Thermal melanism explains macroevolutionary variation of dorsal pigmentation in Eurasian vipers.

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Supplementary Material

Supplementary Tables

Table S1 – Lineage name (LINEAGE), number of specimens according to lineage (N), species/clades considered within each lineage (SPECIES), average (and range) of total dorsal rows (N rows), sampled dorsal rows (N sample) and source from where specimens were measured (SOURCE: museum collections visited / fieldwork performed by authors / personal collections of colleagues)

LINEAGE	SPECIES	N	N rows	N sample	SOURCE
D. mauritanica	*Daboia mauritanica*	71	26.6 (25-27)	11	collections: MNCN-M, MNHN-P, CEFE, NHM-L, NHM-V, UT, ZFMK / fieldwork
D. palaestinae	*Daboia palaestinae*	23	25.1 (25-27)	11	collections: MNCN-M, MNHN-P, NHM-L, NHM-V
D. russelii	*Daboia russelii*	51	28.7 (29-31)	13	collections: MNHN-P, NHM-L, NHM-V, ZFMK
D. siamensis	*Daboia siamensis*	18	28.5 (27-31)	13	collections: NHM-L, ZFMK
M. lebetina	*Macrovipera lebetina*	39	24.9 (23-25)	11	collections: MNHN-P, NHM-L, NHM-V, NM-P, ZFMK
M. schweizeri	*Macrovipera schweizeri*	13	22.9 (21-23)	9	collections: NHM-L, NHM-V, NM-P, ZFMK
M. bornmuelleri	*Montivipera bornmuelleri*	9	22.3 (21-23)	9	collections: NHM-L, NHM-V / personal collections: K. Mebert
M. raddei	*Montivipera latifii, Montivipera raddei*	50	22.9 (21-23)	9	collections: MNHN-P, NHM-L, NHM-V, NM-P, ZFMK / personal collections: K. Mebert
M. wagneri	*Montivipera bulgardaghica, M. wagneri*	36	23 (23)	9	collections: MNHN-P, NHM-V, NM-P, ZFMK / personal collections: K. Mebert
M. xanthina - G	*Montivipera xanthina*, Greek clade	31	23 (23)	9	collections: NHM-L, NHM-V, ZFMK / personal collections: K. Mebert
M. xanthina - L	*Montivipera xanthina*, Lycian clade	6	23 (23)	9	collections: NHM-V / personal collections: K. Mebert
M. xanthina - T	*Montivipera xanthina*, Taurus clade	5	23 (23)	9	collections: NHM-V, ZFMK / personal collections: K. Mebert
V. ammodytes CYC	*Vipera ammodytes*, Cyclades clade	8	21 (21)	9	collections: NHM-L, ZFMK
V. ammodytes MO	*Vipera ammodytes*, Montenegro clade	14	21.6 (21-23)	9	collections: NHM-L, NHM-V, ZFMK
V. ammodytes NE	*Vipera ammodytes*, NE clade	16	21 (21)	9	collections: NHM-L, NHM-V
V. ammodytes NW	*Vipera ammodytes*, NW clade	77	21.4 (21-23)	9	collections: MNCN-M, MNHN-P, NHM-L, NHM-V, NM-P, ZFMK
V. ammodytes PEL	*Vipera ammodytes*, Peloponeso clade	20	21 (21)	9	collections: MNHN-P, NHM-L, ZFMK / fieldwork
V. ammodytes S+E	*Vipera ammodytes*, South and and East clades	50	21.04 (21-23)	9	collections: MNCN-M, MNHN-P, NHM-L, NHM-V, NM-P, ZFMK / fieldwork
V. ammodytes SW	*Vipera ammodytes*, SW clade	10	21.2 (21-23)	9	collections: NHM-L, NHM-V

