Supplementary Materials

Supplementary information and results of the experiments performed for the paper submitted to the 19th Symposium on Intelligent Data Analysis (IDA 2021).

Table 1 contains the description of the variables used. Table 2 shows the list of Ecological variables selected by the PCA for each group of species. Table 3 contains the results of final models for each combination of method and dataset.

Table 1. List of the Geographic and Ecological variables by type, source, name and description. All raster layers used for the Ecological variables have a 1 km resolution.

Type (Source)	Name	Description (unit)
Geographic		
(GBIF [10], PREDICTS [11] BioTIME [12], LPI [13])	AOO	Area of occupancy of a species (km^2)
	EOO	Extent of occurrence of a species (km^2)
	min_lat	5th percentile of latitude (°)
	max_lat	95th percentile of latitude (°)
	med_dist_eq	Median distance to the equator (°)
	med_long	Median longitude (°)
Ecological		
Climatic (CHELSA [14])	bio_1	Annual mean temperature (°C)
	bio_2	Mean diurnal range (°C)
	bio_3	Isothermality
	bio_4	Temperature seasonality
	bio_5	Max Temperature of warmest month (°C)
	bio_6	Min Temperature of coldest month (°C)
	bio_7	Temperature annual range (°C)
	bio_8	Mean Temperature of wettest quarter (°C)
	bio_9	Mean Temperature of driest quarter (°C)
	bio_10	Mean Temperature of warmest quarter (°C)
	bio_11	Mean Temperature of coldest quarter (°C)
	bio_12	Annual precipitation (mm)
	bio_13	Precipitation of wettest month (mm)
	bio_14	Precipitation of driest month (mm)
	bio_15	Precipitation seasonality (mm)
	bio_16	Precipitation of wettest quarter (mm)
	bio_17	Precipitation of driest quarter (mm)
	bio_18	Precipitation of warmest quarter (mm)
	bio_19	Precipitation of coldest quarter (mm)
Topographic (EarthEnv [15])	eastness	Aspect eastness
	elevation	Elevation (meters a.s.l.)
	northness	Aspect northness
	roughness	Roughness
Habitat heterogeneity (EarthEnv [16])	contrast	Contrast
	cv	Coefficient of variation
	homogeneity	Homogeneity
	maximum	Maximum
(Copernicus [17] [18]	fcover	Fraction of green vegetation cover
	ndvi	Normalized Difference Vegetation Index

Table 4. List of Ecological variables selected for each of the groups by the PCA step of the pipeline.

Group	Ecological variables
Amphisbaenians	
	– bio_5
	– bio_9
	– bio_13
	– northness
	– contrast
	– maximum
	– ndvi
Crocodiles	
	– bio_2
	– bio_8
	– bio_9
	– bio_12
	– eastness
	– roughness
	– contrast
	– homogeneity
Lizards	
	– bio_1
	– bio_3
	– bio_12
	– eastness
	– northness
	– cv
	– homogeneity
Snakes	
	– bio_7
	– bio_10
	– bio_15
	– bio_18
	– northness
	– cv
	– homogeneity
Turtles	
	– bio_1
	– bio_7
	– bio_8
	– bio_9
	– eastness
	– contrast
	– cv
	– maximum
All species	
	– bio_5
	– bio_6
	– bio_13
	– bio_17
	– eastness
	– contrast
	– cv
	– maximum

Table 3. The following tables show the results of final models for each combination of method and dataset. Each subtable details the values for the six metrics used, sensitivity, specificity, precision, $F_{\beta=0.5}$, AUC and TSS, for each of the six groups of species. They also contain the results of the paired one-sided Wilcoxon tests done using the AOO_EOO dataset as baseline, or the AllFeatures or AllFeatures_FS in the case of the tests done between the EcoFeatures and AllFeatures datasets, see eco-all columns. Values marked with a bold color represent models where performance, for that particular metric and algorithm, was, significatively, improved relative to the AOO_EOO dataset. Values of the Wilcoxon tests marked with one or two asterisks (*, **) indicate significance values higher than 95%, or 99%, respectively.

Amphisbaenians

Sensitivity

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.950	0.158	0.800	0.350	0.978	0.800	0.350	0.978	0.579	0.750	0.354	0.986	0.950	0.158	1.000	0.986
xgboost	0.800	0.422	0.600	0.394	0.940	0.750	0.354	0.807	0.978	0.750	0.264	0.672	0.650	0.474	0.963	0.294
c50	0.900	0.211	0.750	0.354	0.907	0.700	0.350	0.960	0.412	0.600	0.394	0.988	0.900	0.211	0.579	0.977
knn	0.550	0.497	0.800	0.258	0.112	0.667	0.408	0.361	0.259	0.800	0.258	0.112	**0.900**	0.211	0.050*	0.970
glm	1.000	0.000	0.683	0.364	0.986	0.683	0.364	0.986	1.000	0.750	0.354	0.981	0.750	0.354	0.981	0.579
rpart	0.800	0.422	0.600	0.516	0.970	0.600	0.516	0.970	1.000	0.600	0.516	0.970	0.600	0.516	0.970	1.000

