Spatial adaptive responses of highly threatened European mammal species under climate change

APPENDIX I

Tables

Table S1 – A list of all species in Habitats Directive annex IV, the justification for their inclusion/ exclusion in analysis, plus the species that were added to the analysis (either in annex II and V) because of their current decreasing abundance trends (as in IUCN Red List). Gray lines signalize the analyzed species.

Taxonomic group	Annex	Inclusion/ Exclusion (justification, except inclusion/Annex IV)
INSECTIVORA		
Erinaceidae		
Erinaceus algirus	**IV**	yes
Soricidae		
Crocidura canariensis	**IV**	no (less than 20 records)
Crocidura sicula	**IV**	no (less than 20 records)
Talpidae		
Galemys pyrenaicus	**IV**	yes
MICROCHIROPTERA		
All species	**IV**	no (very specialized species)
MEGACHIROPTERA		
Pteropodidae		
Rousettus aegyptiacus	**IV**	no (very specialized species)
RODENTIA		
Gliridae		
All species except *Glis glis* and *Eliomys quercinus*	**IV**	only *Dryomis nitedula, Muscardinus avellanarius*
Sciuridae		
Marmota marmota latirostris	**IV**	no (less than 20 records)
Pteromys volans	**IV**	yes
Spermophilus citellus	**IV**	yes
Spermophilus suslicus	**IV**	no (less than 20 records)
Sciurus anomalus	**IV**	no (less than 20 records)
Castoridae		
Castor fiber	**IV**	yes
Cricetidae		
Cricetus cricetus	**IV**	yes
Mesocricetus newtoni	**IV**	no (less than 20 records)
Microtidae		
Dinaromys bogdanovi	**IV**	no (less than 20 records)
Microtus cabrerae	**IV**	yes
Microtus oeconomus arenicola	**IV**	no (less than 20 records)
Microtus oeconomus mehelyi	**IV**	no (less than 20 records)
Microtus tatricus	**IV**	no (less than 20 records)
Zapodidae		
Sicista betulina	**IV**	yes
Sicista subtilis	**IV**	no (less than 20 records)
Hystricidae		
Hystrix cristata	**IV**	yes
CARNIVORA		
Canidae		
Alopex lagopus	**IV**	yes
Canis aureus	V	yes (decreasing population trends, IUCN Red list)
Canis lupus	**IV**	yes
Ursidae		
Ursus arctos	**IV**	yes

Taxonomic group	Annex	Inclusion/ Exclusion (justification, except inclusion/Annex IV)
Mustelidae		
Gulo gulo	II	yes (priority species)
Lutra lutra	**IV**	yes
Martes martes	V	yes
Mustela eversmanii	**IV**	no (possible sampling biases)
Mustela lutreola	**IV**	yes
Mustela putorius	V	yes (decreasing population trends, IUCN Red list)
Vormela peregusna	**IV**	no (possible sampling biases)
Viverridae		
Genneta genneta	V	yes (decreasing population trends, IUCN Red list)
Hespestes ichneumon	V	yes (decreasing population trends, IUCN Red list)
Felidae		
Felis silvestris	**IV**	yes
Lynx lynx	**IV**	yes
Lynx pardinus	**IV**	yes
Phocidae		
Monachus monachus	**IV**	no (marine species)
Phoca hispida saimensis	**IV**	no (marine species)
DUPLICIDENTATA		
Lepus timidus	V	yes (decreasing population trends, IUCN Red list)
ARTIODACTYLA		
Cervidae		
Cervus elaphus corsicanus	**IV**	no (less than 20 records)
Bovidae		
Bison bonasus	**IV**	no (less than 20 records)
Capra aegagrus	**IV**	no (less than 20 records)
Capra ibex	V	yes (decreasing population trends, IUCN Red list)
Capra pyrenaica pyrenaica	**IV**	yes
Ovis ammon	**IV**	yes
Ovis orientalis ophion	**IV**	no (less than 20 records)
Rupicapra pyrenaica ornata	**IV**	yes
Rupicapra rupicapra balcanica	**IV**	yes (indistinct from *R rupicapra tatrica*)
Rupicapra rupicapra tatrica	**IV**	yes (indistinct from *R rupicapra balcanica*)

Table S2 – Summary data on species distribution model accuracy (TSS values) obtained by running seven distinct models and projected trends of suitable climate until 2080 in Europe evaluated in a previous study (Araújo et al, 2011) for Natura 2000 sites (N2k), nationally designed protected areas (PAs) and the remaining areas (out) under three RCP projections for future climates (W: for winner species; L: for loser species). Range size is the number of 50km x 50km sites where each species was recorded; Prevalence is the fraction of sites in the whole study region (Europe) where each species was recorded.

