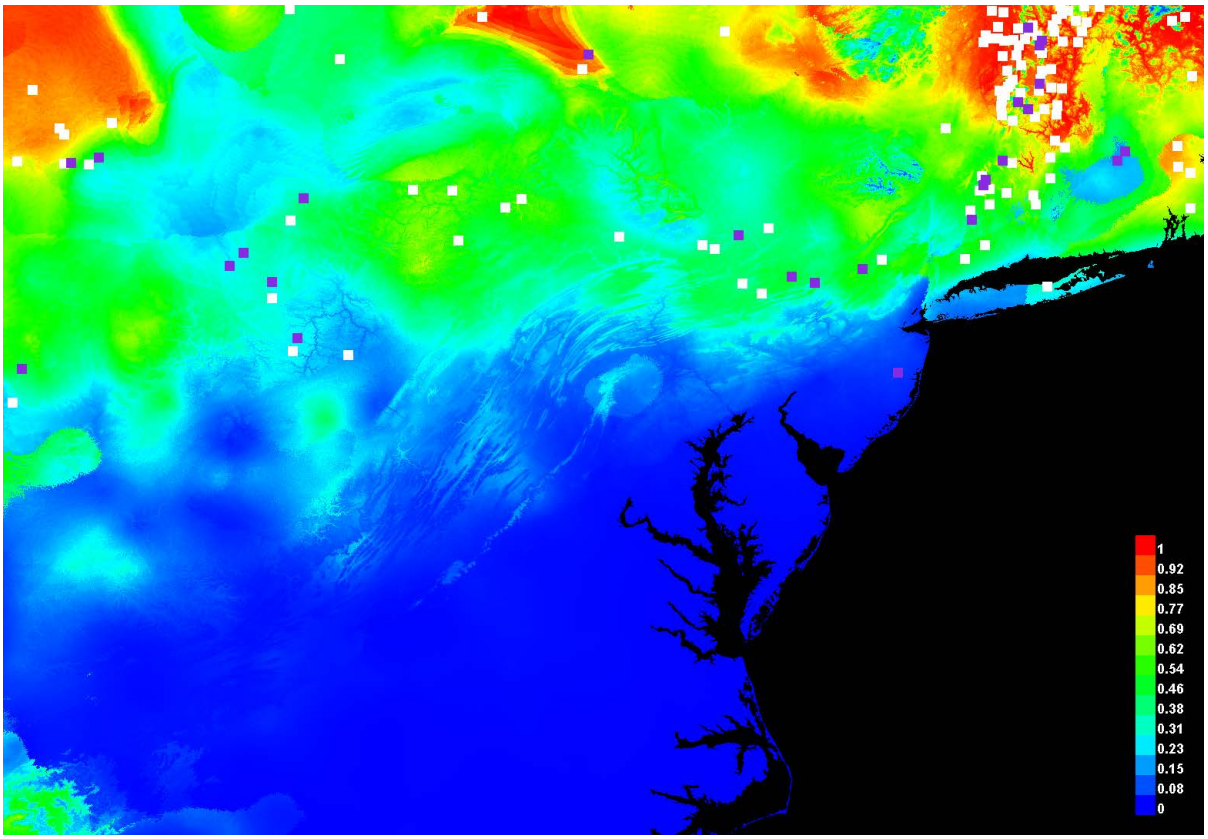
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.066	Fixed cumulative value 1	0.691	0.000	0.038	1.424E-3
5.000	0.191	Fixed cumulative value 5	0.548	0.009	0.115	2.839E-4
10.000	0.270	Fixed cumulative value 10	0.458	0.028	0.231	7.259E-4
3.593	0.153	Minimum training presence	0.584	0.000	0.038	4.707E-5
20.095	0.379	10 percentile training presence	0.336	0.093	0.423	4.702E-3
36.310	0.507	Equal training sensitivity and specificity	0.201	0.206	0.577	2.366E-3
32.990	0.474	Maximum training sensitivity plus	0.224	0.159	0.500	3.803E-

		specificity				4
17.063	0.353	Equal test sensitivity and specificity	0.368	0.075	0.385	4.447E-3
4.059	0.166	Maximum test sensitivity plus specificity	0.571	0.009	0.038	2.888E-5
3.593	0.153	Balance training omission, predicted area and threshold value	0.584	0.000	0.038	4.707E-5
8.779	0.253	Equate entropy of thresholded and original distributions	0.477	0.028	0.192	3.733E-4

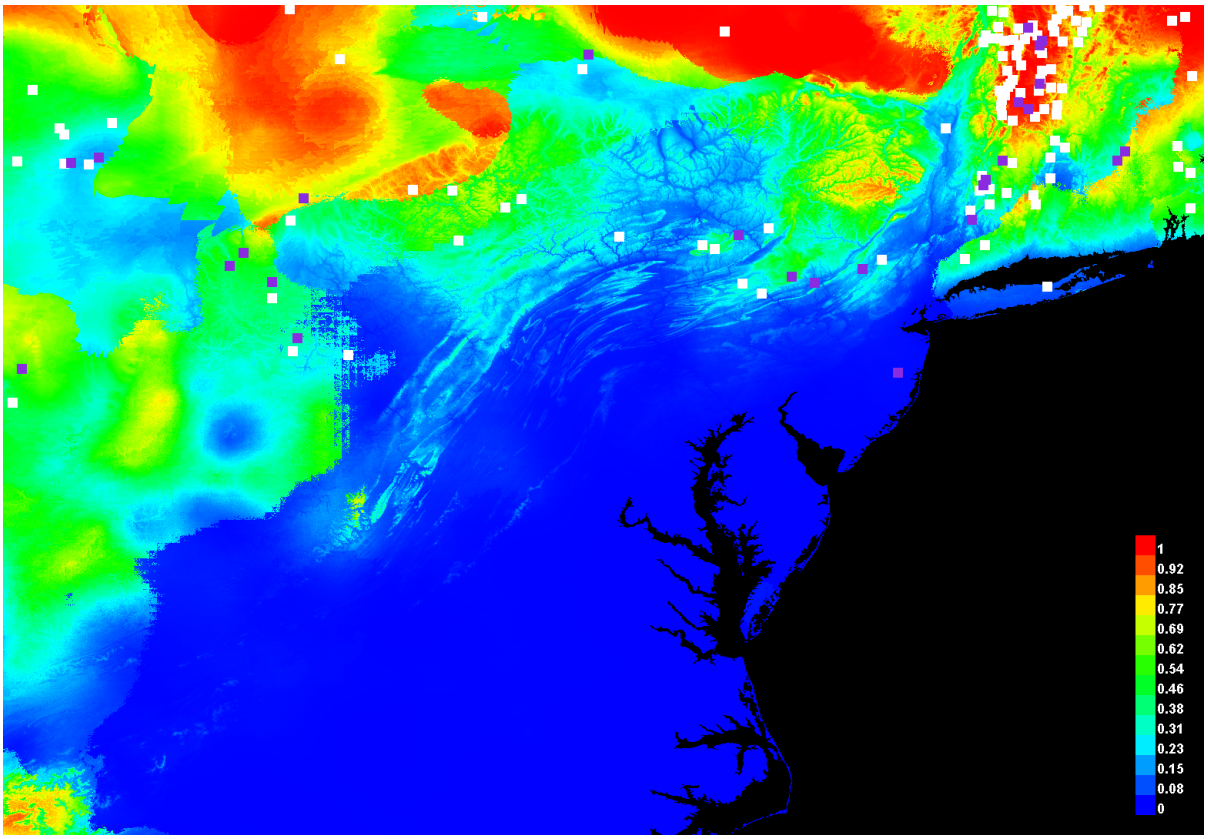
Pictures of the model

This is a representation of the Maxent model for Lethe_eurydice. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



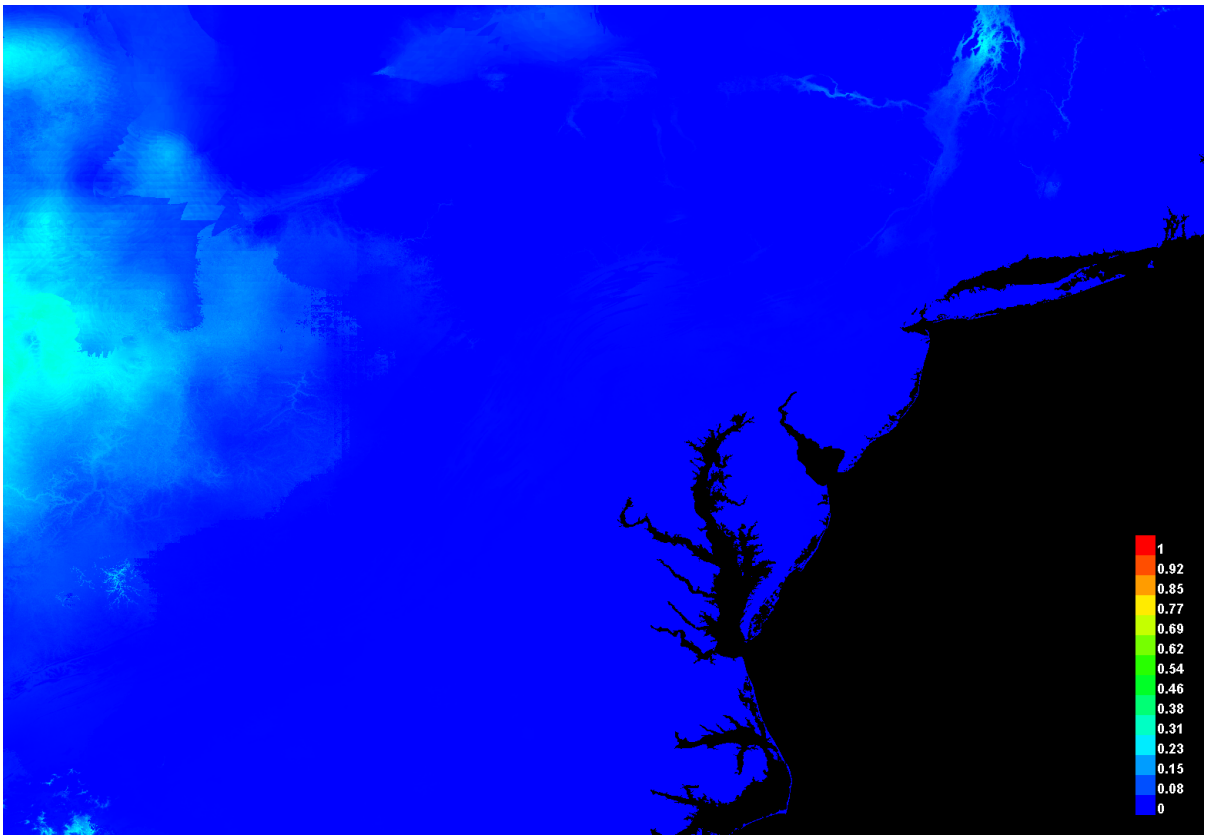
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

This is the projection of the Maxent model for Lethe_eurydice onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

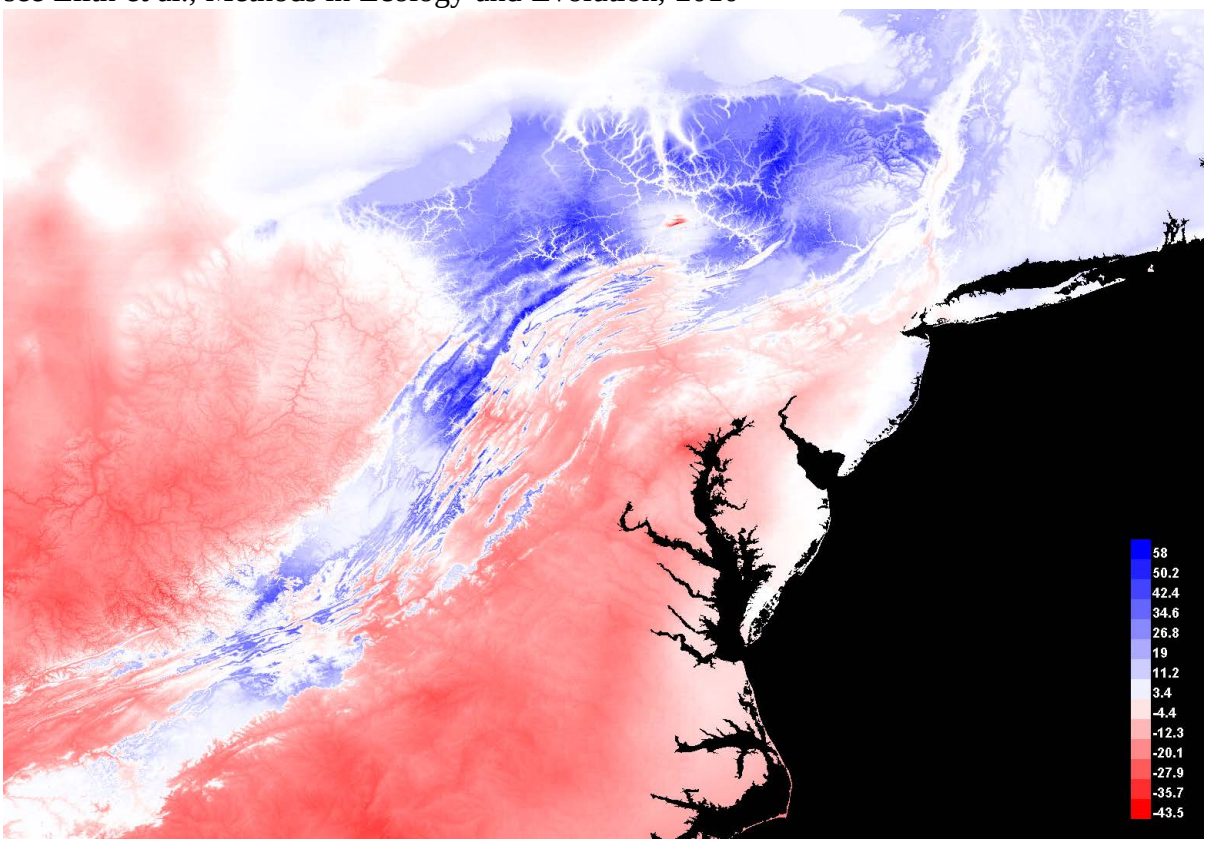


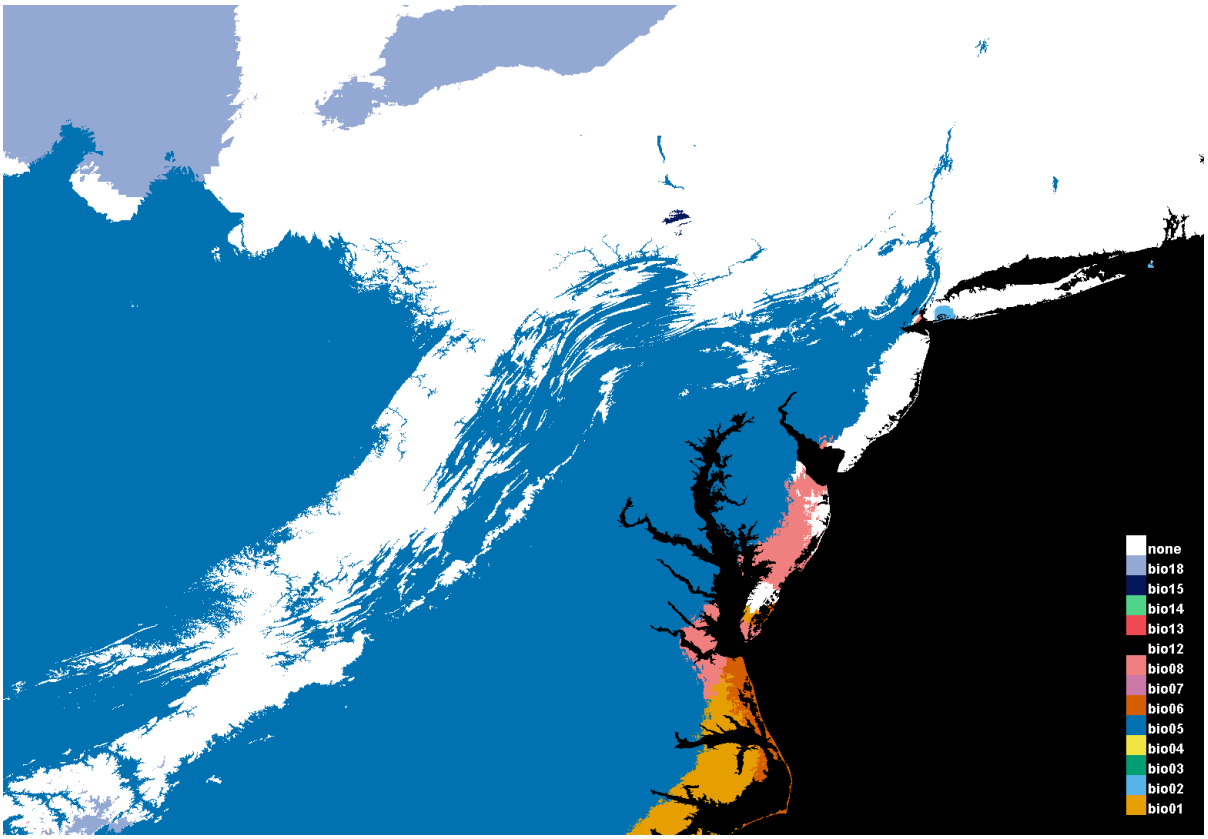
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



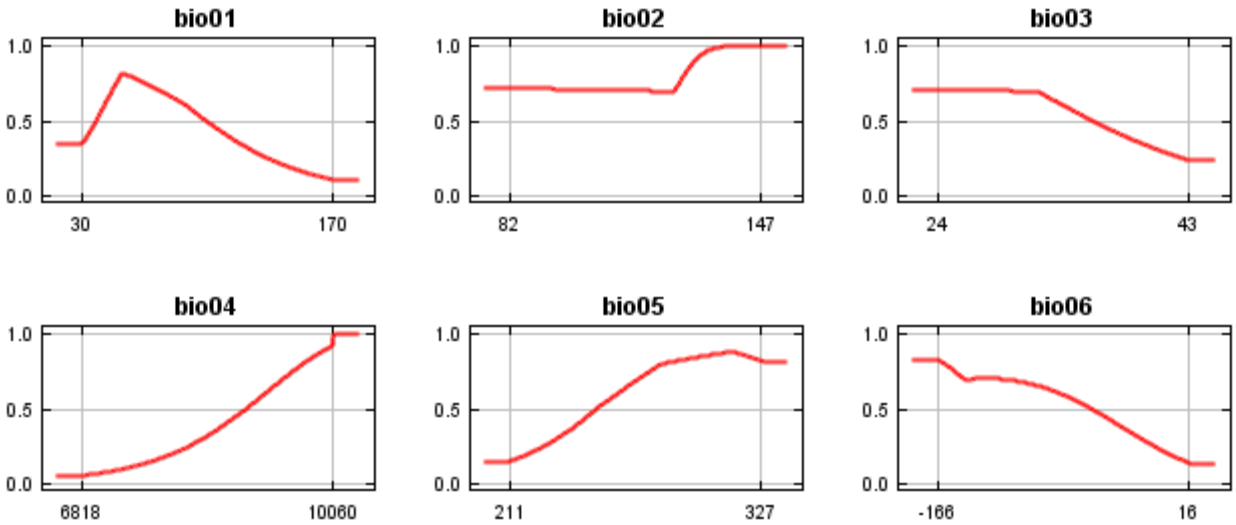
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

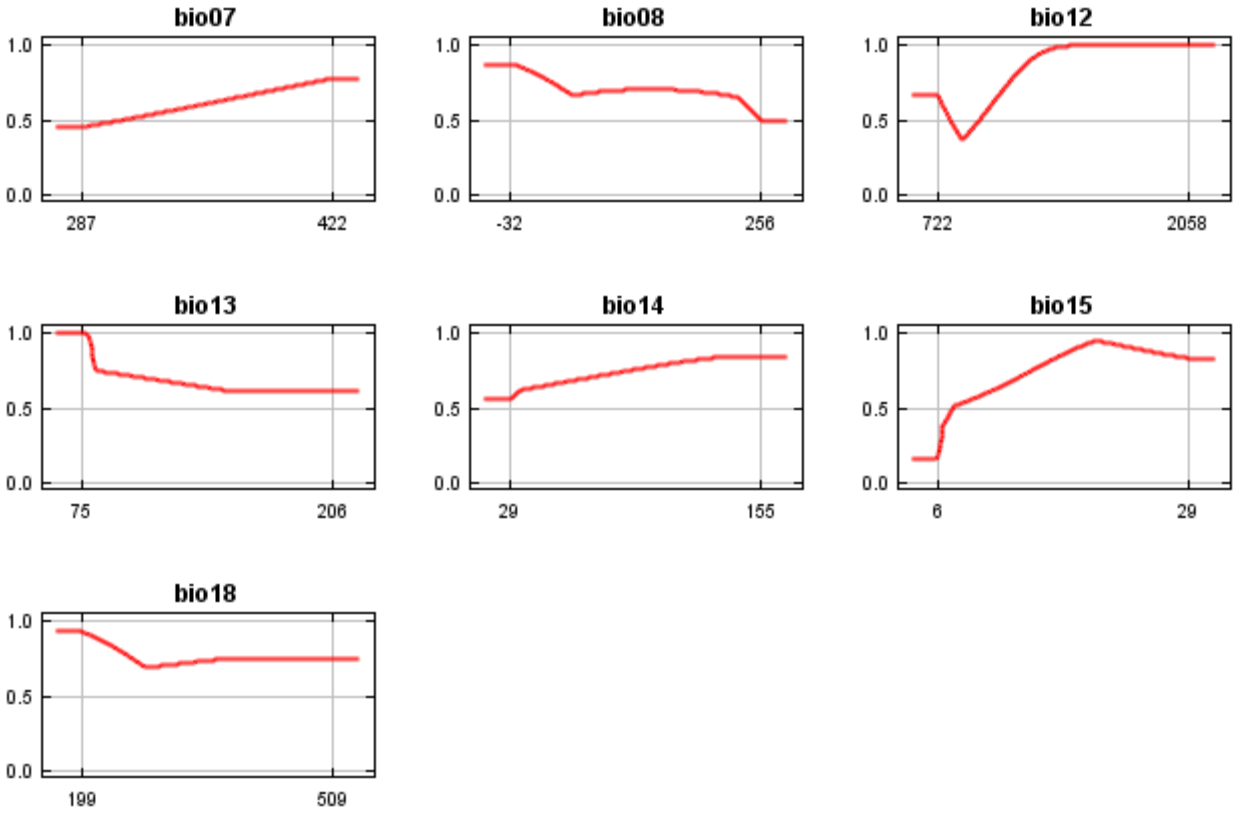




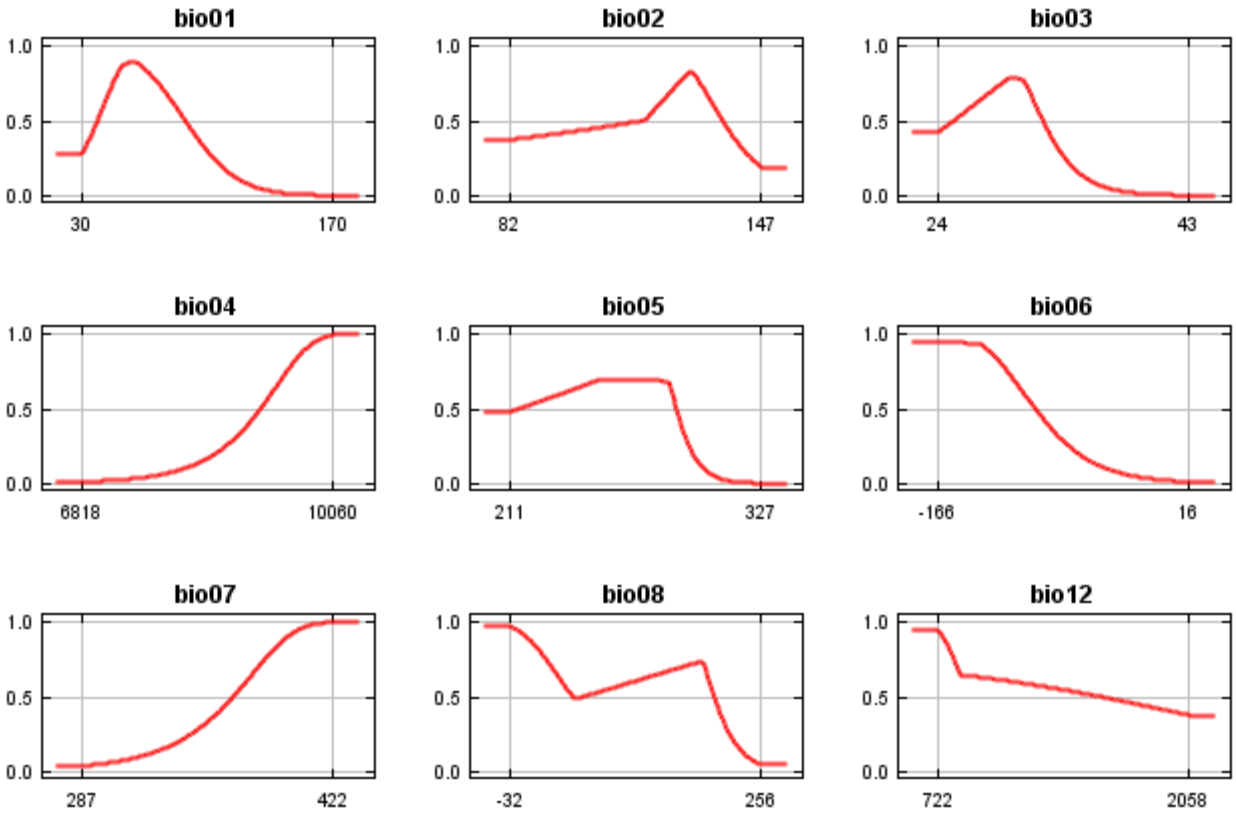
Response curves

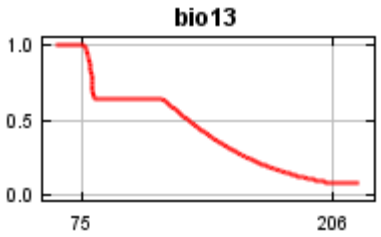
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.

