Supplementary Material

1 Supplementary Results

1.1 Description of explanatory variables used in the models other than the four approaches

1.1.1 Boyce index

The SDM models showed variability between taxa in their performance, as indicated by Boyce index (ANOVA, $\chi^2_2 = 11.984$, $P = 0.0074$). Birds had relatively low Boyce index values, while mammals had relatively high values (see Supplementary Figure 5A).

1.1.2 Indices that describe the area of suitable habitat and its changes

Only area of suitable habitat (ASH) showed variability across different taxa (ANOVA, χ^2_2 = 23.79, P < 0.0001), among the constructed GLMM models. ASH of birds (57189.66 ± 49386.30; mean ± standard deviation) and mammals (59052.24 ± 69395.95) was significantly larger than that of amphibians (26223.06 ± 31106.35) and reptiles (40486.53 ± 58155.62) (see Supplementary Figure 5B).

Change of range index (CRI) and loss of range index (LRI) showed the most influence of the different SSP scenarios (Supplementary Table 4A). Specifically, this factor was significant for CRI (ANOVA: χ^2_2 = 31.85, P < 0.0001) and LRI (ANOVA: χ22 = 1226.52, P < 0.0001), but was not for ASH. In the more severe future scenarios, the animals will face more serious threats; for example, comparing SSP5 to others, a larger area will become unsuitable, and the amount of suitable area will shrink (for SSP5: CRI: 0.060 ± 2.247; LRI: 0.288 ± 0.253; for SSP1: CRI: -0.066 ± 0.607; LRI: 0.212 ± 0.199).

All the different models exhibited significant impacts of the different time periods (Supplementary Table 4B) (ANOVA, ASH: χ^2_2 = 109.17, P < 0.0001; CRI: χ^2_2 = 19.75, P = 0.00019; LRI: χ^2_2 = 10. 3863.91, P < 0.0001). The further future scenario of 2080-2100 shows significantly more serious threats, that is, less area that is suitable, more area becoming unsuitable, and the overall distribution shrinking (ASH: 41284.38 ± 53644.68; CRI: 0.073 ± 2.380; LRI: 0.308 ± 0.257), than earlier time periods, for example, 2021-2040 (ASH: 41726.94 ± 50693.01; CRI: -0.073 ± 0.366; LRI: 0.185 ± 0.180).

2 Supplementary Figures and Tables

2.1 Supplementary Tables

Supplementary Table 1. Variables included in the analyses and their sources, as well as whether they were retained in the analysis after the pairwise correlation analysis (- = removed from the analysis, + = retained).

Variables	Description	Data type	Correlation	Data source
Bioclimatic				
Bio1	Annual Mean Temperature	continuous	-	(1)
Bio2	Mean Diurnal Range (Mean of monthly (max temp - min temp))	continuous	-	(1)
Bio3	Isothermality (Bio2/Bio7) (* 100)	continuous	+	(1)
Bio4	Temperature Seasonality (standard deviation *100)	continuous	+	(1)
Bio5	Max Temperature of Warmest Month	continuous	+	(1)
Bio6	Min Temperature of Coldest Month	continuous	+	(1)
Bio7	Temperature Annual Range (Bio5-Bio6)	continuous	-	(1)
Bio8	Mean Temperature of Wettest Quarter	continuous	-	(1)
Bio9	Mean Temperature of Driest Quarter	continuous	-	(1)
Bio10	Mean Temperature of Warmest Quarter	continuous	-	(1)
Bio11	Mean Temperature of Coldest Quarter	continuous	-	(1)
Bio12	Annual Precipitation	continuous	-	(1)
Bio13	Precipitation of Wettest Month	continuous	-	(1)
Bio14	Precipitation of Driest Month	continuous	+	(1)
Bio15	Precipitation Seasonality (Coefficient of Variation)	continuous	+	(1)
Bio16	Precipitation of Wettest Quarter	continuous	-	(1)
Bio17	Precipitation of Driest Quarter	continuous	-	(1)
Bio18	Precipitation of Warmest Quarter	continuous	+	(1)
Bio19	Precipitation of Coldest Quarter	continuous	-	(1)
Geographic				
Aspect	Aspect eastness	continuous	+	(2)
Slope	Slope	continuous	+	(2)
Distance from water	Euclidean distance from above ground water (m)	continuous	+	(3)
Anthropogenic				
Human population	Human population density	continuous	+	(4)
Land-use	Land-use based on the downscaling of GCAM	categorical	+	(5)

Data sources: (1) WorldClim, http://www.worldclim.org; (2) the United States Geological Survey (https://www.usgs.gov/, http://www.earthenv.org/topography); (3) OpenStreetMap Data Extracts (https://download.geofabrik.de/); (4)(M. Chen et al., 2020); (5)(Gao, 2017) (https://data.pnnl.gov/dataset/13192).

Supplementary Table 2. Retained and removed climatic variables. Variables in orange text were not highly correlated (Pearson |r| < 0.7) with any other variable. Variables in red text were highly correlated, but were retained, because they have been often selected in previous studies with these taxa (as shown in the rest of the table). Crossed out variables represent those that were removed.

Climatic variables	Reason for retention	Reference Article: amphibians	birds	mammals	reptiles	other
~~Bio1~~						
~~Bio2~~				(Ribeiro, B.R. et al., 2018)		
Bio3	No correlation	(Mokhatla, M.M. et al., 2015)	(Distler, T. et al., 2015; Li, X. et al., 2015; Magory Cohen, T. and Dor, R., 2019)	(Ribeiro, B.R. et al., 2018)		
Bio4	Use in previous literature	(Lemes, P. et al., 2014; Munguía, M. et al., 2012; Peñalver-Alcázar, M. et al., 2021; Sangermano, F. et al., 2015)	(Ko, C.Y. et al., 2016; Li, X. et al., 2015; Magory Cohen, T. and Dor, R., 2019)	(Bogoni, J.A. and Tagliari, M.M., 2021; Deb, J.C. et al., 2020; Guevara, L. et al., 2018; Leach, K. et al., 2017; Morueta-Holme, N. et al., 2010; Stevens, R.D., 2013)	(Barnagaud, J.Y. et al., 2021; Clusella-trullas, A.S. et al., 2011; Ribeiro, B.R. et al., 2018; Sheldon, K.S. et al., 2015)	(Mouchet, M. et al., 2015)
Bio5	Use in previous literature	(Biber, M.F. et al., 2020; Gherghel, I. et al., 2020; Groff, L.A. et al., 2014; Munguía, M. et al., 2012)	(Cohen, J.M. et al., 2020; Distler, T. et al., 2015; Huang, Q. et al., 2017; Li, X. et al., 2015)	(Guevara, L. et al., 2018; Leach, K. et al., 2017; Morán-Ordóñez, A. et al., 2017; Ribeiro, B.R. et al., 2018)	(Console, G. et al., 2020; Farashi, A. and Alizadeh-Noughani, M., 2021; Li, X. et al., 2016; Muñoz, A. et al., 2016)	(Germain, S.J. and Lutz, J.A., 2020; Li, Y. et al., 2016; Zhang, Z. et al., 2021)
Bio6	Use in previous literature	(Gherghel, I. et al., 2020; Groff, L.A. et al., 2014; Li, X. et al., 2016; Munguía, M. et al., 2012; Muñoz, A. et al., 2016; Vasconcelos, T.S. et al., 2012)	(Cohen, J.M. et al., 2020; Distler, T. et al., 2015; Huang, Q. et al., 2017; Li, X. et al., 2015)	(Guevara, L. et al., 2018; Jurestovsky, D. and Andrew Joyner, T., 2018; Morán-Ordóñez, A. et al., 2017)	(Console, G. et al., 2020; Ihlow, F. et al., 2012; Li, X. et al., 2016; Muñoz, A. et al., 2016)	(Germain, S.J. and Lutz, J.A., 2020; Li, Y. et al., 2016; Zhang, Z. et al., 2021)
~~Bio7~~						
~~Bio8~~		(Mokhatla, M.M. et al., 2015)	(Salas, E.A.L.. et al., 2017)			
~~Bio9~~		(Mokhatla, M.M. et al., 2015)	(Salas, E.A.L.. et al., 2017)			
~~Bio10~~						
~~Bio11~~					(Cunningham, H.R. et al., 2016)	
~~Bio12~~			(Schooler, S.L. et al., 2020)			
~~Bio13~~				(Ribeiro, B.R. et al., 2018) (Deb, J.C. et al., 2019)	(Farashi, A. and Alizadeh-Noughani, M., 2021)	

Bio14	Use in previous literature	(Gherghel, I. et al., 2020; Sangermano, F. et al., 2015; Vol, H., 2021)	(Distler, T. et al., 2015; Dreitz, V.J. et al., 2012; Li, X. et al., 2015; Magory Cohen, T. and Dor, R., 2019; Salas, E.A.L.. et al., 2017; Schooler, S.L. et al., 2020)	(Guevara, L. et al., 2018; Hill, S.E. and Winder, I.C., 2019; Morueta-Holme, N. et al., 2010; Ribeiro, B.R. et al., 2018)	(Console, G. et al., 2020)	(Xu, Z., 2015)
Bio15	No correlation	(Barrett, K. et al., 2014; Gherghel, I. et al., 2020; Goudarzi, F. et al., 2021; Lemes, P. et al., 2014; Mokhatla, M.M. et al., 2015; Peñalver-Alcázar, M. et al., 2021; Vasconcelos, T.S. et al., 2012)	(Biber, M.F. et al., 2020; Ko, C.Y. et al., 2016; Li, X. et al., 2015; Salas, E.A.L.. et al., 2017)	(Biber, M.F. et al., 2020; Deb, J.C. et al., 2020; Dormann, C.F. et al., 2008; Lamelas-López, L. et al., 2020; Leach, K. et al., 2017; Morueta-Holme, N. et al., 2010)	(Barnagaud, J.Y. et al., 2021; Ihlow, F. et al., 2012; Li, X. et al., 2016; Rodrigues, J.F.M. and Lima-Ribeiro, M.S., 2018)	
~~Bio16~~					(Farashi, A. and Alizadeh-Noughani, M., 2021)	
~~Bio17~~					(Farashi, A. and Alizadeh-Noughani, M., 2021)	
Bio18	Not correlated with the remaining variables	(Araújo, M.B. et al., 2006; Barrett, K. et al., 2014; Biber, M.F. et al., 2020; Gherghel, I. et al., 2020; Vasconcelos, T.S. et al., 2012)	(Matthews, S.N. et al., 2011)(Distler, T. et al., 2015)	(Dormann, C.F. et al., 2008; Maiorano, L. et al., 2011; Mestre, F. et al., 2017; Morueta-Holme, N. et al., 2010; Ribeiro, B.R. et al., 2018)	(Araújo, M.B. et al., 2006; Farashi, A. and Alizadeh-Noughani, M., 2021; Ihlow, F. et al., 2012; Thompson, D.M. et al., 2017)	
~~Bio19~~					(Farashi, A. and Alizadeh-Noughani, M., 2021)	

Supplementary Table 3. Studied species and SDM performance, as measured by the Boyce index, in all four approaches, and models' maxTSS threshold values. Species are ordered by taxa and then scientific name.