V. ammodytes T+AM	*Vipera ammodytes*, Turkish and Asian Minor clades	14	21.1 (21-23)	9	collections: NHM-L, NHM-V, ZFMK
V. anatolica	*Vipera anatolica*	29	19	7	collections: MNHN-P / personal collections: K. Mebert
V. aspis E	*Vipera aspis*, East clade	60	20.9 (19-21)	9	collections: MNHN-P, NHM-L, NHM-V, NM-P, ZFMK
V. aspis W	*Vipera aspis*, West clade	110	21.02 (19-23)	9	collections: AR, EBD, IPE, MNC-B, MNCN-M, MNHN-P, CEFE, NHM-L, NHM-V, NM-P, UB, USAL, ZFMK
V. berus	*Vipera berus (barani* and *nikolskii* included)	280	21 (19-23)	9	collections: MNCN-M, MNHN-P, NHM-L, NHM-V, NM-P, ZFMK
V. darevskii	*Vipera darevskii*	20	20.9 (19-21)	9	collections: MNCN-M, NM-P / personal collections: K. Mebert
V. graeca	*Vipera graeca*	28	19 (19)	7	collections: NHM-L, NHM-V, ZFMK / personal collections: E. Miszei
V. kaznakovi	*Vipera kaznakovi, V. dinniki, V. orlovi*	46	21 (21-23)	9	collections: NHM-L, NHM-V, NM-P, ZFMK / personal collections: K. Mebert
V. latastei East-CNS	*Vipera latastei*, Iberia, Eastern-CNS clade	31	21 (21)	9	collections: EBD, USAL, ZFMK / fieldwork
V. latastei East-SOU	*Vipera latastei*, Iberia, Eastern-SOU clade	24	21 (21)	9	collections: EBD, MNCN-M / personal collections: X. Santos
V. latastei South	*Vipera latastei*, Southern clade	14	21 (21)	9	collections: EBD, MNCN-M / fieldwork / personal collections: X. Santos, F. Jiménez Cazalla
V. latastei W	*Vipera latastei*, Iberia, Western clade	60	20.9 (19-21)	9	collections: EBD, MHN-Li, MNCN-M, CEFE, NHM-V, USAL / fieldwork / personal collections: J.C. Brito
V. monticola CH-Atl	*Vipera latastei* (*monticola*), Central High Atlas	17	19 (19)	7	collections: MNCN-M, NHM-V / fieldwork / personal collections: J.C. Brito
V. latastei RIF	*Vipera latastei*, Rif, Eastern Atlas and Algerian clade	15	20.7 (19-23)	9	collections: MNCN-M, CEFE, NHM-L / fieldwork / personal collections: J.C. Brito
V. monticola WH-Atl	*Vipera latastei* (*monticola*), Western High Atlas	2	19 (19)	7	fieldwork
V. renardi	*Vipera renardi, V. lotievi, V. altaica, V. eriwanensis*	55	20.9 (19-21)	9	collections: MNHN, NHM-V, NM-P, ZFMK
V. sakoi	*Vipera sakoi*	11	20.8 (19-21)	9	personal collections: K. Mebert
V. seoanei	*Vipera seoanei*	165	21 (19 -23)	9	collections: AR, BIC, EBD, MNCN-M, MNHN-P, UO, UA / fieldwork / personal collections: J.C. Brito
V. ursinii	*Vipera ursinii*	91	19.1 (19-21)	7	collections: NHM-L, NHM-V, NM-P, ZFMK
V. walser	*Vipera walser*	19	20.8 (19-21)	9	personal collections: S. Ghielmi

Acronyms for museum collections: AR (Sociedad de Ciencias Aranzadi, Donosti, Spain), BIC (Paisagem Protegida do Corno do Bico, Paredes de Coura, Portugal), EBD (Estación Biológica de Doñana – CSIC, Sevilla, Spain), IPE (Instituto Pirenaico de Ecología, Jaca, Spain), MCN-B (Museu de Ciències Naturals, Barcelona, Spain), MHN-Li (Museu Nacional de História Natural e da Ciência, Lisboa, Portugal), MNCN-M (Museo Nacional de Ciencias Naturales – CSIC, Madrid, Spain), MNHN-P (Muséum National d´Histoire Naturelle, Paris, France), CEFE (Centre d'Ecologie Fonctionnelle & Evolutive – CNRS, Montpellier, France), NHM-L (Natural History Museum, London, UK), NM-P (National Museum, Prague, Czeck Republic), UO (Universidad de Oviedo, Oviedo, Spain), UC (Universidade da Coruña, A Coruña, Spain), UB (Universitat de Barçelona, Barçelona, Spain), UT (Université Abdelmalek Essaadi, Tetouan, Morocco), USAL (Universidad de Salamanca, Salamanca, Spain), ZFMK (Zoological Research Museum Alexander Koenig, Bonn, Germany).