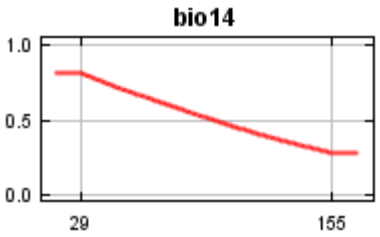


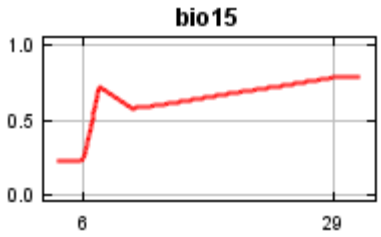


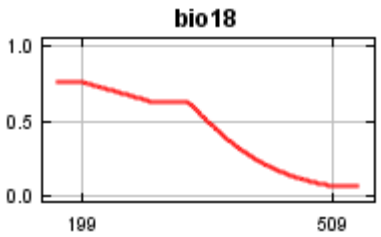
In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.











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
bio07	61.1	1.2
bio04	11.1	31.5
bio01	6.1	17.3
bio06	4.9	7.7
bio05	4.6	3.8
bio12	3.2	15.2
bio02	2.5	7.2
bio08	1.9	7.4
bio15	1.8	0.3
bio13	1.5	0.1
bio18	0.6	0
bio03	0.6	6.4
bio14	0.1	2

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.557, training AUC is 0.889, unregularized training gain is 0.678.
Unregularized test gain is 0.267.
Test AUC is 0.722, standard deviation is 0.039 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (3 seconds).

The follow settings were used during the run:
107 presence records used for training, 26 for testing.
10107 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.050, categorical: 0.250, threshold: 1.000, hinge: 0.500
Feature types used: hinge product linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

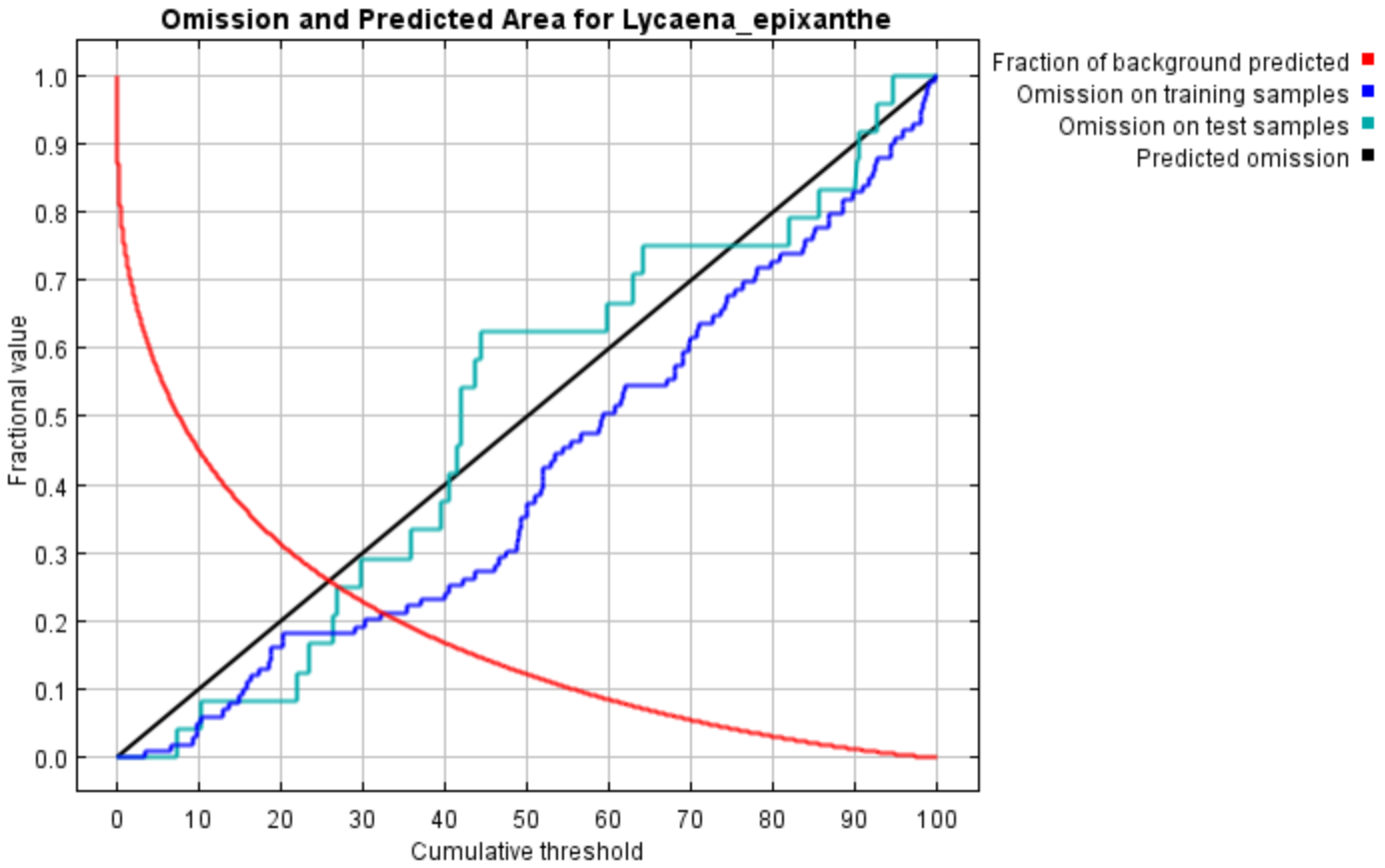
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Lethe_eurydice responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Lycaena_epixanthe

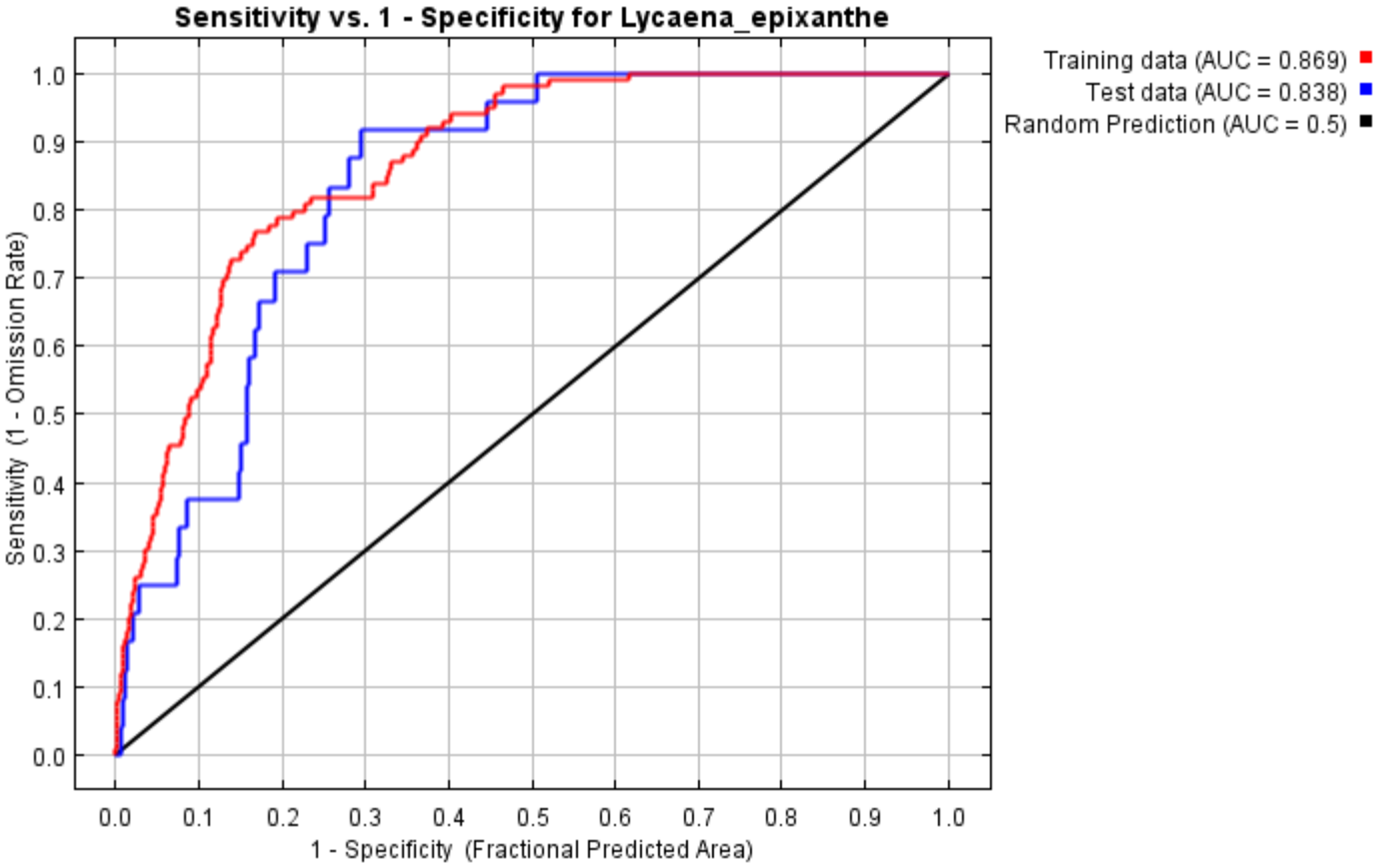
This page contains some analysis of the Maxent model for Lycaena_epixanthe, created Mon Jan 15 14:48:23 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.818 rather than 1; in practice the test AUC may exceed this bound.



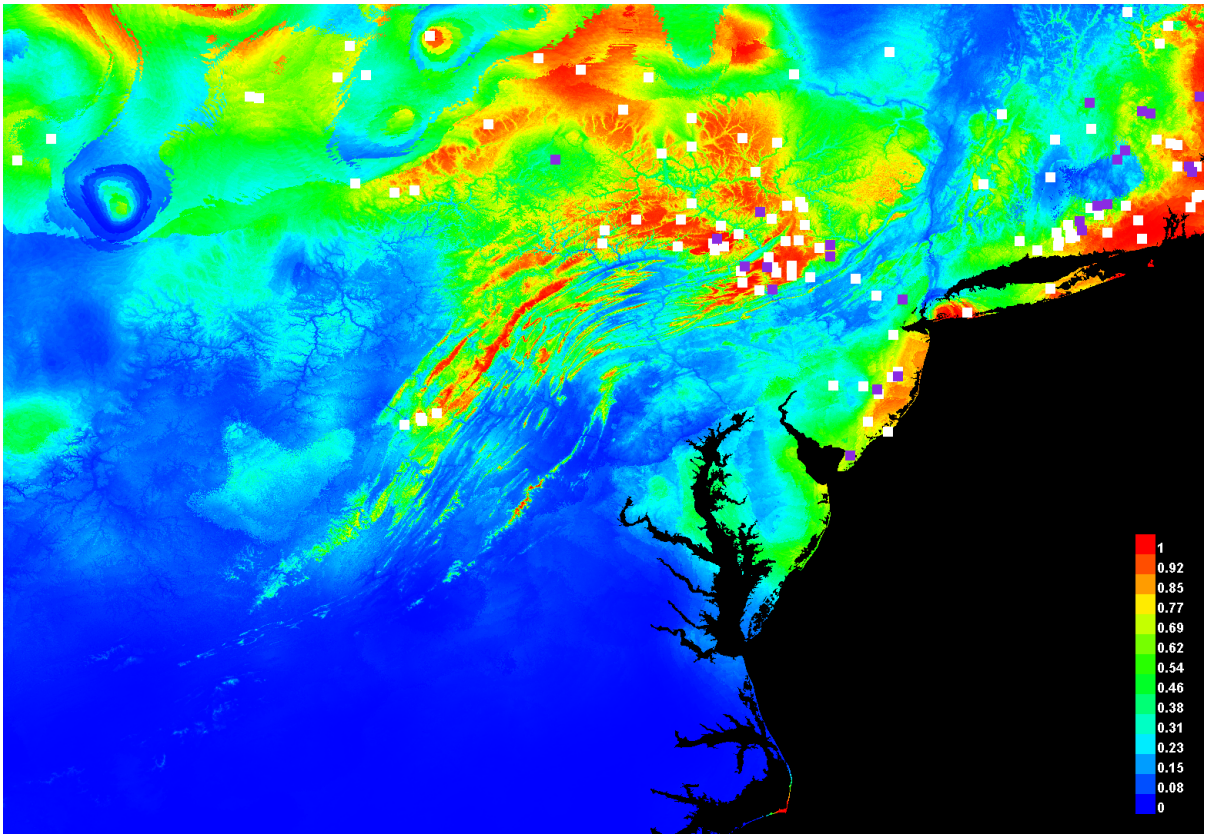
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.062	Fixed cumulative value 1	0.742	0.000	0.000	7.758E-4
5.000	0.149	Fixed cumulative value 5	0.566	0.010	0.000	1.174E-6
10.000	0.232	Fixed cumulative value 10	0.451	0.051	0.042	1.488E-7
3.510	0.120	Minimum training presence	0.616	0.000	0.000	8.92E-6
15.451	0.307	10 percentile training presence	0.367	0.091	0.083	2.999E-8
32.420	0.526	Equal training sensitivity and specificity	0.212	0.212	0.292	2.594E-7
40.034	0.609	Maximum training sensitivity plus specificity	0.168	0.232	0.375	6.881E-7

27.066	0.464	Equal test sensitivity and specificity	0.250	0.182	0.250	3.879E-7
21.863	0.398	Maximum test sensitivity plus specificity	0.294	0.182	0.083	2.963E-10
3.510	0.120	Balance training omission, predicted area and threshold value	0.616	0.000	0.000	8.92E-6
8.379	0.207	Equate entropy of thresholded and original distributions	0.482	0.020	0.042	6.723E-7

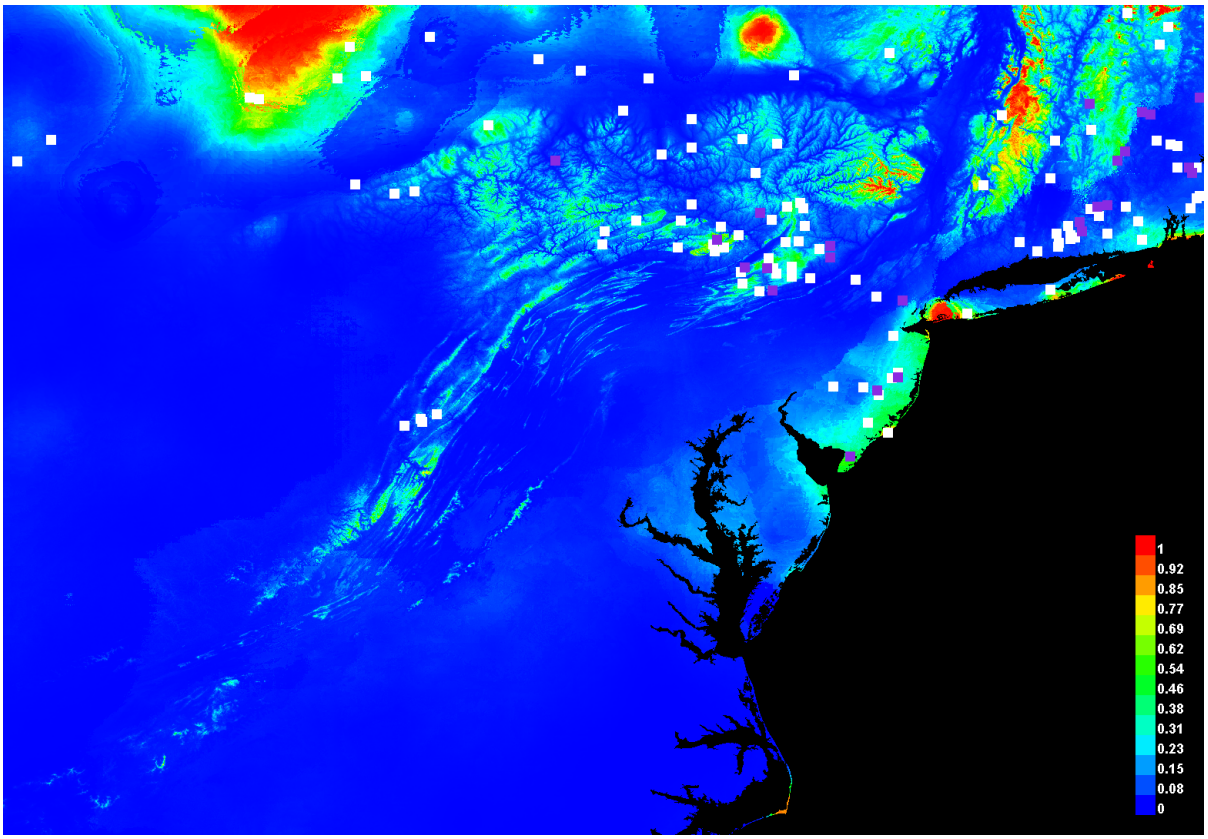
Pictures of the model

This is a representation of the Maxent model for Lycaena_epixanthe. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



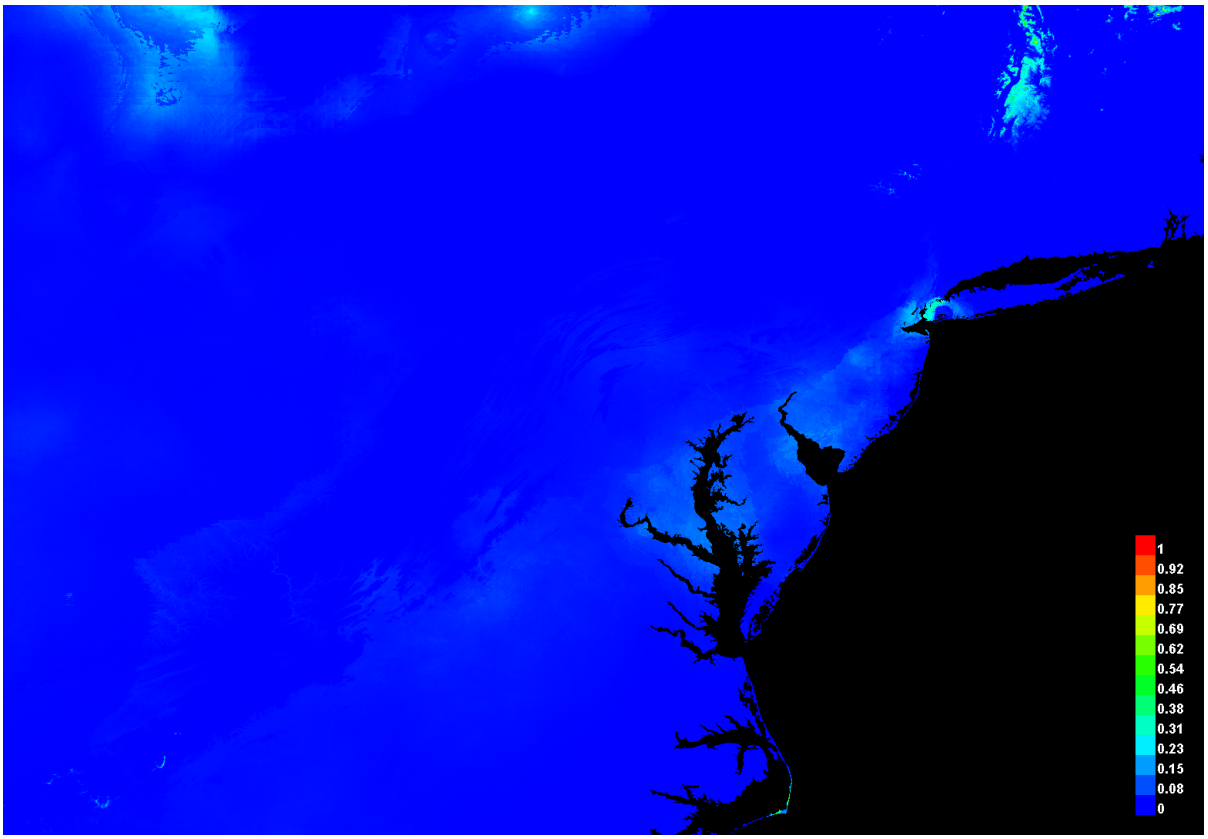
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

This is the projection of the Maxent model for Lycaena_epixanthe onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

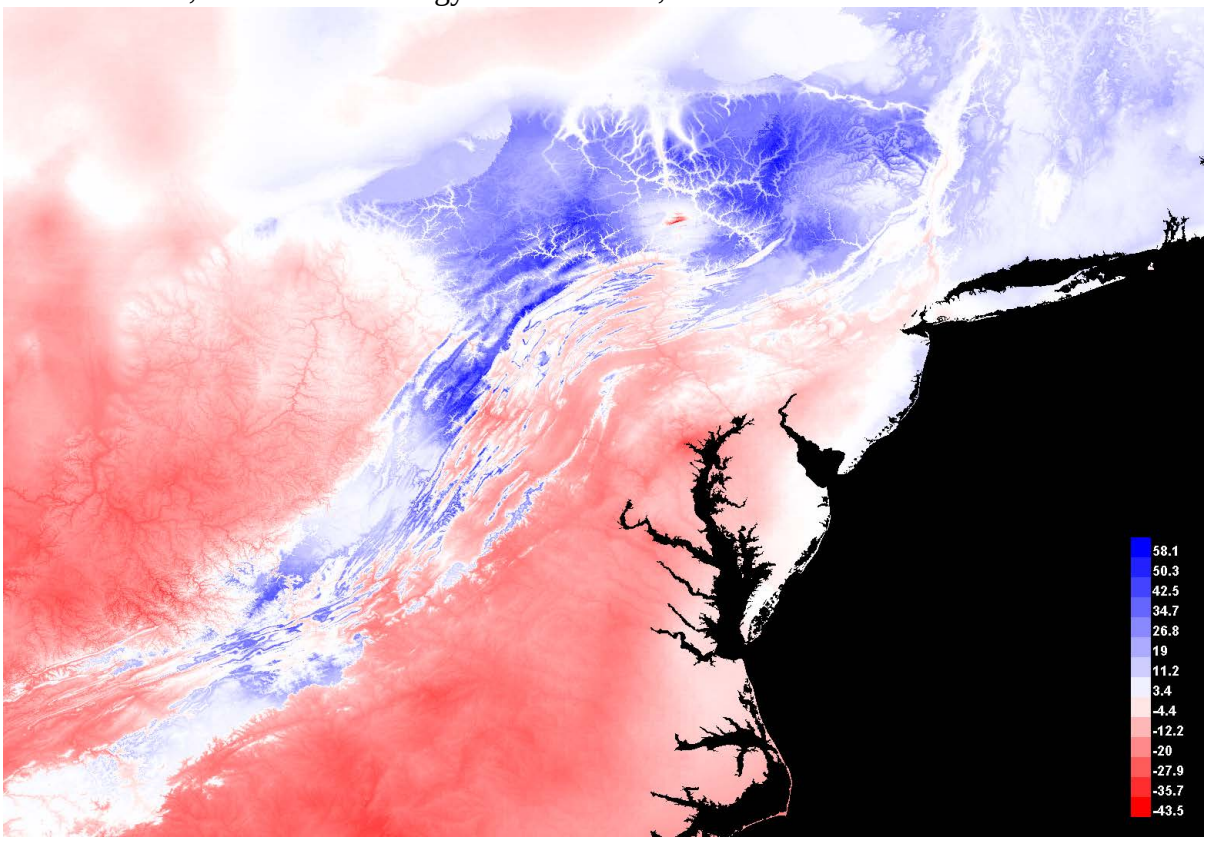


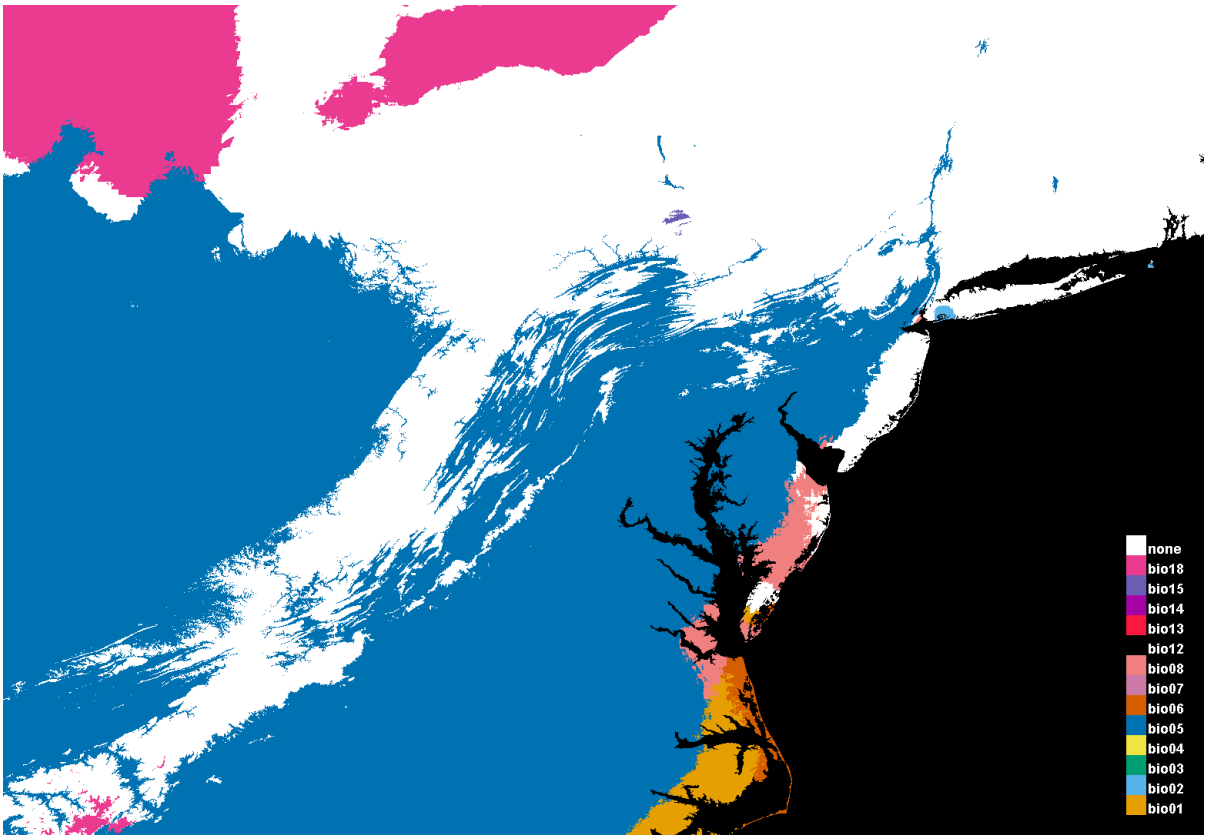
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