Species information			Boyce index			Approach 4
Latin name	Family	IUCN	Approach 1	Approach 2&3	Approach 4	threshold
Amphibians						
Amolops aniqiaoensis	Ranidae	LC	0.915	0.972	0.925	0.170
Amolops bellulus	Ranidae	VU	0.636	0.715	1	1.000
Amolops daiyunensis	Ranidae	VU	0.931	0.936	0.959	0.436
Amolops granulosus	Ranidae	NT	0.997	0.993	0.997	0.133
Amolops hainanensis	Ranidae	EN	0.947	0.986	0.976	0.181
Amolops hongkongensis	Ranidae	EN	0.889	0.919	0.901	0.123
Amolops lifanensis	Ranidae	LC	0.99	0.999	0.957	0.249
Amolops loloensis	Ranidae	VU	0.991	0.994	0.995	0.156
Amolops torrentis	Ranidae	LC	0.743	0.91	0.956	0.298
Amolops wuyiensis	Ranidae	LC	0.991	0.995	0.993	0.082
Andrias davidianus	Cryptobranchidae	CR	0.994	0.996	0.997	0.173
Aquixalus idiootocus	Rhacophoridae	LC	0.942	0.907	0.895	0.163
Bamburana exiliversabilis	Ranidae	NT	0.884	0.908	0.949	0.304
Bamburana nasuta	Ranidae	VU	0.994	0.994	0.995	0.332
Bamburana versabilis	Ranidae	NT	0.88	0.88	0.908	0.432
Batrachuperus karlschmidti	Hynobiidae	VU	0.953	0.921	0.702	0.427
Batrachuperus londongensis	Hynobiidae	VU	0.923	0.923	0.899	0.064
Batrachuperus pinchonii	Hynobiidae	VU	0.952	0.952	0.965	0.190
Batrachuperus tibetanus	Hynobiidae	VU	0.993	0.993	0.989	0.075
Batrachuperus yenyuanensis	Hynobiidae	VU	0.997	0.997	0.806	0.264
Bombina fortinuptialis	Bombinatoridae	VU	0.993	0.993	0.964	0.111
Bombina maxima	Bombinatoridae	LC	0.967	0.967	0.962	0.299
Brachytarsophrys chuannanensis	Megophryidae	NT	0.921	0.921	0.757	0.717
Buergeria robusta	Rhacophoridae	LC	0.95	0.95	0.952	0.244
Bufo bankorensis	Bufonidae	LC	0.915	0.915	0.873	0.199
Bufo tibetanus	Bufonidae	LC	0.886	0.84	0.877	0.107
Bufo tuberculatus	Bufonidae	NT	0.998	0.998	0.995	0.206
Cynops chenggongensis	Salamandridae	CR	0.865	0.769	0.922	0.067
Cynops cyanurus	Salamandridae	NT	0.995	0.995	0.988	0.316
Cynops orientalis	Salamandridae	NT	0.868	0.868	0.997	0.238
Dianrana pleuraden	Ranidae	LC	0.965	0.965	0.994	0.357
Duttaphrynus cyphosus	Bufonidae	LC	1	1	1	0.457
Feirana quadranus	Dicroglossidae	NT	0.991	0.991	0.996	0.373
Feirana taihangnica	Dicroglossidae	VU	0.942	0.942	0.938	0.316
Glandirana minima	Ranidae	CR	0.975	0.975	0.985	0.299
Gynandropaa liui	Dicroglossidae	VU	0.874	0.874	0.939	0.114
Huangixalus translineatus	Rhacophoridae	VU	0.969	0.969	0.968	0.444
Hyla sanchiangensis	Hylidae	LC	0.978	0.978	0.994	0.274
Hyla tsinlingensis	Hylidae	LC	0.872	0.872	0.913	0.064
Hynobius arisanensis	Hynobiidae	EN	0.992	0.999	0.99	0.218

Hynobius yiwuensis	Hynobiidae	VU	0.751	0.875	0.851	0.331
Kaloula nonggangensis	Microhylidae	DD	0.422	0.858	0.991	0.905
Kaloula rugifera	Microhylidae	LC	0.99	0.976	0.988	0.226
Kaloula verrucosa	Microhylidae	LC	0.464	0.951	0.874	0.510
Leptobrachium hainanense	Megophryidae	VU	0.99	0.992	0.969	0.245
Leptobrachium huashen	Megophryidae	NT	0.802	0.901	0.922	0.429
Liangshantriton taliangensis	Salamandridae	VU	0.98	0.959	0.949	0.279
Limnonectes fragilis	Dicroglossidae	EN	0.877	0.941	0.969	0.293
Limnonectes fujianensis	Dicroglossidae	NT	0.971	0.95	0.957	0.219
Liua shihi	Hynobiidae	NT	0.976	0.98	0.99	0.154
Liuhurana shuchinae	Ranidae	NT	0.988	0.982	0.938	0.232
Liuixalus hainanus	Rhacophoridae	DD	0.993	0.989	0.995	0.272
Liuixalus kempii	Rhacophoridae	DD	0.784	0.923	0.948	0.260
Liuixalus romeri	Rhacophoridae	VU	0.858	0.923	0.873	0.485
Liurana xizangensis	Occidozygidae	DD	0.978	0.996	0.997	0.133
Maculopaa maculosa	Dicroglossidae	EN	0.976	0.96	0.992	0.318
Megophrys binchuanensis	Megophryidae	VU	0.941	0.941	0.959	0.308
Megophrys boettgeri	Megophryidae	LC	0.897	0.97	0.999	0.203
Megophrys daweimontis	Megophryidae	VU	0.97	0.987	0.993	0.296
Megophrys gigantica	Megophryidae	VU	0.877	0.971	0.975	0.415
Megophrys huangshanensis	Megophryidae	VU	0.996	0.991	0.917	0.203
Megophrys jingdongensis	Megophryidae	NT	0.939	0.999	0.984	0.224
Megophrys jinggangensis	Megophryidae	DD	0.951	0.913	0.961	0.221
Megophrys lini	Megophryidae	DD	0.995	0.988	0.928	0.388
Megophrys mangshanensis	Megophryidae	NT	0.768	0.858	0.848	0.456
Megophrys medogensis	Megophryidae	EN	0.957	0.921	0.917	0.178
Megophrys omeimontis	Megophryidae	VU	0.998	0.995	0.997	0.297
Megophrys shapingensis	Megophryidae	LC	0.98	0.996	0.959	0.103
Megophrys spinata	Megophryidae	LC	0.999	0.996	0.995	0.195
Microhyla mixtura	Microhylidae	LC	0.983	0.994	0.9	0.269
Micryletta steinegeri	Microhylidae	LC	0.971	0.973	0.987	0.041
Nanorana pleskei	Dicroglossidae	LC	0.999	0.954	0.997	0.267
Nanorana ventripunctata	Dicroglossidae	LC	0.992	0.981	0.816	0.235
Nidirana daunchina	Ranidae	LC	0.989	0.978	0.963	0.269
Odorrana anlungensis	Ranidae	VU	0.885	0.911	1	0.280
Odorrana hainanensis	Ranidae	VU	0.906	0.954	0.952	0.400
Odorrana hejiangensis	Ranidae	VU	0.999	0.999	0.998	0.286
Odorrana huanggangensis	Ranidae	LC	0.966	0.529	0.94	0.639
Odorrana jingdongensis	Ranidae	VU	0.856	0.914	0.99	0.208
Odorrana junlianensis	Ranidae	NT	0.997	0.919	0.923	0.217
Odorrana lungshengensis	Ranidae	NT	0.904	0.994	0.955	0.200
Odorrana nanjiangensis	Ranidae	NT	0.999	0.995	0.995	0.399
Odorrana swinhoana	Ranidae	LC	0.851	0.844	0.857	0.236
Odorrana tiannanensis	Ranidae	VU	0.978	0.975	0.967	0.180
Odorrana tormota	Ranidae	VU	0.96	0.974	0.972	0.408
Odorrana yizhangensis	Ranidae	VU	0.921	0.851	0.923	0.078
Onychodactylus zhangyapingi	Hynobiidae	VU	0.902	0.966	0.999	0.231

Oreolalax granulosus	Megophryidae	VU	0.982	0.974	0.992	0.296
Oreolalax jingdongensis	Megophryidae	VU	0.943	0.984	0.991	0.294
Oreolalax lichuanensis	Megophryidae	NT	0.973	0.997	0.77	0.081
Oreolalax major	Megophryidae	VU	0.994	0.989	0.798	0.408
Oreolalax pingii	Megophryidae	VU	0.99	0.975	0.99	0.321
Oreolalax popei	Megophryidae	VU	1	1	0.994	0.297
Oreolalax puxiongensis	Megophryidae	EN	0.742	0.849	0.997	0.869
Oreolalax rhodostigmatus	Megophryidae	VU	0.995	0.994	0.967	0.196
Oreolalax rugosus	Megophryidae	NT	0.998	0.997	0.822	0.291
Oreolalax schmidti	Megophryidae	NT	0.99	0.999	1	0.240
Oreolalax xiangchengensis	Megophryidae	LC	0.83	0.86	0.788	0.346
Pachytriton archospotus	Salamandridae	LC	0.998	0.932	0.967	0.322
Pachytriton brevipes	Salamandridae	LC	0.902	1	0.997	0.270
Pachytriton changi	Salamandridae	DD	0.901	0.923	0.899	0.747
Pachytriton granulosus	Salamandridae	DD	0.995	0.996	0.981	0.147
Pachytriton inexpectatus	Salamandridae	VU	0.942	0.996	0.907	0.427
Pachytriton moi	Salamandridae	DD	0.963	0.982	0.982	0.265
Paramegophrys alpinus	Megophryidae	EN	0.963	0.958	0.833	0.241
Paramegophrys liui	Megophryidae	LC	0.828	0.857	0.833	0.415
Paramegophrys oshanensis	Megophryidae	LC	1	0.999	0.956	0.291
Paramesotriton caudopunctatus	Salamandridae	VU	0.993	0.954	0.96	0.398
Paramesotriton chinensis	Salamandridae	NT	0.984	0.984	0.998	0.142
Paramesotriton fuzhongensis	Salamandridae	VU	0.984	0.99	0.994	0.270
Paramesotriton hongkongensis	Salamandridae	NT	0.941	0.992	0.971	0.327
Paramesotriton maolanensis	Salamandridae	DD	-0.093	0.786	0.909	0.577
Paramesotriton yunwuensis	Salamandridae	EN	0.967	0.948	0.762	0.290
Paramesotriton zhijinensis	Salamandridae	EN	0.975	0.723	0.863	0.478
Parapelophryne scalpta	Bufonidae	VU	0.786	0.992	0.976	0.221
Pelophylax fukienensis	Ranidae	NT	0.972	0.961	0.992	0.243
Pelophylax hubeiensis	Ranidae	LC	0.985	0.997	0.984	0.180
Pelophylax plancyi	Ranidae	LC	0.909	0.995	0.903	0.294
Pseudoamolops sauteri	Ranidae	VU	0.998	0.999	0.972	0.186
Pseudohynobius flavomaculatus	Hynobiidae	VU	0.579	0.881	0.821	0.945
Pseudorana sangzhiensis	Ranidae	LC	0.967	0.97	0.955	0.091
Pseudorana weiningensis	Ranidae	NT	0.998	1	0.971	0.279
Qiongbufo ledongensis	Bufonidae	EN	0.952	0.846	0.74	0.059
Quasipaa exilispinosa	Dicroglossidae	VU	0.614	0.792	0.898	0.171
Quasipaa jiulongensis	Dicroglossidae	VU	0.999	0.994	0.998	0.131
Quasipaa shini	Dicroglossidae	VU	1	0.996	0.99	0.311
Rana chaochiaoensis	Ranidae	LC	0.653	0.984	0.998	0.225
Rana chensinensis	Ranidae	LC	0.994	0.992	0.999	0.421
Rana kukunoris	Ranidae	LC	0.993	0.993	0.944	0.153
Rana longicrus	Ranidae	LC	0.933	0.969	0.954	0.190
Rana omeimontis	Ranidae	LC	0.99	0.999	1	0.234
Rana zhenhaiensis	Ranidae	LC	0.996	0.985	0.998	0.222
Rhacophorus arvalis	Rhacophoridae	VU	0.939	0.907	0.962	0.150