Specificity

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.700	0.350	0.650	0.412	0.707	0.700	0.350	0.681	0.661	0.750	0.354	0.386	0.750	0.354	0.500	0.681
xgboost	0.650	0.337	0.650	0.412	0.579	0.650	0.337	0.681	0.681	0.650	0.412	0.579	0.750	0.354	0.173	0.862
c50	0.750	0.354	0.550	0.438	0.931	0.650	0.412	0.977	0.862	0.700	0.422	0.814	0.750	0.354	1.000	0.814
knn	0.650	0.474	0.650	0.337	0.556	0.700	0.350	0.445	0.977	0.650	0.337	0.556	0.650	0.412	0.543	0.607
glm	0.750	0.354	0.550	0.438	0.843	0.550	0.438	0.843	1.000	0.700	0.422	0.814	0.750	0.354	0.681	0.715
rpart	0.200	0.422	0.400	0.516	0.173	0.400	0.516	0.173	1.000	0.400	0.516	0.173	0.400	0.516	0.173	1.000

Precision

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.825	0.194	0.758	0.325	0.865	0.758	0.325	0.865	0.542	0.824	0.222	0.789	0.875	0.163	0.500	0.789
xgboost	0.713	0.309	0.694	0.358	0.099	0.725	0.314	0.186	0.605	0.775	0.261	0.138	0.821	0.170	0.500	0.607
c50	0.858	0.193	0.713	0.232	0.956	0.787	0.232	0.814	0.572	0.781	0.263	0.814	0.875	0.163	0.500	0.789
knn	0.694	0.245	0.742	0.237	0.977	0.731	0.333	0.574	0.707	0.742	0.237	0.977	0.825	0.194	0.133	0.901
glm	0.875	0.163	0.731	0.220	0.948	0.731	0.220	0.948	1.000	0.806	0.257	0.789	0.843	0.197	0.814	0.769
rpart	0.542	0.077	0.500	0.000	1.000	0.500	0.000	1.000	1.000	0.500	0.000	1.000	0.500	0.000	1.000	1.000

F1 0.5

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.916	0.152	0.856	0.179	0.962	0.868	0.197	0.969	0.664	0.822	0.231	0.950	0.922	0.136	0.500	0.950
xgboost	0.947	0.045	0.739	0.242	0.972	0.808	0.207	0.963	0.969	0.741	0.244	0.979	0.889	0.152	0.977	0.972
c50	0.881	0.191	0.785	0.209	0.899	0.754	0.216	0.973	0.500	0.739	0.242	0.969	0.878	0.174	0.715	0.889
knn	0.827	0.149	0.785	0.247	0.795	0.816	0.199	0.312	0.708	0.785	0.247	0.795	0.872	0.186	0.500	0.899
glm	0.966	0.044	0.725	0.236	0.993	0.725	0.236	0.993	1.000	0.817	0.239	0.969	0.819	0.215	0.969	0.606
rpart	0.852	0.035	0.833	0.000	1.000	0.833	0.000	1.000	1.000	0.833	0.000	1.000	0.833	0.000	1.000	1.000

AUC

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.825	0.206	0.725	0.249	0.883	0.750	0.264	0.978	0.661	0.750	0.236	0.907	0.850	0.175	0.500	0.940
xgboost	0.725	0.249	0.625	0.270	0.972	0.700	0.230	0.807	0.978	0.700	0.258	0.807	0.700	0.197	0.814	0.556
c50	0.825	0.206	0.650	0.211	0.981	0.675	0.206	0.962	0.725	0.650	0.242	0.979	0.825	0.169	0.579	0.967
knn	0.600	0.175	0.725	0.249	0.084	0.683	0.242	0.213	0.375	0.725	0.249	0.084	**0.775**	0.219	0.032*	0.771
glm	0.875	0.177	0.617	0.209	0.989	0.617	0.209	0.989	1.000	0.725	0.275	0.969	0.750	0.204	0.972	0.644
rpart	0.500	0.000	0.500	0.000	1.000	0.500	0.000	1.000	1.000	0.500	0.000	1.000	0.500	0.000	1.000	1.000

TSS

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.650	0.412	0.450	0.497	0.883	0.500	0.527	0.978	0.661	0.500	0.471	0.907	0.700	0.350	0.500	0.940
xgboost	0.450	0.497	0.250	0.540	0.972	0.400	0.459	0.807	0.978	0.400	0.516	0.807	0.400	0.394	0.814	0.556
c50	0.650	0.412	0.300	0.422	0.981	0.350	0.412	0.962	0.725	0.300	0.483	0.979	0.650	0.337	0.579	0.967
knn	0.200	0.350	0.450	0.497	0.084	0.367	0.483	0.213	0.375	0.450	0.497	0.084	**0.550**	0.438	0.032*	0.771
glm	0.750	0.354	0.233	0.417	0.989	0.233	0.417	0.989	1.000	0.450	0.550	0.969	0.500	0.408	0.972	0.644
rpart	0.000	0.000	0.000	0.000	1.000	0.000	0.000	1.000	1.000	0.000	0.000	1.000	0.000	0.000	1.000	1.000