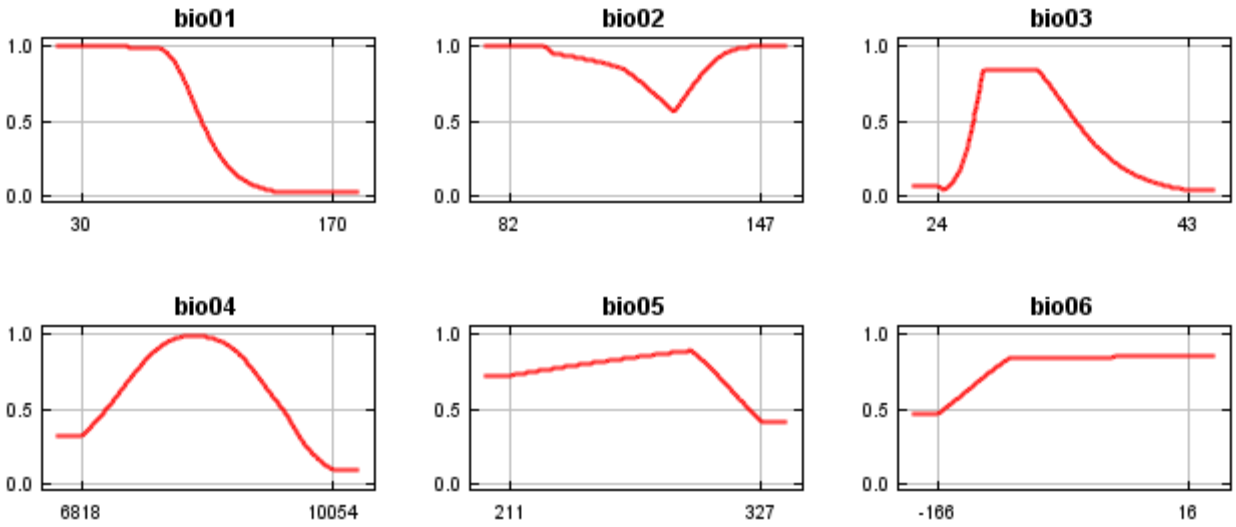
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

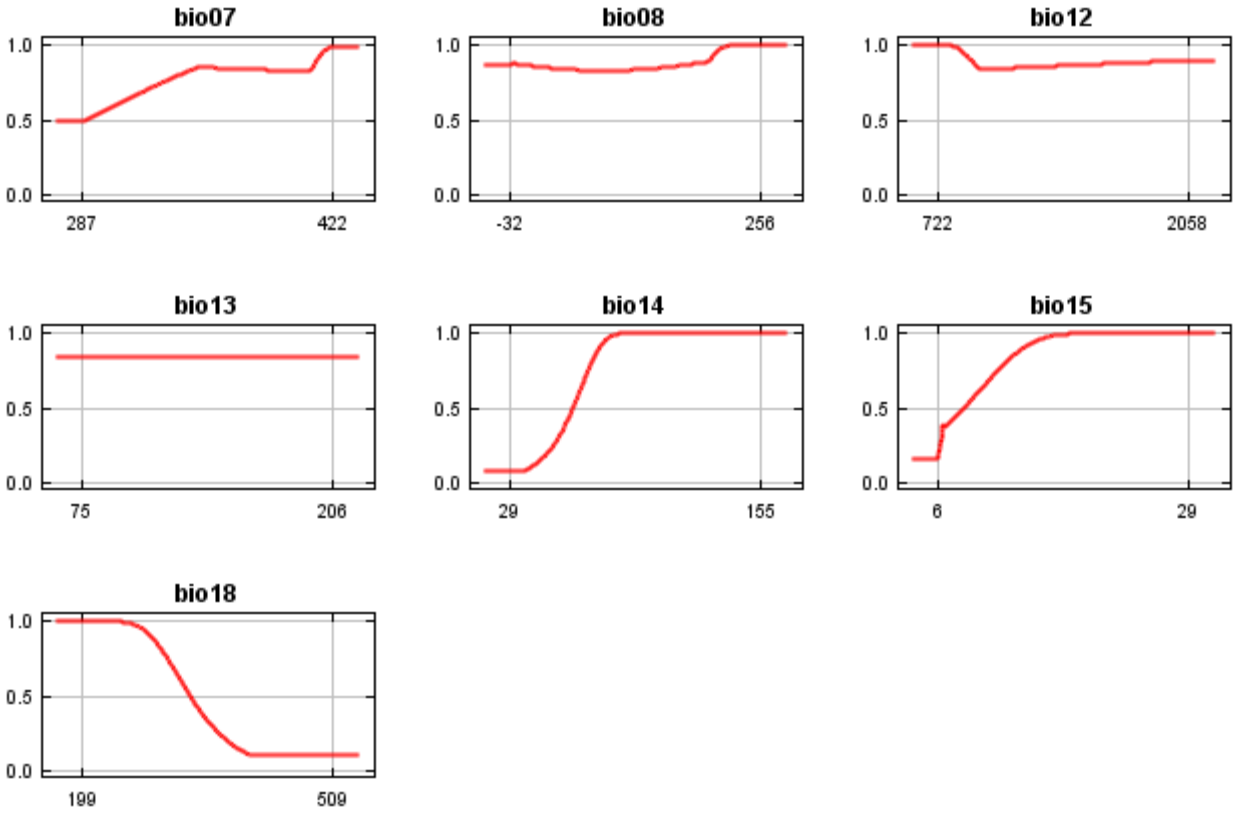




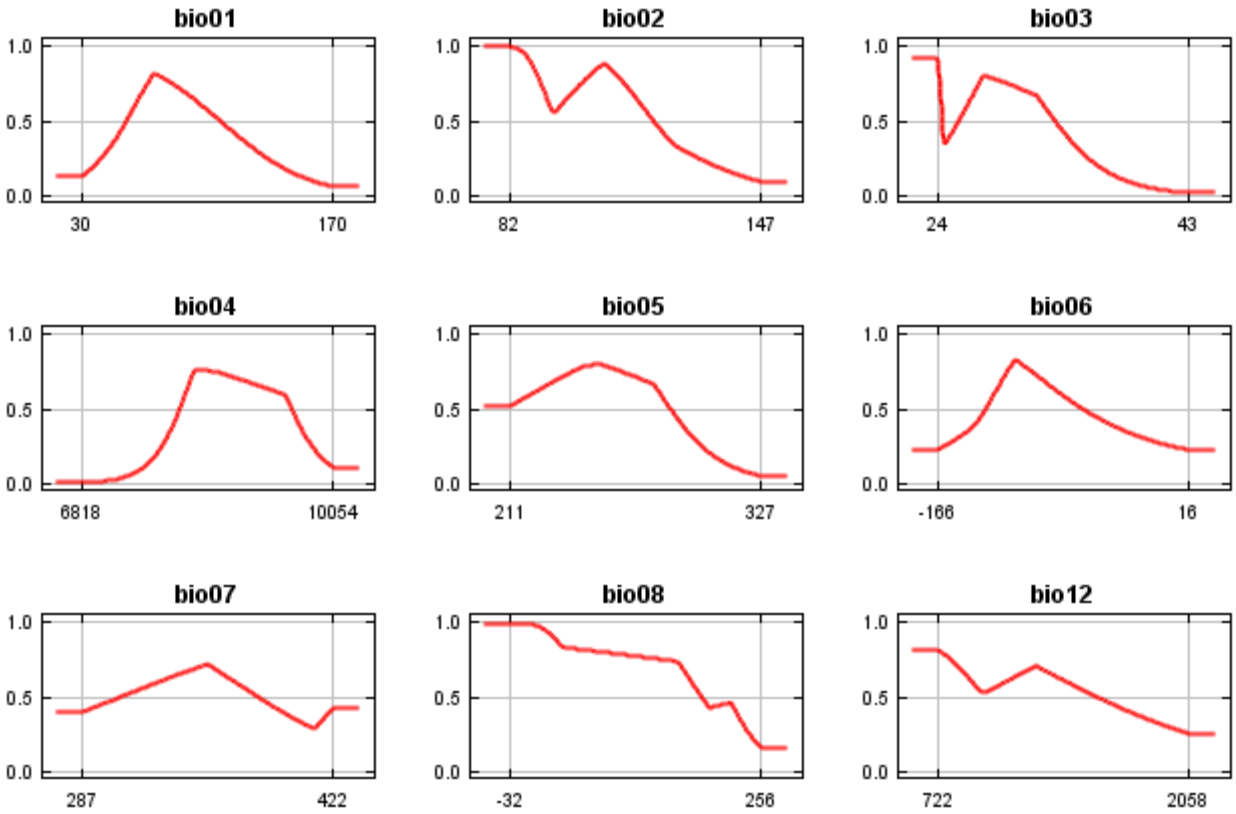
Response curves

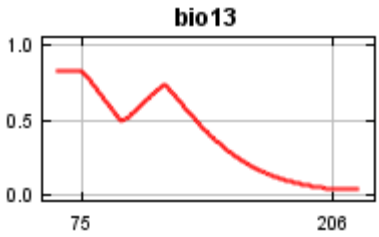
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.

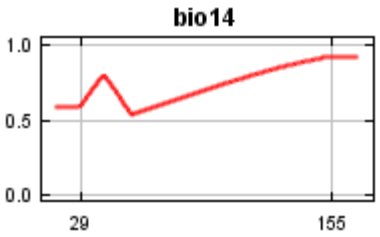


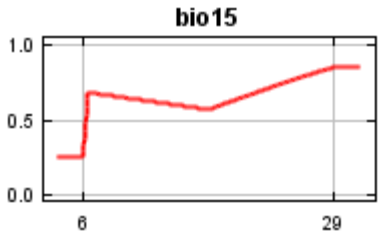


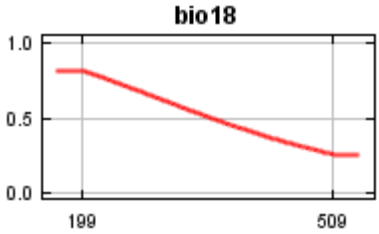
In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.











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
bio02	26	3.6
bio05	17.9	1.5
bio04	12.8	9.4
bio08	10.4	4.3
bio03	7.7	17.2
bio15	7.5	5.5
bio01	7	29.3
bio12	3.7	0.9
bio14	3	20.2
bio18	2.4	7.1
bio07	1	0.7
bio06	0.4	0.4
bio13	0.3	0

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.541, training AUC is 0.869, unregularized training gain is 0.797.
Unregularized test gain is 0.808.
Test AUC is 0.838, standard deviation is 0.027 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (3 seconds).

The follow settings were used during the run:
99 presence records used for training, 24 for testing.
10097 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.057, categorical: 0.250, threshold: 1.010, hinge: 0.500
Feature types used: hinge product linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

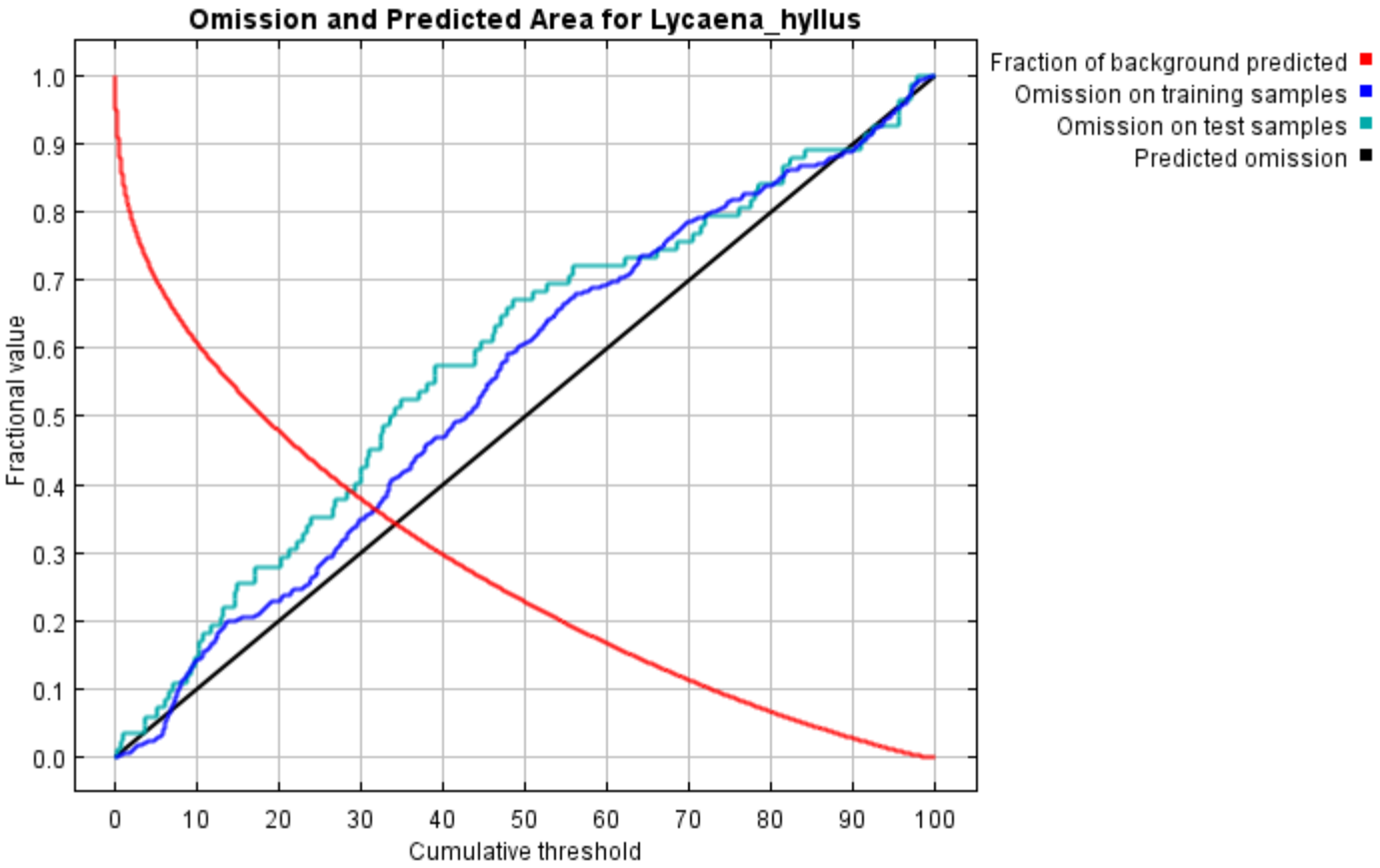
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Lycaena_epixanthe responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Lycaena_hyllus

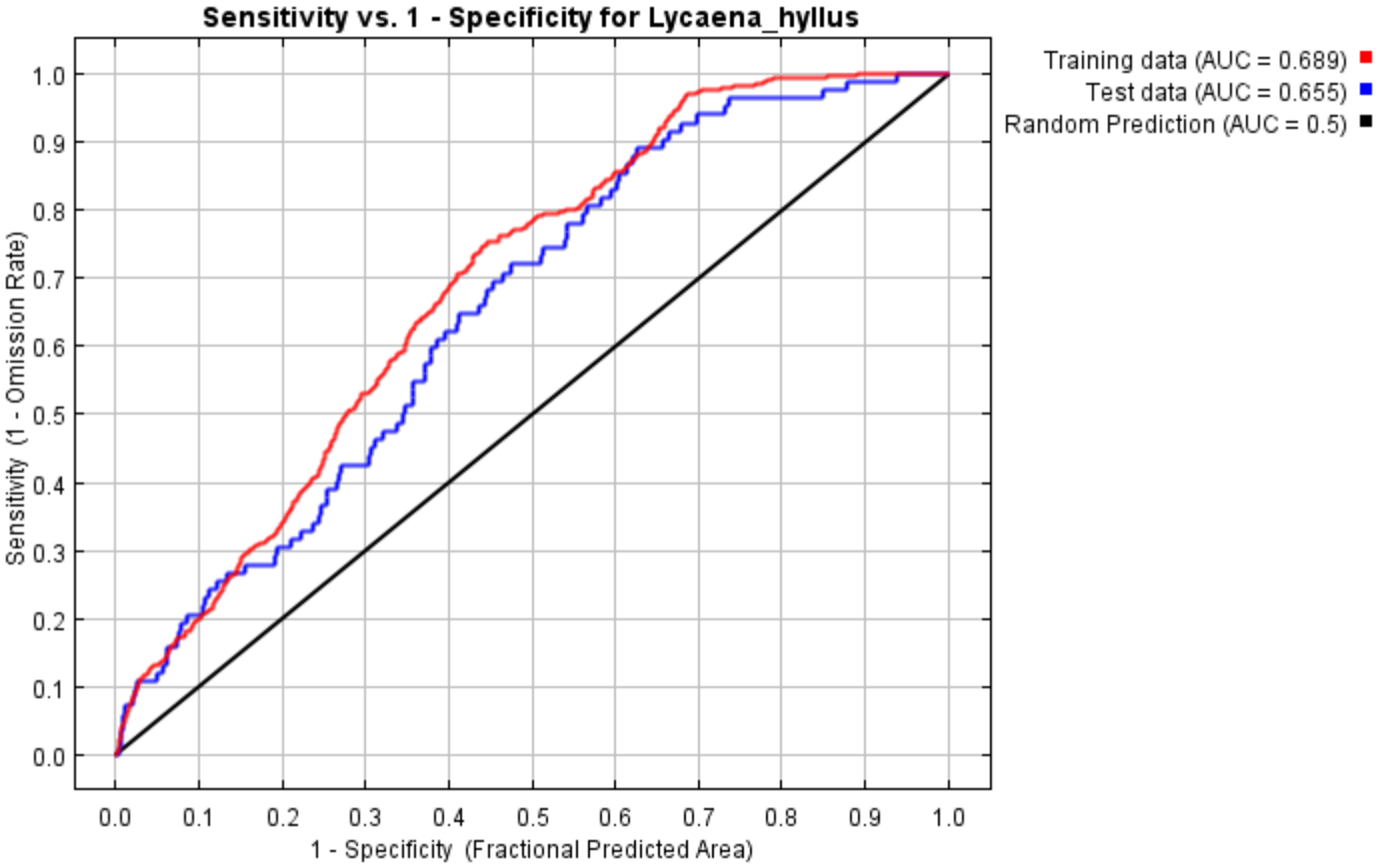
This page contains some analysis of the Maxent model for Lycaena_hyllus, created Mon Jan 15 14:48:58 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.722 rather than 1; in practice the test AUC may exceed this bound.



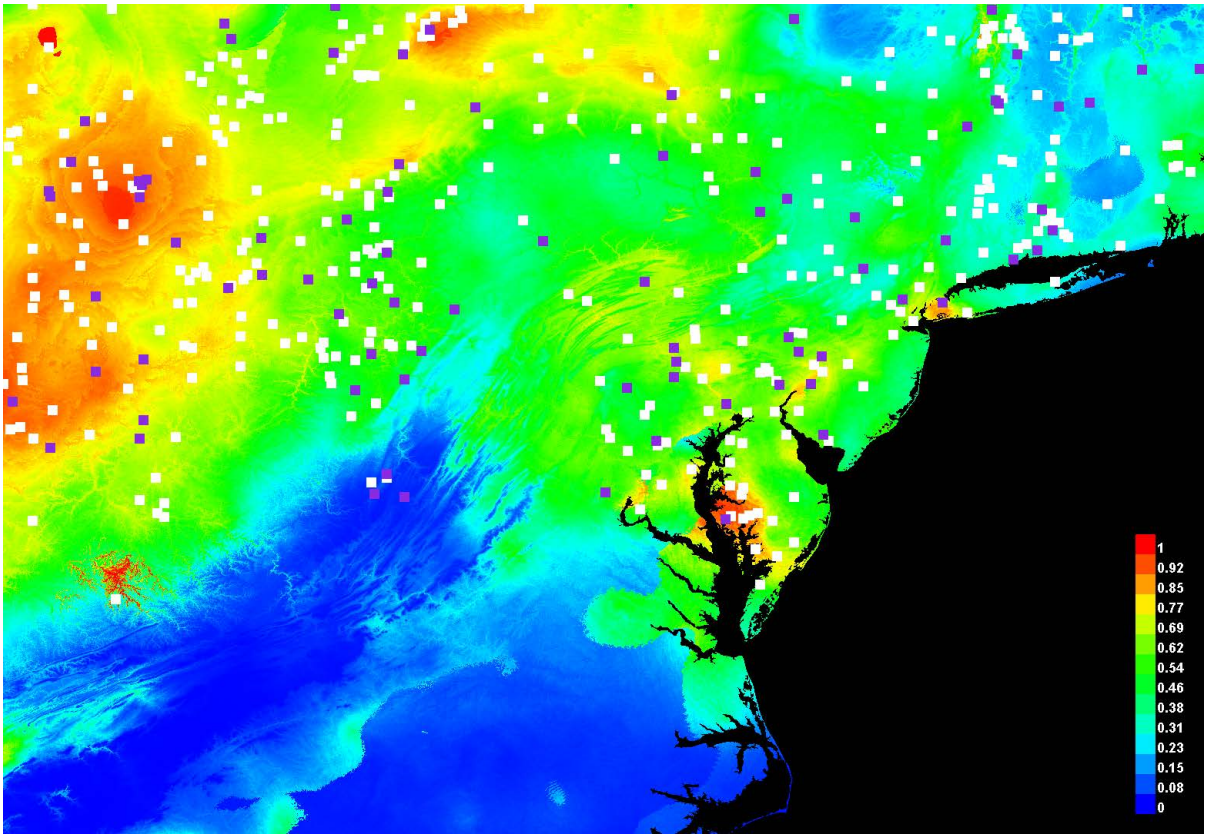
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.092	Fixed cumulative value 1	0.845	0.006	0.037	1.505E-3
5.000	0.264	Fixed cumulative value 5	0.701	0.027	0.061	1.267E-6
10.000	0.365	Fixed cumulative value 10	0.608	0.145	0.146	2.563E-6
0.504	0.058	Minimum training presence	0.890	0.000	0.012	2.36E-3
7.814	0.328	10 percentile training presence	0.644	0.100	0.110	1.622E-6
31.882	0.562	Equal training sensitivity and specificity	0.363	0.363	0.451	2.257E-4
23.580	0.501	Maximum training sensitivity plus specificity	0.440	0.254	0.341	3.38E-5

28.761	0.541	Equal test sensitivity and specificity	0.390	0.335	0.390	2.301E-5
8.892	0.347	Maximum test sensitivity plus specificity	0.626	0.124	0.110	3.691E-7
2.024	0.159	Balance training omission, predicted area and threshold value	0.790	0.006	0.037	5.945E-5
4.621	0.254	Equate entropy of thresholded and original distributions	0.710	0.024	0.061	2.465E-6

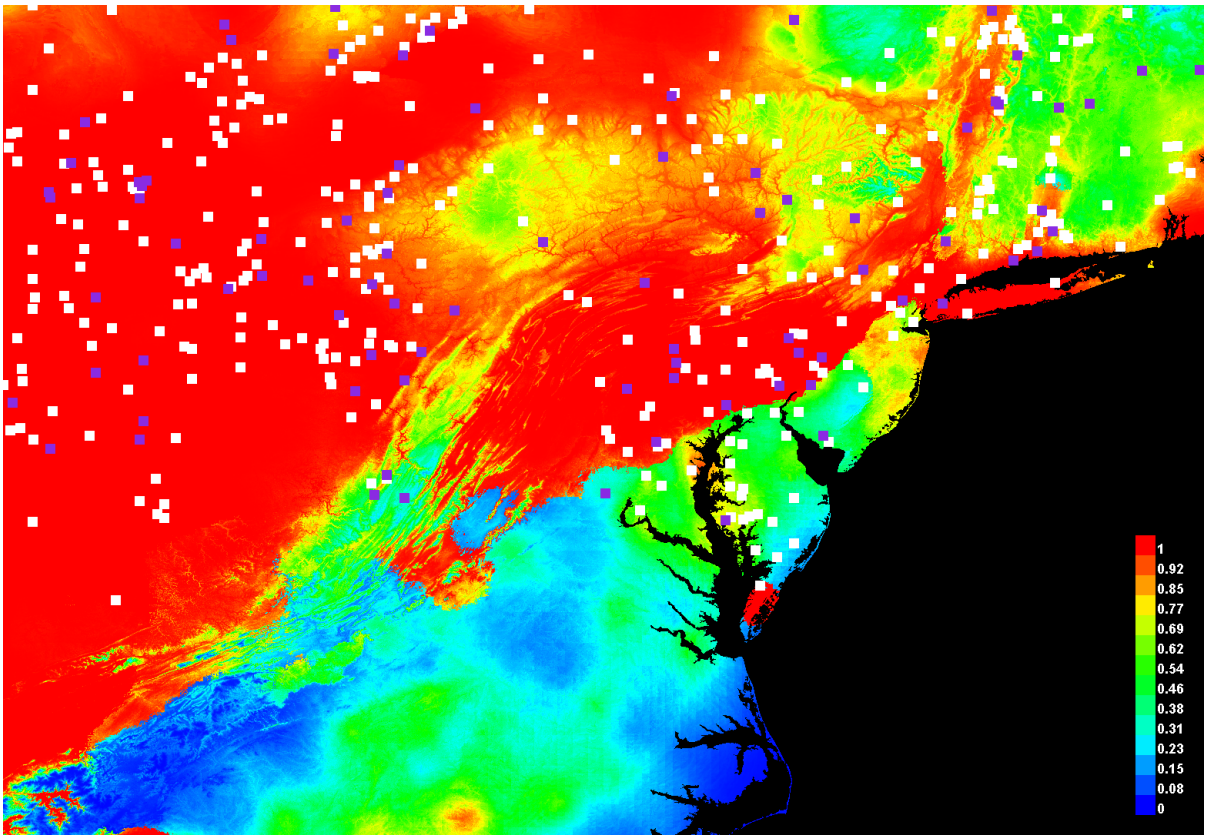
Pictures of the model

This is a representation of the Maxent model for Lycaena_hyllus. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