Table S2 - Mean values of ANOVA statistics from pairwise PGLS models fit to examine the evolutionary covariation of WPI and range descriptors. Significant p-values (at a = 0.05) are highlighted in boldface. The estimated value for the regression coefficient (Coef) and the number of significant p-values over 1000 phylogeny iterations are also provided (only for significant effects).

Range descriptors	R^2	F	Z	pval	Coef	pval<0.05
PRECmax	0.126	5.35	1.277	**0.039**	0.049	837
PRECmin	0.038	1.473	0.701	0.249	-0.019	
SRADavg	0.201	9.318	1.549	**0.006**	-0.068	1000
SRADmax	0.024	0.925	0.42	0.387	-0.024	
SRADmin	0.28	14.393	1.737	**0.003**	-0.064	1000
TAVGavg	0.05	1.949	0.838	0.18	-0.033	
TAVGmax	0.007	0.254	-0.116	0.632	-0.011	
TAVGmin	0.061	2.413	0.923	0.141	-0.031	
TMAXmax	0.001	0.032	-1.605	0.897	-0.002	
TMAXmin	0.054	2.098	0.87	0.161	-0.031	
TMINmax	0.025	0.97	0.507	0.349	-0.02	
TMINmin	0.071	2.845	1.012	0.116	-0.032	
VPRavg	0.003	0.113	-0.987	0.794	-0.005	
VPRmax	0.04	1.535	0.722	0.237	-0.029	
VPRmin	0.021	0.793	0.396	0.403	-0.021	
ELEVavg	0.004	0.151	-0.812	0.765	-0.005	
ELEVmax	0.079	3.218	1.062	0.093	0.024	
ELEVmin	0.189	8.623	1.471	**0.005**	-0.045	1000
LATavg	0.124	5.227	1.275	**0.025**	0.059	1000
LATmax	0.185	8.394	1.461	**0.009**	0.049	1000
LATmin	0.002	0.080	-1.008	0.820	0.008	

Table S3 - Mean values of ANOVA statistics from pairwise PGLS models fit to examine the evolutionary covariation of DM and range descriptors. Significant p-values (at a = 0.05) are highlighted in boldface. The estimated value for the regression coefficient (Coef) and the number of significant p-values over 1000 phylogeny iterations are also provided (only for significant effects).

Range descriptors	R^2	F	Z	pval	Coef	pval<0.05
PRECmax	0.001	0.021	-1.655	0.902	-0.115	
PRECmin	0.009	0.339	0.049	0.579	0.811	
SRADavg	0.032	1.232	0.63	0.292	-2.355	
SRADmax	0.071	2.825		0.108	-3.744	
SRADmin	0.005	0.191	-0.269	0.669	-0.733	
TAVGavg	0.012	0.451	0.18	0.509	-1.388	
TAVGmax	0.096	3.937	1.154	0.057	-3.828	
TAVGmin	0.001	0.022	-1.747	0.908	0.065	
TMAXmax	0.116	4.84	1.309	**0.039**	-4.268	858
TMAXmin	0.005	0.169	-0.37	0.706	-0.732	
TMINmax	0.049	1.891	0.853	0.18	-2.475	
TMINmin	0.004	0.162	-0.417	0.706	0.638	
VPRavg	0.001	0.044	-1.268	0.862	-0.328	
VPRmax	0.001	0.04	-1.234	0.856	-0.332	
VPRmin	0.002	0.071	-0.833	0.797	-0.516	
ELEVavg	0.006	0.222	-0.188	0.64	0.668	
ELEVmax	0.002	0.07	-1.173	0.839	-0.226	
ELEVmin	0.012	0.439	0.151	0.533	0.958	
LATavg	0.004	0.159	-0.366	0.709	0.927	
LATmax	0.004	0.147	-0.444	0.744	-0.597	
LATmin	0.049	1.925	0.83	0.178	4.226	