Rhacophorus aurantiventris	Rhacophoridae	VU	0.934	0.868	0.943	0.204
Rhacophorus chenfui	Rhacophoridae	LC	0.999	0.992	0.999	0.277
Rhacophorus dennysi	Rhacophoridae	LC	0.828	0.836	0.811	0.386
Rhacophorus hungfuensis	Rhacophoridae	EN	0.997	0.981	0.993	0.238
Rhacophorus leucofasciatus	Rhacophoridae	VU	0.989	0.965	0.995	0.341
Rhacophorus minimus	Rhacophoridae	NT	0.707	1	0.855	0.634
Rhacophorus nigropunctatus	Rhacophoridae	NT	0.99	0.999	0.996	0.372
Rhacophorus prasinatus	Rhacophoridae	NT	0.957	0.955	0.706	0.252
Rhacophorus rhodopus	Rhacophoridae	LC	0.939	0.96	0.999	0.395
Rhacophorus taipeianus	Rhacophoridae	NT	0.9	0.973	0.922	0.162
Rhacophorus verrucopus	Rhacophoridae	DD	0.912	0.989	0.927	0.384
Rhacophorus yaoshanensis	Rhacophoridae	EN	0.984	0.994	0.997	0.205
Rugosa tientaiensis	Ranidae	NT	0.962	0.977	0.981	0.279
Scutiger glandulatus	Megophryidae	LC	0.99	0.983	0.991	0.116
Scutiger jiulongensis	Megophryidae	VU	0.982	0.989	0.959	0.186
Scutiger maculatus	Megophryidae	CR	0.994	0.989	0.975	0.169
Scutiger mammatus	Megophryidae	LC	0.929	0.894	0.949	0.288
Scutiger muliensis	Megophryidae	EN	0.956	0.949	0.965	0.145
Scutiger ningshanensis	Megophryidae	EN	0.996	1	0.999	0.424
Scutiger pingwuensis	Megophryidae	EN	0.99	0.984	0.978	0.160
Scutiger tuberculatus	Megophryidae	VU	0.999	0.997	0.989	0.320
Sylvirana bannanica	Ranidae	VU	0.972	0.962	0.983	0.098
Sylvirana hekouensis	Ranidae	VU	0.956	0.987	0.983	0.501
Sylvirana latouchii	Ranidae	LC	0.822	0.79	0.829	0.477
Sylvirana menglaensis	Ranidae	LC	0.932	0.988	0.991	0.476
Sylvirana nigrotympanica	Ranidae	DD	0.944	0.982	0.98	0.512
Sylvirana spinulosa	Ranidae	NT	0.95	0.958	0.982	0.293
Taylorana liui	Occidozygidae	VU	0.459	0.898	0.857	0.471
Theloderma moloch	Rhacophoridae	DD	0.987	0.993	0.986	0.157
Torrentophryne ailaoanus	Bufonidae	LC	0.845	0.949	0.945	0.314
Torrentophryne aspinia	Bufonidae	VU	0.693	0.979	0.98	0.632
Tylototriton kweichowensis	Salamandridae	VU	0.991	0.996	0.973	0.169
Tylototriton pseudoverrucosus	Salamandridae	NT	0.848	0.863	0.754	0.349
Tylototriton yangi	Salamandridae	NT	0.998	0.999	0.997	0.234
Unculuana unculuanus	Dicroglossidae	EN	0.941	0.997	0.995	0.263
Vibrissaphora boringii	Megophryidae	EN	0.998	0.998	0.999	0.251
Vibrissaphora leishanensis	Megophryidae	VU	0.957	0.903	0.948	0.068
Vibrissaphora liui	Megophryidae	NT	0.877	0.922	0.891	0.394
Yaotriton hainanensis	Salamandridae	EN	0.8	0.765	0.757	0.371
Yaotriton liuyangensis	Salamandridae	DD	0.999	0.96	0.98	0.313
Yaotriton wenxianensis	Salamandridae	VU	0.742	0.964	0.971	0.255
Yerana yei	Dicroglossidae	VU	1	1	1	0.402
Birds						
Actinodura morrisoniana	Timaliidae	LC	0.96	0.863	0.863	0.071
Aegithalos fuliginosus	Aegithalidae	LC	0.987	0.98	0.98	0.139
Alcippe striaticollis	Timaliidae	LC	0.943	0.925	0.925	0.205

Alcippe variegaticeps	Timaliidae	VU	0.843	0.882	0.882	0.298
Alectoris magna	Phasianidae	NT	0.967	0.967	0.967	0.223
Arborophila ardens	Phasianidae	EN	0.942	0.939	0.939	0.320
Arborophila crudigularis	Phasianidae	NT	0.937	0.87	0.87	0.175
Arborophila gingica	Phasianidae	VU	0.983	0.953	0.953	0.137
Arborophila rufipectus	Phasianidae	EN	0.957	0.915	0.915	0.028
Babax koslowi	Timaliidae	NT	0.532	0.747	0.747	0.389
Bambusicola thoracicus	Phasianidae	LC	1	0.999	0.999	0.319
Certhia tianquanensis	Certhiidae	VU	0.905	0.939	0.939	0.029
Chrysolophus pictus	Phasianidae	NT	0.999	0.999	0.999	0.209
Crossoptilon auritum	Phasianidae	NT	0.99	0.99	0.99	0.121
Crossoptilon crossoptilon	Phasianidae	NT	0.984	0.99	0.99	0.178
Crossoptilon harmani	Phasianidae	NT	0.939	0.99	0.99	0.141
Crossoptilon mantchuricum	Phasianidae	VU	0.976	0.994	0.994	0.257
Emberiza koslowi	Emberizidae	VU	0.977	0.837	0.837	0.229
Garrulax courtoisi	Timaliidae	CR	0.926	0.94	0.94	0.490
Garrulax davidi	Timaliidae	LC	0.995	0.997	0.997	0.377
Garrulax elliotii	Timaliidae	LC	0.998	0.997	0.997	0.333
Garrulax henrici	Timaliidae	LC	0.901	0.81	0.81	0.076
Garrulax lunulatus	Timaliidae	LC	0.85	0.917	0.917	0.165
Garrulax maximus	Timaliidae	LC	0.985	0.98	0.98	0.234
Garrulax morrisonianus	Timaliidae	LC	-0.292	0.597	0.597	0.312
Garrulax poecilorhynchus	Timaliidae	LC	0.998	1	1	0.131
Garrulax sukatschewi	Timaliidae	VU	0.815	0.633	0.633	0.397
Garrulax taewanus	Timaliidae	NT	0.93	0.989	0.989	0.246
Heterophasia auricularis	Timaliidae	LC	0.864	0.87	0.87	0.186
Kozlowia roborowskii	Fringillidae	VU	0.297	0.324	0.324	0.611
Latoucheornis siemsseni	Emberizidae	LC	0.973	0.935	0.935	0.068
Leptopoecile elegans	Sylviidae	NT	0.963	0.958	0.958	0.188
Liocichla omeiensis	Timaliidae	VU	0.892	0.776	0.776	0.302
Liocichla steerii	Timaliidae	LC	0.874	0.863	0.863	0.114
Lophophorus lhuysii	Phasianidae	EN	0.977	0.991	0.991	0.139
Lophura swinhoii	Phasianidae	NT	0.961	0.949	0.949	0.176
Megalima nuchalis	Capitonidae	LC	0.884	0.823	0.823	0.076
Montifringilla henrici	Passeridae	NT	0.885	0.862	0.862	0.147
Moupinia poecilotis	Timaliidae	LC	0.75	0.803	0.803	0.274
Myophonus insularis	Turdidae	LC	0.903	0.941	0.941	0.258
Paradoxornis conspicillatus	Paradoxornithidae	NT	0.952	0.949	0.949	0.185
Paradoxornis paradoxus	Paradoxornithidae	NT	0.959	0.837	0.837	0.365
Parus davidi	Paridae	LC	0.851	0.917	0.917	0.023
Parus holsti	Paridae	LC	0.824	0.253	0.253	0.402
Parus superciliosus	Paridae	NT	0.907	0.938	0.938	0.207
Parus venustulus	Paridae	LC	0.972	0.993	0.993	0.219
Perisoreus internigrans	Corvidae	VU	0.927	0.925	0.925	0.278
Phoenicurus alaschanicus	Turdidae	EN	0.976	0.885	0.885	0.357
Phylloscopus emeiensis	Sylviidae	LC	0.918	0.921	0.921	0.189

Phylloscopus hainanus	Sylviidae	VU	0.804	0.76	0.76	0.342
Phylloscopus kansuensis	Sylviidae	LC	0.97	0.986	0.986	0.231
Podoces biddulphi	Corvidae	VU	0.947	0.933	0.933	0.060
Polyplectron katsumatae	Phasianidae	CR	0.798	0.925	0.925	0.590
Pseudopodoces humilis	Paridae	LC	0.986	0.993	0.993	0.210
Pycnonotus taivanus	Pycnonotidae	VU	0.948	0.937	0.937	0.170
Regulus goodfellowi	Regulidae	LC	0.975	0.949	0.949	0.130
Sitta yunnanensis	Sittidae	VU	0.862	0.985	0.985	0.131
Stachyris nonggangensis	Timaliidae	EN	0.877	0.922	0.922	0.122
Strix davidi	Strigidae	VU	0.811	0.827	0.827	0.211
Syrmaticus ellioti	Phasianidae	VU	0.956	0.987	0.987	0.263
Syrmaticus mikado	Phasianidae	NT	0.989	0.983	0.983	0.175
Syrmaticus reevesii	Phasianidae	EN	0.95	0.988	0.988	0.178
Tarsiger johnstoniae	Turdidae	LC	0.916	0.905	0.905	0.049
Tetraophasis obscurus	Phasianidae	VU	0.974	0.986	0.986	0.166
Tetraophasis szechenyii	Phasianidae	VU	0.956	0.868	0.868	0.138
Tetrastes sewerzowi	Tetraonidae	NT	0.967	0.972	0.972	0.293
Tragopan caboti	Phasianidae	EN	0.985	0.973	0.973	0.168
Turdus mupinensis	Turdidae	LC	0.975	0.985	0.985	0.223
Urocissa caerulea	Corvidae	LC	0.984	0.99	0.99	0.189
Urocynchramus pylzowi	Emberizidae	NT	0.956	0.906	0.906	0.201
Yuhina brunneiceps	Timaliidae	LC	0.895	0.877	0.877	0.164
Mammals						
Aeretes melanopterus	Sciuridae	NT	0.999	0.999	0.988	0.239
Ailuropoda melanoleuca	Ailuropodidae	VU	0.998	0.999	0.995	0.266
Anourosorex yamashinai	Soricidae	DD	0.95	0.984	0.901	0.243
Apodemus chevrieri	Muridae	LC	0.918	0.86	0.993	0.277
Apodemus semotus	Muridae	LC	0.913	0.937	0.47	0.461
Arielulus torquatus	Vespertilionidae	VU	0.945	0.993	0.928	0.320
Barbastella beijingensis	Vespertilionidae	DD	0.941	0.842	0.707	0.074
Blarinella quadraticauda	Soricidae	LC	0.994	0.997	0.997	0.198
Bos mutus	Bovidae	VU	0.999	0.989	0.998	0.157
Brachiones przewalskii	Muridae	LC	0.943	0.996	0.991	0.399
Cansumys canus	Cricetidae	LC	0.965	0.959	0.979	0.118
Capricornis swinhoei	Bovidae	LC	0.951	0.972	0.972	0.169
Caryomys eva	Cricetidae	LC	1	1	0.998	0.292
Caryomys inez	Cricetidae	LC	1	0.979	0.994	0.307
Chaetocauda sichuanensis	Gliridae	EN	0.988	0.9	0.954	0.204
Chodsigoa hypsibia	Soricidae	LC	0.884	0.9	0.986	0.264
Chodsigoa lamula	Soricidae	NT	0.977	0.96	0.964	0.283
Chodsigoa smithii	Soricidae	LC	0.995	0.999	0.995	0.151
Cricetulus kamensis	Cricetidae	NT	0.95	0.951	0.866	0.131
Crocidura rapax	Soricidae	LC	0.91	0.953	0.893	0.137
Crocidura tanakae	Soricidae	LC	0.966	0.977	0.943	0.065
Elaphurus davidianus	Cervidae	CR	0.802	0.76	-0.445	0.433
Eospalax fontanierii	Spalacidae	LC	0.641	0.543	0.959	0.410