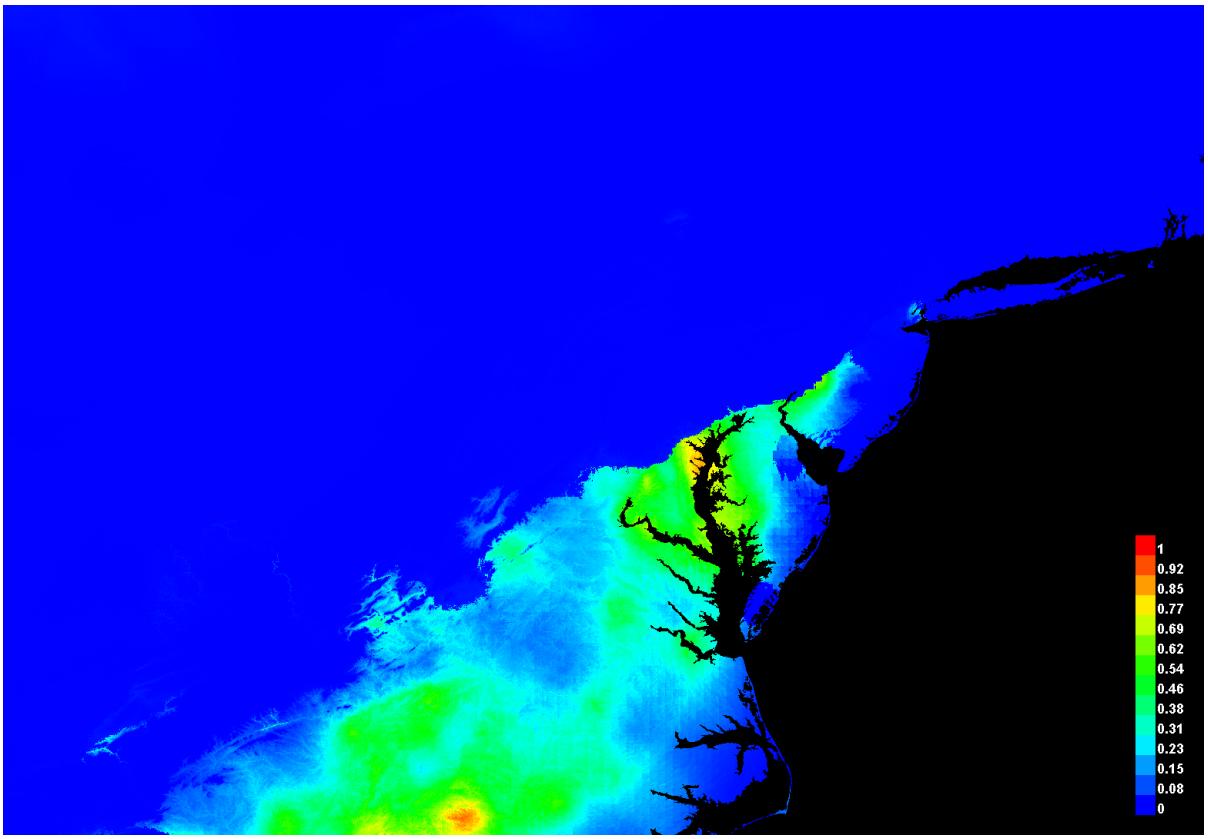
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

This is the projection of the Maxent model for Lycaena_hyllus onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

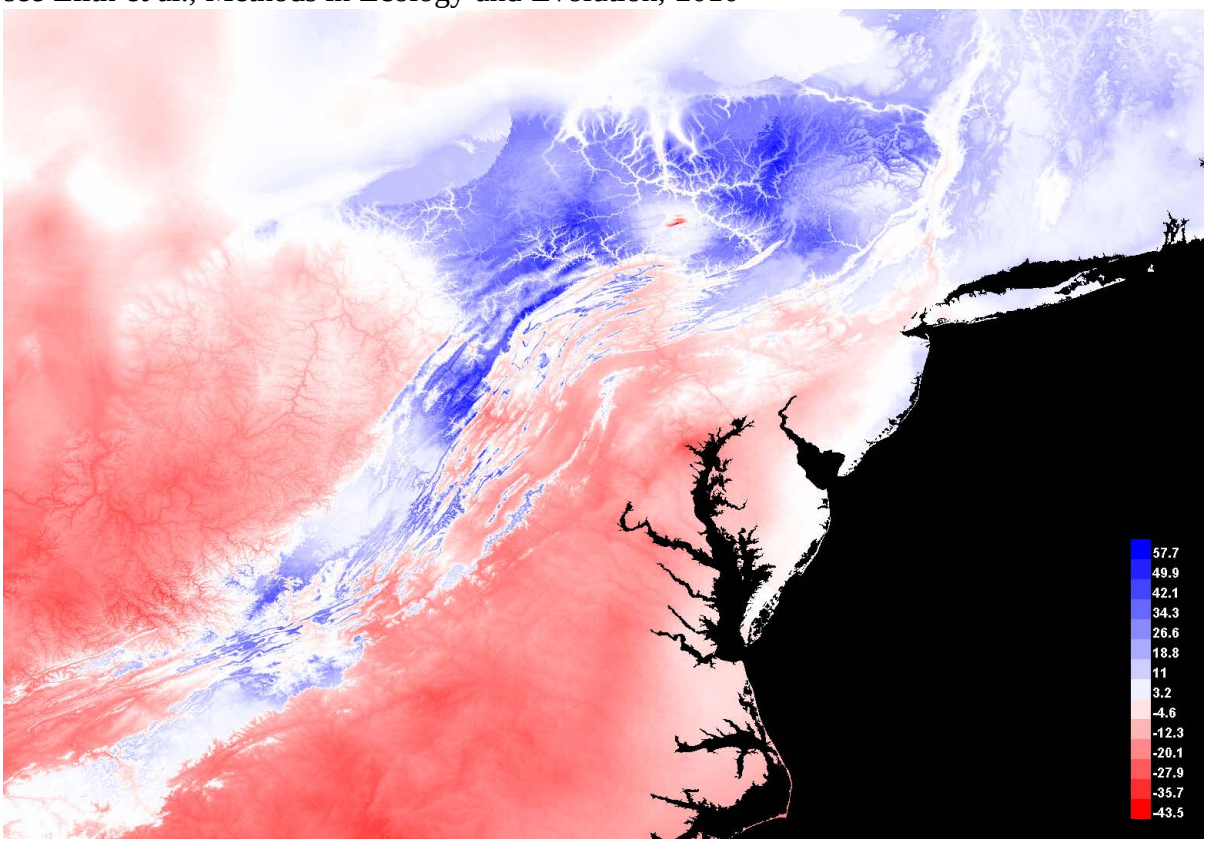


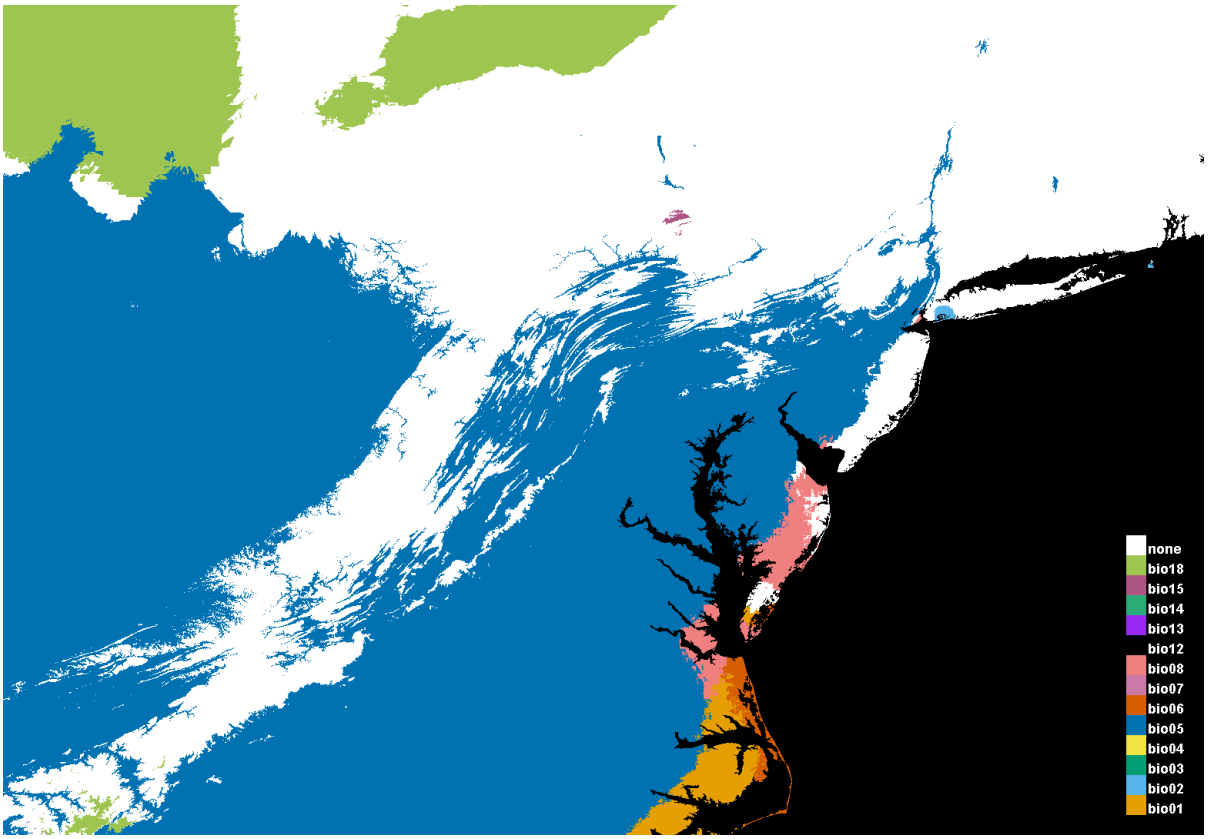
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



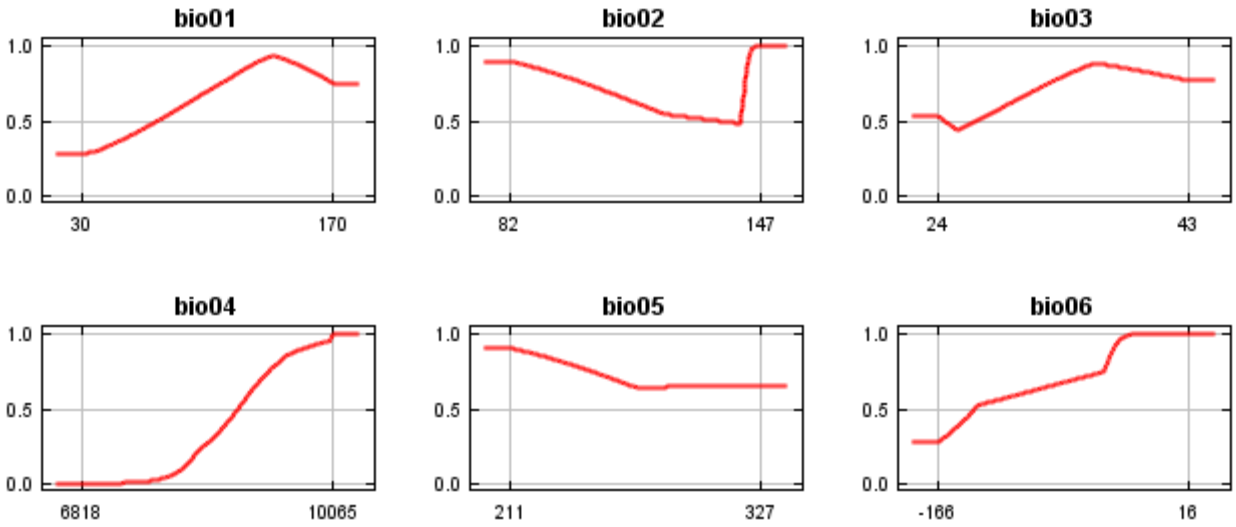
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

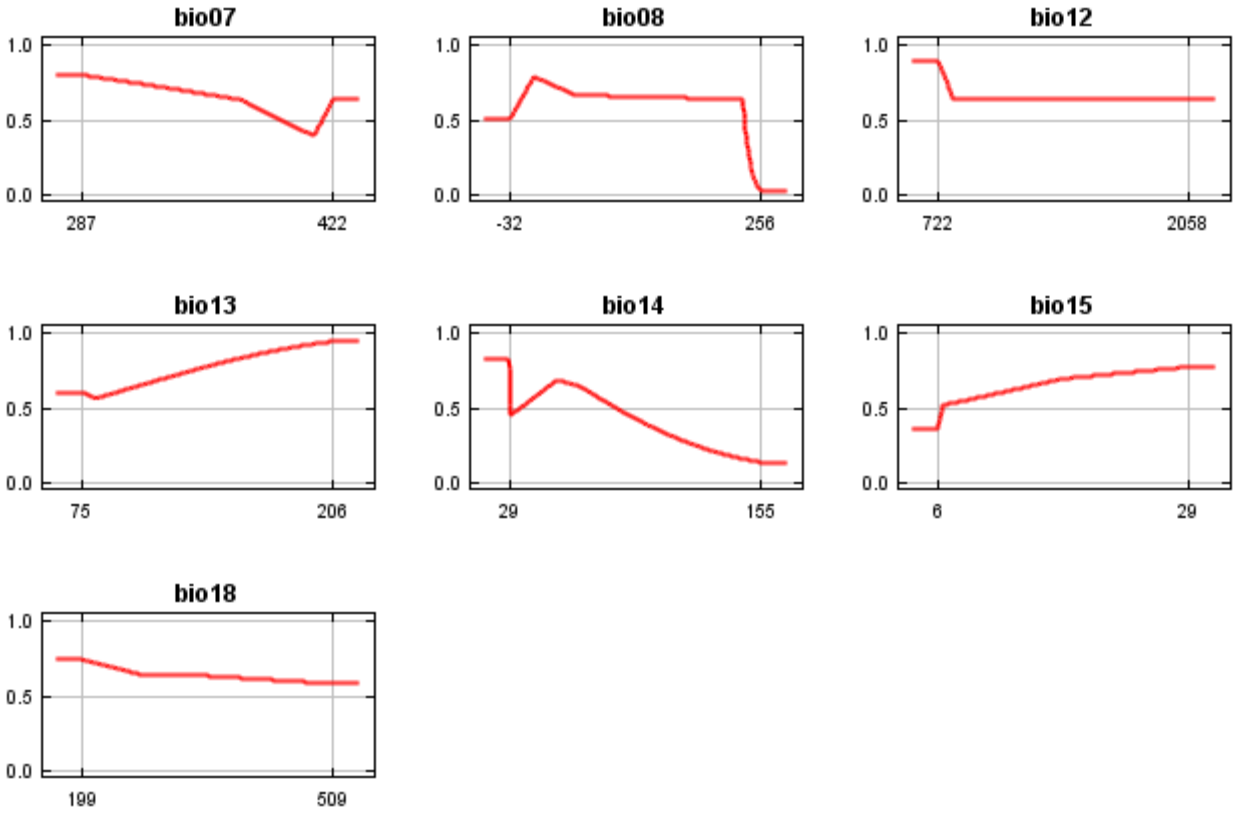




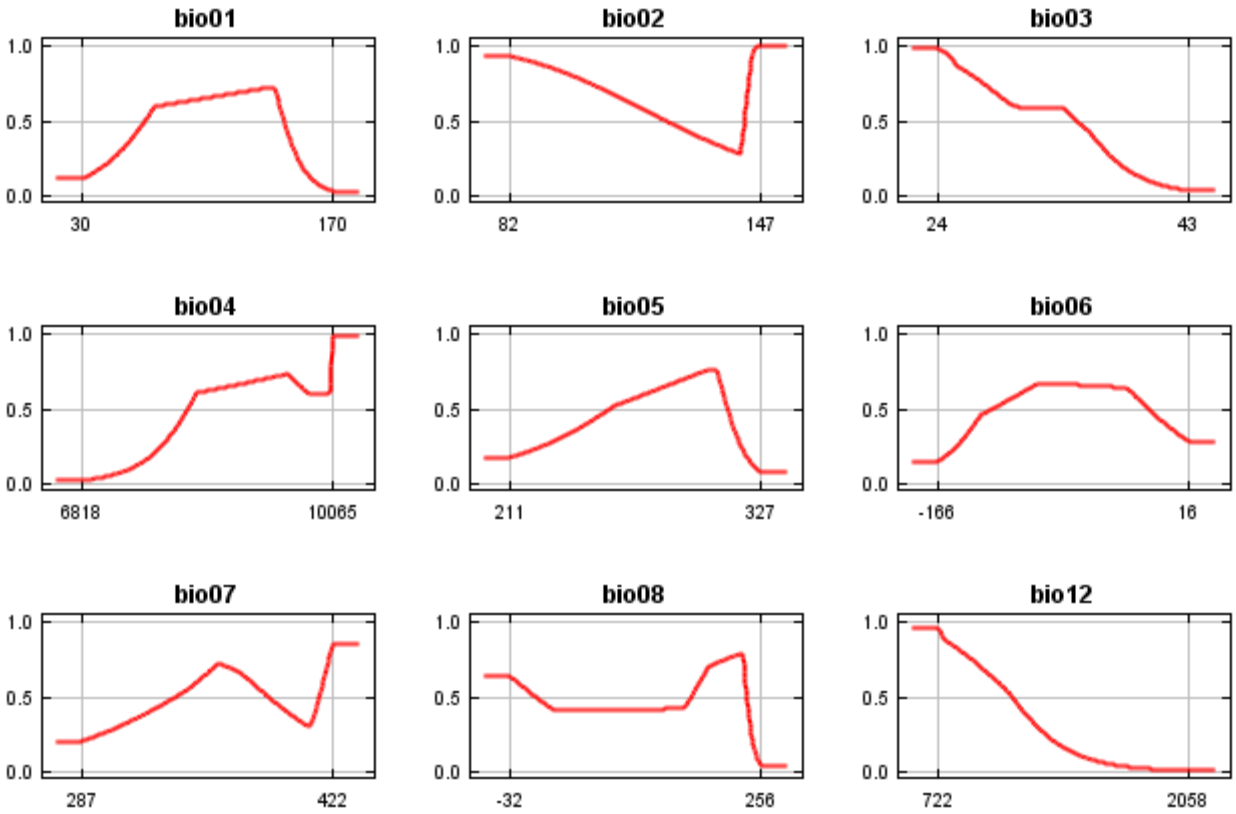
Response curves

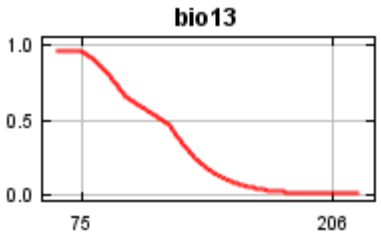
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.

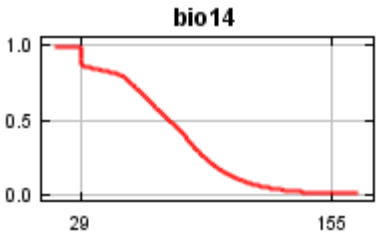


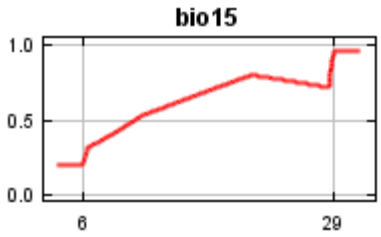


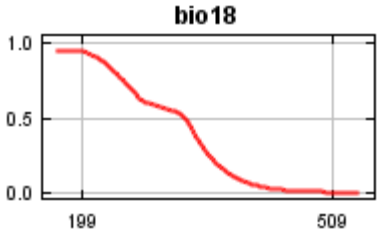
In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.











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
bio12	21.7	0
bio04	16.8	59.7
bio06	12.8	8.7
bio15	11.7	0
bio02	10.8	6.7
bio08	8.8	12.4
bio03	7.4	3
bio14	2.8	0.6
bio05	2.6	0
bio13	1.9	0.1
bio07	1.4	1
bio01	1	7.8
bio18	0.2	0

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.249, training AUC is 0.689, unregularized training gain is 0.325.
Unregularized test gain is 0.146.
Test AUC is 0.655, standard deviation is 0.026 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (3 seconds).

The follow settings were used during the run:
331 presence records used for training, 82 for testing.
10327 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.050, categorical: 0.250, threshold: 1.000, hinge: 0.500
Feature types used: hinge product linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

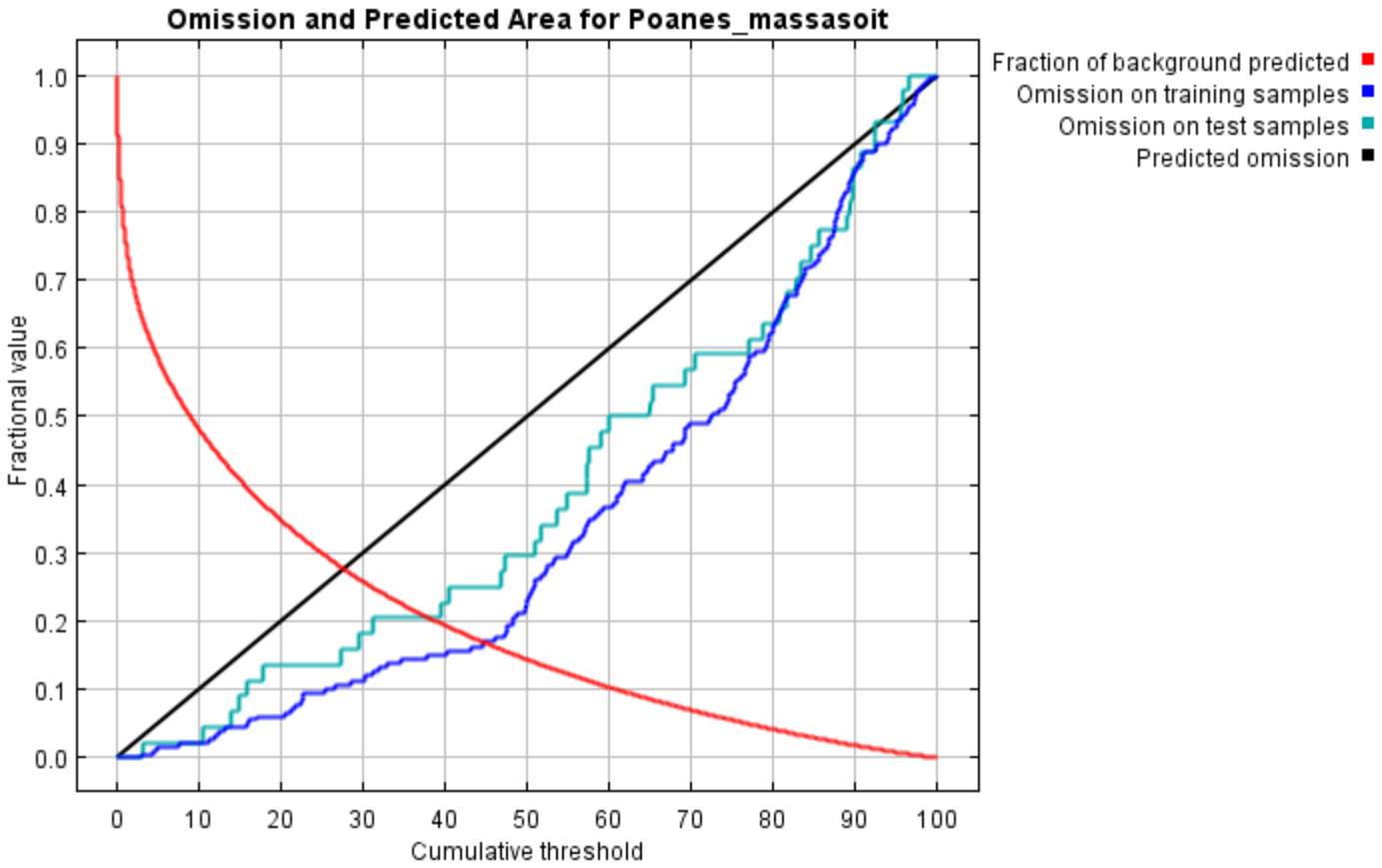
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Lycaena_hyllus responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Poanes_massasoit

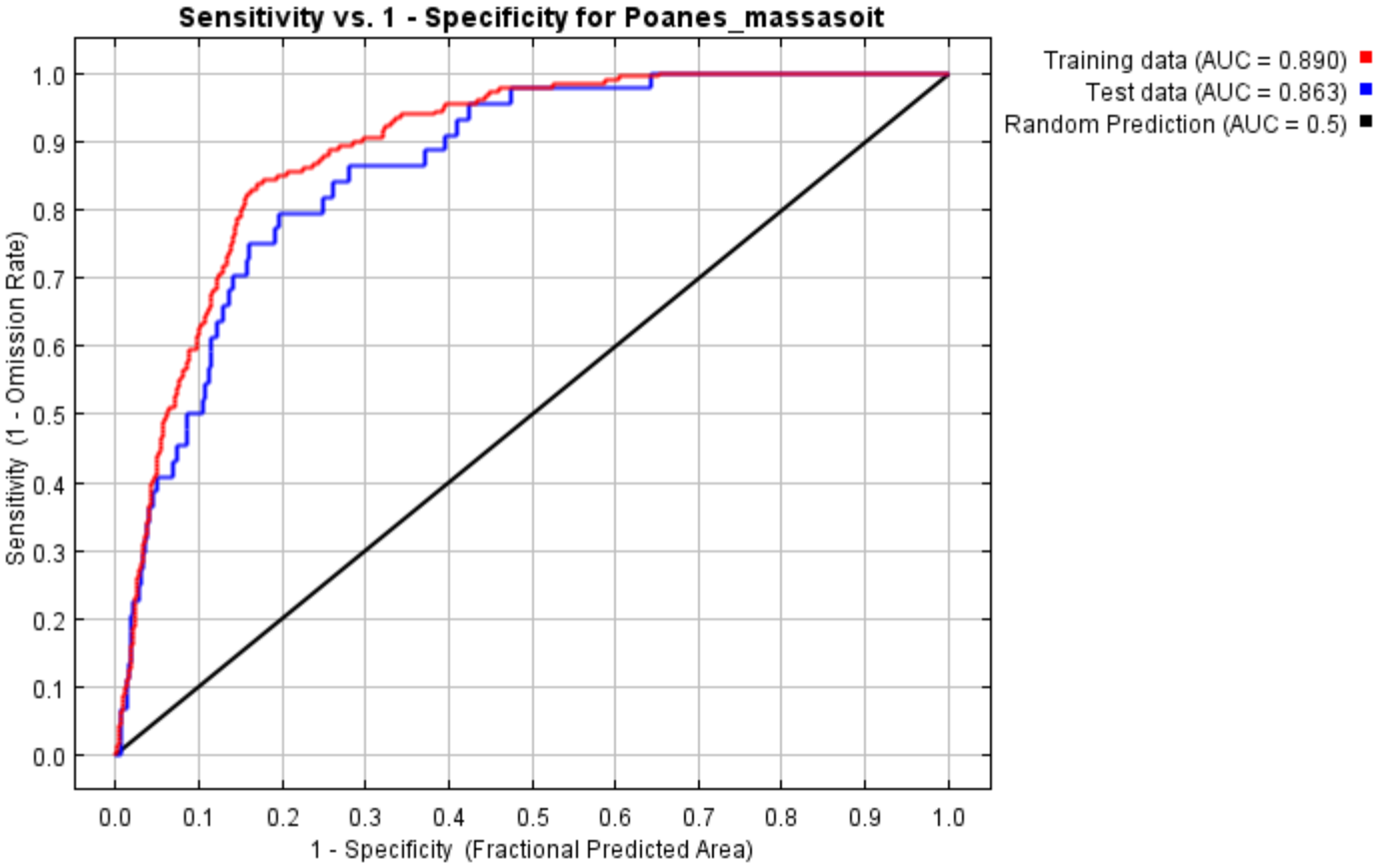
This page contains some analysis of the Maxent model for Poanes_massasoit, created Mon Jan 15 14:49:30 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.798 rather than 1; in practice the test AUC may exceed this bound.