			TSS*								Climate trend (N2k/PAs/out)		
Species	**Range size**	**Prevalence**	**ANN**	**BRT**	**CTA**	**FDA**	**GAM**	**GLM**	**SRE**	**Ensemble**	**RCP 8.5**	**RCP 6.0**	**RCP 4.5**
A lagopus	149	0.07	0.86	0.90	0.93	0.67	0.93	0.95	0.59	0.87	**L/L/L**	**L/L/L**	**L/L/L**
A algirus	33	0.01	0.82	0.88	0.84	0.57	0.85	0.87	0.51	0.78	**L/L/L**	**L/L/L**	**L/L/L**
C aureus	139	0.06	0.73	0.79	0.78	0.58	0.71	0.75	0.60	0.70	W/W/W	W/W/W	W/W/W
C lupus	653	0.29	0.72	0.77	0.74	0.60	0.75	0.67	0.61	0.71	**L/L/L**	**L/L/L**	**L/L/L**
C ibex	58	0.03	0.87	0.86	0.74	0.65	0.82	0.87	0.65	0.88	**L/L/L**	**L/L/L**	**L/L/L**
C pyrenaica	43	0.02	0.84	0.83	0.81	0.58	0.80	0.74	0.57	0.75	**L/L/L**	**L/L/L**	**L/L/L**
C fiber	479	0.21	0.66	0.68	0.56	0.52	0.58	0.54	0.53	0.41	**L/L/L**	**L/L/L**	**L/L/L**
C cricetus	252	0.11	0.76	0.70	0.68	0.52	0.71	0.76	0.57	0.69	**L/L/L**	**L/L/L**	**L/L/L**
D nitedula	181	0.08	0.82	0.85	0.88	0.53	0.74	0.74	0.52	0.74	**L/L/L**	**L/L/L**	**L/L/L**
F silvestris	626	0.27	0.77	0.77	0.75	0.63	0.72	0.70	0.68	0.75	**L**/W/**L**	**L**/W/**L**	**L**/W/**L**
G pyrenaicus	73	0.03	0.86	0.88	0.75	0.57	0.84	0.80	0.52	0.75	**L/L/L**	**L/L/L**	**L/L/L**
G genneta	281	0.12	0.72	0.75	0.70	0.58	0.67	0.69	0.55	0.60	**L/L/L**	**L/L/L**	**L/L/L**
G gulo	159	0.07	0.90	0.92	0.89	0.64	0.84	0.86	0.67	0.82	**L/L/L**	**L/L/L**	**L/L/L**
H ichneumon	63	0.03	0.87	0.90	0.87	0.60	0.91	0.92	0.64	0.87	**L/L/L**	**L/L/L**	**L/L/L**
H cristata	78	0.03	0.81	0.83	0.80	0.61	0.75	0.79	0.57	0.76	W/W/W	W/W/W	W/W/W
L timidus	729	0.32	0.72	0.70	0.67	0.55	0.68	0.63	0.54	0.60	**L/L/L**	**L/L/L**	**L/L/L**
L lutra	1372	0.60	0.69	0.71	0.58	0.53	0.71	0.72	0.52	0.68	**L/L/L**	**L/L/L**	**L/L/L**
L lynx	612	0.27	0.69	0.70	0.69	0.51	0.60	0.57	0.58	0.64	**L/L/L**	**L/L/L**	**L/L/L**
L pardinus	58	0.03	0.92	0.92	0.88	0.69	0.79	0.80	0.64	0.87	**L/L/L**	**L/L/L**	**L/L/L**
M martes	1436	0.63	0.67	0.68	0.57	0.58	0.66	0.60	0.57	0.65	**L/L/L**	**L/L/L**	**L/L/L**
M cabrerae	58	0.03	0.93	0.93	0.78	0.68	0.84	0.89	0.67	0.79	**L/L/L**	**L/L/L**	**L/L/L**
M avellanarius	780	0.34	0.74	0.73	0.60	0.52	0.64	0.68	0.50	0.62	**L/L/L**	**L/L/L**	W/**L/L**
M lutreola	46	0.02	0.94	0.96	0.94	0.69	0.97	0.89	0.60	0.90	**L/L/L**	**L/L/L**	**L/L/L**
M putorius	1295	0.57	0.72	0.66	0.52	0.51	0.63	0.62	0.52	0.71	W/W/W	W/W/W	W/W/W
O ammon	337	0.15	0.83	0.88	0.82	0.60	0.80	0.69	0.51	0.77	**L/L/L**	**L/L/L**	**L/L/L**
P volans	102	0.04	0.85	0.86	0.79	0.66	0.74	0.78	0.54	0.73	**L/L/L**	**L/L/L**	**L/L/L**
R rupicapra	200	0.09	0.72	0.80	0.63	0.62	0.72	0.69	0.57	0.68	**L/L/L**	**L/L/L**	**L/L/L**
S betulina	200	0.09	0.85	0.88	0.86	0.59	0.76	0.78	0.50	0.72	**L/L/L**	**L/L/L**	**L/L/L**
S citellus	179	0.08	0.80	0.86	0.81	0.64	0.79	0.78	0.64	0.73	W/W/W	W/W/W	**L**/W/W
U arctos	489	0.21	0.66	0.65	0.57	0.55	0.58	0.52	0.40	0.61	**L/L/L**	**L/L/L**	**L/L/L**