Supplementary Figure

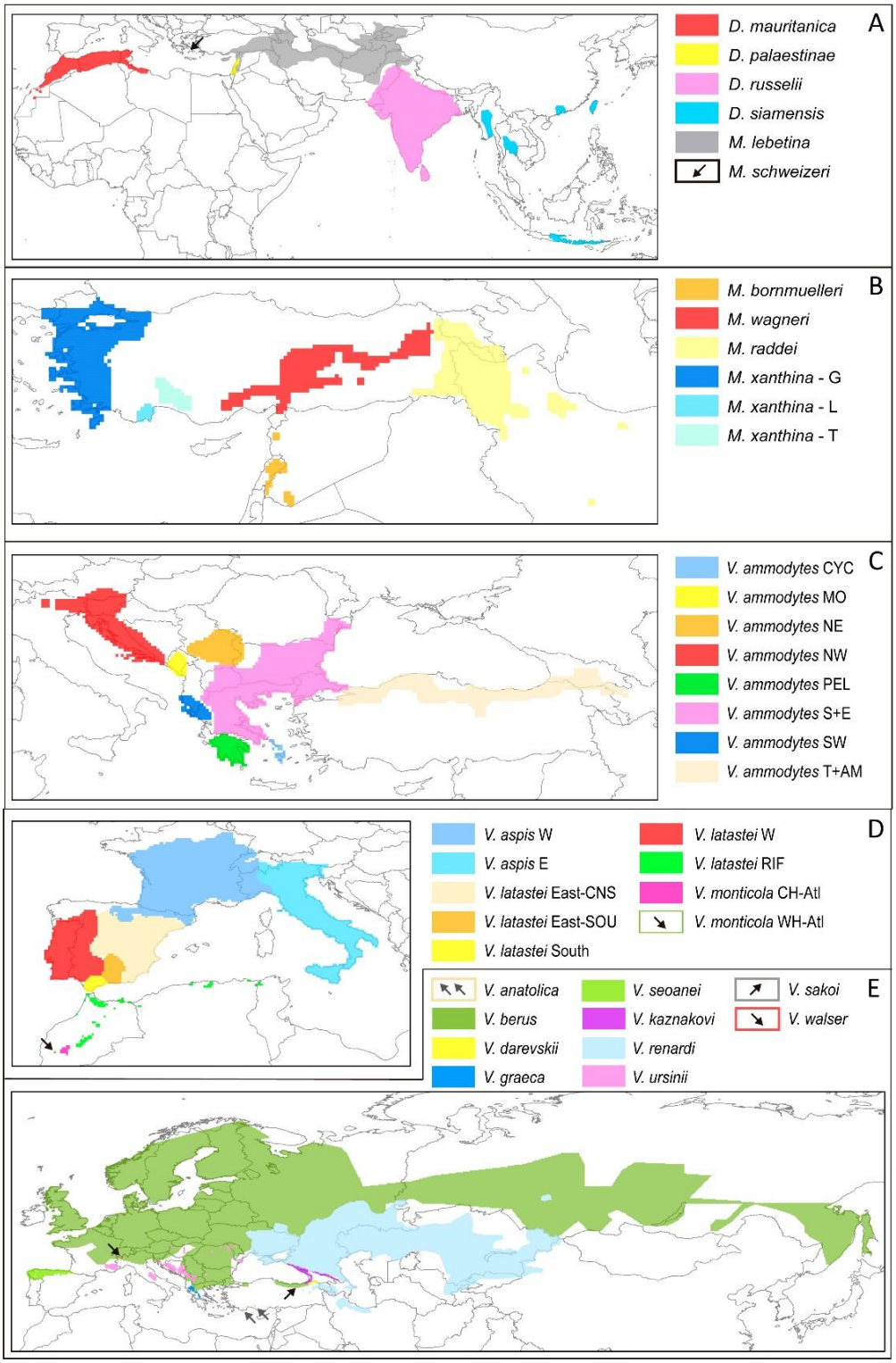

Figure S1 – Distribution ranges for the 39 lineages of Eurasian vipers considered in this study, grouped accordingly to genera (A) *Daboia* and *Macrovipera*, (B) *Montivipera*, (C) *Vipera*, clade *Vipera* 2, (D) *Vipera*, clade *Vipera* 1, and (E) *Vipera*, clade *Pelias*. See Table S1 for lineages names.