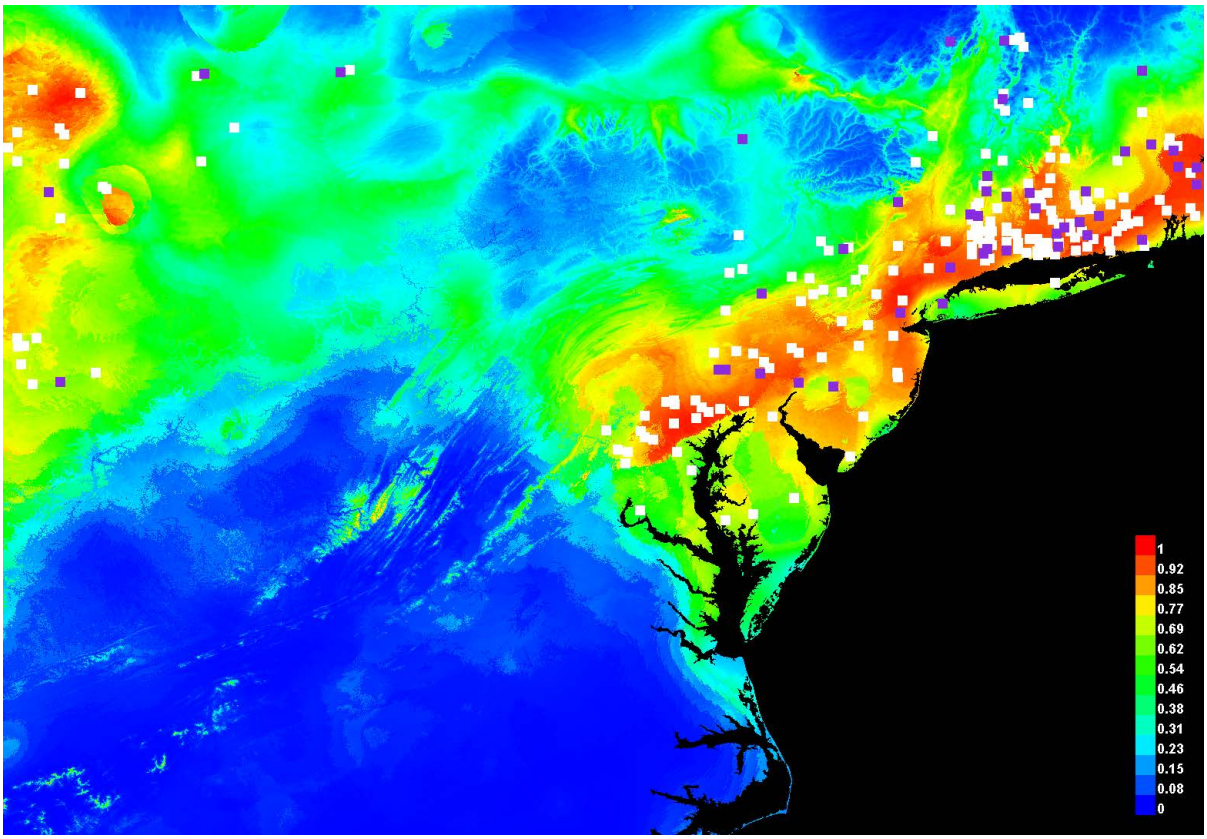
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.054	Fixed cumulative value 1	0.763	0.000	0.000	1.084E-4
5.000	0.184	Fixed cumulative value 5	0.585	0.017	0.023	6.518E-8
10.000	0.275	Fixed cumulative value 10	0.481	0.022	0.023	2.301E-11
2.842	0.130	Minimum training presence	0.653	0.000	0.000	6.717E-7
26.612	0.469	10 percentile training presence	0.285	0.100	0.136	1.003E-17
44.752	0.659	Equal training sensitivity and specificity	0.169	0.167	0.250	4.299E-25
44.732	0.659	Maximum training sensitivity plus	0.169	0.161	0.250	4.299E-

		specificity				25
38.129	0.608	Equal test sensitivity and specificity	0.205	0.150	0.205	1.27E-22
39.507	0.620	Maximum test sensitivity plus specificity	0.197	0.150	0.205	8.234E-24
2.842	0.130	Balance training omission, predicted area and threshold value	0.653	0.000	0.000	6.717E-7
6.942	0.223	Equate entropy of thresholded and original distributions	0.539	0.017	0.023	2.767E-9

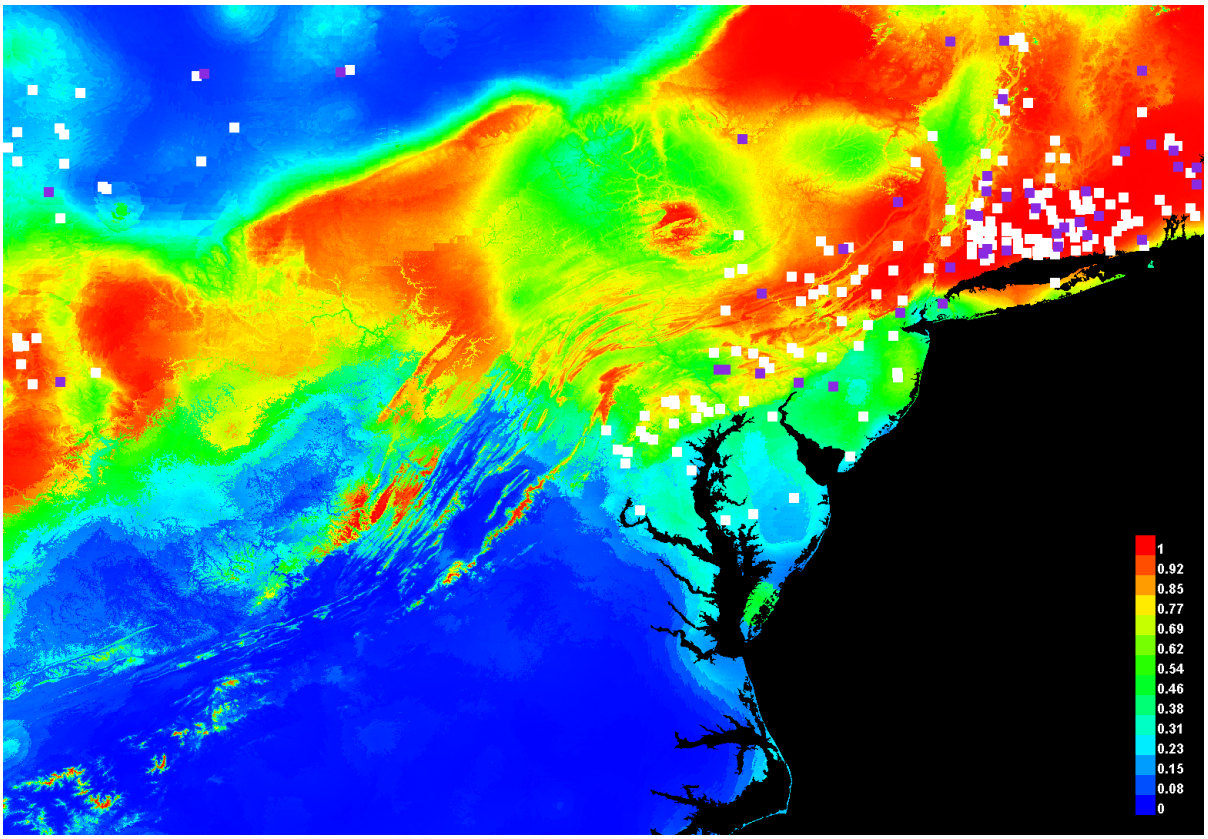
Pictures of the model

This is a representation of the Maxent model for Poanes_massasoit. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



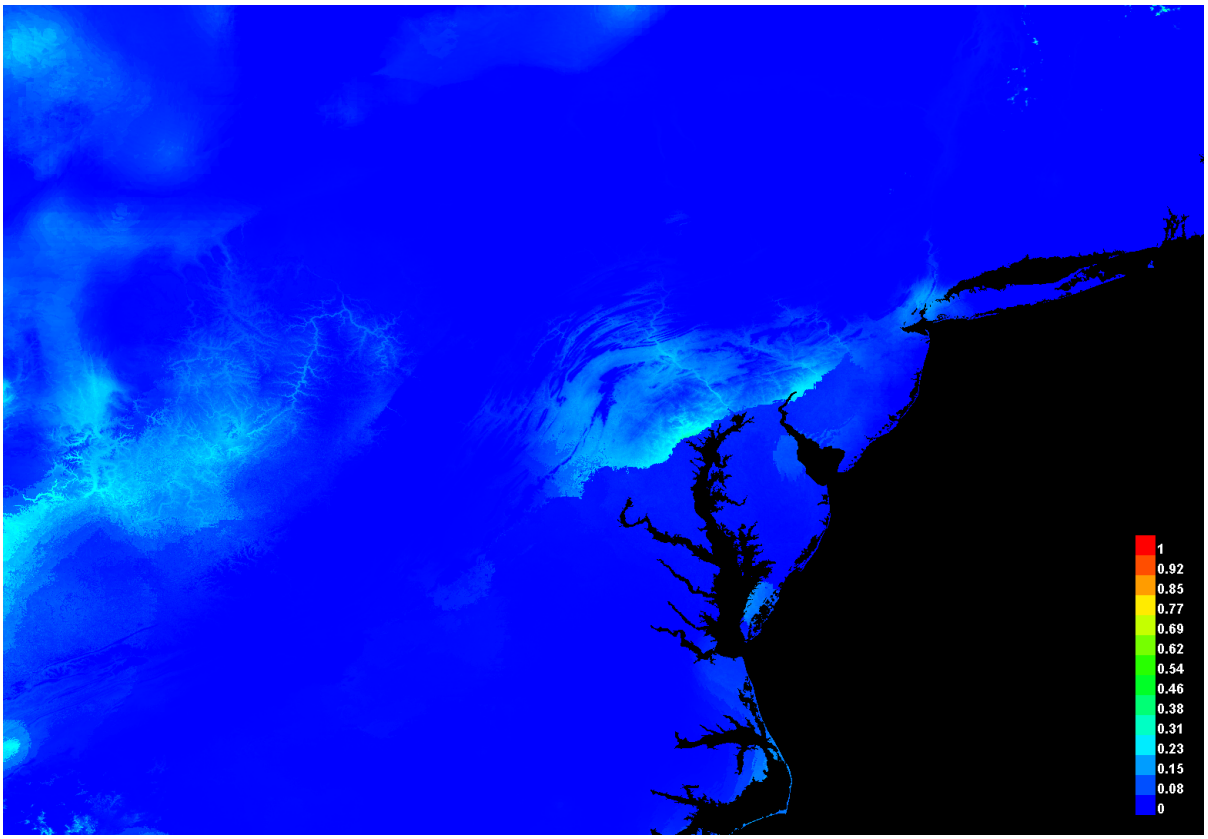
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

This is the projection of the Maxent model for Poanes_massasoit onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

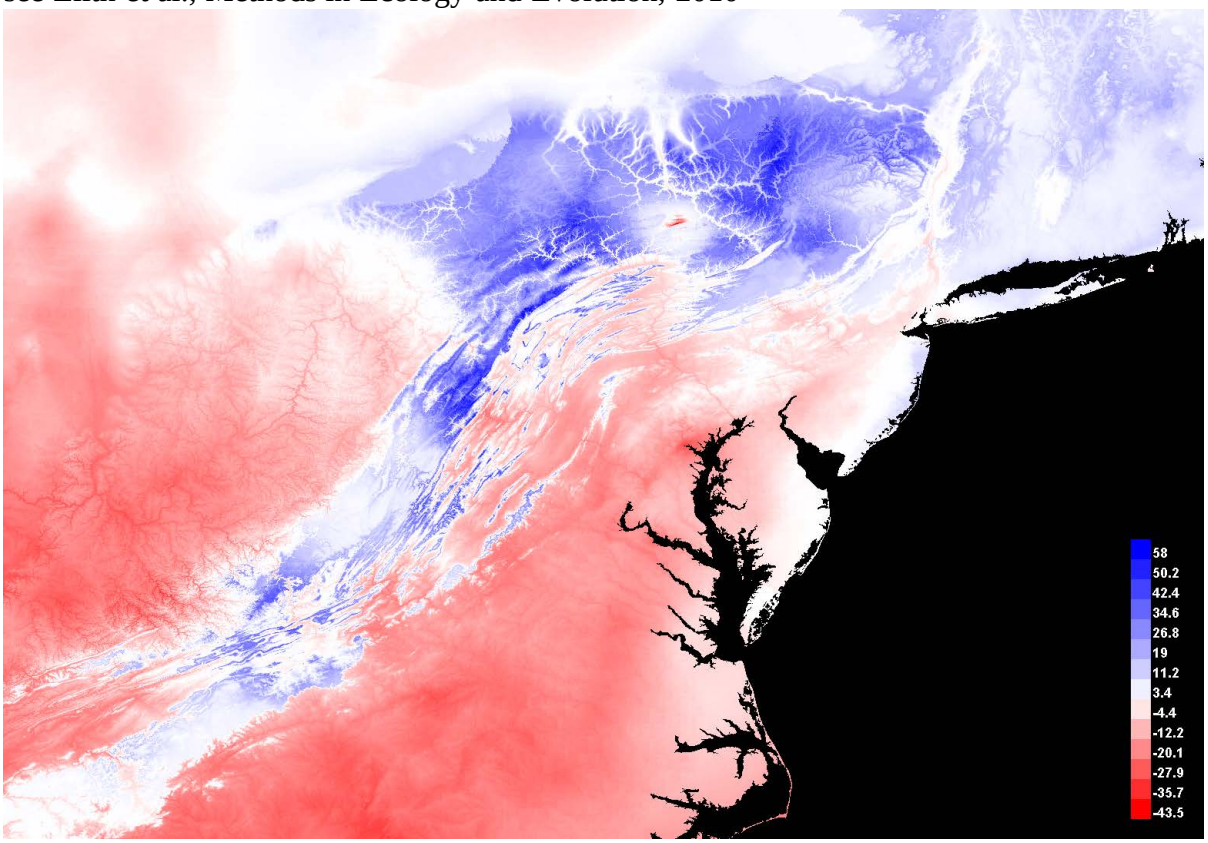


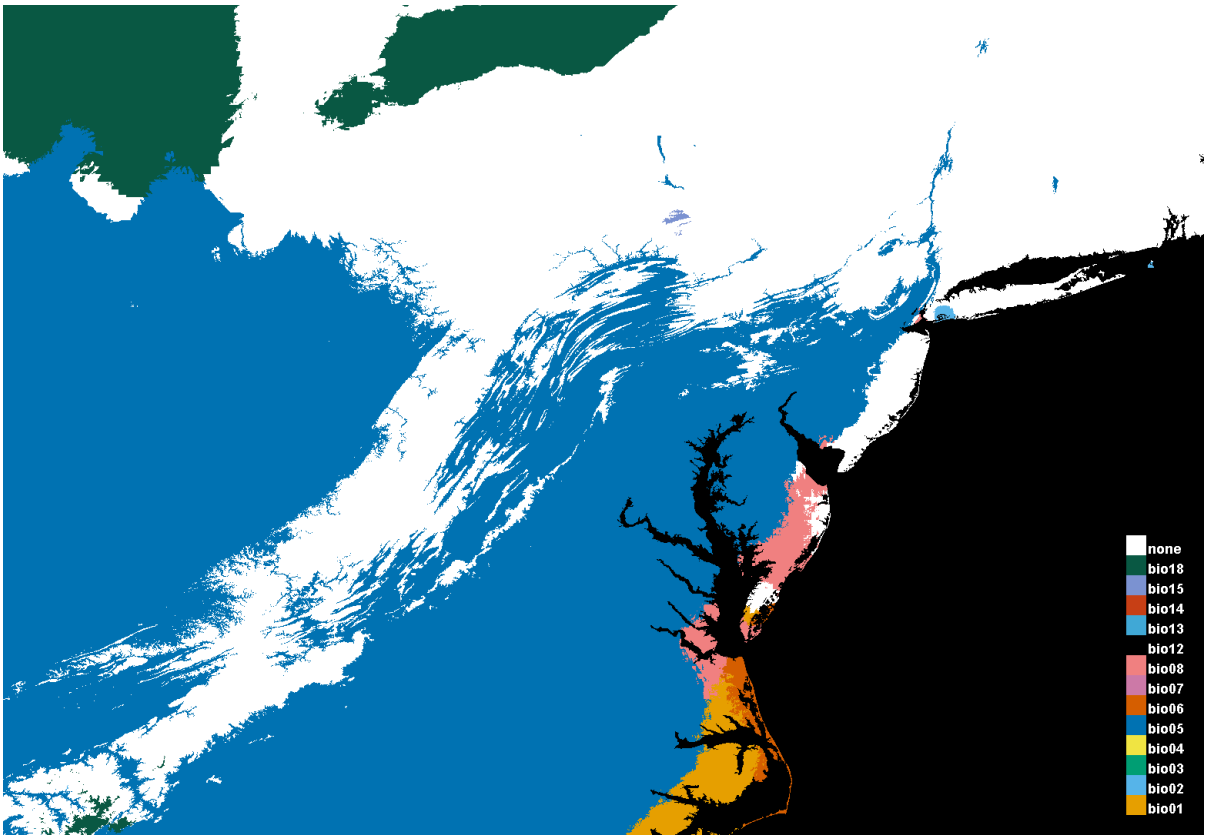
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



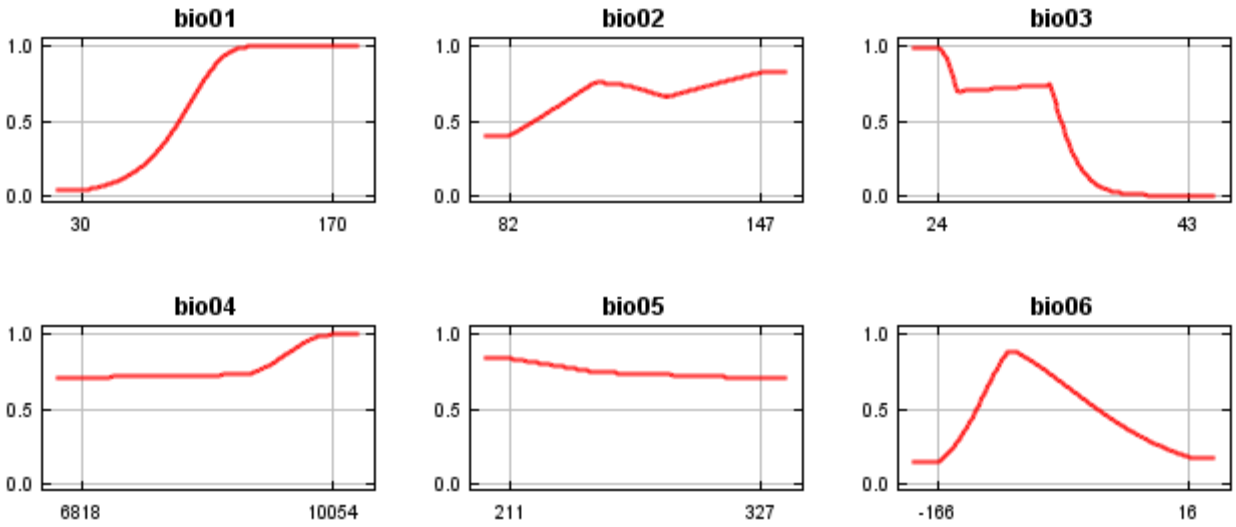
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

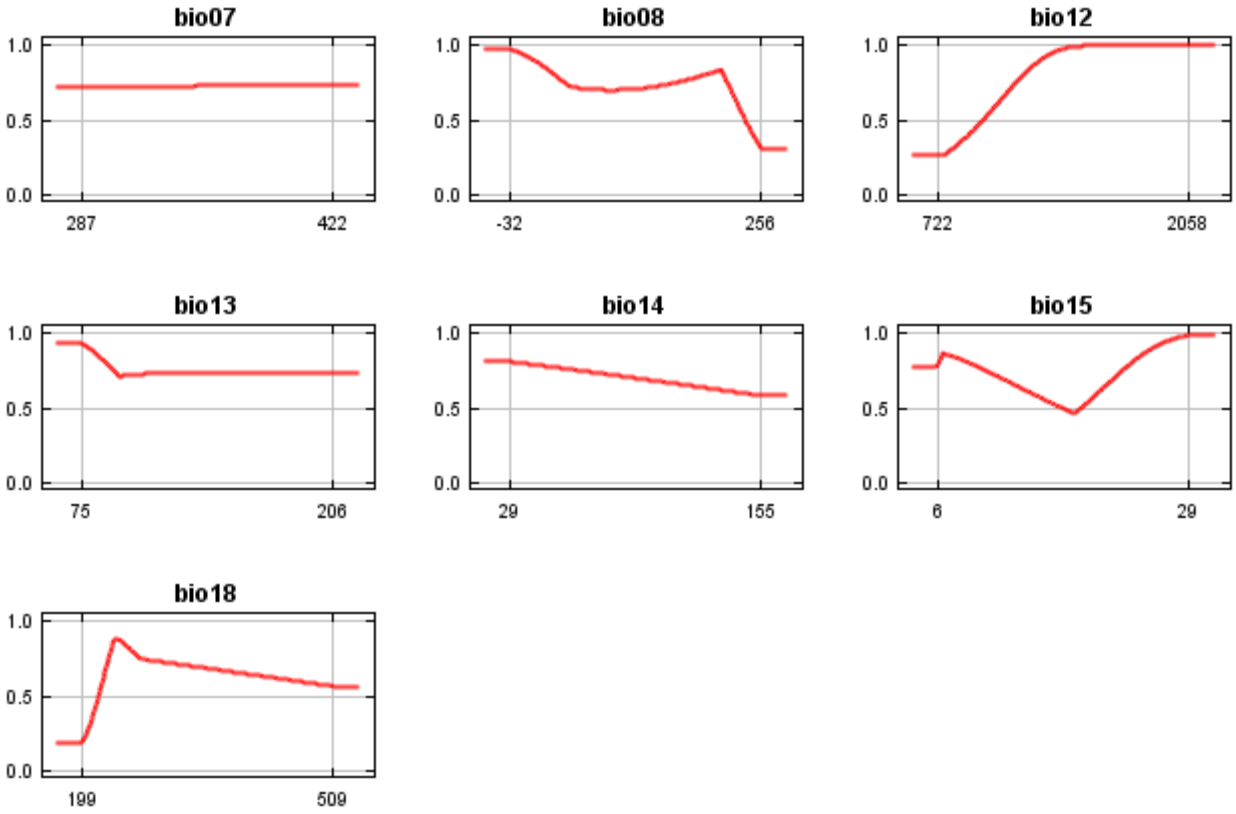




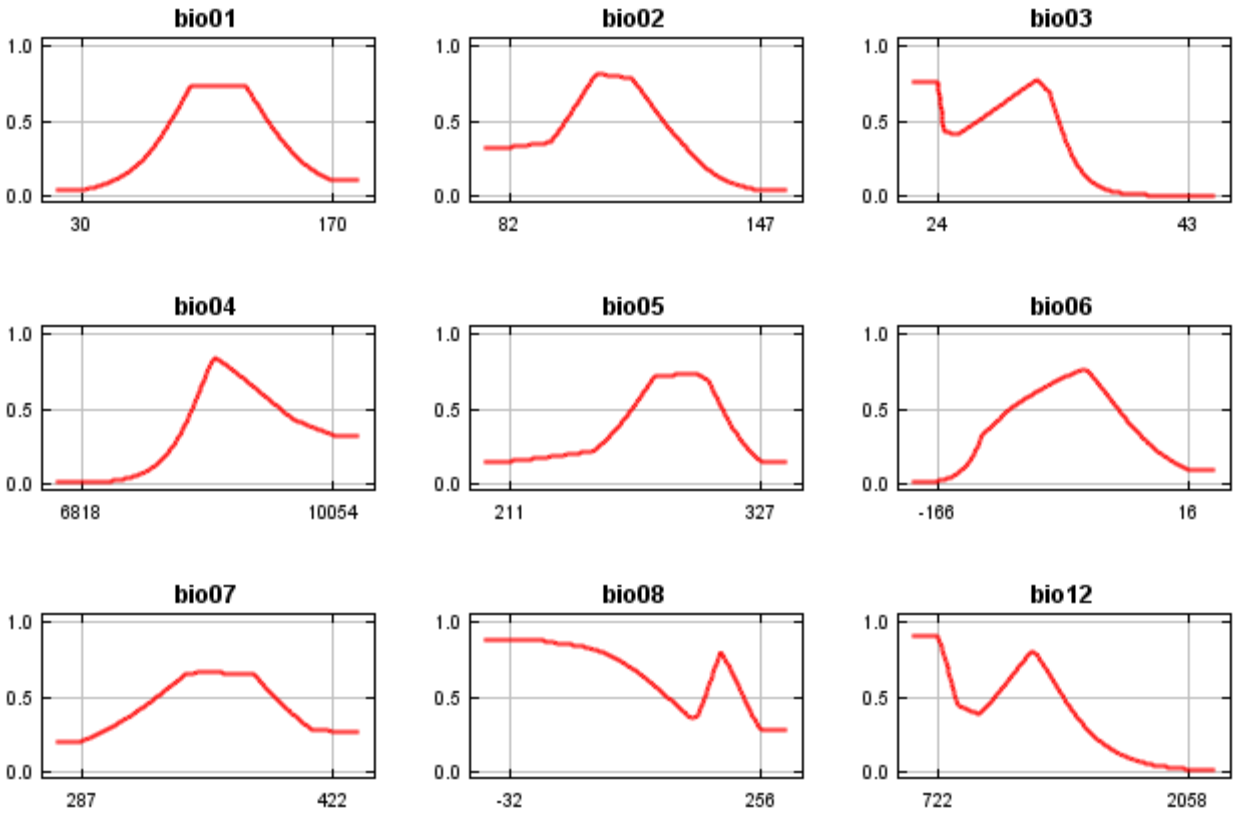
Response curves

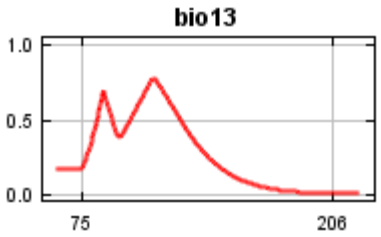
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.