Crocodiles

Sensitivity

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.917	0.180	0.950	0.158	0.500	1.000	0.000	0.186	0.977	0.950	0.158	0.500	1.000	0.000	0.186	0.977
xgboost	0.700	0.270	0.900	0.211	0.080	**0.867**	0.219	0.049*	0.500	**0.950**	0.158	0.027*	**1.000**	0.000	0.016*	0.977
c50	0.817	0.337	0.917	0.180	0.293	0.867	0.322	0.293	0.500	0.767	0.251	0.717	1.000	0.000	0.091	0.988
knn	0.917	0.180	0.917	0.180	0.574	1.000	0.000	0.186	0.963	1.000	0.000	0.186	1.000	0.000	0.186	1.000
glm	0.917	0.180	0.600	0.402	0.972	0.600	0.402	0.972	1.000	0.950	0.158	0.500	1.000	0.000	0.186	0.977
rpart	1.000	0.000	1.000	0.000	1.000	1.000	0.000	1.000	1.000	1.000	0.000	1.000	1.000	0.000	1.000	1.000

Specificity

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.800	0.422	0.750	0.264	0.604	0.800	0.258	0.556	0.725	0.700	0.258	0.696	0.950	0.158	0.186	0.976
xgboost	0.750	0.354	0.750	0.354	0.556	0.700	0.422	0.666	0.391	0.750	0.264	0.579	0.800	0.258	0.412	0.807
c50	0.900	0.211	0.650	0.242	0.958	0.600	0.211	0.995	0.383	0.750	0.264	0.890	0.600	0.211	0.995	0.074
knn	0.700	0.422	0.800	0.258	0.304	0.700	0.258	0.500	0.173	0.800	0.258	0.294	0.700	0.258	0.546	0.242
glm	0.700	0.422	0.650	0.412	0.672	0.650	0.412	0.672	1.000	0.750	0.264	0.396	**0.900**	0.211	0.036*	0.890
rpart	0.000	0.000	0.000	0.000	1.000	0.000	0.000	1.000	1.000	0.000	0.000	1.000	0.000	0.000	1.000	1.000

Precision

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.883	0.249	0.833	0.188	0.633	0.875	0.163	0.706	0.709	0.800	0.185	0.714	0.967	0.105	0.186	0.958
xgboost	0.800	0.258	0.852	0.201	0.294	0.825	0.250	0.500	0.446	0.833	0.188	0.446	0.875	0.163	0.221	0.769
c50	0.850	0.337	0.758	0.178	0.784	0.675	0.273	0.991	0.333	0.825	0.194	0.633	0.750	0.136	0.911	0.136
knn	0.817	0.254	0.850	0.200	0.387	0.808	0.167	0.458	0.290	0.883	0.153	0.276	0.808	0.167	0.664	0.133
glm	0.817	0.254	0.683	0.404	0.828	0.683	0.404	0.828	1.000	0.833	0.188	0.416	**0.933**	0.141	0.049*	0.829
rpart	0.520	0.042	0.520	0.042	1.000	0.520	0.042	1.000	1.000	0.520	0.042	1.000	0.520	0.042	1.000	1.000

F1 0.5

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.900	0.185	0.919	0.152	0.400	0.966	0.044	0.337	0.709	0.910	0.150	0.472	0.991	0.029	0.091	0.958
xgboost	0.702	0.242	0.878	0.190	0.054	**0.845**	0.210	0.026*	0.337	**0.919**	0.152	0.026*	**0.966**	0.044	0.010*	0.865
c50	0.913	0.181	0.874	0.163	0.803	0.906	0.097	0.667	0.802	0.759	0.209	0.915	0.933	0.037	0.602	0.974
knn	0.886	0.187	0.898	0.175	0.444	0.948	0.045	0.358	0.821	0.969	0.041	0.134	0.948	0.045	0.337	0.133
glm	0.882	0.178	0.733	0.216	0.882	0.733	0.216	0.882	1.000	0.919	0.152	0.311	**0.982**	0.038	0.029*	0.829
rpart	0.843	0.021	0.843	0.021	1.000	0.843	0.021	1.000	1.000	0.843	0.021	1.000	0.843	0.021	1.000	1.000

AUC

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.858	0.267	0.850	0.175	0.633	0.900	0.129	0.543	0.802	0.825	0.169	0.715	0.975	0.079	0.091	0.977
xgboost	0.725	0.233	0.825	0.206	0.114	0.783	0.267	0.304	0.500	0.850	0.175	0.061	0.900	0.129	0.053	0.885
c50	0.858	0.267	0.783	0.172	0.782	0.733	0.211	0.967	0.412	0.758	0.154	0.837	0.800	0.105	0.810	0.748
knn	0.808	0.275	0.858	0.197	0.362	0.850	0.129	0.375	0.425	0.900	0.129	0.303	0.850	0.129	0.295	0.242
glm	0.808	0.258	0.625	0.297	0.927	0.625	0.297	0.927	1.000	0.850	0.175	0.471	**0.950**	0.105	0.027*	0.912
rpart	0.500	0.000	0.500	0.000	1.000	0.500	0.000	1.000	1.000	0.500	0.000	1.000	0.500	0.000	1.000	1.000