* ANN: Artificial Neural Networks; BRT: Boosted Regression Trees; CTA: Classification Tree Analysis; FDA: Flexible Discriminant Analysis; GAM: Generalized Additive Models; GLM: Generalized Linear Models; SER: Surface Range Envelope; Ensemble: after model calibration and evaluation.

Table S3 – The species analyzed and predicted dispersal rates based on Schloss et al 2012. Whenever data on dispersal rate (km/yr) of a particular species were not found, an approximated value was obtained by averaging dispersal rates of taxonomically-similar species with body-size on the same order of magnitude. *Dmax* defines a 30 yrs dispersal ability, directly obtained from Schloss et al (2012); *D'max* corresponds to a more optimistic dispersal aptitude of species, so to mimic possible, less-frequent, extreme cases of dispersal (50% larger dispersal than D1).

Species	Coding	Dispersal rate (km/yr)	Justification	***Dmax* (km) Disp rate.30**	***D'max* (km) 1.5.*Dmax***
Alopex lagopus	*Ala*	21.48	*Alopex lagopus*	644.4	966.6
Atelerix algirus	*Aal*	0.05	mean of Soricidae	1.5	2.25
Canis aureus	*Cau*	43.4	mean of *Canis*, sp	1302.0	1953.0
Canis lupus	*Clu*	43.4	mean of *Canis*, sp	1302.0	1953.0
Capra ibex	*Cib*	14.66	*Ovis canadensis*	439.8	659.7
Capra pyrenaica	*Cpy*	14.66	*Ovis canadensis*	439.8	659.7
Castor fiber	*Cfi*	2.90	*Castor canadensis*	87.0	130.5
Cricetus cricetus	*Ccr*	1.30	mean of Muridae	39.0	58.5
Dryomys nitedula	*Dni*	1.00	mean of Sciuridae, except *Marmota* because of weight	30.0	45.0
Felis silvestris	*Fsi*	8.89	mean of *Oricefelis*	266.7	400.1
Galemys pyrenaicus	*Gpy*	0.46	mean of Talpidae	13.8	20.7
Genneta genneta	*Gge*	8.89	mean of *Oricefelis,* sp	266.7	400.1
Gulo gulo	*Ggu*	13.50	*Gulo gulo*	405.0	607.5
Hespestes ichneumon	*Hic*	8.89	mean of *Oricefelis,* sp	266.7	400.1
Hystrix cristata	*Hcr*	1.62	mean of Erethizontidae	48.6	72.9
Lepus timidus	*Lti*	4.12	mean of *Lepus,* sp	123.6	185.4
Lutra lutra	*Llu*	10.20	mean of *Lontra,* sp	306.0	459.0
Lynx lynx	*Lly*	11.70	*Lynx canadensis*	351.0	526.5
Lynx pardinus	*Lpa*	11.70	*Lynx canadensis*	351.0	526.5
Martes martes	*Mma*	1.69	*Martes americana*	50.7	76.1
Microtus cabrerae	*Mca*	1.79	mean of *Microtus,* sp	53.7	80.6
Muscardinus avellanarius	*Mav*	1.00	mean of Sciuridae, except *Marmota* because of weight	30.0	45.0
Mustela lutreola	*Mlu*	1.25	mean of *Mustela africana* & *Mustela erminea*	37.5	56.3
Mustela putorius	*Mpu*	1.25	mean of *Mustela africana* & *Mustela erminea*	37.5	56.3
Ovis ammon	*Oam*	14.66	*Ovis canadensis*	439.8	659.7
Pteromys volans	*Pvo*	0.43	mean of *Tamias,* sp	12.9	19.4
Rupicapra rupicapra	*Rru*	14.66	*Ovis canadensis*	439.8	659.7
Sicista betulina	*Sbe*	0.27	*Napacozapus insignis*	8.1	12.2
Spermophilus citellus	*Sci*	1.27	mean of *Spermophilus*	38.1	57.2
Ursus arctos	*Uar*	5.84	mean of *Ursus,* sp	175.2	262.8

Table S4- Comparisons of land uses (urb: urban areas; arab: arable land; grass: grassland; for: forest land; and crop: cropland) and conservation area coverage (Natura 2000, N2k; nationally-designated protected areas, PAs) and habitat disturbance (the human footprint index, HII) in sites crossed by several C^s SATs of a species, against sites crossed by only one SAT. Effect size values are averages of Wilcox-strictly standardized mean difference taken from significant test ($P < 0.05$) among species. Positive/negative values (e+/e-) indicate that convergence points present higher/lower coverage or disturbance of the tested variables when compared with the non-convergence sites. n+/n- is the number of species with positive/negative effect size. Analyses were performed for each of the three climate x four dispersal scenarios tested. Each table refer to a time-period in ***C^s* SAT sets.**