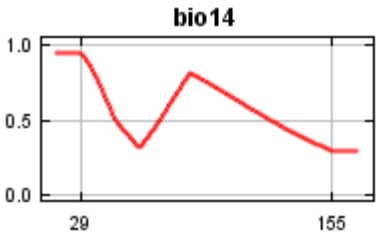


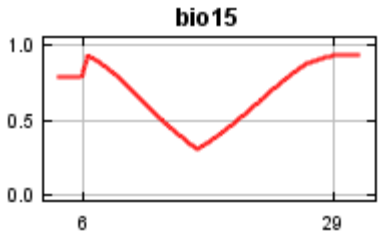


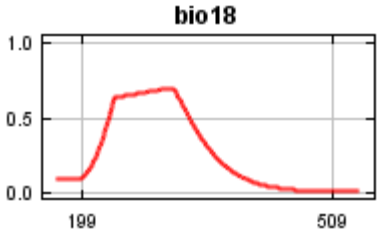
In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.











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
bio15	26.3	6.1
bio03	25.6	40.6
bio01	25.5	22.5
bio06	8.3	8.9
bio08	5	3.7
bio04	2.2	1.3
bio02	2.1	0.9
bio14	2	0
bio18	1.6	1
bio13	0.7	0.1
bio12	0.6	14.7
bio05	0	0.2
bio07	0	0

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.434, training AUC is 0.890, unregularized training gain is 0.549.
Unregularized test gain is 0.925.
Test AUC is 0.863, standard deviation is 0.022 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (3 seconds).

The follow settings were used during the run:
180 presence records used for training, 44 for testing.
10179 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.050, categorical: 0.250, threshold: 1.000, hinge: 0.500
Feature types used: hinge product linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

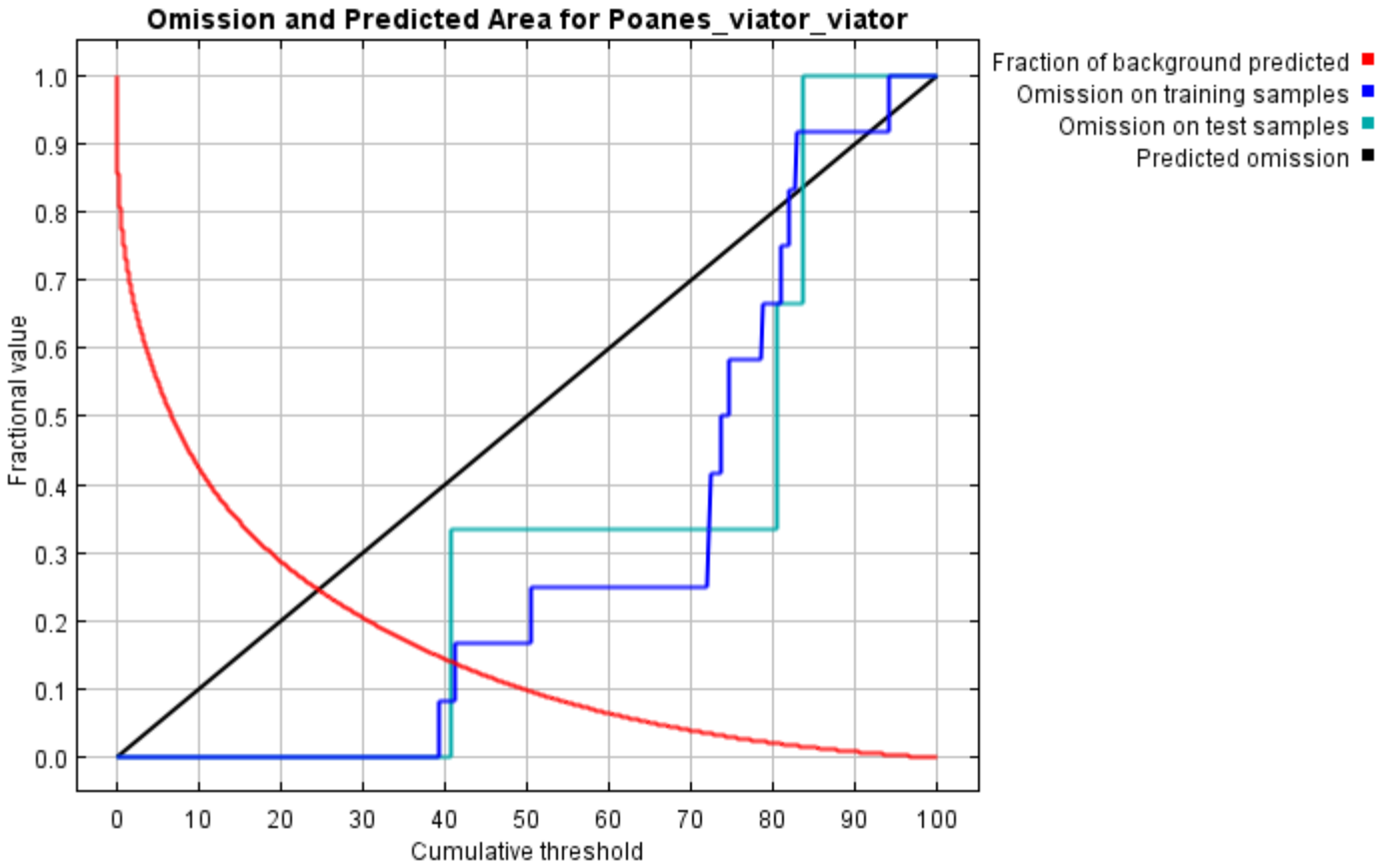
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Poanes_massasoit responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Poanes_viator_viator

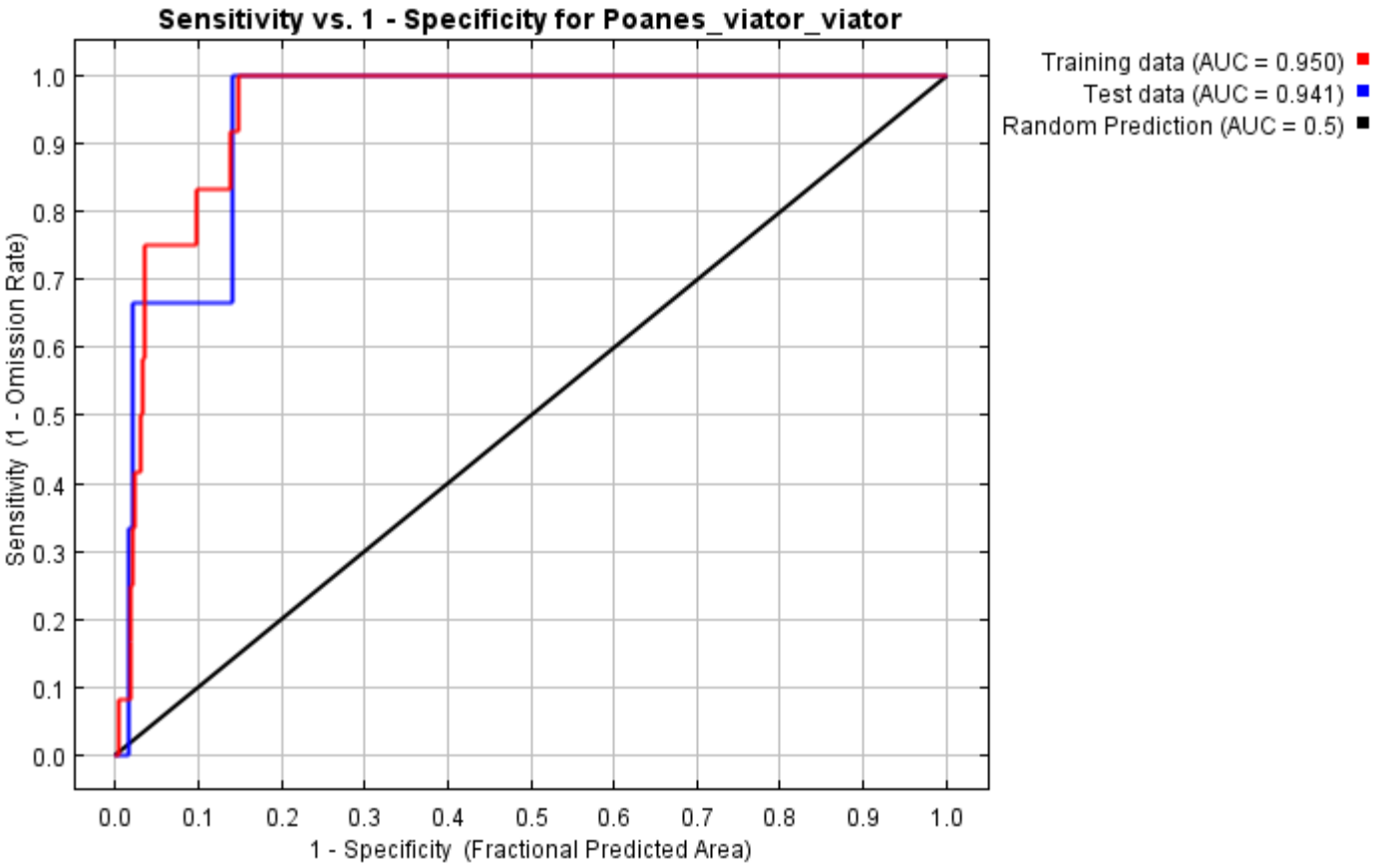
This page contains some analysis of the Maxent model for Poanes_viator_viator, created Mon Jan 15 14:50:07 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.836 rather than 1; in practice the test AUC may exceed this bound.



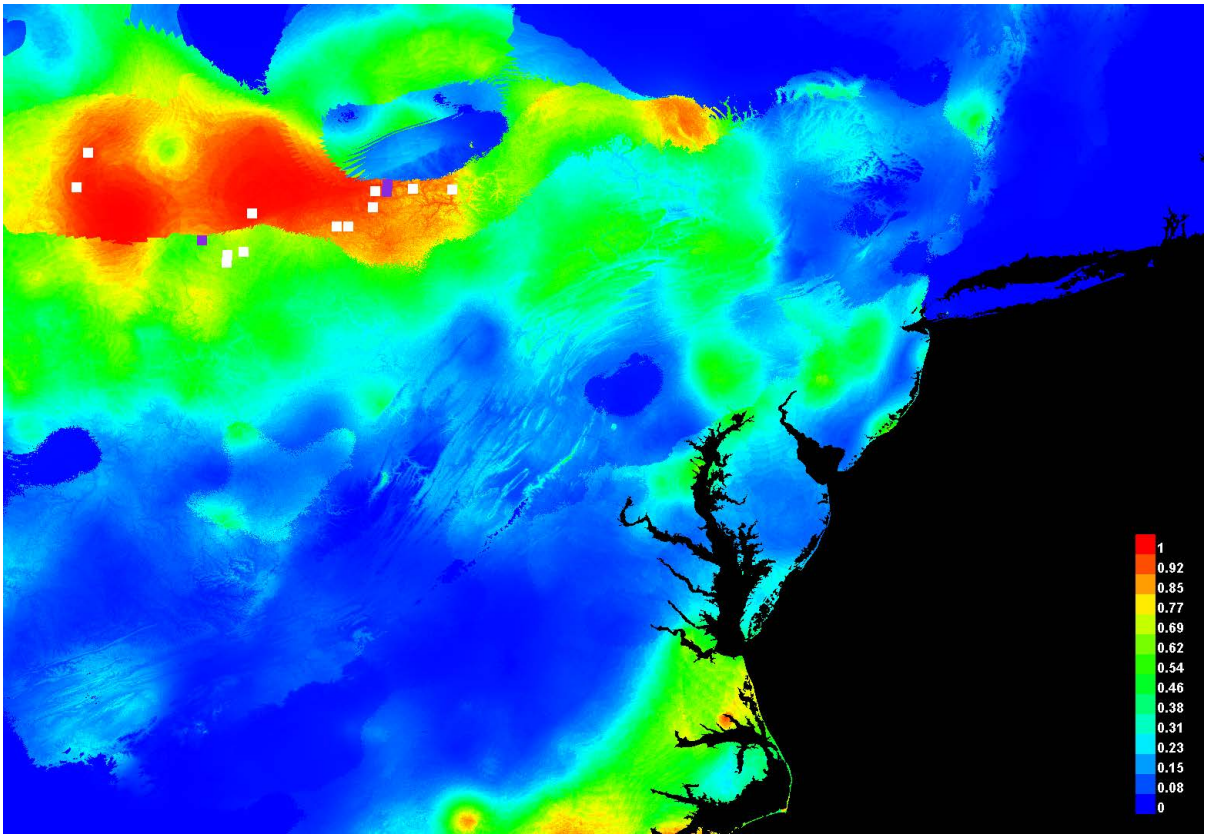
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.050	Fixed cumulative value 1	0.737	0.000	0.000	4.003E-1
5.000	0.124	Fixed cumulative value 5	0.550	0.000	0.000	1.661E-1
10.000	0.196	Fixed cumulative value 10	0.424	0.000	0.000	7.644E-2
39.330	0.552	Minimum training presence	0.148	0.000	0.000	3.25E-3
41.219	0.569	10 percentile training presence	0.138	0.083	0.333	5.211E-2
41.239	0.569	Equal training sensitivity and specificity	0.138	0.167	0.333	5.211E-2
39.330	0.552	Maximum training sensitivity plus specificity	0.148	0.000	0.000	3.25E-3

40.838	0.566	Equal test sensitivity and specificity	0.140	0.083	0.000	2.764E-3
40.838	0.566	Maximum test sensitivity plus specificity	0.140	0.083	0.000	2.764E-3
7.400	0.157	Balance training omission, predicted area and threshold value	0.482	0.000	0.000	1.118E-1
9.918	0.194	Equate entropy of thresholded and original distributions	0.426	0.000	0.000	7.736E-2

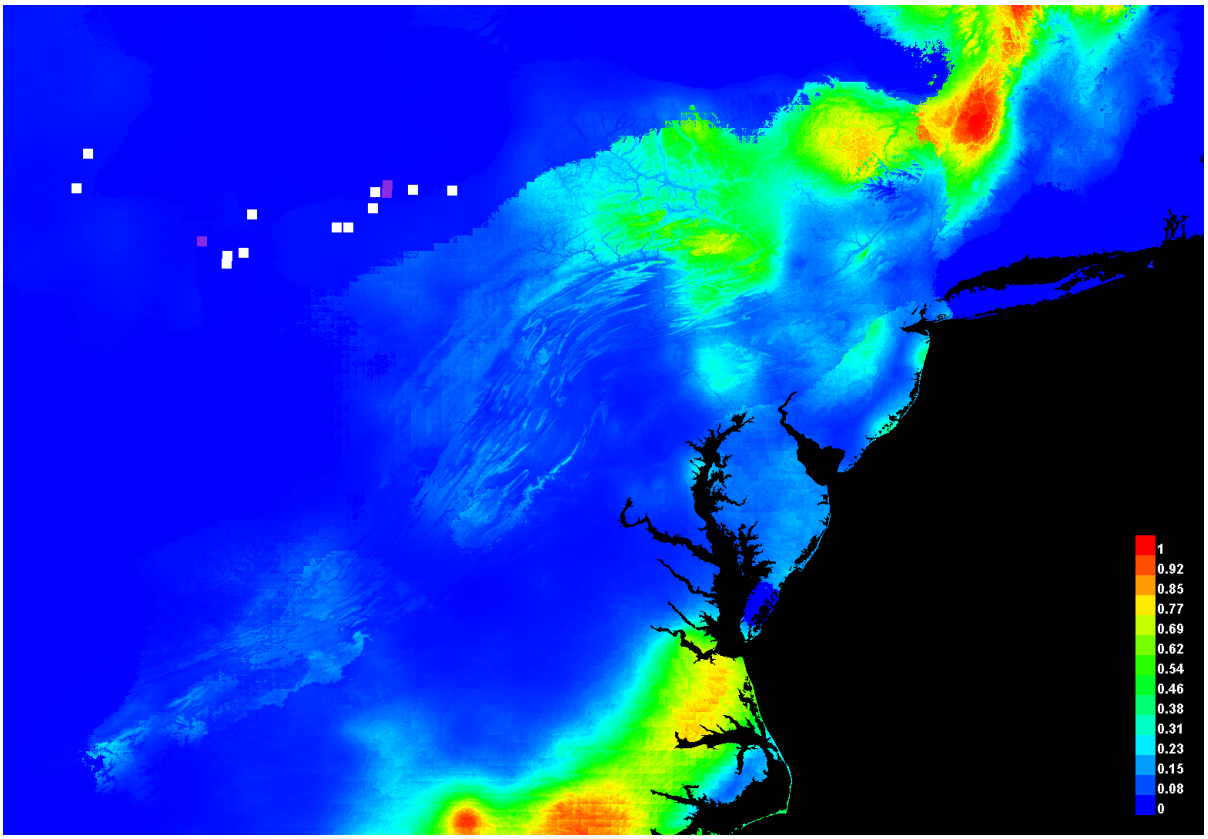
Pictures of the model

This is a representation of the Maxent model for Poanes_viator_viator. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



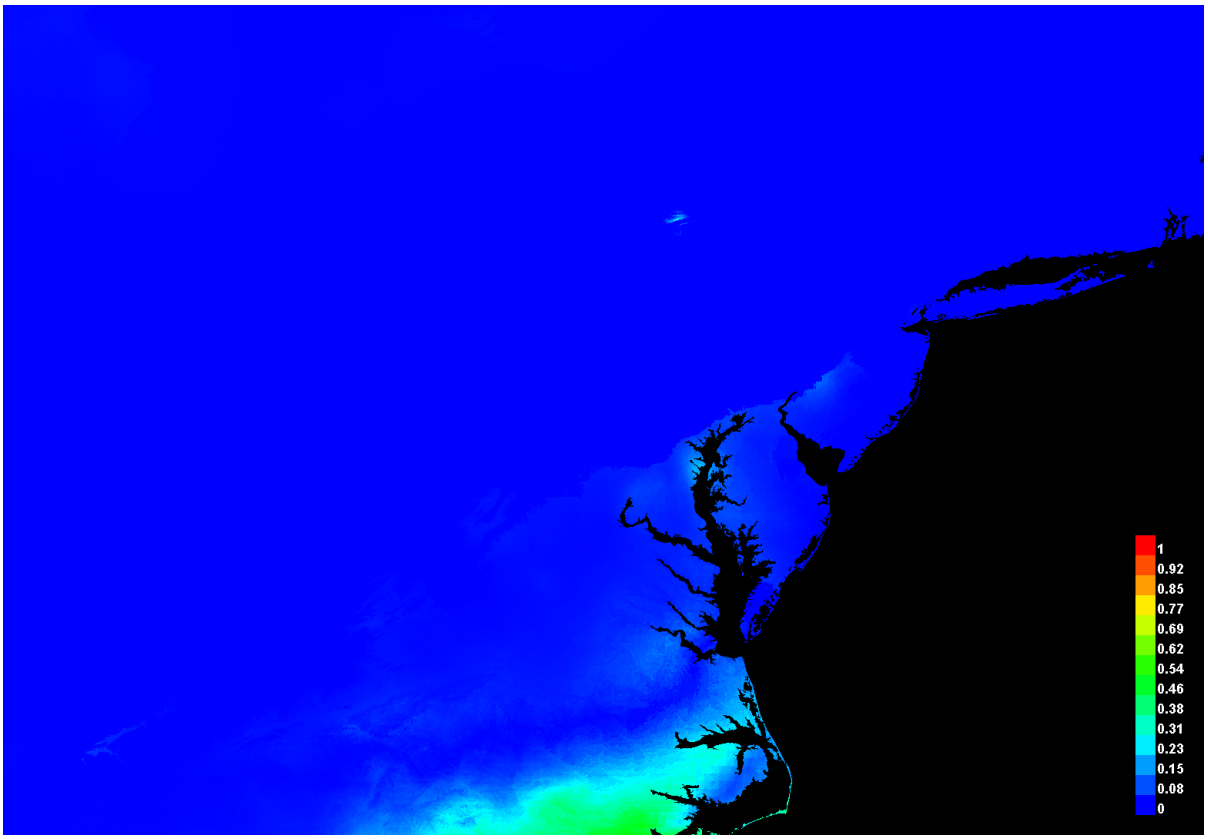
Click here to interactively explore this prediction using the Explain tool. If clicking from your browser does not succeed in starting the tool, try running the script in E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias\Poanes_viator_viator_explain.bat directly. This tool requires the environmental grids to be small enough that they all fit in memory.

This is the projection of the Maxent model for Poanes_viator_viator onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

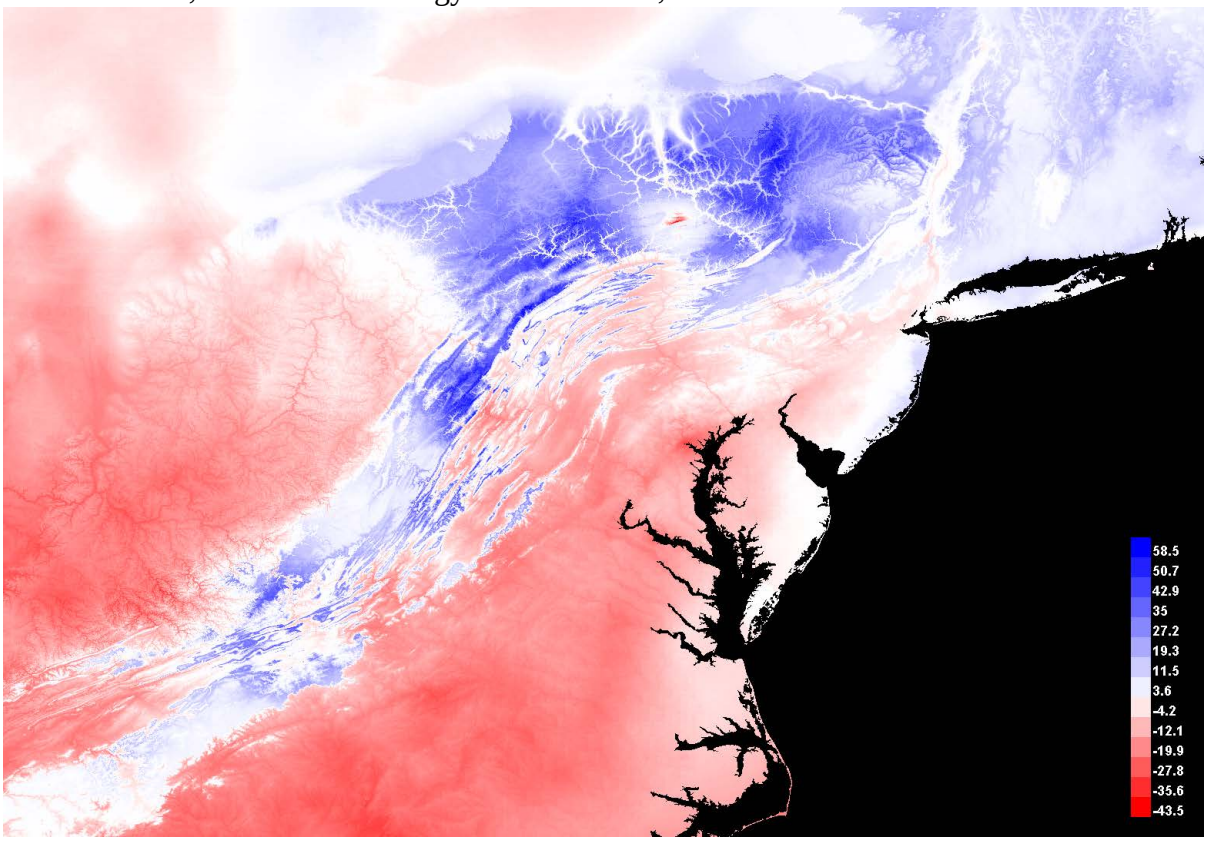


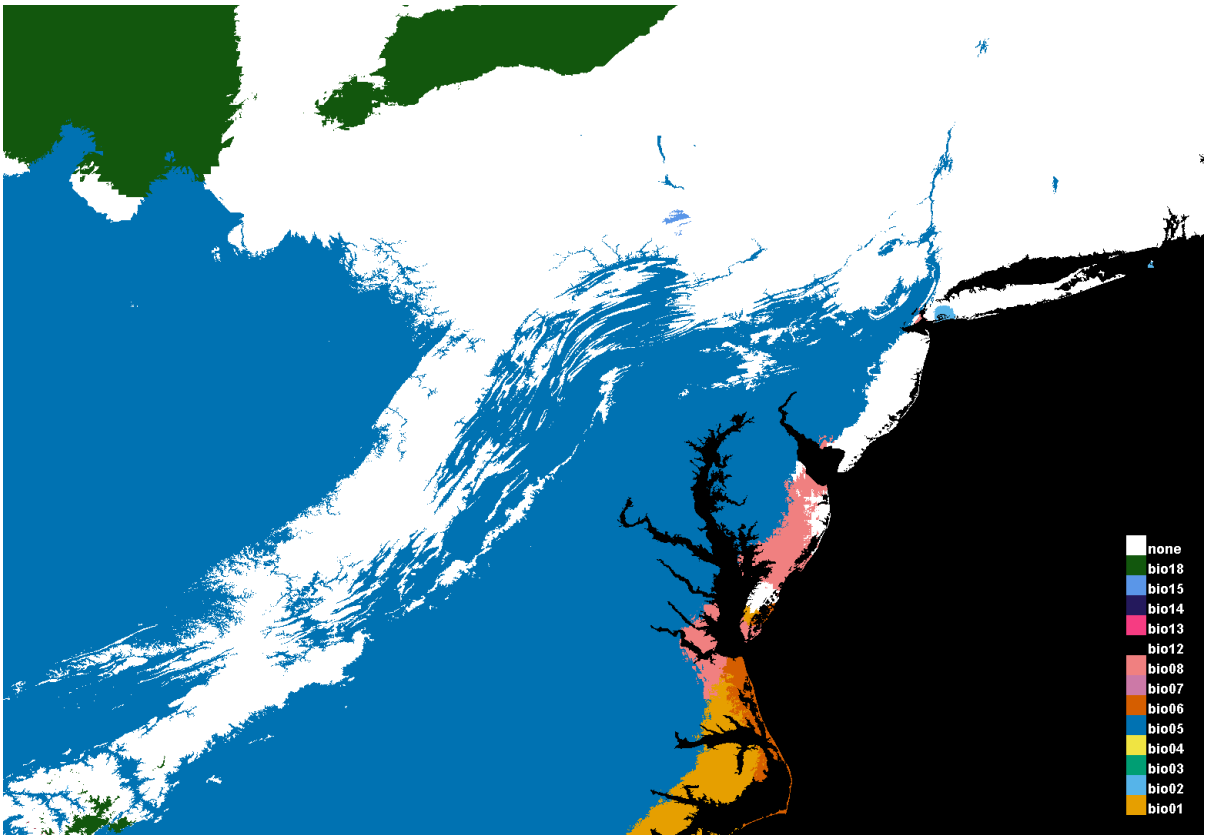
Click here to interactively explore this prediction using the Explain tool. If clicking from your browser does not succeed in starting the tool, try running the script in E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias\Poanes_viator_viator_he45bi50_explain.bat directly. This tool requires the environmental grids to be small enough that they all fit in memory.