Eospalax rothschildi	Spalacidae	LC	1	0.992	0.984	0.240
Eospalax smithii	Spalacidae	NT	0.984	0.964	0.996	0.178
Eothenomys chinensis	Cricetidae	NT	0.993	0.991	0.998	0.115
Eothenomys custos	Cricetidae	LC	0.951	0.974	0.988	0.133
Eothenomys miletus	Cricetidae	LC	1	1	0.97	0.083
Eothenomys olitor	Cricetidae	NT	0.888	0.988	0.973	0.101
Eothenomys proditor	Cricetidae	NT	0.981	0.98	0.472	0.231
Eothenomys wardi	Cricetidae	NT	0.956	0.985	0.987	0.240
Eozapus setchuanus	Dipodidae	LC	0.782	0.966	0.999	0.289
Episoriculus fumidus	Soricidae	NT	0.928	0.935	0.945	0.253
Euroscaptor grandis	Talpidae	VU	0.88	0.985	0.979	0.324
Felis bieti	Felidae	CR	0.975	0.986	0.975	0.170
Lepus yarkandensis	Leporidae	NT	0.939	0.996	0.997	0.260
Lipotes vexillifer	Lipotidae	CR	0.995	0.996	0.974	0.282
Macaca thibetana	Cercopithecidae	VU	0.76	0.97	0.994	0.374
Mesechinus hughi	Erinaceidae	NT	0.986	0.971	0.872	0.266
Microtus kikuchii	Cricetidae	NT	0.915	0.923	0.648	0.579
Mogera kanoana	Talpidae	DD	0.811	0.656	0.844	0.180
Moschus anhuiensis	Moschidae	CR	0.988	0.994	0.989	0.430
Moschus fuscus	Moschidae	CR	0.992	0.962	0.998	0.192
Muntiacus crinifrons	Cervidae	EN	0.922	0.982	0.963	0.164
Muntiacus gongshanensis	Cervidae	CR	0.97	0.966	0.963	0.188
Muntiacus reevesi	Cervidae	VU	0.918	0.993	0.994	0.302
Murina bicolor	Vespertilionidae	DD	0.895	0.87	0.924	0.176
Murina chrysochaetes	Vespertilionidae	DD	0.98	0.964	0.904	0.139
Murina gracilis	Vespertilionidae	DD	0.969	0.818	0.945	0.163
Murina lorelieae	Vespertilionidae	DD	0.879	0.898	0.92	0.546
Murina puta	Vespertilionidae	NT	0.95	0.973	0.914	0.319
Murina recondita	Vespertilionidae	DD	0.918	0.869	0.855	0.187
Myodes shanseius	Cricetidae	DD	0.815	0.947	0.996	0.229
Myotis davidii	Vespertilionidae	LC	0.978	0.999	0.998	0.391
Myotis fimbriatus	Vespertilionidae	NT	0.746	1	0.782	0.731
Myotis pequinius	Vespertilionidae	LC	0.995	0.977	0.992	0.119
Neodon irene	Cricetidae	LC	0.94	0.944	0.997	0.155
Neodon linzhiensis	Cricetidae	NT	0.941	0.981	0.925	0.874
Neohylomys hainanensis	Erinaceidae	VU	0.991	0.997	0.999	0.371
Niviventer andersoni	Muridae	LC	0.974	0.975	0.984	0.115
Niviventer coninga	Muridae	LC	0.867	0.93	0.961	0.201
Niviventer culturatus	Muridae	NT	0.809	0.941	0.759	0.308
Niviventer excelsior	Muridae	LC	0.853	0.958	0.999	0.162
Nyctalus plancyi	Vespertilionidae	LC	1	0.991	1	0.309
Ochotona cansus	Ochotonidae	LC	0.995	0.883	0.96	0.170
Ochotona erythrotis	Ochotonidae	LC	0.707	0.778	0.922	0.499
Ochotona gloveri	Ochotonidae	LC	0.797	0.858	0.816	0.123
Ochotona iliensis	Ochotonidae	EN	0.983	0.996	0.974	0.176
Ochotona thomasi	Ochotonidae	NT	0.725	0.822	0.982	0.321

Pantholops hodgsonii	Bovidae	NT	0.794	0.881	0.824	0.211
Petaurista alborufus	Sciuridae	LC	0.963	0.972	0.996	0.298
Petaurista xanthotis	Sciuridae	LC	0.741	0.893	0.996	0.159
Plecotus taivanus	Vespertilionidae	NT	0.964	0.98	0.658	0.288
Procapra picticaudata	Bovidae	NT	0.924	1	0.994	0.145
Proedromys bedfordi	Cricetidae	VU	0.991	0.996	1	0.469
Proedromys liangshanensis	Cricetidae	NT	0.964	0.939	0.983	0.233
Rhinolophus formosae	Rhinolophidae	NT	0.981	0.975	0.995	0.160
Rhinolophus huananus	Rhinolophidae	NT	0.643	0.881	0.988	0.163
Rhinolophus monoceros	Rhinolophidae	VU	0.912	0.945	0.91	0.100
Rhinolophus rex	Rhinolophidae	NT	0.483	0.83	0.993	0.333
Rhinolophus xinanzhongguoensis	Rhinolophidae	DD	0.64	0.885	0.659	0.221
Rhinopithecus bieti	Cercopithecidae	EN	0.997	0.998	0.973	0.269
Rhinopithecus roxellana	Cercopithecidae	VU	0.999	0.998	0.997	0.265
Scapanulus oweni	Talpidae	NT	1	0.999	0.999	0.175
Scaptochirus moschatus	Talpidae	NT	0.969	0.957	0.963	0.431
Sciurotamias davidianus	Sciuridae	LC	0.877	0.887	0.864	0.542
Sorex cylindricauda	Soricidae	NT	0.97	0.923	0.952	0.196
Sorex sinalis	Soricidae	NT	0.992	0.997	0.995	0.038
Sorex thibetanus	Soricidae	NT	0.984	0.993	0.966	0.322
Trogopterus xanthipes	Sciuridae	VU	0.998	0.916	0.989	0.177
Uropsilus investigator	Talpidae	NT	0.888	0.99	0.971	0.193
Uropsilus soricipes	Talpidae	LC	0.999	1	0.999	0.192
Volemys millicens	Cricetidae	NT	0.999	0.972	0.983	0.172
Volemys musseri	Cricetidae	NT	0.963	0.959	0.989	0.250
Reptiles						
Achalinus hainanus	Xenodermatid ae	VU	0.561	0.836	0.904	0.435
Achalinus meiguensis	Xenodermatidae	LC	1	1	0.817	0.172
Achalinus niger	Xenodermatidae	LC	0.961	0.945	0.993	0.152
Alligator sinensis	Alligatoridae	CR	0.981	0.96	0.827	0.633
Amphiesma miyajimae	Colubridae	EN	-0.183	0.668	0.998	0.305
Calamaria yunnanensis	Colubridae	VU	0.921	0.923	0.974	0.239
Cyrtodactylus zhaoermii	Gekkonidae	DD	0.524	0.849	0.821	0.735
Dopasia hainanensis	Anguidae	EN	0.922	0.92	0.976	0.319
Elaphe anomala	Colubridae	VU	0.847	0.903	0.809	0.451
Elaphe bimaculata	Colubridae	LC	0.959	0.992	0.995	0.413
Euprepiophis perlacea	Colubridae	EN	0.959	0.991	0.999	0.286
Gekko chinensis	Gekkonidae	LC	0.799	0.875	0.995	0.317
Gekko kikuchii	Gekkonidae	VU	0.792	0.125	0.72	0.624
Gekko liboensis	Gekkonidae	LC	0.996	0.998	0.995	0.166
Gekko melli	Gekkonidae	VU	0.393	0.997	0.99	0.196
Gekko scabridus	Gekkonidae	LC	0.993	0.997	0.976	0.229
Gekko similignum	Gekkonidae	DD	0.908	0.895	0.985	0.316
Gekko subpalmatus	Gekkonidae	LC	0.854	0.843	0.985	0.339
Gekko swinhonis	Gekkonidae	VU	0.988	0.999	0.995	0.299
Goniurosaurus hainanensis	Eublepharidae	VU	0.982	0.922	0.911	0.234

Goniurosaurus liboensis	Eublepharidae	EN	0.763	0.135	0.833	0.246
Japalura brevipes	Agamidae	NT	0.802	0.734	0.997	0.095
Japalura makii	Agamidae	VU	0.844	0.158	0.894	0.280
Japalura swinhonis	Agamidae	LC	0.991	0.987	0.974	0.365
Laudakia wui	Agamidae	NT	0.962	0.993	0.994	0.143
Lycodon gongshan	Colubridae	NT	0.407	0.885	0.95	0.425
Lycodon multizonatus	Colubridae	NT	0.986	0.987	0.996	0.181
Lycodon synaptor	Colubridae	DD	0.729	0.936	0.935	0.273
Macropisthodon rudis	Colubridae	LC	0.937	0.907	0.98	0.549
Oligodon ornatus	Colubridae	NT	0.856	0.99	0.984	0.061
Opisthotropis andersonii	Colubridae	NT	0.982	0.972	0.986	0.336
Opisthotropis cheni	Colubridae	NT	0.967	0.963	0.931	0.058
Opisthotropis guangxiensis	Colubridae	NT	0.644	0.985	0.85	0.263
Opisthotropis jacobi	Colubridae	NT	0.986	0.996	0.979	0.374
Opisthotropis kuatunensis	Colubridae	LC	0.963	0.837	0.937	0.312
Opisthotropis latouchii	Colubridae	LC	0.515	0.996	0.948	0.451
Opisthotropis maxwelli	Colubridae	NT	0.914	0.965	0.942	0.281
Pareas boulengeri	Pareatidae	LC	0.943	0.976	0.961	0.266
Pareas chinensis	Pareatidae	LC	0.881	0.85	0.902	0.430
Pareas formosensis	Pareatidae	NT	0.968	0.948	0.964	0.300
Pareas nigriceps	Pareatidae	DD	0.908	0.942	0.891	0.292
Pareas stanleyi	Pareatidae	LC	0.804	0.962	0.87	0.268
Phrynocephalus erythrurus	Agamidae	LC	0.942	0.961	0.997	0.154
Phrynocephalus forsythii	Agamidae	LC	0.864	0.956	0.882	0.388
Phrynocephalus przewalskii	Agamidae	LC	0.973	0.966	0.97	0.155
Phrynocephalus putjatai	Agamidae	NT	0.988	0.967	0.97	0.202
Plestiodon capito	Scincidae	LC	1	0.991	0.997	0.343
Rhabdophis adleri	Colubridae	NT	0.844	0.907	0.911	0.288
Rhabdophis swinhonis	Colubridae	NT	0.914	0.954	0.937	0.292
Scincella modesta	Scincidae	LC	0.954	0.97	0.933	0.184
Scincella tsinlingensis	Scincidae	LC	1	1	0.995	0.289
Scincella formosensis	Scincidae	LC	0.996	0.99	0.997	0.301
Scincella potanini	Scincidae	LC	0.977	0.999	0.999	0.506
Sinomicrurus hatori	Elapidae	VU	0.898	0.595	0.83	0.090
Sinomicrurus sauteri	Elapidae	VU	0.993	0.993	0.898	0.205
Sinonatrix annularis	Colubridae	VU	0.877	0.926	0.819	0.409
Sphenomorphus taiwanensis	Scincidae	LC	0.913	0.949	0.877	0.107
Takydromus formosanus	Lacertidae	LC	0.973	0.96	0.882	0.166
Takydromus hsuehshanensis	Lacertidae	LC	0.941	0.96	0.953	0.330
Takydromus intermedius	Lacertidae	NT	0.651	0.794	0.857	0.532
Takydromus luyeanus	Lacertidae	LC	0.938	0.92	0.84	0.387
Takydromus sauteri	Lacertidae	NT	0.99	0.965	0.995	0.278
Takydromus septentrionalis	Lacertidae	LC	0.897	0.75	0.989	0.439
Takydromus stejnegeri	Lacertidae	LC	0.987	0.980	0.624	0.409
Takydromus sylvaticus	Lacertidae	EN	0.993	0.991	0.962	0.265
Takydromus viridipunctatus	Lacertidae	LC	0.913	0.886	0.845	0.371

Teratoscincus roborowskii	Sphaerodactyli dae	NT	0.977	0.974	0.998	0.126
Thermophis baileyi	Colubridae	CR	0.989	0.969	0.826	0.237
Thermophis zhaoermii	Colubridae	CR	0.955	0.981	0.996	0.227
Trimeresurus gracilis	Viperidae	NT	0.809	0.756	0.862	0.085
Xenopeltis hainanensis	Xenopeltidae	NT	0.878	0.945	1.000	0.370

Supplementary Table 4A. The influence of SSPs in models testing the suitable area and its change (P-values obtained using Tukey multiple comparisons). Results that are significantly different from each other are represented using different letters, and those that are smallest have the smallest values alphabetically (i.e., a is smallest).