TSS

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.717	0.533	0.700	0.350	0.633	0.800	0.258	0.543	0.802	0.650	0.337	0.715	0.950	0.158	0.091	0.977
xgboost	0.450	0.465	0.650	0.412	0.084	0.567	0.534	0.304	0.500	0.700	0.350	0.061	0.800	0.258	0.053	0.885
c50	0.717	0.533	0.567	0.344	0.782	0.467	0.422	0.967	0.412	0.517	0.309	0.837	0.600	0.211	0.810	0.748
knn	0.617	0.550	0.717	0.393	0.362	0.700	0.258	0.375	0.425	0.800	0.258	0.303	0.700	0.258	0.295	0.242
glm	0.617	0.516	0.250	0.594	0.927	0.250	0.594	0.927	1.000	0.700	0.350	0.471	**0.900**	0.211	0.027*	0.912
rpart	0.000	0.000	0.000	0.000	1.000	0.000	0.000	1.000	1.000	0.000	0.000	1.000	0.000	0.000	1.000	1.000

Lizards

Sensitivity

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.933	0.019	0.836	0.034	0.998	**0.961**	0.017	0.003**	0.998	0.811	0.027	0.998	**0.963**	0.017	0.003**	1.000
xgboost	0.942	0.023	0.851	0.022	0.998	**0.956**	0.015	0.006**	0.998	0.812	0.025	0.998	**0.958**	0.018	0.009**	0.998
c50	0.914	0.027	0.741	0.057	1.000	0.909	0.034	0.637	1.000	0.718	0.059	0.998	0.912	0.034	0.528	1.000
knn	0.945	0.022	0.777	0.050	0.998	0.805	0.039	1.000	0.986	0.777	0.032	0.998	0.823	0.034	0.998	0.998
glm	0.922	0.023	0.743	0.020	0.998	0.881	0.033	0.999	0.998	0.757	0.023	1.000	0.884	0.030	0.997	1.000
rpart	0.915	0.015	0.668	0.082	1.000	0.914	0.014	0.963	1.000	0.690	0.085	1.000	0.914	0.014	0.963	1.000

Specificity

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.715	0.034	**0.750**	0.033	0.007**	0.711	0.026	0.639	0.005**	**0.740**	0.029	0.038*	0.717	0.025	0.383	0.026*
xgboost	0.738	0.031	0.703	0.028	0.991	0.703	0.023	0.998	0.439	0.712	0.032	0.976	0.701	0.028	0.998	0.116
c50	0.721	0.048	0.695	0.085	0.882	0.733	0.054	0.500	0.958	0.719	0.057	0.472	0.742	0.042	0.363	0.904
knn	0.713	0.025	**0.746**	0.029	0.007**	**0.738**	0.038	0.046*	0.120	0.730	0.035	0.078	**0.737**	0.037	0.023*	0.784
glm	0.718	0.069	0.732	0.031	0.238	0.711	0.037	0.784	0.033*	0.735	0.024	0.312	0.713	0.033	0.722	0.012*
rpart	0.757	0.025	0.744	0.067	0.652	0.756	0.025	0.963	0.652	0.723	0.073	0.923	0.756	0.025	0.963	0.923

Precision

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.632	0.030	0.637	0.031	0.312	0.635	0.023	0.246	0.423	0.620	0.024	0.839	0.640	0.022	0.097	0.995
xgboost	0.653	0.032	0.600	0.024	1.000	0.628	0.021	1.000	1.000	0.597	0.026	1.000	0.626	0.023	1.000	0.999
c50	0.633	0.043	0.566	0.057	1.000	0.643	0.042	0.500	1.000	0.574	0.038	1.000	0.650	0.035	0.277	1.000
knn	0.632	0.024	0.615	0.035	0.903	0.617	0.038	0.839	0.423	0.602	0.031	0.999	0.621	0.034	0.935	0.968
glm	0.635	0.055	0.592	0.031	0.997	0.615	0.032	0.958	0.995	0.599	0.023	0.986	0.617	0.030	0.947	0.993
rpart	0.664	0.025	0.582	0.042	1.000	0.662	0.024	0.969	1.000	0.571	0.048	1.000	0.662	0.024	0.969	1.000

F1 0.5

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.852	0.019	0.787	0.028	1.000	**0.872**	0.018	0.001**	1.000	0.763	0.022	1.000	**0.874**	0.016	0.001**	1.000
xgboost	0.865	0.025	0.785	0.019	1.000	0.866	0.017	0.246	1.000	0.757	0.020	1.000	0.866	0.017	0.246	1.000
c50	0.839	0.029	0.695	0.036	1.000	0.839	0.024	0.500	1.000	0.682	0.041	1.000	0.843	0.027	0.318	1.000
knn	0.859	0.022	0.738	0.044	1.000	0.759	0.034	1.000	0.976	0.734	0.027	1.000	0.772	0.027	1.000	1.000
glm	0.845	0.025	0.707	0.021	1.000	0.810	0.028	0.999	1.000	0.719	0.020	1.000	0.813	0.027	0.999	1.000
rpart	0.851	0.016	0.646	0.059	1.000	0.849	0.015	0.969	1.000	0.659	0.061	1.000	0.849	0.015	0.969	1.000