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



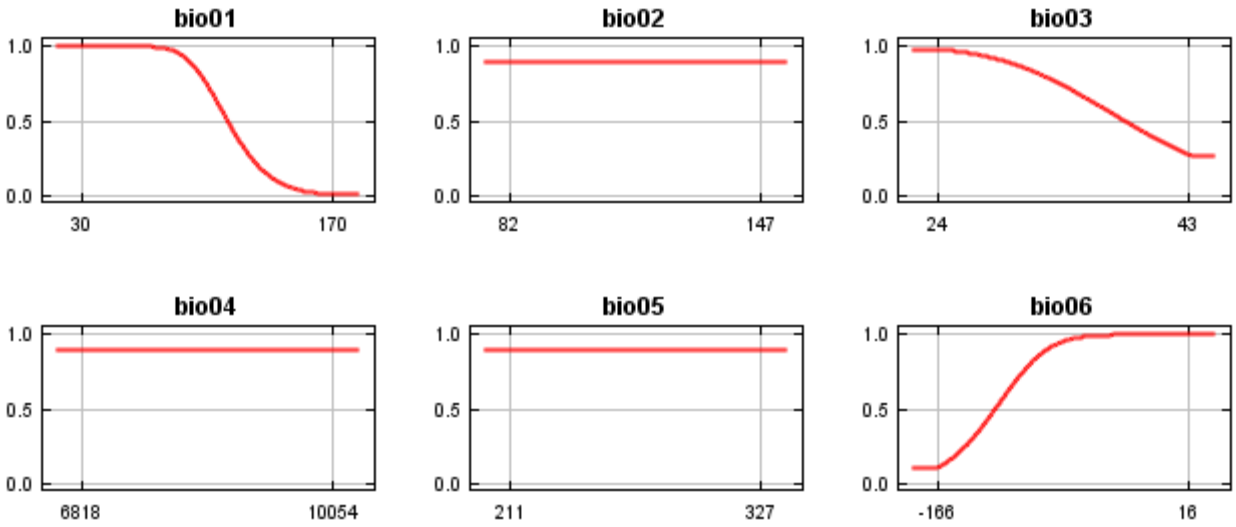
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

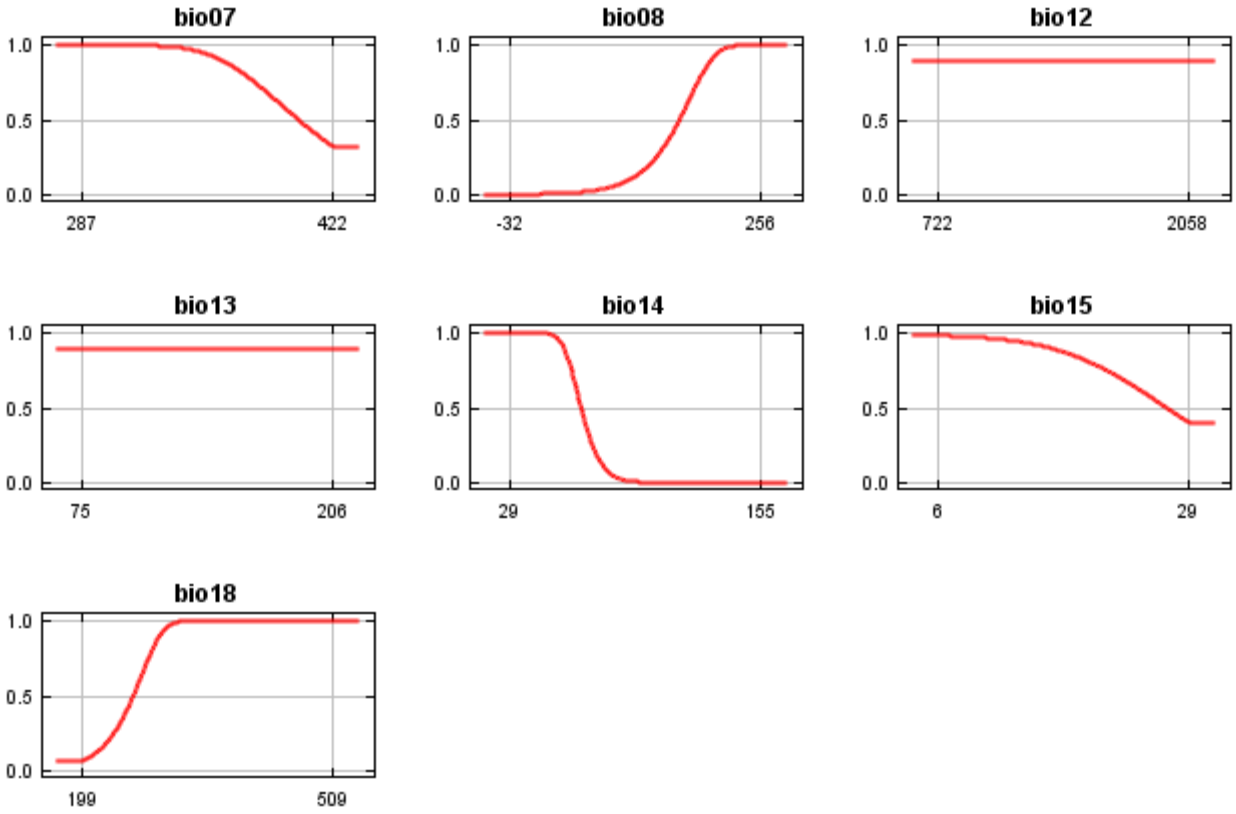




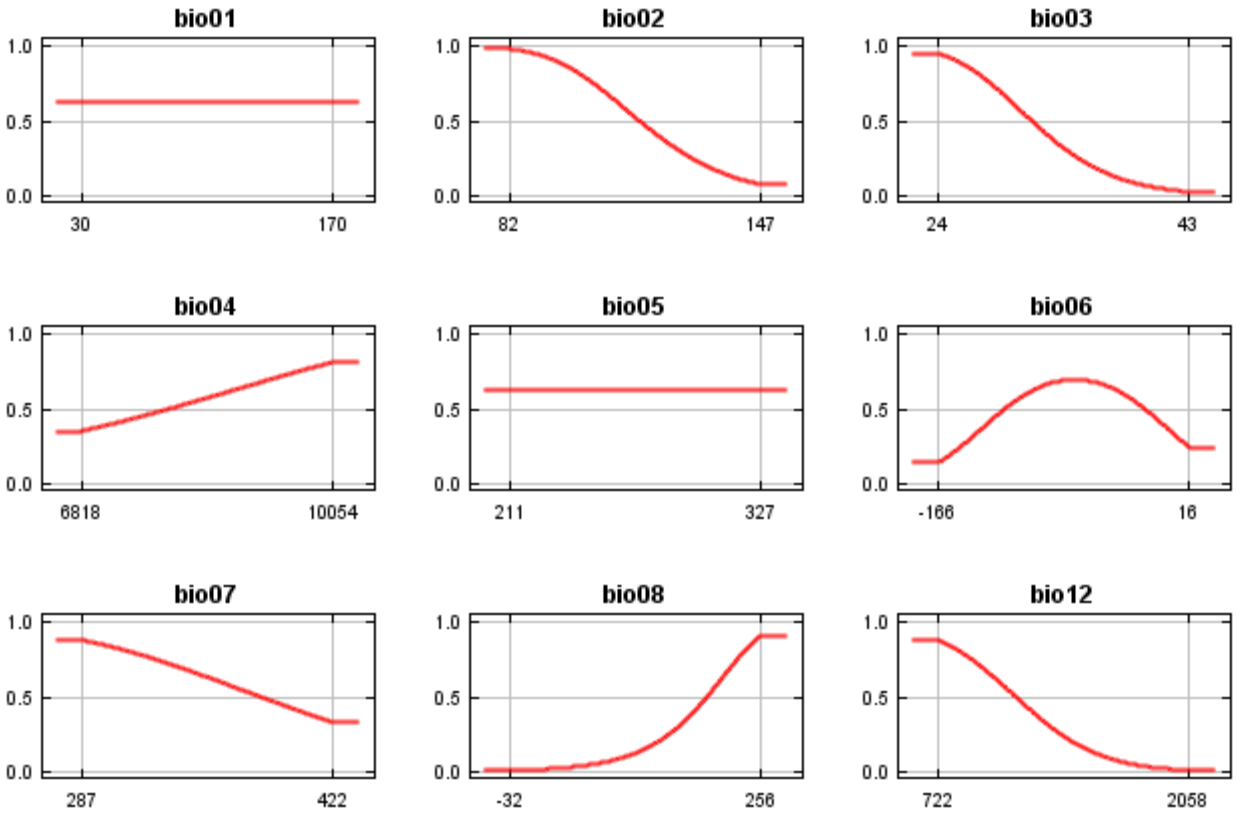
Response curves

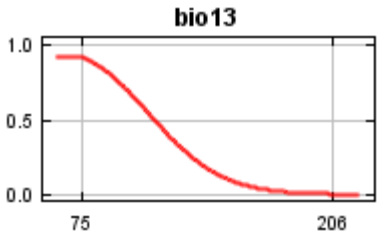
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.

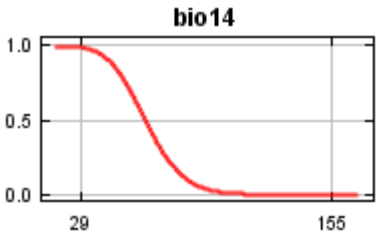


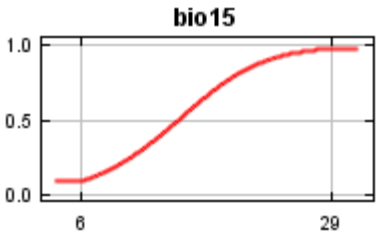


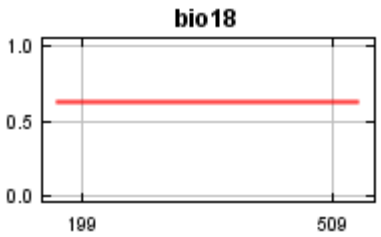
In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.











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
bio15	23.5	4
bio08	21.1	8.7
bio02	19.6	0
bio14	16	33.9
bio18	7	16.8
bio01	6.5	24.6
bio06	4.5	8.4
bio03	0.6	1.9
bio07	0.6	1.8
bio05	0.5	0
bio04	0	0
bio13	0	0
bio12	0	0

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.961, training AUC is 0.950, unregularized training gain is 1.681.
Unregularized test gain is 1.531.
Test AUC is 0.941, standard deviation is 0.033 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm converged after 280 iterations (1 seconds).

The follow settings were used during the run:
12 presence records used for training, 3 for testing.
10012 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.714, categorical: 0.429, threshold: 1.880, hinge: 0.500
Feature types used: linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

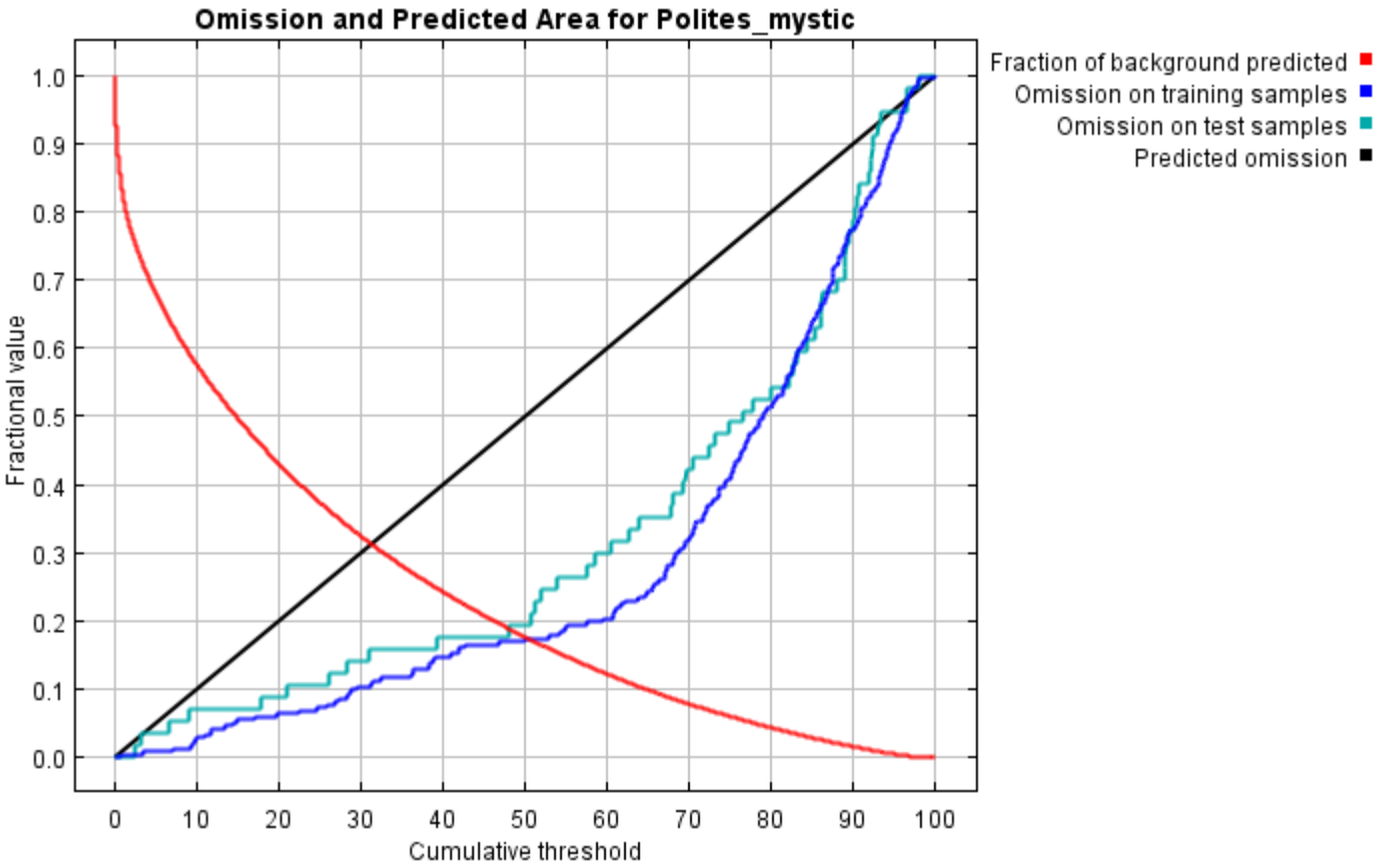
Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Poanes_viator_viator responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19

Maxent model for Polites_mystic

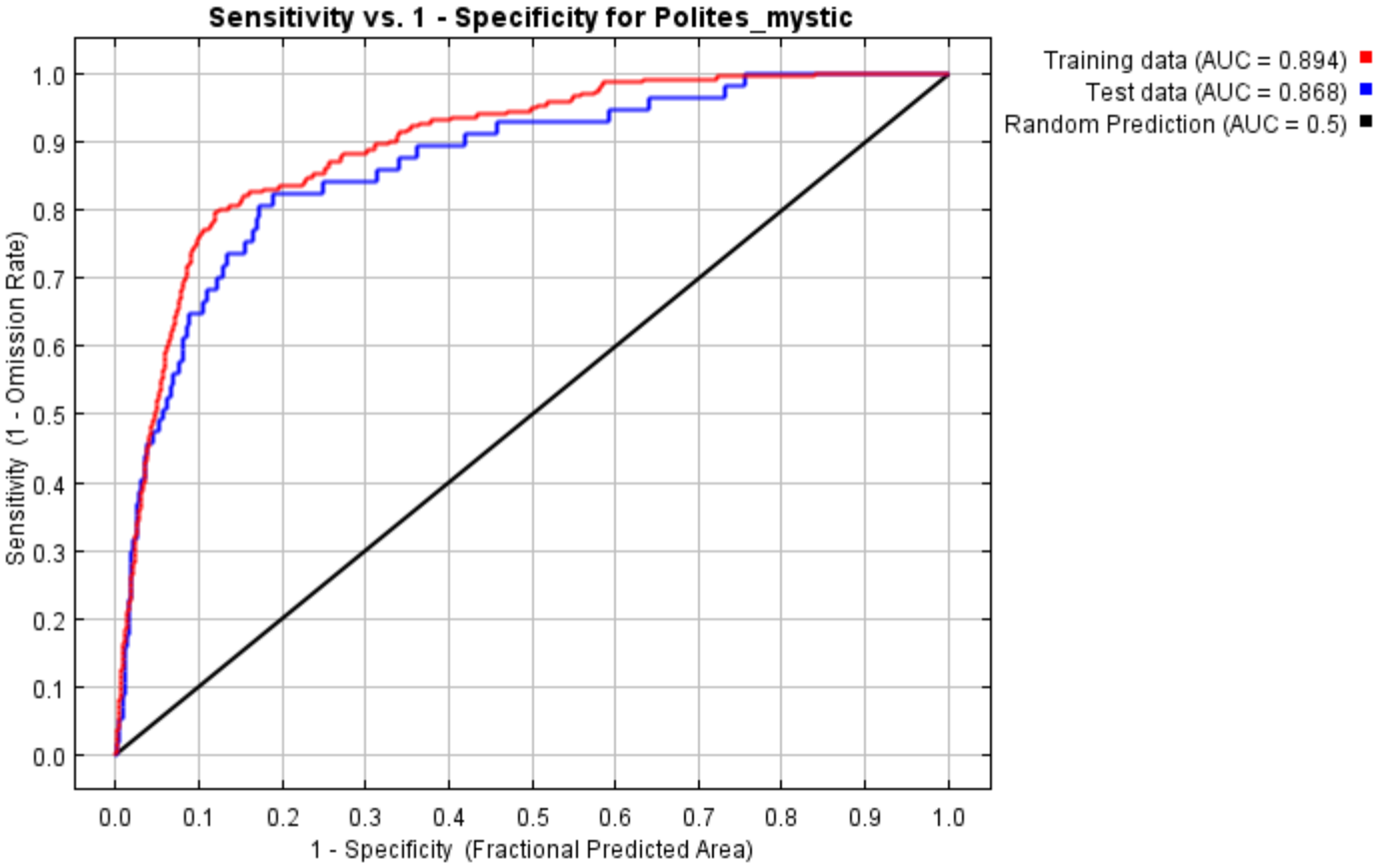
This page contains some analysis of the Maxent model for Polites_mystic, created Mon Jan 15 14:51:19 EST 2018 using Maxent version 3.4.1. If you would like to do further analyses, the raw data used here is linked to at the end of this page.

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 0.759 rather than 1; in practice the test AUC may exceed this bound.



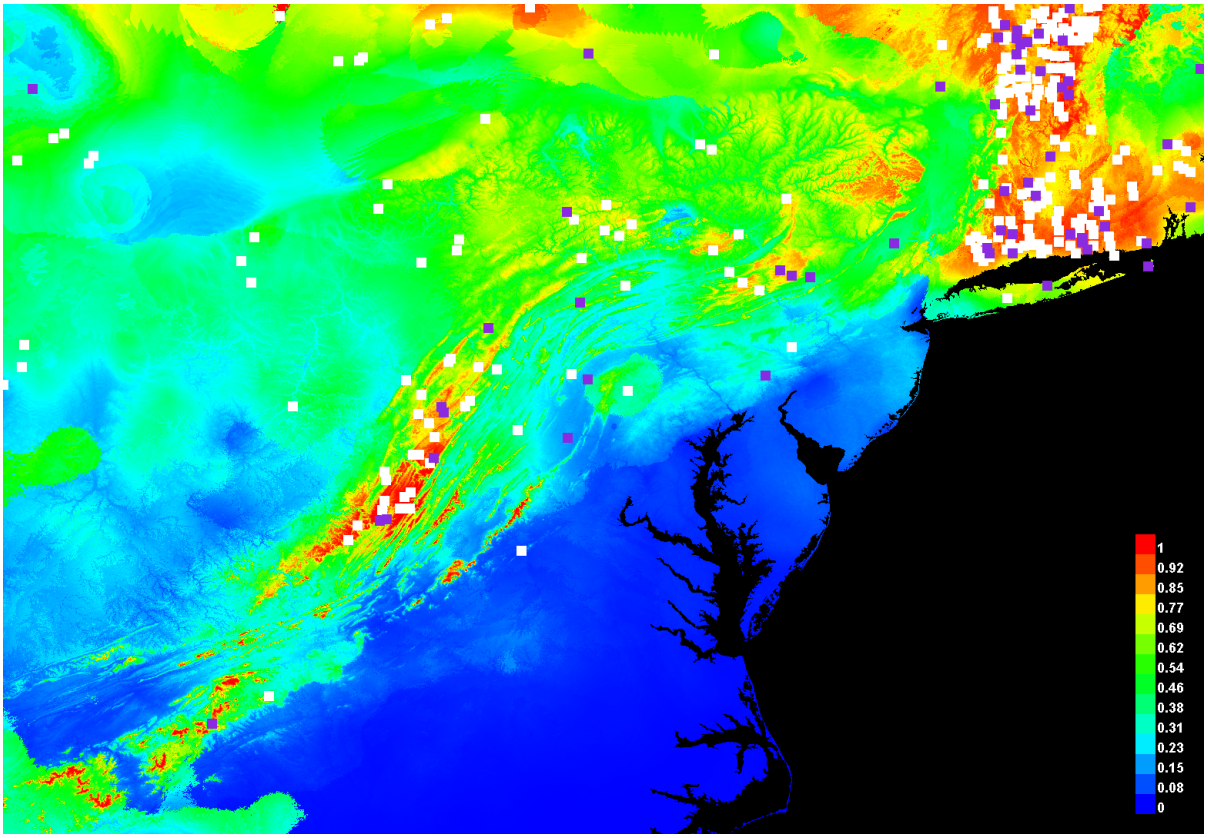
Some common thresholds and corresponding omission rates are as follows. If test data are available, binomial probabilities are calculated exactly if the number of test samples is at most 25, otherwise using a normal approximation to the binomial. These are 1-sided p-values for the null hypothesis that 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	Test omission rate	P-value
1.000	0.084	Fixed cumulative value 1	0.822	0.004	0.000	2.25E-4
5.000	0.216	Fixed cumulative value 5	0.679	0.009	0.035	1.913E-6
10.000	0.296	Fixed cumulative value 10	0.575	0.030	0.070	3.048E-8
0.783	0.072	Minimum training presence	0.839	0.000	0.000	4.688E-4
29.487	0.484	10 percentile training presence	0.329	0.100	0.140	7.916E-18
50.550	0.647	Equal training sensitivity and specificity	0.174	0.174	0.193	9.26E-37
60.635	0.720	Maximum training sensitivity plus specificity	0.120	0.204	0.316	1.178E-39

47.958	0.630	Equal test sensitivity and specificity	0.190	0.170	0.193	6.723E-33
47.955	0.630	Maximum test sensitivity plus specificity	0.190	0.170	0.175	1.112E-34
3.446	0.188	Balance training omission, predicted area and threshold value	0.722	0.004	0.035	2.121E-5
7.728	0.264	Equate entropy of thresholded and original distributions	0.618	0.013	0.053	1.539E-7

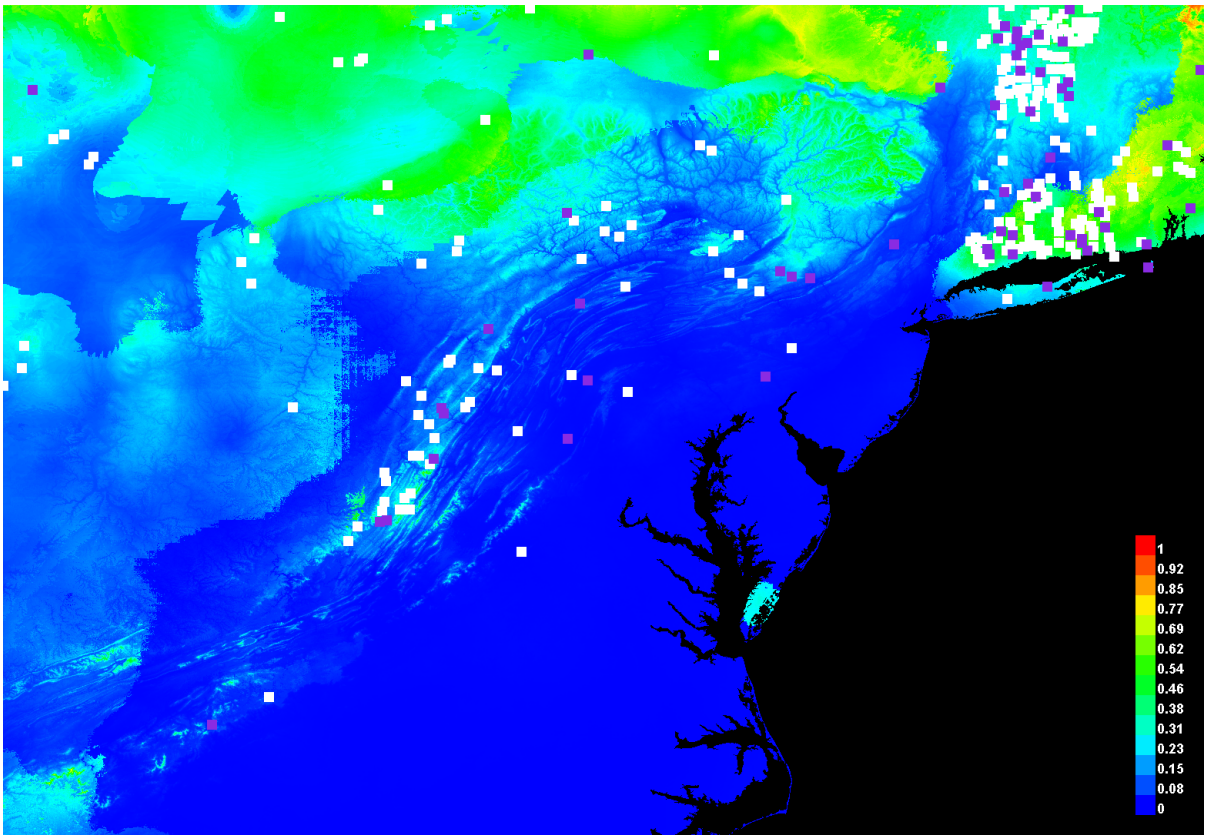
Pictures of the model

This is a representation of the Maxent model for Polites_mystic. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.