	ASH	CRI	LRI	ASH	CRI	LRI
SSP2 - SSP1	1	0.99942	< 0.0001	a-a	a-a	b-a
SSP3 - SSP1	1	0.00341	< 0.0001	a-a	b-a	c-a
SSP5 - SSP1	1	< 0.0001	< 0.0001	a-a	b-a	d-a
SSP3 - SSP2	1	0.00472	< 0.0001	a-a	b-a	c-b
SSP5 - SSP2	1	< 0.0001	< 0.0001	a-a	b-a	d-b
SSP5 - SSP3	1	0.71412	< 0.0001	a-a	b-b	d-c

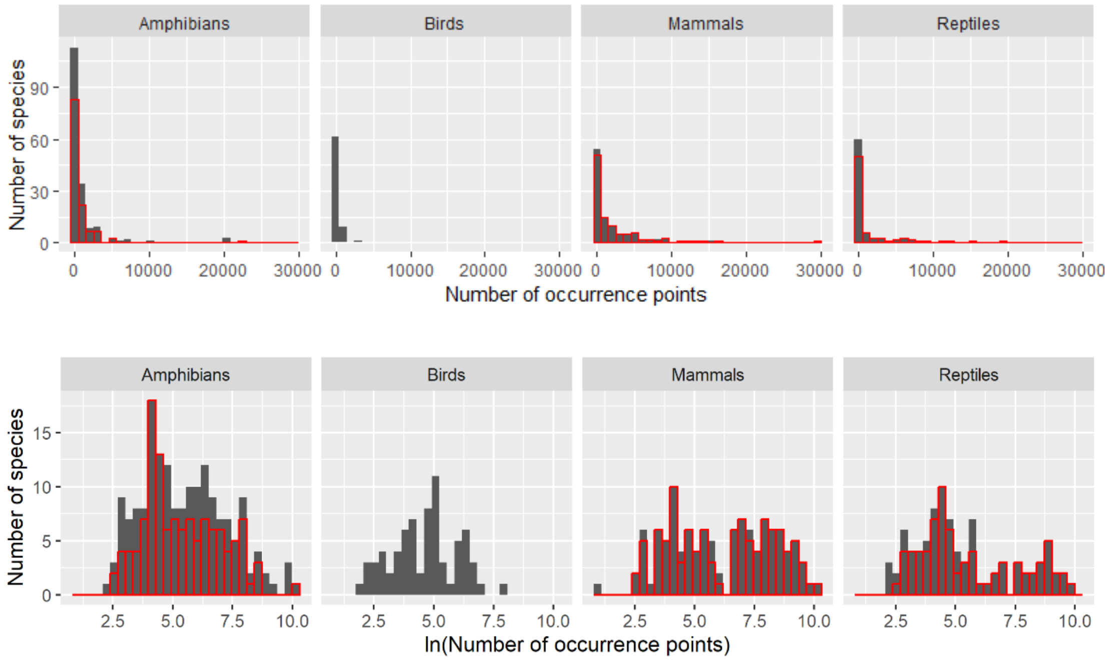
Supplementary Table 4B. The influence of Period in models testing the suitable area and its change (P-values obtained using Tukey multiple comparisons). Results that are significantly different from each other are represented using different letters, and those that are smallest have the smallest values alphabetically (i.e., a is smallest).

	ASH	CRI	LRI	ASH	CRI	LRI
2041-2060 - 2021-2040	0.0185	1.0	< 0.0001	b-c	a-a	b-a
2061-2080 - 2021-2040	< 0.0001	0.05981	< 0.0001	b-c	ab-a	c-a
2081-2100 - 2021-2040	< 0.0001	0.00196	< 0.0001	a-c	b-a	d-a
2061-2080 - 2041-2060	0.1713	0.05757	< 0.0001	b-b	ab-a	c-b
2081-2100 - 2041-2060	< 0.0001	0.00171	< 0.0001	a-b	b-a	d-b
2081-2100 - 2061-2080	< 0.0001	0.70113	< 0.0001	a-b	b-ab	d-c

Supplementary Table 5. The number of endemic vertebrates that will face a threat of extinction in the period 2080-2100 under the different future scenarios, organized by IUCN levels. Species will be threatened by extinction if their future distribution is predicted to be less than 20% of their current distribution (i.e., CRI < -0.8), or if 80% of the currently suitable area becomes unsuitable in the future (i.e., LRI > 0.8).

SSP	CRI < -0.8	LRI > 0.8	Total species	Threatened	LC	NT	Threatened %	LC %	NT %
Amphibians									
SSP1	8	10	11	8	1	2	9.88	2.13	6.45
SSP2	13	11	16	14	0	2	17.72	0.00	6.25
SSP3	13	17	17	14	1	2	17.72	2.13	6.25
SSP5	25	33	33	23	6	4	28.75	13.04	12.50
Birds									
SSP1	0	0	0	0	0	0	0.00	0.00	0.00
SSP2	1	0	1	1	0	0	3.85	0.00	0.00
SSP3	1	2	2	2	0	0	7.69	0.00	0.00
SSP5	2	3	3	3	0	0	11.54	0.00	0.00
Mammals									
SSP1	0	1	1	0	1	0	0.00	3.23	0.00
SSP2	1	0	1	1	0	0	4.76	0.00	0.00
SSP3	1	2	2	1	0	1	4.76	0.00	3.03
SSP5	6	10	10	3	3	4	14.29	10.00	12.12
Reptiles									
SSP1	2	1	2	2	0	0	10.53%	0.00%	0.00%
SSP2	4	2	4	3	0	1	15.79%	0.00%	5.26%
SSP3	4	5	5	4	0	1	21.05%	0.00%	5.26%
SSP5	5	5	5	3	0	2	15.79%	0.00%	10.53%

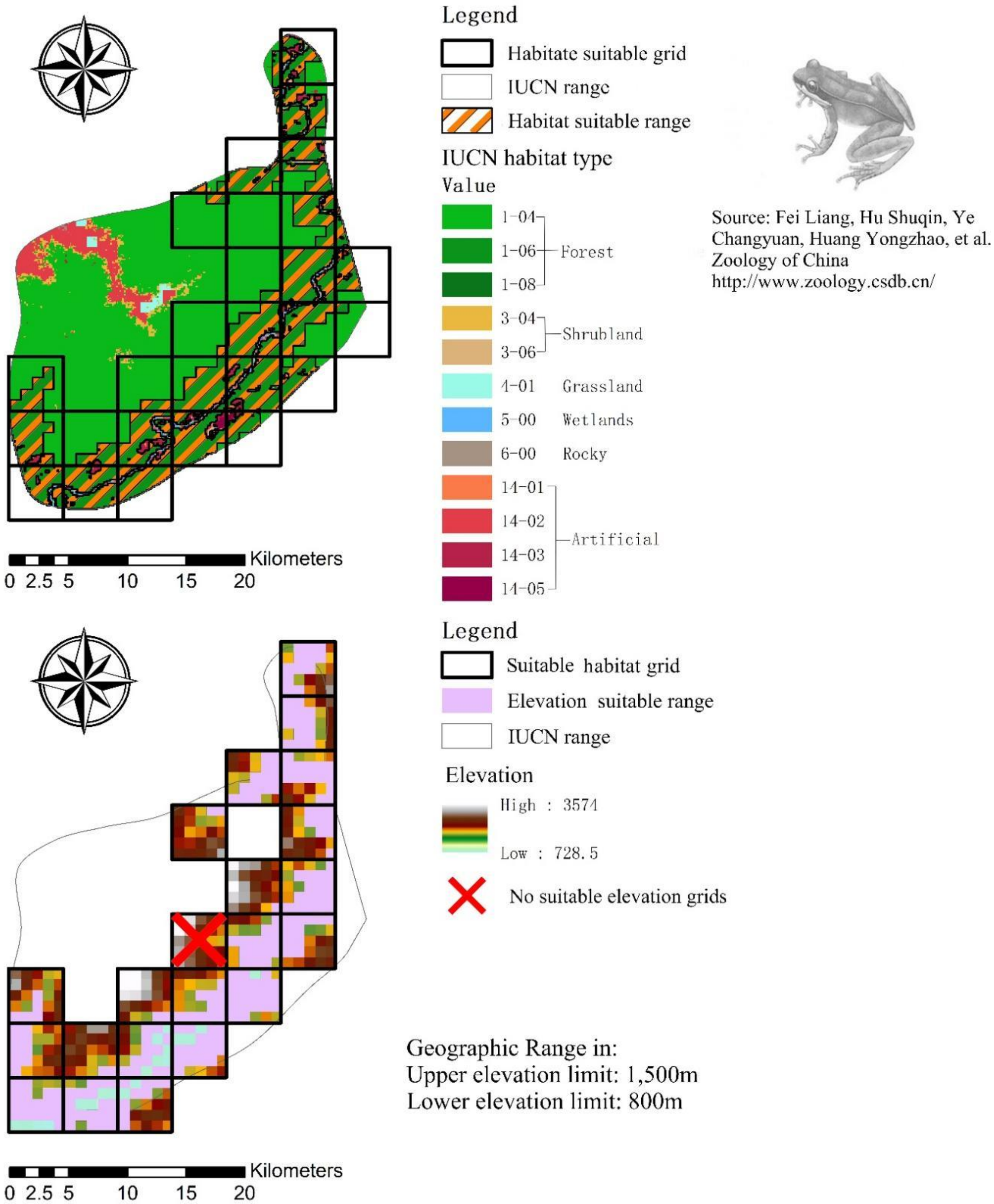
2.2 Supplementary Figures



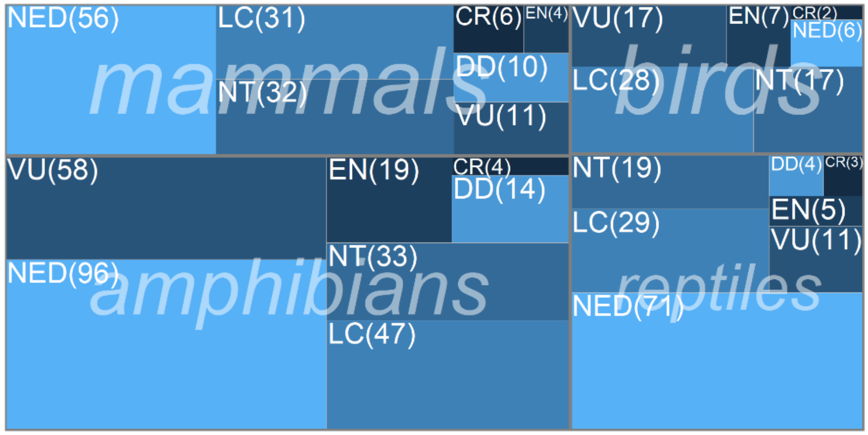
Supplementary Figure 1 . Histograms of the number of occurrence records for the different species in each taxon. Upper panels are based on the raw data, and the lower panels show a log transformation. Red color marks out the IUCN data; other data are from Global Biodiversity Information Facility (GBIF: www.gbif.org) or the Chinese Bird Report (www.birdreport.cn; for birds specifically).

Suitable habitat for *Amolops aniqiaoensis* according to its IUCN range vs. AOH.