Baseline period

		RCP45				RCP60				RCP85			
		D1	**D2**	**D3**	**D4**	**D1**	**D2**	**D3**	**D4**	**D1**	**D2**	**D3**	**D4**
PAs	**n+**	1	1	1	3	1	0	0	0	1	2	1	0
	e+	0.5604	0.5781	0.5163	0.4869	0.2306	-	-	-	0.6615	0.2989	0.4641	-
	n-	0	1	2	2	2	3	3	1	2	1	2	2
	e-	-	-0.2483	-0.2385	-0.1460	-0.1950	-0.3117	-0.3941	-0.1358	-0.3994	-0.3081	-0.1125	-0.1790
N2k	**n+**	3	3	3	4	3	3	3	2	2	3	3	1
	e+	0.4313	0.3850	0.3067	0.4202	0.3946	0.3919	0.3642	0.3096	0.3597	0.2404	0.2866	0.2701
	n-	3	1	1	0	3	2	1	1	3	2	1	1
	e-	-0.2446	-0.1322	-0.1096	-	-0.2679	-0.1325	-0.1168	-0.1439	-0.3263	-0.4195	-0.3553	-0.3181
HII	**n+**	2	3	4	3	4	5	5	4	4	4	2	2
	e+	0.4076	0.4882	0.4422	0.4569	0.5389	0.5084	0.5993	0.6860	0.4010	0.4884	0.7049	0.8247
	n-	5	5	5	5	5	5	4	4	5	7	4	3
	e-	-0.3645	-0.3543	-0.3998	-0.4043	-0.3507	-0.3598	-0.3647	-0.3960	-0.3752	-0.4764	-0.3123	-0.3303
urb	**n+**	0	0	0	1	2	2	2	3	2	1	2	2
	e+	-	-	-	0.4026	0.3024	0.2471	0.2941	0.3900	0.1932	0.1661	0.1974	0.3677
	n-	2	1	2	0	2	2	2	0	2	3	1	2
	e-	-0.3157	-0.1923	-0.4711	-	-0.3071	-0.2675	-0.2934	-	-0.2757	-0.1973	-0.1699	-0.3236
arab	**n+**	2	2	4	5	2	2	4	4	3	3	4	5
	e+	0.5113	0.6619	0.6163	0.6239	0.5136	0.5582	0.7777	0.5894	0.4183	0.7152	0.6020	0.6562
	n-	2	2	3	1	2	2	2	2	2	3	1	1
	e-	-0.3532	-0.3708	-1.3010	-0.3713	-0.3778	-0.3766	-0.3335	-0.3253	-0.5513	-0.6409	-0.4353	-0.3823
grass	**n+**	0	0	0	0	0	1	1	1	0	0	0	0
	e+	-	-	-	-	-	0.0862	0.3142	0.1646	-	-	-	-
	n-	3	2	0	1	1	1	1	2	2	3	1	2
	e-	-0.1563	-0.1817	-	-0.5363	-0.3997	-0.4700	-0.5704	-0.5758	-0.2571	-0.5486	-0.3964	-0.4664
for	**n+**	4	2	1	2	2	3	3	2	4	5	4	3
	e+	0.3462	0.3722	0.4427	0.5840	0.4662	0.4383	0.3917	0.6431	0.3212	0.3535	0.4931	0.6377
	n-	3	4	4	4	3	3	4	4	3	4	3	2
	e-	-0.3618	-0.3651	-0.3979	-0.4876	-0.3448	-0.3194	-0.4164	-0.4890	-0.4724	-0.4486	-0.5431	-0.8190
crop	**n+**	1	1	1	0	2	1	2	1	0	2	0	0
	e+	0.3152	0.2873	1.6273	-	0.8772	0.3033	0.3630	0.6304	-	0.9463	-	-
	n-	6	6	6	5	6	6	3	4	5	5	3	5
	e-	-0.4113	-0.4980	-0.6564	-0.5978	-0.3587	-0.3605	-0.3543	-0.4312	-0.6362	-0.4473	-0.4478	-0.4512

(continued)