AUC

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.824	0.021	0.793	0.023	0.998	**0.836**	0.018	0.014*	1.000	0.775	0.017	1.000	**0.840**	0.017	0.005**	1.000
xgboost	0.840	0.025	0.777	0.018	1.000	0.830	0.017	0.986	1.000	0.762	0.018	1.000	0.829	0.018	0.986	1.000
c50	0.817	0.032	0.718	0.031	1.000	0.821	0.024	0.318	1.000	0.718	0.025	1.000	0.827	0.024	0.062	0.998
knn	0.829	0.020	0.762	0.033	1.000	0.772	0.029	1.000	0.920	0.754	0.022	1.000	0.780	0.023	1.000	1.000
glm	0.820	0.035	0.738	0.021	1.000	0.796	0.026	0.998	1.000	0.746	0.017	1.000	0.798	0.024	0.993	1.000
rpart	0.836	0.017	0.706	0.026	1.000	0.835	0.016	0.969	1.000	0.706	0.028	1.000	0.835	0.016	0.969	1.000

TSS

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.648	0.042	0.586	0.045	0.998	**0.672**	0.037	0.014*	1.000	0.551	0.035	1.000	**0.680**	0.034	0.005**	1.000
xgboost	0.680	0.049	0.554	0.035	1.000	0.660	0.035	0.986	1.000	0.524	0.036	1.000	0.659	0.036	0.986	1.000
c50	0.635	0.063	0.436	0.061	1.000	0.643	0.048	0.318	1.000	0.437	0.050	1.000	0.654	0.049	0.062	0.998
knn	0.657	0.041	0.523	0.065	1.000	0.543	0.059	1.000	0.920	0.507	0.044	1.000	0.560	0.046	1.000	1.000
glm	0.641	0.070	0.475	0.042	1.000	0.592	0.052	0.998	1.000	0.492	0.034	1.000	0.596	0.049	0.993	1.000
rpart	0.673	0.034	0.412	0.051	1.000	0.670	0.033	0.969	1.000	0.413	0.056	1.000	0.670	0.033	0.969	1.000

Snakes

Sensitivity

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.942	0.032	0.914	0.040	0.968	**0.967**	0.028	0.007**	0.997	0.910	0.044	0.984	**0.973**	0.028	0.007**	0.998
xgboost	0.949	0.025	0.930	0.039	0.975	**0.965**	0.029	0.011*	0.993	0.926	0.040	0.993	**0.967**	0.024	0.007**	0.995
c50	0.856	0.077	0.797	0.088	0.916	0.838	0.052	0.807	0.923	0.809	0.067	0.946	0.821	0.051	0.899	0.779
knn	0.945	0.032	0.908	0.051	0.986	0.959	0.033	0.276	0.998	0.914	0.035	0.984	0.947	0.033	0.500	0.997
glm	0.971	0.025	0.918	0.037	0.995	0.953	0.035	0.979	0.995	0.920	0.036	0.995	0.949	0.037	0.986	0.993
rpart	0.846	0.081	0.825	0.084	0.763	0.838	0.083	0.663	0.762	0.809	0.085	0.931	0.840	0.081	0.534	0.967

Specificity

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.820	0.036	0.756	0.041	0.997	0.722	0.036	0.998	0.005**	0.756	0.042	0.997	0.710	0.037	1.000	0.003**
xgboost	0.794	0.042	0.750	0.038	0.989	0.750	0.041	1.000	0.637	0.752	0.028	0.989	0.757	0.039	0.997	0.736
c50	0.867	0.043	0.818	0.050	0.984	0.878	0.028	0.181	0.995	0.820	0.061	0.976	0.881	0.029	0.193	0.997
knn	0.851	0.032	0.751	0.045	0.998	0.716	0.051	0.998	0.009**	0.741	0.043	1.000	0.745	0.043	0.998	0.620
glm	0.621	0.071	**0.759**	0.041	0.001**	**0.743**	0.046	0.001**	0.071	**0.751**	0.043	0.003**	**0.745**	0.047	0.002**	0.305
rpart	0.870	0.033	0.754	0.123	0.995	0.867	0.030	0.825	0.997	0.776	0.135	0.995	0.868	0.032	0.778	0.991

Precision

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.657	0.044	0.577	0.041	1.000	0.558	0.032	1.000	0.032*	0.576	0.042	0.999	0.549	0.035	1.000	0.014*
xgboost	0.627	0.048	0.575	0.036	0.998	0.585	0.040	1.000	0.812	0.574	0.028	0.999	0.591	0.041	0.999	0.935
c50	0.706	0.056	0.618	0.054	1.000	0.715	0.042	0.312	1.000	0.626	0.066	0.998	0.717	0.048	0.278	0.999
knn	0.699	0.045	0.571	0.051	1.000	0.552	0.044	1.000	0.042*	0.562	0.041	1.000	0.575	0.038	1.000	0.935
glm	0.484	0.044	**0.581**	0.038	0.001**	**0.576**	0.041	0.001**	0.264	**0.574**	0.040	0.001**	**0.576**	0.043	0.002**	0.652
rpart	0.705	0.048	0.567	0.081	1.000	0.696	0.043	0.853	1.000	0.592	0.096	1.000	0.700	0.044	0.819	0.998