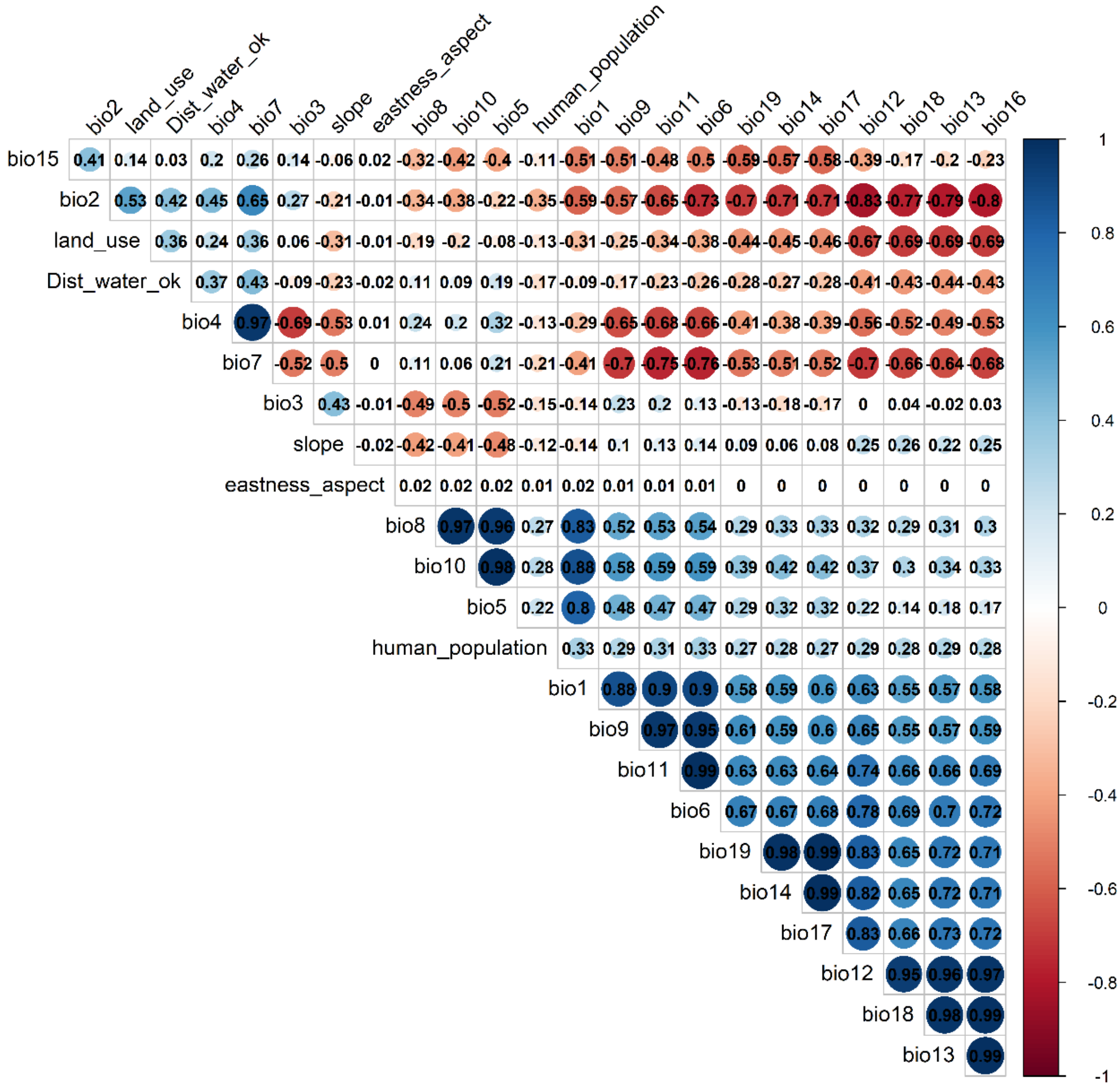
Level 1	Level 2
1. Forest	1.6. Forest - Subtropical/Tropical Moist Lowland
	1.9. Forest - Subtropical/Tropical Moist Montane
5. Wetlands (inland)	5.1. Wetlands (inland) - Permanent Rivers/Streams/Creeks (includes waterfalls)



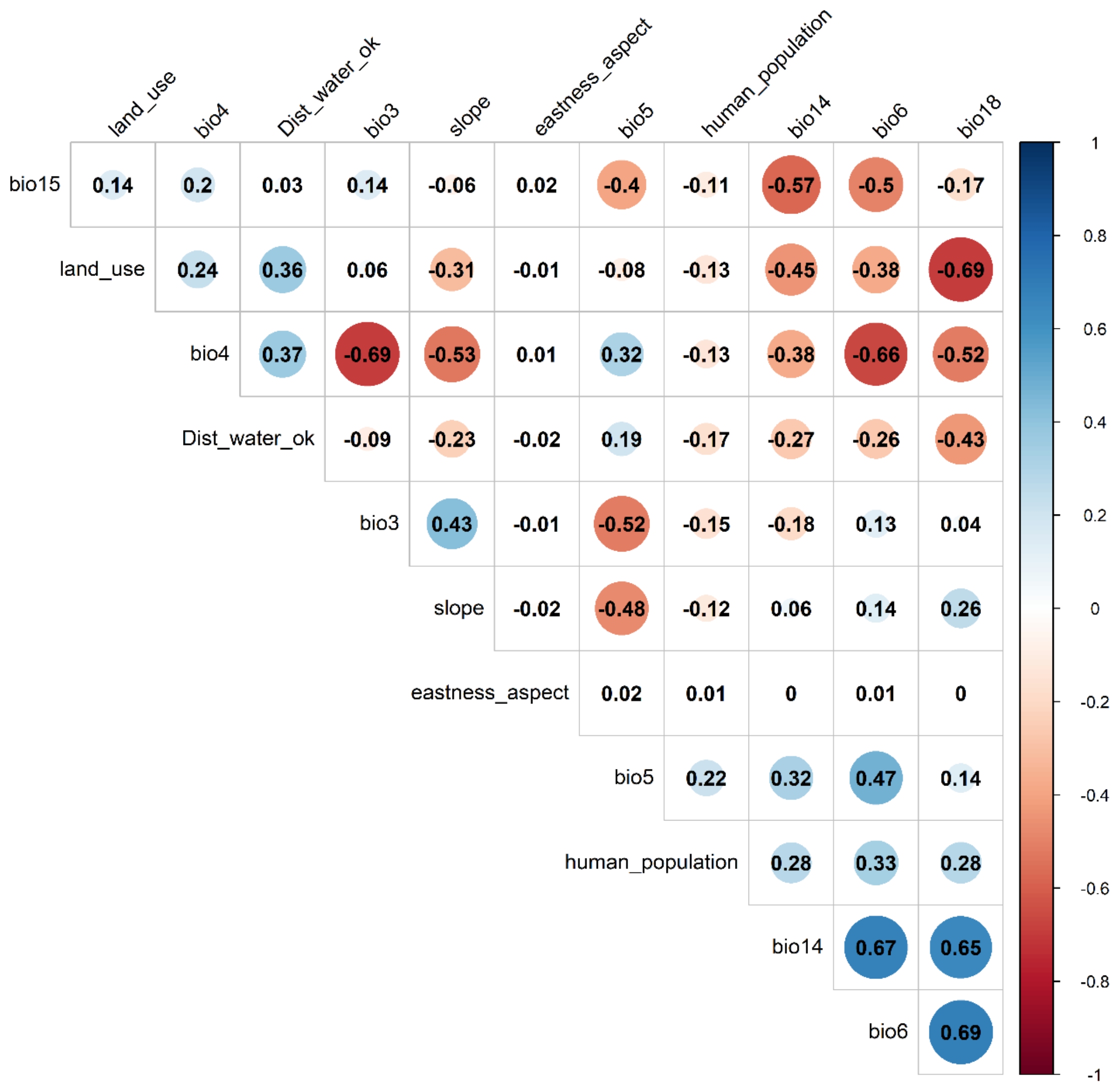
Supplementary Figure 2 . Example of *Amolops aniqiaoensis* illustrating Approach 4. The gridcell is shown if any area within it was suitable. In this example, one gridcell was removed because it did not contain suitable elevation.



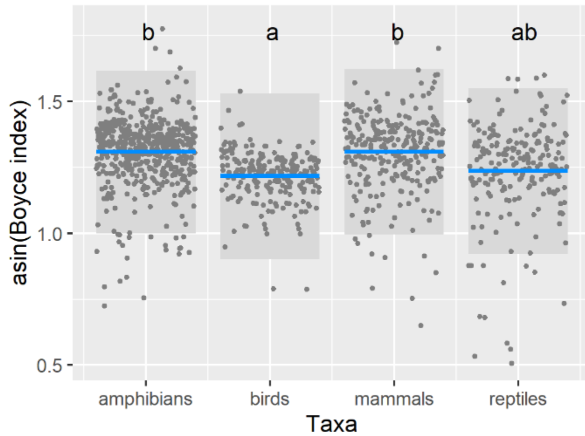
Supplementary Figure 3. A treemap showing the sample size for each taxon, and subgroups at different category levels (higher category levels in dark blue). Species that did not have enough data for the analysis, that is, species that had less than 10 occurrence points after unsuitable habitat was removed, are represented by Not Enough Data (NED). Other abbreviations represent the species threat status: LC = Least Concern, NT = Near Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered, DD = Data Deficient.



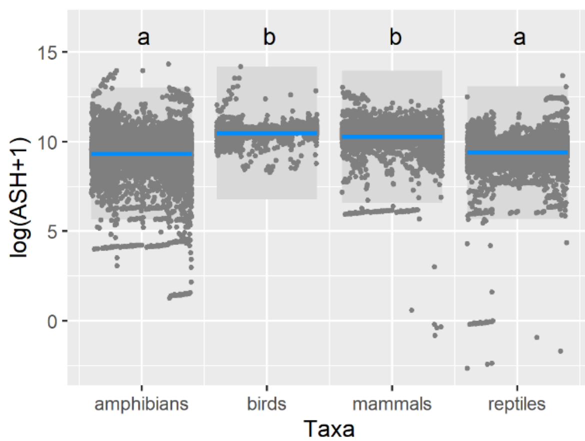
Supplementary Figure 4A. Matrix of pairwise correlations as assessed by the Pearson correlation coefficient for the original 24 variables.



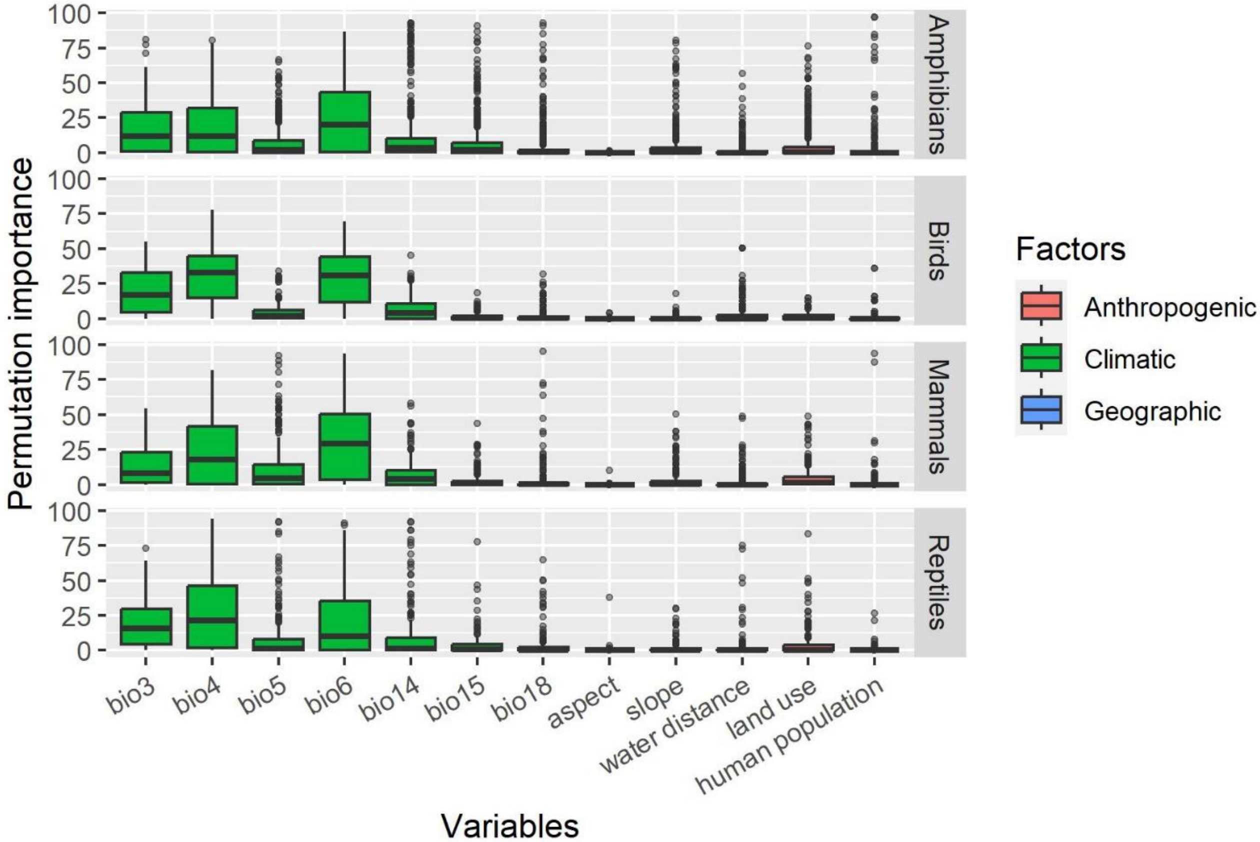
Supplementary Figure 4B. The same matrix for the remaining 12 variables after correlated variables (|r| > 0.7) were removed.