2020

		RCP45				RCP60				RCP85			
		D1	**D2**	**D3**	**D4**	**D1**	**D2**	**D3**	**D4**	**D1**	**D2**	**D3**	**D4**
PA	**n+**	1	1	0	2	1	0	0	0	2	1	1	1
	e+	0.4864	0.3883	-	0.4642	0.2824	-	-	-	0.4275	0.5113	0.3028	0.3725
	n-	1	0	0	2	2	1	2	2	4	2	1	1
	e-	-0.3574	-	-	-0.4204	-0.1389	-0.8764	-0.4287	-0.1520	-0.2013	-0.1890	-0.1306	-0.2614
N2K	**n+**	3	3	3	3	3	3	3	2	2	2	3	3
	e+	0.3970	0.3736	0.3421	0.3517	0.2863	0.3960	0.3427	0.3531	0.3084	0.2671	0.3424	0.4044
	n-	4	1	0	0	4	3	1	0	4	3	1	1
	e-	-0.3041	-0.1367	-	-	-0.3301	-0.2711	-0.0720	-	-0.4274	-0.3183	-0.3258	-0.3224
HII	**n+**	2	1	3	3	2	3	3	3	3	2	3	1
	e+	0.3271	0.4079	0.6180	0.5920	0.6579	0.6771	0.6386	0.6777	0.3521	0.3977	0.4904	0.3425
	n-	6	5	7	8	7	6	4	5	5	5	5	4
	e-	-0.4093	-0.3861	-0.3903	-0.6621	-0.4018	-0.4376	-0.4071	-0.3925	-0.3855	-0.4227	-0.4695	-0.4925
urb	**n+**	0	0	0	1	1	2	1	3	1	1	1	2
	e+	-	-	-	0.6048	0.4591	0.4681	0.4207	0.3505	0.1544	0.1503	0.1531	0.2183
	n-	5	4	2	1	4	3	3	2	3	4	3	4
	e-	-0.3407	-0.4024	-0.3181	-0.1995	-0.2789	-0.2702	-0.2846	-0.2169	-0.3226	-0.2564	-0.2943	-0.3118
arab	**n+**	2	2	3	3	2	2	4	4	2	3	3	5
	e+	0.5488	0.4734	0.5213	0.6976	0.4518	0.3493	0.5188	0.4870	0.6087	0.6002	0.6333	0.6160
	n-	4	2	3	2	3	4	3	3	4	3	2	2
	e-	-0.3296	-0.3680	-0.3931	-0.4097	-0.3728	-0.5003	-0.3423	-0.3509	-0.5230	-0.4789	-0.4488	-0.4243
grass	**n+**	0	0	1	1	0	0	1	1	0	0	0	0
	e+	-	-	0.0759	0.0793	-	-	0.2804	0.1557	-	-	-	-
	n-	3	4	2	2	2	4	2	2	3	3	3	2
	e-	-0.3150	-0.3307	-0.4586	-0.5181	-0.4772	-0.8517	-0.4713	-0.5655	-0.3266	-0.3449	-0.3462	-0.4889
for	**n+**	3	2	3	2	4	3	4	3	3	3	4	3
	e+	0.3926	0.3570	0.3391	0.5974	0.5422	0.4378	0.5212	0.4024	0.2933	0.3541	0.5350	0.3977
	n-	3	4	4	3	3	4	4	2	4	6	4	3
	e-	-0.3425	-0.4234	-0.4022	-0.4688	-0.3152	-0.3889	-0.3928	-0.4734	-0.6333	-0.8423	-0.7085	-0.5730
crop	**n+**	1	1	1	0	3	2	2	1	3	2	2	0
	e+	0.3763	0.3596	0.3159	-	0.4239	0.3643	0.3598	0.5455	0.5740	0.5703	0.5609	-
	n-	4	3	5	7	4	3	4	3	4	5	5	4
	e-	-0.3752	-0.4191	-0.6131	-0.6420	-0.3819	-0.4331	-0.4800	-0.6437	-0.9678	-0.8230	-0.4507	-0.4428

(continued)