F1 0.5

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.866	0.024	0.818	0.034	0.999	0.843	0.023	0.993	0.997	0.815	0.037	0.999	0.842	0.025	0.990	1.000
xgboost	0.860	0.022	0.827	0.031	1.000	0.853	0.026	0.947	0.995	0.824	0.031	1.000	0.857	0.025	0.784	1.000
c50	0.818	0.052	0.751	0.066	0.999	0.809	0.037	0.688	0.990	0.762	0.049	0.995	0.797	0.038	0.754	0.920
knn	0.882	0.028	0.811	0.044	0.999	0.835	0.026	1.000	0.990	0.811	0.029	1.000	0.838	0.023	1.000	0.999
glm	0.806	0.026	**0.822**	0.029	0.032*	**0.841**	0.021	0.002**	0.994	**0.820**	0.028	0.032*	**0.839**	0.024	0.003**	0.993
rpart	0.812	0.062	0.748	0.038	0.997	0.804	0.062	0.779	0.993	0.744	0.030	0.999	0.806	0.059	0.528	0.998

AUC

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.881	0.019	0.835	0.028	1.000	0.845	0.021	0.999	0.958	0.833	0.030	1.000	0.841	0.023	1.000	0.862
xgboost	0.872	0.021	0.840	0.026	1.000	0.858	0.024	0.984	0.990	0.839	0.023	1.000	0.862	0.024	0.981	0.999
c50	0.862	0.029	0.808	0.041	1.000	0.858	0.021	0.539	0.999	0.814	0.036	0.999	0.851	0.023	0.722	0.986
knn	0.898	0.022	0.830	0.036	1.000	0.837	0.025	1.000	0.884	0.827	0.025	1.000	0.846	0.020	1.000	0.998
glm	0.796	0.034	**0.839**	0.025	0.002**	**0.848**	0.019	0.001**	0.988	**0.836**	0.025	0.003**	**0.847**	0.021	0.002**	0.976
rpart	0.858	0.038	0.789	0.035	1.000	0.853	0.037	0.853	1.000	0.793	0.034	1.000	0.854	0.035	0.583	0.998

TSS

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.762	0.039	0.670	0.056	1.000	0.689	0.042	0.999	0.958	0.666	0.061	1.000	0.682	0.046	1.000	0.862
xgboost	0.743	0.042	0.680	0.051	1.000	0.715	0.048	0.984	0.990	0.678	0.046	1.000	0.724	0.047	0.981	0.999
c50	0.723	0.057	0.616	0.083	1.000	0.716	0.043	0.539	0.999	0.629	0.072	0.999	0.702	0.046	0.722	0.986
knn	0.797	0.044	0.659	0.072	1.000	0.675	0.050	1.000	0.884	0.655	0.051	1.000	0.692	0.039	1.000	0.998
glm	0.591	0.067	**0.678**	0.050	0.002**	**0.696**	0.038	0.001**	0.988	**0.671**	0.050	0.003**	**0.694**	0.041	0.002**	0.976
rpart	0.716	0.075	0.579	0.071	1.000	0.705	0.074	0.853	1.000	0.585	0.068	1.000	0.708	0.070	0.583	1.000

Turtles

Sensitivity

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.736	0.123	0.742	0.140	0.276	0.742	0.131	0.453	0.500	0.769	0.136	0.077	0.758	0.125	0.180	0.547
xgboost	0.769	0.136	0.720	0.150	0.800	0.735	0.114	0.780	0.698	0.802	0.106	0.117	0.802	0.112	0.223	0.500
c50	0.608	0.263	0.539	0.435	0.730	0.691	0.176	0.109	0.797	0.713	0.274	0.142	**0.741**	0.142	0.032*	0.639
knn	0.687	0.153	0.576	0.125	0.970	0.687	0.129	0.571	0.916	0.742	0.073	0.102	0.748	0.104	0.262	0.633
glm	0.896	0.080	0.687	0.136	0.997	0.721	0.143	0.997	0.763	0.710	0.114	0.998	0.737	0.115	0.996	0.724
rpart	0.616	0.151	0.675	0.173	0.238	0.719	0.185	0.086	0.858	0.703	0.135	0.091	**0.758**	0.171	0.029*	0.955

Specificity

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.723	0.142	0.644	0.146	0.914	0.761	0.107	0.135	0.989	0.724	0.183	0.453	0.707	0.156	0.583	0.178
xgboost	0.708	0.182	0.698	0.139	0.600	0.742	0.082	0.363	0.886	0.742	0.161	0.337	0.716	0.104	0.541	0.383
c50	0.661	0.382	0.663	0.272	0.571	0.577	0.250	0.797	0.264	0.600	0.244	0.730	0.602	0.182	0.762	0.524
knn	0.698	0.179	**0.795**	0.083	0.046*	0.733	0.117	0.311	0.060	0.642	0.143	0.781	0.661	0.092	0.696	0.617
glm	0.180	0.105	**0.606**	0.145	0.003**	**0.670**	0.156	0.003**	0.854	**0.634**	0.107	0.003**	**0.687**	0.123	0.003**	0.930
rpart	0.768	0.158	0.611	0.183	0.971	0.673	0.181	0.940	0.898	0.592	0.202	0.988	0.673	0.193	0.947	0.939