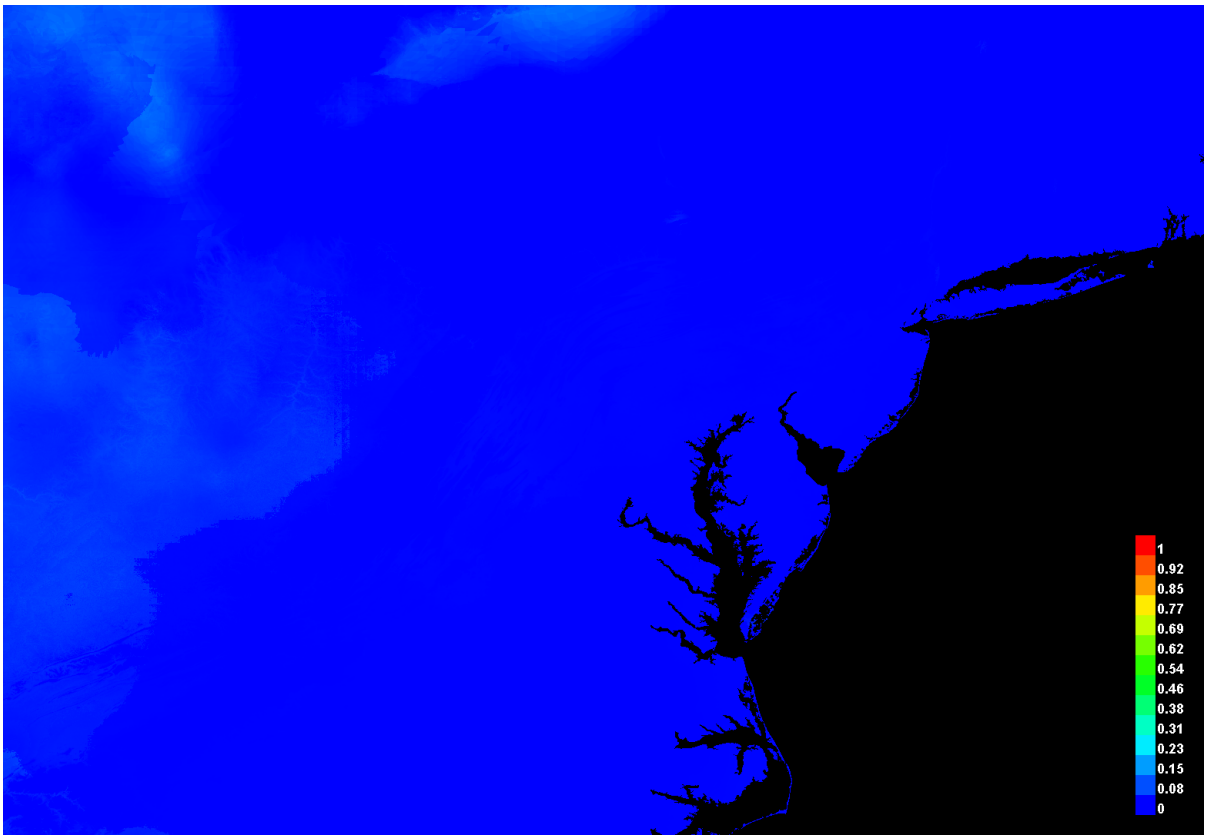
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

This is the projection of the Maxent model for Polites_mystic onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. Warmer colors show areas with better predicted conditions. White dots show the presence locations used for training, while violet dots show test locations. Click on the image for a full-size version.

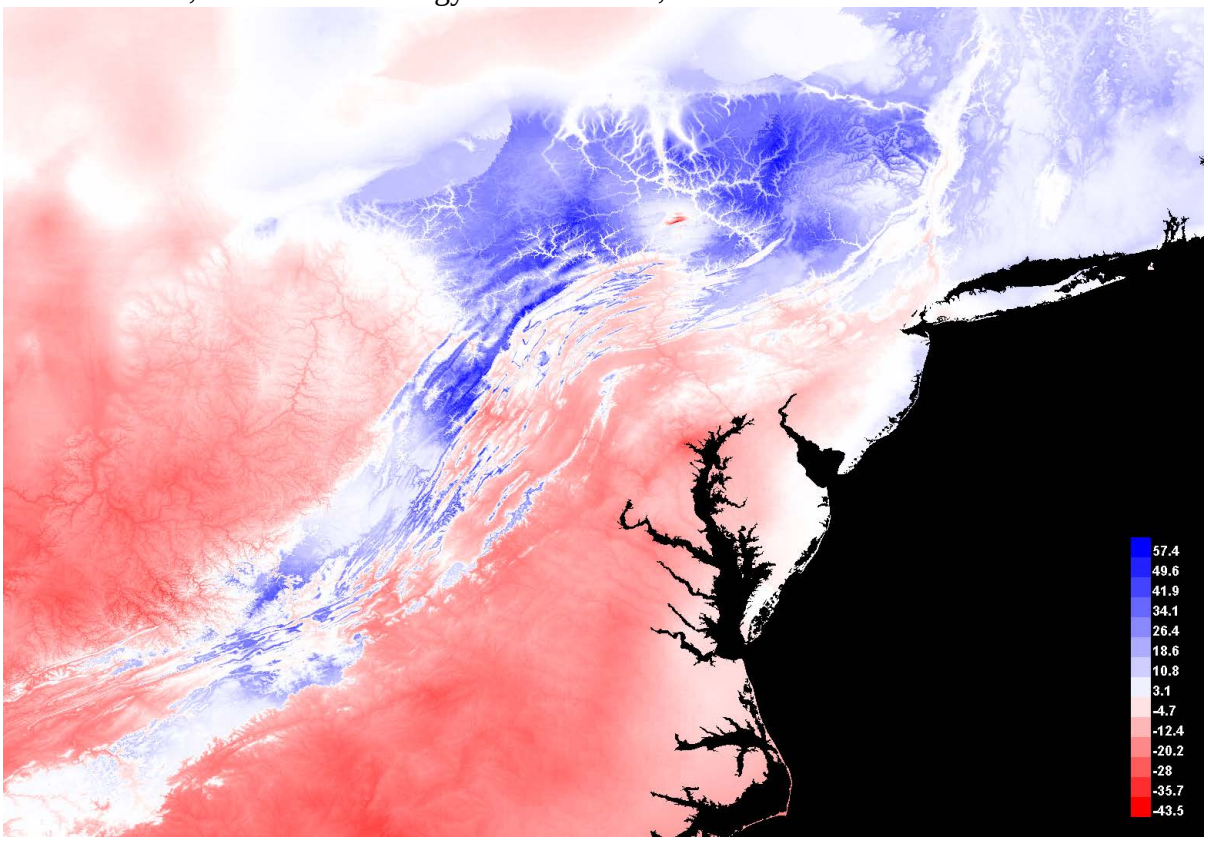


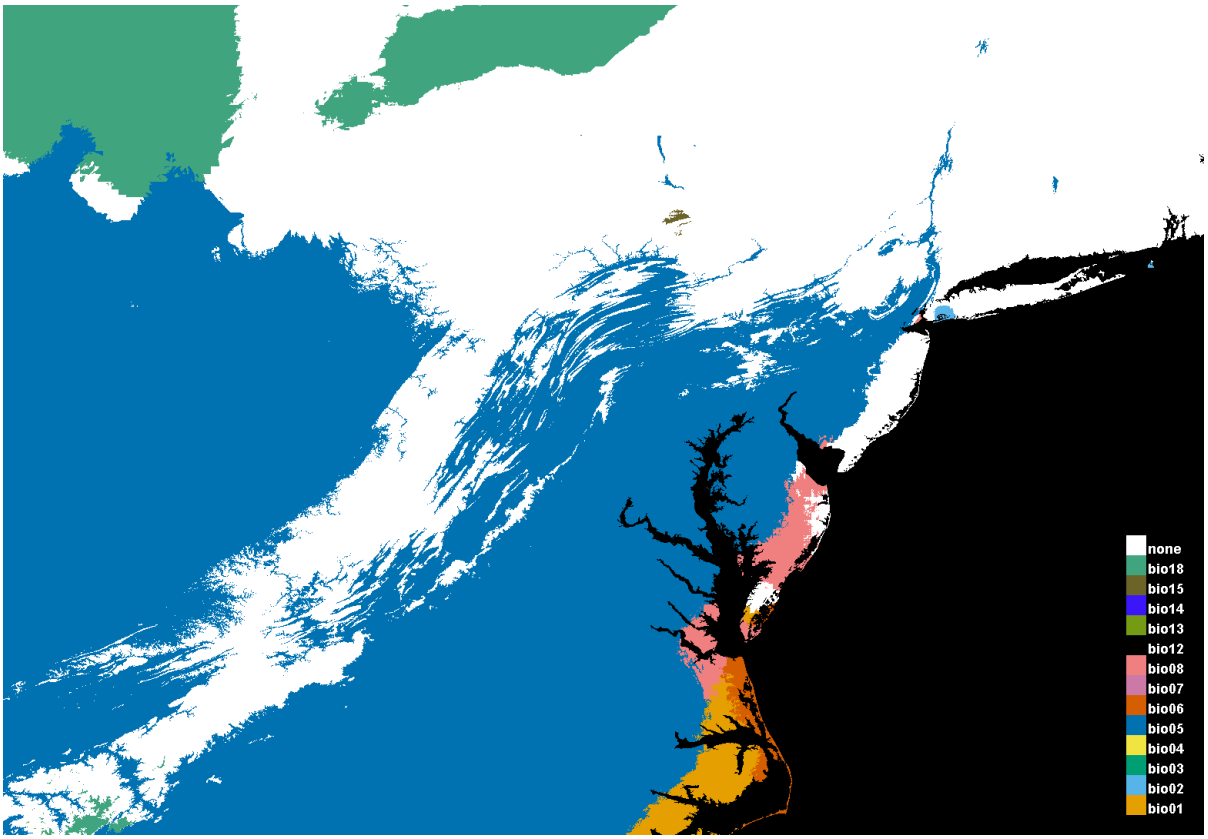
(A link to the Explain tool was not made for this model. The model uses product features, while the Explain tool can only be used for additive models.)

The following picture shows where the prediction is most affected by variables being outside their training range, while projecting the Maxent model onto the environmental variables in E:\MA_ButterflyClimate\ClimateModels\he45bi50. The values shown in the picture give the absolute difference in predictions when using vs not using clamping. (Clamping means that environmental variables and features are restricted to the range of values encountered during training.) Warmer colors show areas where the treatment of variable values outside their training ranges is likely to have a large effect on predicted suitability.



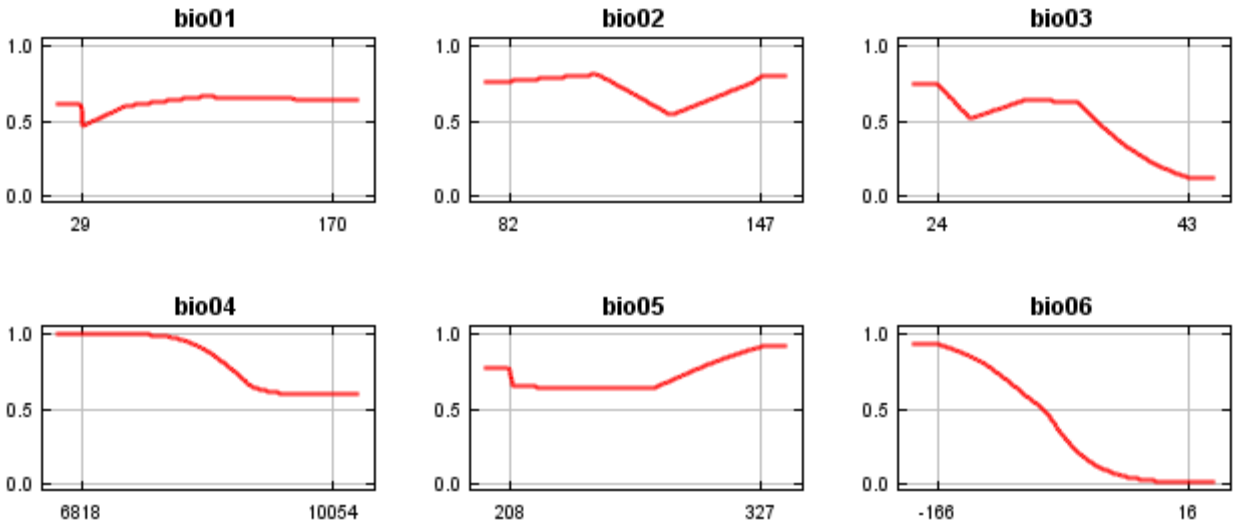
The following two pictures compare the environmental similarity of variables in he45bi50 to the environmental data used for training the model. In the first picture (MESS), areas in red have one or more environmental variables outside the range present in the training data, so predictions in those areas should be treated with strong caution. The second picture (MoD) shows the most dissimilar variable, i.e., the one that is furthest outside its training range. For details, see Elith et al., Methods in Ecology and Evolution, 2010

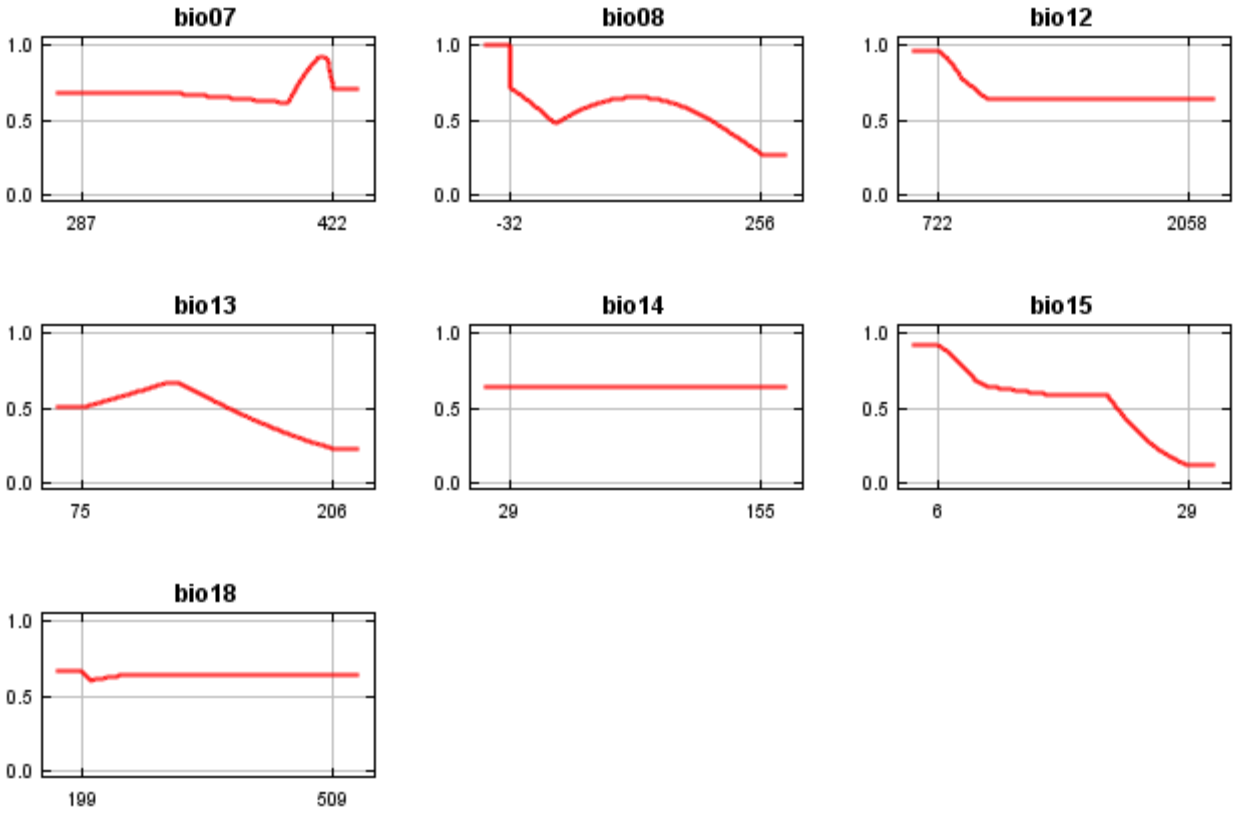




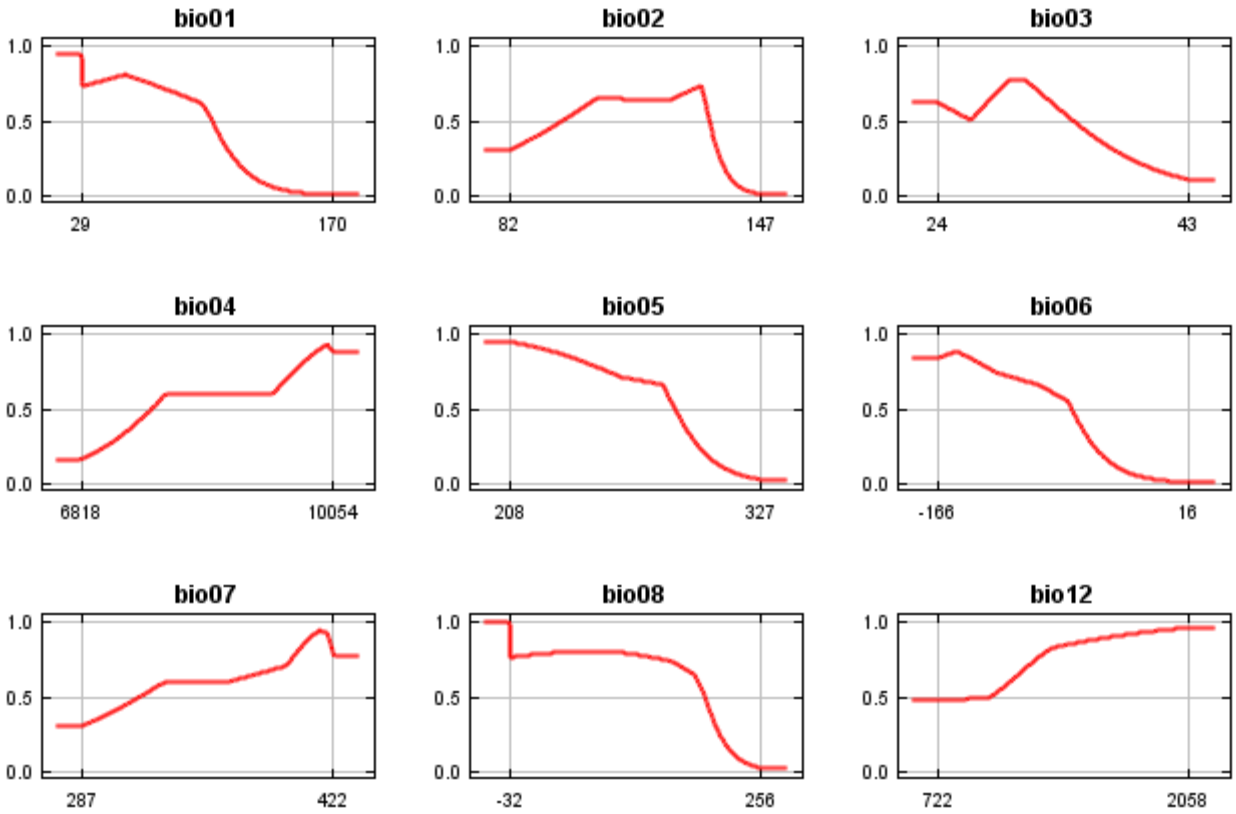
Response curves

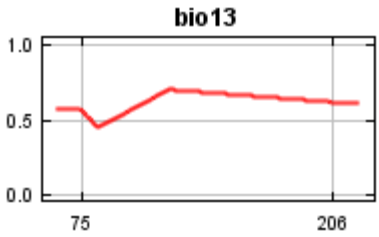
These curves show how each environmental variable affects the Maxent prediction. The curves show how the predicted probability of presence changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Click on a response curve to see a larger version. Note that the curves can be hard to interpret if you have strongly correlated variables, as the model may depend on the correlations in ways that are not evident in the curves. In other words, the curves show the marginal effect of changing exactly one variable, whereas the model may take advantage of sets of variables changing together.

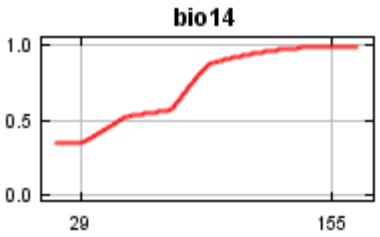


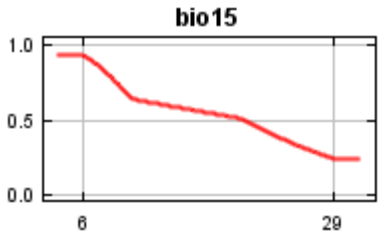


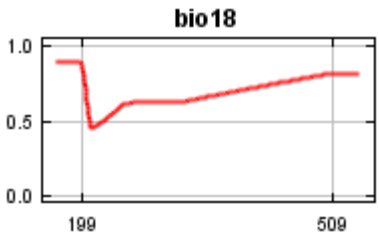
In contrast to the above marginal response curves, each of the following curves represents a different model, namely, a Maxent model created using only the corresponding variable. These plots reflect the dependence of predicted suitability both on the selected variable and on dependencies induced by correlations between the selected variable and other variables. They may be easier to interpret if there are strong correlations between variables.











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
bio08	36	13.5
bio15	20.3	7.8
bio07	19.6	1.9
bio06	6.6	52.5
bio04	5.5	12.1
bio03	3.9	5.4
bio01	2.8	0.3
bio05	2.7	1.9
bio02	1.3	2.2
bio13	0.7	1.3
bio12	0.6	1
bio18	0	0.1
bio14	0	0

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 model applied to the environmental layers in E:\MA_ButterflyClimate\ClimateModels\he45bi50
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 0.313, training AUC is 0.894, unregularized training gain is 0.420.
Unregularized test gain is 0.906.
Test AUC is 0.868, standard deviation is 0.025 (calculated as in DeLong, DeLong & Clarke-Pearson 1988, equation 2).
Algorithm terminated after 500 iterations (4 seconds).

The follow settings were used during the run:
230 presence records used for training, 57 for testing.
10229 points used to determine the Maxent distribution (background points and presence points).
Environmental layers used (all continuous): bio01 bio02 bio03 bio04 bio05 bio06 bio07 bio08 bio12 bio13 bio14 bio15 bio18
Regularization values: linear/quadratic/product: 0.050, categorical: 0.250, threshold: 1.000, hinge: 0.500
Feature types used: hinge product linear quadratic
responsecurves: true
outputdirectory: E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias
projectionlayers: E:\MA_ButterflyClimate\ClimateModels\he45bi50
samplesfile: E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv
environmentallayers: E:\MA_ButterflyClimate\ClimateModels\current
askoverwrite: false
randomtestpoints: 20
biasfile: E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc
biastype: 3
applythresholdrule: maximum test sensitivity plus specificity
Command line used:

Command line to repeat this species model: java density.MaxEnt nowarnings noprefixes -E "" -E Polites_mystic responsecurves outputdirectory=E:\MA_ButterflyClimate\ClimateModels\output20180115_he45bi50bias projectionlayers=E:\MA_ButterflyClimate\ClimateModels\he45bi50 samplesfile=E:\MA_ButterflyClimate\ClimateModels\rare5k_spatially_rarified_locs.csv environmentallayers=E:\MA_ButterflyClimate\ClimateModels\current noaskoverwrite randomtestpoints=20 biasfile=E:\MA_ButterflyClimate\ButterflyClimate\Rarefy\biasfiles\biastest01.asc biastype=3 "applythresholdrule=maximum test sensitivity plus specificity" -N bio09 -N bio10 -N bio11 -N bio16 -N bio17 -N bio19