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		RCP45				RCP60				RCP85			
		D1	**D2**	**D3**	**D4**	**D1**	**D2**	**D3**	**D4**	**D1**	**D2**	**D3**	**D4**
PA	**n+**	0	0	0	2	0	0	0	0	3	2	2	0
	e+	-	-	-	0.4566	-	-	-	-	0.3539	0.3237	0.2403	-
	n-	0	1	1	0	1	1	2	1	5	2	2	2
	e-	-	-0.2112	-0.2635	-	-0.2700	-0.8463	-0.6750	-0.1464	-0.3563	-0.1745	-0.1774	-0.5013
N2K	**n+**	3	2	3	3	2	2	2	2	2	2	2	2
	e+	0.3819	0.3124	0.3496	0.3307	0.3199	0.3225	0.2934	0.2875	0.3001	0.2851	0.2925	0.2840
	n-	2	1	1	0	3	2	2	1	3	3	2	2
	e-	-0.1626	-0.1837	-0.1663	-	-0.2999	-0.5126	-0.4218	-0.3092	-0.4252	-0.3559	-0.3977	-0.4504
HII	**n+**	2	1	3	3	2	3	4	3	1	1	4	2
	e+	0.4809	0.3677	0.4395	0.3404	0.6328	0.5908	0.6530	0.5670	0.5073	0.4607	0.4890	0.3715
	n-	7	6	5	6	6	6	5	5	5	6	4	4
	e-	-0.4115	-0.3894	-0.3863	-0.3670	-0.4429	-0.4614	-0.3999	-0.4077	-0.4687	-0.4918	-0.3974	-0.3647
urb	**n+**	0	0	0	0	1	1	2	3	0	0	1	0
	e+	-	-	-	-	0.3858	0.3561	0.3250	0.3402	-	-	0.4437	-
	n-	5	3	2	2	3	2	2	2	4	4	4	2
	e-	-0.3022	-0.2723	-0.3201	-0.2810	-0.3156	-0.2858	-0.3173	-0.2821	-0.2751	-0.2381	-0.2551	-0.2586
arab	**n+**	2	1	2	3	2	1	3	3	2	1	3	4
	e+	0.5366	0.7405	0.6983	0.6413	0.4911	0.6903	0.6568	0.5512	0.5687	0.9027	0.4970	0.5416
	n-	4	2	3	1	3	3	2	3	4	4	4	4
	e-	-0.3339	-0.3938	-0.4022	-0.4227	-0.3432	-0.3279	-0.3570	-0.3742	-0.5143	-0.4743	-0.3500	-0.4386
grass	**n+**	0	0	0	0	1	0	1	1	1	1	1	1
	e+	-	-	-	-	0.2368	-	0.3926	0.2306	0.2703	0.2696	0.3042	0.3525
	n-	3	3	2	2	3	2	2	2	4	4	3	2
	e-	-0.3800	-0.3354	-0.4995	-0.5172	-0.4549	-0.5829	-0.5790	-0.5792	-0.3816	-0.4025	-0.5029	-0.6620
for	**n+**	3	3	3	4	4	5	4	4	4	2	3	4
	e+	0.4206	0.2995	0.4796	0.5933	0.4756	0.4556	0.3856	0.4077	0.6244	0.4102	0.4009	0.4458
	n-	4	5	6	5	4	5	5	6	2	3	5	3
	e-	-0.3672	-0.4193	-0.4408	-0.3747	-0.3406	-0.3948	-0.4377	-0.3693	-0.3863	-0.3394	-0.4081	-0.3593
crop	**n+**	1	2	2	1	2	3	3	2	2	3	1	1
	e+	0.3783	0.3026	0.2689	0.3550	0.3421	0.2871	0.3480	0.4321	0.4398	0.4799	0.7510	0.2702
	n-	6	6	4	4	5	4	3	5	4	6	5	3
	e-	-0.4443	-0.4243	-0.6306	-0.5521	-0.4001	-0.3537	-0.3632	-0.7141	-0.4745	-0.4608	-0.5872	-0.4990

(continued)