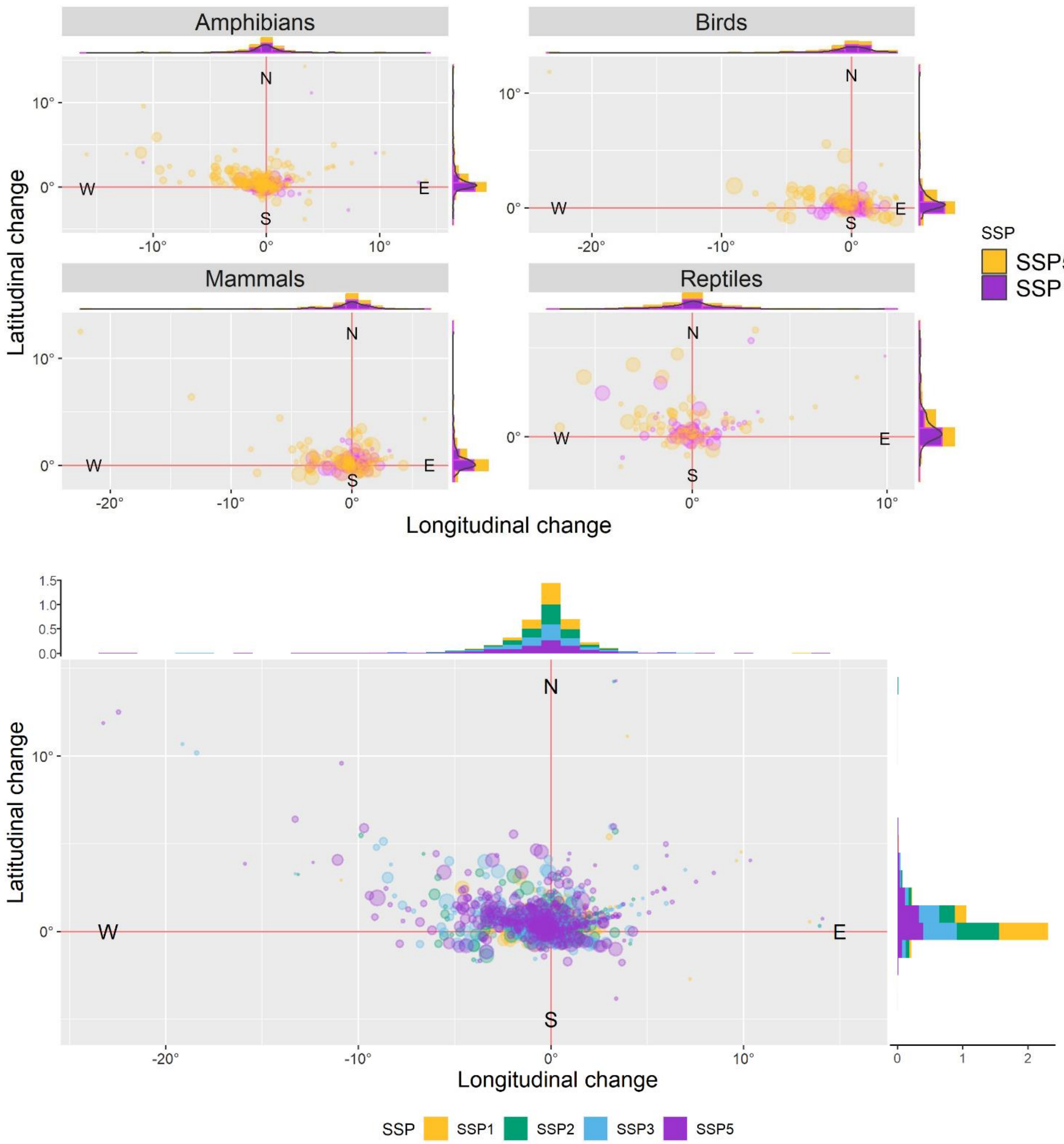
Supplementary Figure 5A. The models analyzing Boyce index varied by Taxa. Blue is the predicted mean value, and the gray area represents the 95% confidence interval. Columns with the same letter are not significantly different.



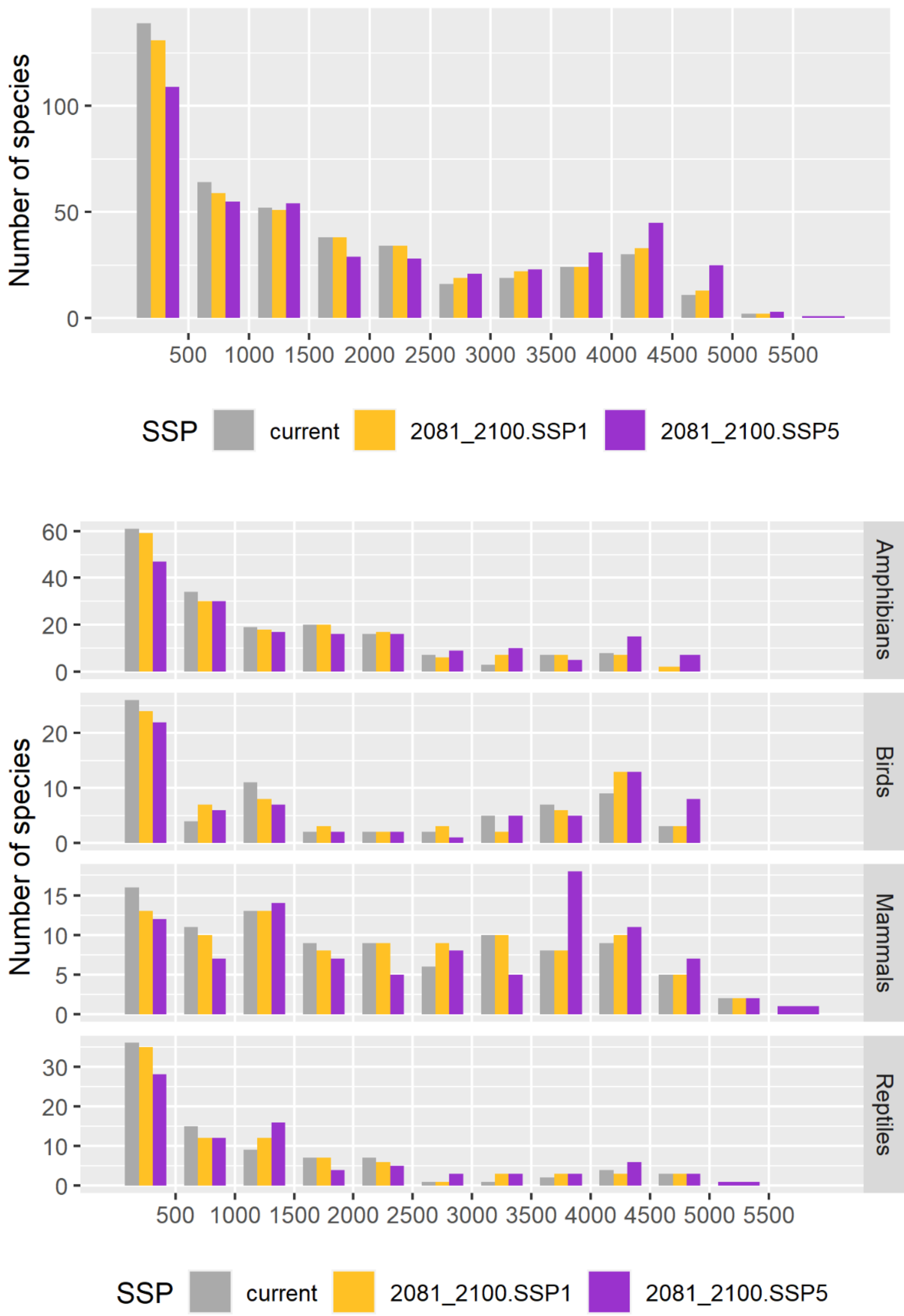
Supplementary Figure 5B. The models analyzing ASH varied by Taxa. Blue is the predicted mean value, and the gray area represents the 95% confidence interval. Columns with the same letter are not significantly different.



Supplementary Figure 6. A boxplot illustrating the permutation importance of each of the twelve explanatory variables in the best models based on Approach 4 for each taxon. The variables are classified into three different classes: climatic, geographic and anthropogenic.



Supplementary Figure 7. Geographic change from current distributions to those in 2080-2100 when using Approach 4. In above with different taxa in the SSP1 and SSP5 scenario and in bottom with four different scenarios for all taxa. The units are degree (1°~ 111 km). The area of the circle is proportional to the species' current distribution. The axes on panel B shows the histogram in different latitudinal and longitudinal.



Supplementary Figure 8. The mean elevation (in m a.s.l.) for each species in Approach 4, currently, and under the different climate scenarios in above, with different taxa in bottom.

3 Supplementary References

Araújo, M. B., Thuiller, W., and Pearson, R. G. (2006). Climate warming and the decline of amphibians and reptiles in Europe. Journal of Biogeography, *33*(10), 1712–1728. https://doi.org/10.1111/j.1365-2699.2006.01482.x

Barnagaud, J. Y., Geniez, P., Cheylan, M., and Crochet, P. A. (2021). Climate overrides the effects of land use on the functional composition and diversity of Mediterranean reptile assemblages. Diversity and Distributions, *27*(1), 50–64. https://doi.org/10.1111/ddi.13176

Barrett, K., Nibbelink, N. P., and Maerz, J. C. (2014). Identifying priority species and conservation opportunities under future climate scenarios: Amphibians in a biodiversity hotspot. Journal of Fish and Wildlife Management, *5*(2), 282–297. https://doi.org/10.3996/022014-JFWM-015

Biber, M. F., Voskamp, A., Niamir, A., Hickler, T., and Hof, C. (2020). A comparison of macroecological and stacked species distribution models to predict future global terrestrial vertebrate richness. Journal of Biogeography, *47*(1), 114–129. https://doi.org/10.1111/jbi.13696

Bogoni, J. A., and Tagliari, M. M. (2021). Potential distribution of piscivores across the Atlantic Forest: From bats and marsupials to large-bodied mammals under a trophic-guild viewpoint. Ecological Informatics, *64*(April), 101357. https://doi.org/10.1016/j.ecoinf.2021.101357

Clusella-trullas, A. S., Blackburn, T. M., Chown, S. L., Clusella-trullas, S., Blackburn, T. M., and Chown, S. L. (2011). *Climatic Predictors of Temperature Performance Curve Parameters in Ectotherms Imply Complex Responses to Climate Change*. *177*(6), 738–751. https://doi.org/10.1086/660021

Cohen, J. M., Fink, D., and Zuckerberg, B. (2020). *Avian responses to extreme weather across functional traits and temporal scales*. *March*, 1–11. https://doi.org/10.1111/gcb.15133

Console, G., Iannella, M., Cerasoli, F., D'Alessandro, P., and Biondi, M. (2020). A European perspective of the conservation status of the threatened meadow viper Vipera ursinii (BONAPARTE, 1835) (Reptilia, Viperidae). Wildlife Biology, *2020*(2). https://doi.org/10.2981/wlb.00604

Cunningham, H. R., Rissler, L. J., Buckley, L. B., and Urban, M. C. (2016). Abiotic and biotic constraints across reptile and amphibian ranges. Ecography, *39*(1), 1–8. https://doi.org/10.1111/ecog.01369

Deb, J. C., Forbes, G., and MacLean, D. A. (2020). Modelling the spatial distribution of selected North American woodland mammals under future climate scenarios. Mammal Review, *50*(4), 440–452. https://doi.org/10.1111/mam.12210

Deb, J. C., Phinn, S., Butt, N., and McAlpine, C. A. (2019). Adaptive management and planning for the conservation of four threatened large Asian mammals in a changing climate. Mitigation and Adaptation Strategies for Global Change, *24*(2), 259–280. https://doi.org/10.1007/s11027-018-9810-3

Distler, T., Schuetz, J. G., and Vel, J. (2015). *Stacked species distribution models and macroecological models provide congruent projections of avian species richness under climate change*. 976–988. https://doi.org/10.1111/jbi.12479

Dormann, C. F., Gruber, B., Winter, M., and Lett, D. H. B. (2008). *Detailed methods and additional results accompanying " Evolution of climate niches in European mammals " by*. 1–11.