Precision

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.816	0.080	0.778	0.050	0.857	0.834	0.074	0.118	0.985	0.830	0.076	0.312	0.814	0.074	0.385	0.278
xgboost	0.818	0.088	0.800	0.061	0.652	0.824	0.036	0.594	0.882	0.845	0.077	0.216	0.824	0.052	0.577	0.342
c50	0.806	0.123	0.701	0.101	0.922	0.759	0.140	0.938	0.852	0.755	0.082	0.819	0.765	0.104	0.882	0.752
knn	0.799	0.080	0.821	0.063	0.207	0.805	0.089	0.423	0.143	0.777	0.065	0.797	0.784	0.042	0.652	0.615
glm	0.640	0.031	**0.742**	0.071	0.002**	**0.786**	0.081	0.001**	0.839	**0.762**	0.046	0.001**	**0.796**	0.066	0.001**	0.935
rpart	0.825	0.091	0.743	0.104	0.958	0.791	0.119	0.884	0.970	0.746	0.090	0.991	0.793	0.126	0.797	0.967

F1 0.5

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.747	0.108	0.744	0.113	0.318	0.756	0.115	0.318	0.779	0.775	0.110	0.080	0.765	0.100	0.246	0.423
xgboost	0.773	0.117	0.729	0.125	0.839	0.749	0.094	0.797	0.784	0.806	0.083	0.053	0.803	0.091	0.278	0.461
c50	0.614	0.203	0.746	0.252	0.234	0.690	0.147	0.097	0.289	0.780	0.086	0.082	**0.739**	0.121	0.019*	0.500
knn	0.699	0.127	0.610	0.112	0.968	0.706	0.119	0.577	0.839	0.746	0.060	0.078	0.752	0.084	0.246	0.615
glm	0.828	0.057	0.694	0.114	0.999	0.729	0.122	0.990	0.722	0.716	0.093	1.000	0.745	0.100	0.981	0.812
rpart	0.642	0.131	0.682	0.147	0.246	0.725	0.163	0.097	0.839	0.706	0.114	0.118	**0.761**	0.154	0.024*	0.978

AUC

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.729	0.082	0.693	0.055	0.905	0.751	0.086	0.142	0.971	0.746	0.079	0.270	0.733	0.072	0.461	0.361
xgboost	0.738	0.094	0.709	0.071	0.821	0.739	0.043	0.500	0.947	0.772	0.071	0.161	0.759	0.058	0.500	0.278
c50	0.635	0.081	0.601	0.116	0.920	0.634	0.090	0.581	0.784	0.657	0.096	0.423	**0.671**	0.085	0.033*	0.778
knn	0.692	0.064	0.686	0.059	0.500	0.710	0.106	0.342	0.577	0.692	0.068	0.547	0.704	0.052	0.305	0.601
glm	0.538	0.052	**0.646**	0.079	0.002**	**0.696**	0.088	0.001**	0.839	**0.672**	0.046	0.001**	**0.712**	0.083	0.001**	0.923
rpart	0.692	0.069	0.643	0.109	0.903	0.696	0.118	0.216	0.981	0.648	0.099	0.978	0.715	0.143	0.246	0.984

TSS

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.458	0.164	0.386	0.111	0.914	0.502	0.171	0.143	0.971	0.493	0.157	0.278	0.465	0.144	0.461	0.348
xgboost	0.476	0.188	0.417	0.143	0.821	0.478	0.086	0.500	0.935	0.544	0.141	0.161	0.518	0.116	0.500	0.278
c50	0.270	0.161	0.202	0.233	0.920	0.267	0.180	0.581	0.784	0.313	0.192	0.423	**0.343**	0.171	0.033*	0.784
knn	0.385	0.128	0.372	0.117	0.500	0.421	0.212	0.342	0.577	0.384	0.136	0.547	0.408	0.103	0.305	0.581
glm	0.076	0.103	**0.293**	0.159	0.002**	**0.392**	0.177	0.001**	0.839	**0.344**	0.093	0.001**	**0.424**	0.166	0.001**	0.920
rpart	0.384	0.139	0.286	0.218	0.903	0.393	0.235	0.216	0.982	0.296	0.199	0.978	0.431	0.286	0.246	0.984

All species

Sensitivity

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.913	0.014	0.896	0.019	0.986	**0.943**	0.017	0.003**	0.998	0.886	0.018	0.997	**0.945**	0.015	0.003**	0.998
xgboost	0.917	0.015	0.895	0.024	0.986	**0.949**	0.012	0.003**	1.000	0.864	0.017	1.000	**0.943**	0.013	0.005**	1.000
c50	0.885	0.020	0.769	0.049	1.000	**0.908**	0.034	0.038*	0.998	0.777	0.038	1.000	**0.925**	0.021	0.004**	0.998
knn	0.916	0.014	0.854	0.023	1.000	0.795	0.024	0.998	0.003**	0.844	0.023	1.000	0.824	0.019	1.000	0.005**
glm	0.783	0.258	0.748	0.034	0.615	0.851	0.025	0.539	0.998	0.741	0.030	0.652	0.861	0.022	0.539	0.998
rpart	0.879	0.023	0.717	0.085	1.000	0.879	0.027	0.500	1.000	0.692	0.095	1.000	0.879	0.027	0.500	0.998