2080

		RCP45				RCP60				RCP85			
		D1	**D2**	**D3**	**D4**	**D1**	**D2**	**D3**	**D4**	**D1**	**D2**	**D3**	**D4**
PA	**n+**	2	0	1	3	0	0	0	0	3	3	2	1
	e+	0.3186	-	0.2727	0.4341	-	-	-	-	0.3779	0.3271	0.3040	0.2514
	n-	2	0	2	1	1	1	3	2	3	2	2	1
	e-	-0.1790	-	-0.3039	-0.1112	-0.1661	-0.0873	-0.5863	-0.7701	-0.2412	-0.1674	-0.5204	-0.2059
N2K	**n+**	2	1	2	3	2	2	3	2	5	1	3	4
	e+	0.3151	0.2741	0.2708	0.3024	0.3553	0.2591	0.3221	0.2704	0.3029	0.3138	0.4304	0.4570
	n-	1	2	1	1	1	2	2	1	1	2	2	2
	e-	-0.1936	-0.1528	-0.1178	-0.1274	-0.2015	-0.3376	-0.5342	-0.3019	-0.3591	-0.4367	-0.5406	-0.3202
HII	**n+**	1	1	3	3	2	3	4	4	3	2	3	2
	e+	0.4633	0.4538	0.5868	0.4303	0.6640	0.6129	0.6772	0.5547	0.5653	0.6812	0.4708	0.7342
	n-	7	7	6	7	7	7	6	8	5	5	6	5
	e-	-0.4459	-0.4894	-0.4473	-0.4576	-0.4580	-0.5265	-0.4554	-0.4265	-0.4880	-0.4503	-0.4977	-0.3335
urb	**n+**	0	1	1	0	1	1	3	3	0	1	0	1
	e+	-	0.4409	0.4737	-	0.4368	0.3966	0.3228	0.5043	-	0.5689	-	0.0336
	n-	4	5	2	2	6	3	2	2	4	4	3	3
	e-	-0.3612	-0.3156	-0.3366	-0.3408	-0.2925	-0.3382	-0.3314	-0.3180	-0.3373	-0.3683	-0.3083	-0.3641
arab	**n+**	1	2	2	4	1	1	2	4	1	1	2	2
	e+	0.8272	0.5760	0.8427	0.5791	0.7337	0.7109	0.8055	0.5366	0.9721	0.9243	0.5122	0.4618
	n-	4	2	4	3	2	2	2	3	4	3	3	4
	e-	-0.3714	-0.4208	-0.4438	-0.4021	-0.3766	-0.3910	-0.3557	-0.4334	-0.5437	-0.6027	-0.3409	-0.4150
grass	**n+**	0	1	0	1	0	1	2	2	1	1	2	1
	e+	-	0.2174	-	0.3083	-	0.2226	0.3274	0.2397	0.1946	0.2291	0.3135	0.3131
	n-	4	4	3	4	5	3	4	2	5	4	3	2
	e-	-0.3397	-0.3600	-0.3572	-0.6977	-0.3260	-0.3641	-0.3568	-0.6080	-0.3675	-0.3794	-0.3836	-0.5208
for	**n+**	2	3	4	4	3	3	3	3	4	4	3	4
	e+	0.3431	0.3207	0.3872	0.4467	0.4645	0.4429	0.4380	0.5103	0.4229	0.5442	0.4509	0.4255
	n-	5	4	7	5	4	5	5	6	2	3	3	6
	e-	-0.4028	-0.3341	-0.4501	-0.4920	-0.3340	-0.4159	-0.4502	-0.6381	-0.3666	-0.2292	-0.2801	-0.3561