Dreitz, V. J., Conrey, R. Y., and Skagen, S. K. (2012). *Drought and Cooler Temperatures Are Associated with Higher Nest Survival in Mountain Plovers La sécheresse et les températures fraîches sont associées au taux de survie des nids supérieur chez le Pluvier montagnard*. *7*(1).

Farashi, A., and Alizadeh-Noughani, M. (2021). Predicting the invasion risk of non-native reptiles as pets in the Middle East. Global Ecology and Conservation, *31*(June), e01818. https://doi.org/10.1016/j.gecco.2021.e01818

Germain, S. J., and Lutz, J. A. (2020). Climate extremes may be more important than climate means when predicting species range shifts. Climatic Change, *163*(1), 579–598. https://doi.org/10.1007/s10584-020-02868-2

Gherghel, I., Brischoux, F., Nyári, Á. S., and Papeş, M. (2020). A simple framework for estimating potential distributions of amphibious marine species and implications for conservation. Coral Reefs, *39*(4), 1081–1090. https://doi.org/10.1007/s00338-020-01937-3

Goudarzi, F., Hemami, M. R., Malekian, M., Fakheran, S., and Martínez-Freiría, F. (2021). Species versus within-species niches: a multi-modelling approach to assess range size of a spring-dwelling amphibian. Scientific Reports, *11*(1), 1–11. https://doi.org/10.1038/s41598-020-79783-0

Groff, L. A., Groff, L. A., and Hayes, M. P. (2014). Using ecological niche models to direct rare amphibian surveys: A case study using the oregon spotted frog (Rana pretiosa). Herpetological Conservation and Biology, *9*(2), 354–368.

Guevara, L., Gerstner, B. E., Kass, J. M., and Anderson, R. P. (2018). Toward ecologically realistic predictions of species distributions: A cross-time example from tropical montane cloud forests. Global Change Biology, *24*(4), 1511–1522. https://doi.org/10.1111/gcb.13992

Hill, S. E., and Winder, I. C. (2019). *Predicting the impacts of climate change on Papio baboon biogeography : Are widespread , generalist primates ' safe '? May 2018*, 1–26. https://doi.org/10.1111/jbi.13582

Huang, Q., Sauer, J. R., and Dubayah, R. O. (2017). *Multi-directional Abundance Shifts Among North American Birds and the Relative Influence of Multi- Faceted Climate Factors*. 0–2. https://doi.org/10.1111/ijlh.12426

Ihlow, F., Dambach, J., Engler, J. O., Flecks, M., Hartmann, T., Nekum, S., Rajaei, H., and Rödder, D. (2012). On the brink of extinction? How climate change may affect global chelonian species richness and distribution. Global Change Biology, *18*(5), 1520–1530. https://doi.org/10.1111/j.1365-2486.2011.02623.x

Jurestovsky, D., and Andrew Joyner, T. (2018). Applications of species distribution modeling for palaeontological fossil detection: late Pleistocene models of Saiga (Artiodactyla: Bovidae, Saiga tatarica). Palaeobiodiversity and Palaeoenvironments, *98*(2), 277–285. https://doi.org/10.1007/s12549-017-0298-8

Ko, C. Y., Schmitz, O. J., and Jetz, W. (2016). The limits of direct community modeling approaches for broad-scale predictions of ecological assemblage structure. Biological Conservation, *201*, 396–404. https://doi.org/10.1016/j.biocon.2016.07.026

Lamelas-López, L., Pardavila, X., Borges, P. A. V., Santos-Reis, M., Amorim, I. R., and Santos, M. J. (2020). Modelling the distribution of Mustela nivalis and M. putorius in the Azores archipelago based on native and introduced ranges. PLoS ONE, *15*(8 August), 1–19. https://doi.org/10.1371/journal.pone.0237216

Leach, K., Montgomery, W. I., and Reid, N. (2017). Characterizing biotic interactions within the Order Lagomorpha using Joint Species Distribution Models at 3 different spatial scales. Journal of Mammalogy, *98*(5), 1434–1442. https://doi.org/10.1093/jmammal/gyx105

Lemes, P., Melo, A. S., and Loyola, R. D. (2014). Climate change threatens protected areas of the Atlantic Forest. Biodiversity and Conservation, *23*(2), 357–368. https://doi.org/10.1007/s10531-013-0605-2

Li, X., Clinton, N., Si, Y., Liao, J., Liang, L., and Gong, P. (2015). Projected impacts of climate change on protected birds and nature reserves in China. Science Bulletin, *60*(19), 1644–1653. https://doi.org/10.1007/s11434-015-0892-y

Li, X., Liu, X., Kraus, F., Tingley, R., and Li, Y. (2016). Risk of biological invasions is concentrated in biodiversity hotspots. Frontiers in Ecology and the Environment, *14*(8), 411–417. https://doi.org/10.1002/fee.1321

Li, Y., Li, X., Sandel, B., Blank, D., Liu, Z., Liu, X., and Yan, S. (2016). *Climate and topography explain range sizes of terrestrial vertebrates*. *6*(818). https://doi.org/10.1038/NCLIMATE2895

Magory Cohen, T., and Dor, R. (2019). The effect of local species composition on the distribution of an avian invader. Scientific Reports, *9*(1), 1–9. https://doi.org/10.1038/s41598-019-52256-9

Maiorano, L., Falcucci, A., Zimmermann, N. E., Psomas, A., Pottier, J., Baisero, D., Rondinini, C., Guisan, A., and Boitani, L. (2011). The future of terrestrial mammals in the Mediterranean basin under climate change. Philosophical Transactions of the Royal Society B: Biological Sciences, *366*(1578), 2681–2692. https://doi.org/10.1098/rstb.2011.0121

Matthews, S. N., Iverson, L. R., Prasad, A. M., and Peters, M. P. (2011). Changes in potential habitat of 147 North American breeding bird species in response to redistribution of trees and climate following predicted climate change. Ecography, *34*(6), 933–945. https://doi.org/10.1111/j.1600-0587.2011.06803.x

Mestre, F., Risk, B. B., Mira, A., Beja, P., and Pita, R. (2017). A metapopulation approach to predict species range shifts under different climate change and landscape connectivity scenarios. Ecological Modelling, *359*, 406–414. https://doi.org/10.1016/j.ecolmodel.2017.06.013

Mokhatla, M. M., Dennis Rödder, and G. John Measey. (2015). Assessing the effects of climate change on distributions of Cape Floristic Region amphibians. South African Journal of Science, *Volume 111*(Number 11/12), 1–7. https://doi.org/10.17159/sajs.2015/20140389

Morán-Ordóñez, A., Briscoe, N. J., and Wintle1, B. A. (2017). *Modelling species responses to extreme weather provides new insights into constraints on range and likely climate change impacts for Australian mammals*.

Morueta-Holme, N., Flöjgaard, C., and Svenning, J. C. (2010). Climate change risks and conservation implications for a threatened small-range mammal species. PLoS ONE, *5*(4). https://doi.org/10.1371/journal.pone.0010360

Mouchet, M., Levers, C., Zupan, L., and Kuemmerle, T. (2015). *Testing the Effectiveness of Environmental Variables to Explain European Terrestrial Vertebrate Species Richness across Biogeographical Scales*. 1–16. https://doi.org/10.1371/journal.pone.0131924

Munguía, M., Rahbek, C., Rangel, T. F., Diniz-Filho, J. A. F., and Araújo, M. B. (2012). Equilibrium of global amphibian species distributions with climate. PloS One, *7*(4), 1–9. https://doi.org/10.1371/journal.pone.0034420

Muñoz, A., Santos, X., and Felicísimo, Á. M. (2016). Local-scale models reveal ecological niche variability in amphibian and reptile communities from two contrasting biogeographic regions. PeerJ, *2016*(10), 1–20. https://doi.org/10.7717/peerj.2405

Peñalver-Alcázar, M., Jiménez-Valverde, A., and Aragón, P. (2021). Niche differentiation between deeply divergent phylogenetic lineages of an endemic newt: implications for Species Distribution Models. Zoology, *144*(June 2020). https://doi.org/10.1016/j.zool.2020.125852

Ribeiro, B. R., Sales, L. P., and Loyola, R. (2018). Strategies for mammal conservation under climate change in the Amazon. Biodiversity and Conservation, *27*(8), 1943–1959. https://doi.org/10.1007/s10531-018-1518-x

Rodrigues, J. F. M., and Lima-Ribeiro, M. S. (2018). Predicting where species could go: climate is more important than dispersal for explaining the distribution of a South American turtle. Hydrobiologia, *808*(1), 343–352. https://doi.org/10.1007/s10750-017-3436-4

Salas, E. A. L. ., A. Seamster, V., G. Boykin, K., M. Harings, N., and W. Dixon, K. (2017). Modeling the impacts of climate change on Species of Concern (birds) in South Central U.S. based on bioclimatic variables. AIMS Environmental Science, *4*(2), 358–385. https://doi.org/10.3934/environsci.2017.2.358

Sangermano, F., Bol, L., Galvis, P., Gullison, R. E., Hardner, J., and Ross, G. S. (2015). Habitat suitability and protection status of four species of amphibians in the Dominican Republic. Applied Geography, *63*, 55–65. https://doi.org/10.1016/j.apgeog.2015.06.002

Schooler, S. L., Johnson, M. D., Njoroge, P., and Bean, W. T. (2020). *Shade trees preserve avian insectivore biodiversity on coffee farms in a warming climate*. *October*. https://doi.org/10.1002/ece3.6879

Sheldon, K. S., Leaché, A. D., and Cruz, F. B. (2015). *The influence of temperature seasonality on elevational range size across latitude : a test using Liolaemus lizards*. https://doi.org/10.1111/geb.12284

Stevens, R. D. (2013). Gradients of bat diversity in atlantic forest of South America: Environmental seasonality, sampling effort and spatial autocorrelation. Biotropica, *45*(6), 764–770. https://doi.org/10.1111/btp.12056

Thompson, D. M., Ligon, D. B., Patton, J. C., and Papeş, M. (2017). Effects of life-history requirements on the distribution of a threatened reptile. Conservation Biology, *31*(2), 427–436. https://doi.org/10.1111/cobi.12800

Vasconcelos, T. S., Rodríguez, M. Á., and Hawkins, B. A. (2012). Species distribution modelling as a macroecological tool: A case study using New World amphibians. Ecography, *35*(6), 539–548. https://doi.org/10.1111/j.1600-0587.2011.07050.x

Vol, H. (2021). *Kidov A . A ., Litvinchuk S . N . Distribution and conservation status of the Hyrcanian wood frog (Rana pseudodalmatina) in Azerbaijan // Russian*. *28*(May). https://doi.org/10.30906/1026-2296-2021-28-2-97-107

Xu, Z. (2015). Potential distribution of invasive alien species in the upper Ili river basin: determination and mechanism of bioclimatic variables under climate change. Environmental Earth Sciences, *73*(2), 779–786. https://doi.org/10.1007/s12665-014-3083-2

Zhang, Z., Kass, J. M., Mammola, S., Koizumi, I., Li, X., Tanaka, K., Ikeda, K., Suzuki, T., Yokota, M., and Usio, N. (2021). Lineage-level distribution models lead to more realistic climate change predictions for a threatened crayfish. Diversity and Distributions, *27*(4), 684–695. https://doi.org/10.1111/ddi.13225