Specificity

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.717	0.032	0.724	0.018	0.500	**0.767**	0.022	0.001**	0.998	0.709	0.020	0.884	**0.778**	0.022	0.001**	0.998
xgboost	0.760	0.030	0.710	0.023	0.997	0.749	0.025	0.986	1.000	0.726	0.021	0.997	0.760	0.025	0.561	1.000
c50	0.752	0.022	0.715	0.029	0.997	0.768	0.037	0.323	0.999	0.717	0.052	0.981	0.751	0.025	0.620	0.938
knn	0.766	0.029	0.706	0.022	1.000	0.760	0.025	0.682	0.998	0.709	0.024	1.000	0.749	0.022	0.981	1.000
glm	0.695	0.171	0.748	0.019	0.161	0.736	0.020	0.188	0.007**	0.726	0.020	0.312	0.727	0.023	0.278	0.594
rpart	0.783	0.025	0.699	0.095	0.990	0.780	0.029	0.814	0.989	0.704	0.071	0.990	0.780	0.029	0.814	0.990

Precision

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.620	0.028	0.620	0.018	0.688	**0.671**	0.023	0.001**	1.000	0.606	0.019	0.935	**0.683**	0.023	0.001**	1.000
xgboost	0.658	0.029	0.608	0.024	1.000	0.656	0.023	0.862	1.000	0.614	0.021	1.000	0.665	0.023	0.278	1.000
c50	0.643	0.023	0.576	0.021	1.000	0.665	0.037	0.065	1.000	0.582	0.039	1.000	0.652	0.024	0.161	1.000
knn	0.664	0.030	0.594	0.023	1.000	0.625	0.028	0.997	1.000	0.594	0.024	1.000	0.623	0.024	0.999	1.000
glm	0.592	0.091	0.599	0.022	0.385	0.619	0.021	0.188	1.000	0.576	0.022	0.754	0.614	0.021	0.312	1.000
rpart	0.672	0.026	0.554	0.056	1.000	0.669	0.027	0.814	1.000	0.544	0.029	1.000	0.669	0.027	0.814	1.000

F1 0.5

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.834	0.016	0.823	0.017	0.947	**0.872**	0.016	0.001**	1.000	0.811	0.018	0.990	**0.877**	0.016	0.001**	1.000
xgboost	0.850	0.017	0.818	0.024	0.999	**0.871**	0.012	0.001**	1.000	0.799	0.017	1.000	**0.870**	0.011	0.002**	1.000
c50	0.823	0.020	0.720	0.035	1.000	**0.845**	0.025	0.007**	1.000	0.727	0.028	1.000	**0.853**	0.015	0.003**	1.000
knn	0.851	0.017	0.785	0.022	1.000	0.754	0.023	1.000	0.001**	0.778	0.022	1.000	0.774	0.019	1.000	0.246
glm	0.711	0.188	0.712	0.029	0.577	0.791	0.022	0.461	1.000	0.700	0.026	0.577	0.796	0.019	0.423	1.000
rpart	0.828	0.018	0.672	0.050	1.000	0.827	0.019	0.814	1.000	0.653	0.065	1.000	0.827	0.019	0.814	1.000

AUC

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.815	0.019	0.810	0.015	0.862	**0.855**	0.016	0.001**	1.000	0.798	0.017	0.981	**0.862**	0.015	0.001**	0.998
xgboost	0.838	0.019	0.802	0.022	1.000	**0.849**	0.014	0.007**	1.000	0.795	0.016	1.000	**0.852**	0.012	0.005**	1.000
c50	0.819	0.018	0.742	0.020	1.000	**0.838**	0.021	0.005**	1.000	0.747	0.025	1.000	**0.838**	0.014	0.005**	1.000
knn	0.841	0.019	0.780	0.021	1.000	0.777	0.020	0.998	0.216	0.776	0.021	1.000	0.786	0.018	1.000	0.995
glm	0.739	0.073	0.748	0.020	0.348	**0.793**	0.017	0.019*	1.000	0.733	0.019	0.577	**0.794**	0.017	0.019*	1.000
rpart	0.831	0.015	0.708	0.022	1.000	0.830	0.014	0.963	1.000	0.698	0.020	1.000	0.830	0.014	0.963	1.000

TSS

	AOO & EOO only (base)		Ecological features only			All features			eco-all	Ecological features only FS			All features FS			eco-all
	mean	sd	mean	sd	p-value	mean	sd	p-value	p-value	mean	sd	p-value	mean	sd	p-value	p-value
rf	0.630	0.038	0.620	0.031	0.862	**0.710**	0.031	0.001**	1.000	0.596	0.034	0.981	**0.723**	0.030	0.001**	1.000
xgboost	0.676	0.038	0.605	0.043	1.000	**0.698**	0.027	0.007**	1.000	0.590	0.032	1.000	**0.704**	0.025	0.005**	1.000
c50	0.637	0.036	0.484	0.040	1.000	**0.676**	0.041	0.005**	1.000	0.493	0.050	1.000	**0.676**	0.028	0.005**	1.000
knn	0.682	0.037	0.560	0.041	1.000	0.554	0.041	1.000	0.216	0.553	0.041	1.000	0.572	0.036	1.000	0.997
glm	0.478	0.146	0.496	0.041	0.348	**0.587**	0.035	0.019*	1.000	0.466	0.038	0.577	**0.587**	0.033	0.019*	1.000
rpart	0.662	0.031	0.416	0.044	1.000	0.660	0.029	0.963	1.000	0.396	0.039	1.000	0.660	0.029	0.963	1.000