crop	**n+**	1	3	2	2	3	3	4	3	2	3	2	1
	e+	0.3461	0.2478	0.3349	0.3709	0.2892	0.3081	0.5481	0.4006	0.4994	0.4209	0.3217	0.3595
	n-	4	5	5	4	4	4	3	4	7	7	6	5
	e-	-0.4045	-0.3458	-0.5386	-0.5092	-0.3752	-0.3166	-0.3674	-0.3690	-0.5157	-0.5247	-0.6266	-0.5176

Table S5- Summary of univariate regression of relative frequency selection of sites crossed by SATs in C^s among the 12 runs obtained by varying climate x dispersal scenarios for each of the four time periods against: land use coverage (Urb: urban areas; Arab: arable lands; Grass: grasslands; For: forest lands; Crop: Croplands); conservation area coverage (Natura 2000, N2k; and nationally-designated protected areas, PAs); habitat disturbance (measured with the human footprint index, HII); summed persistence scores of species SATs crossing the sites (either in the non-independent sets, C^s, and in the independent sets, CI^s) and; the number of trajectories converging in sites (Converg). The plus and minus signs refer to positive and negative slopes (β_{freq}) obtained in regression. Average refers to the average of statistical significant slopes, β_{freq} (P-value ≤ 0.05); sd refers to the standard deviation of statistical significant slopes and nsp refers to the number of species with statistically significant slopes.

		Land use					Conserv areas		HII	Pers		Converg
		Urb	Arab	Grass	For	Crop	N2k	PAs		$C^s/IC50^s$	CI^s	
+	average	0.0035	0.0030	0.0037	0.0050	0.0052	0.0017	0.0065	0.0115	1.0471	0.3642	7.4487
	sd	0.0009	0.0014	0.0020	0.0009	0.0013	0.0008	0.0031	0.0046	1.1264	0.4360	15.8481
	nsp	2	7	7	1	2	5	5	4	29	28	29
-	average	-0.0311	-0.0044	-0.0101	-0.0138	-0.0116	-0.0027	-0.0058	-0.0110	na	na	na
	sd	0.0377	0.0023	0.0055	0.0064	0.0061	0.0011	0.0027	0.0057	na	na	na
	nsp	12	6	7	6	9	5	7	10	0	0	0