Supplementary Material for:
Locomotion and paleoclimate explain the re-evolution of quadrupedal body form in *Brachymeles* lizards

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Supplementary Table S1: Species sampled for morphometric and locomotion data, including their sample sizes, the number of digits they have, species mean snout–vent length (SVL), head length (HL), and pPC-1 (see text). Also presented are countries of origin and collection localities.

Species	n	Digits	SVL	HL	pPC-1	Country	Localities
Brachymeles bicolor	2	5	77.7±2.1	10.5±0.1	-12.04	Philippines	Luzon Island, Quezon Province, Maddiangat
B. boulengeri	8	5	86.7±6.0	12.7±0.4	-19.78	Philippines	Luzon Island, Camarines Sur Province, Tabaco; Camarines Norte Province, Labo
B. kadwa	17	5	111.5±9.6	15.4±1.1	-22.41	Philippines	Luzon Island, Camarines Sur Province, Tabaco; Camarines Norte Province, Labo
B. orientalis	11	5	91.6±17.1	13.2±2.6	-22.63	Philippines	Samar Island, Municipality of San Jose de Buan
B. samad	15	5	68.9±4.7	9.8±0.4	-17.92	Philippines	Samar Island, Municipality of San Jose de Buan
B. taylori	15	5	74.8±14.1	10.2±1.5	-16.00	Philippines	Negros Island, Negros Occidental Province, Municipality of Hinoba-an; Negros Island, Negros Oriental Province, Municipality of Valencia
B. muntingkamay	15	3	71.4±9.6	7.3±0.6	-2.26	Philippines	Luzon Island, Quezon Province, Maddiangat
B. tridactylus	10	3	69.3±7.9	6.8±0.6	5.06	Philippines	Negros Island, Negros Occidental Province, Municipality of Hinoba-an
B. bicolandia	9	2	57.3±5.9	6.0±0.4	8.16	Philippines	Luzon Island, Camarines Sur Province, Municipality of Tabaco; Camarines Norte Province, Municipality of Labo
B. bonitae	3	2	72.6±3.8	7.2±0.2	10.02	Philippines	Luzon Island, Camarines Norte Province, Municipality of Labo
B. ilocandia	11	2	70.6±5.0	6.2±0.3	9.51	Philippines	Luzon Island, Municipality of Gattaran, Nasipping
B. lukbani	15	0	65.6±4.8	6.7±0.5	29.25	Philippines	Luzon Island, Camarines Norte Province, Municipality of Labo
B. miriamae	5	0	61.0±9.1	5.4±0.4	30.47	Thailand	Nakhon Ratchasima, Skaerat Research Station
Lygosoma bowringii	11	5	47.6±4.0	6.7±1.4	-13.85	Thailand	Prachuap Khiri Khan, KU Forestry Training Station; Chumphon, Lang Suan; Nakhon Ratchasima, Sakaerat Research Station.

Supplementary Table S2: Specimens used in collection of morphometric and locomotion data. The Museum ID provides the museum and accession number for each specimen. The Field ID allows linking to field notes from each expedition, and the Trial ID is the identifier used in the morphometric and locomotion data.

Species	Museum ID	Field ID	Trial ID
Brachymeles bicolandia	OMNH-45769	CDS7617	BIC08
Brachymeles bicolandia	OMNH-45770	CDS7618	BIC13
Brachymeles bicolandia	OMNH-45771	CDS7621	BIC09
Brachymeles bicolandia	OMNH-45772	CDS7622	BIC10
Brachymeles bicolandia	OMNH-45773	CDS7625	BIC03
Brachymeles bicolandia	OMNH-45774	CDS7627	BIC05
Brachymeles bicolandia	OMNH-45775	CDS7628	BIC15
Brachymeles bicolandia	OMNH-45776	CDS7630	BIC01
Brachymeles bicolandia	OMNH-45777	CDS7631	BIC12
Brachymeles bicolandia	OMNH-45778	CDS7632	BIC14
Brachymeles bicolor	OMNH-46592	CDS9117	BCOL02
Brachymeles bicolor	OMNH-46593	CDS9147	BCOL03
Brachymeles bonitae	OMNH-45779	CDS8362	BIC19
Brachymeles bonitae	OMNH-45780	CDS8380	BIC21
Brachymeles bonitae	OMNH-45781	CDS8381	BIC20
Brachymeles boulengeri	OMNH-45784	CDS7619	BOU12
Brachymeles boulengeri	OMNH-45785	CDS7620	BOU03
Brachymeles boulengeri	OMNH-45786	CDS7623	BOU11
Brachymeles boulengeri	OMNH-45787	CDS7624	BOU13
Brachymeles boulengeri	OMNH-45788	CDS7626	BOU04
Brachymeles boulengeri	OMNH-45789	CDS7629	BOU06
Brachymeles boulengeri	OMNH-45790	CDS8382	BOU16
Brachymeles boulengeri	OMNH-45782	ESF175	BOU05
Brachymeles boulengeri	OMNH-45783	ESF251	BOU10
Brachymeles ilocandia	OMNH-46596	CDS7930	Ilo01
Brachymeles ilocandia	OMNH-46597	CDS7931	Ilo02
Brachymeles ilocandia	OMNH-46598	CDS7932	Ilo03
Brachymeles ilocandia	OMNH-46599	CDS7933	Ilo04
Brachymeles ilocandia	OMNH-46600	CDS7973	Ilo147a
Brachymeles ilocandia	OMNH-46601	CDS7974	Ilo06
Brachymeles ilocandia	OMNH-46602	CDS7975	Ilo148
Brachymeles ilocandia	OMNH-46603	CDS8665	Ilo09
Brachymeles ilocandia	OMNH-46605	CDS8771	Ilo05
Brachymeles ilocandia	OMNH-46606	CDS8784	Ilo12
Brachymeles ilocandia	OMNH-46594	EDE21	Ilo11
Brachymeles ilocandia	OMNH-46595	EDE22	Ilo10
Brachymeles kadwa	OMNH-45791	CDS8451	KAD04

Species	Museum ID	Field ID	Trial ID
Brachymeles kadwa	OMNH-45792	CDS8452	KAD10
Brachymeles kadwa	OMNH-45793	CDS8453	KAD03
Brachymeles kadwa	OMNH-45794	CDS8454	KAD05
Brachymeles kadwa	OMNH-45795	CDS8455	KAD01
Brachymeles kadwa	OMNH-45796	CDS8456	KAD06
Brachymeles kadwa	OMNH-45797	CDS8457	KAD07
Brachymeles kadwa	OMNH-45798	CDS8458	KAD08
Brachymeles kadwa	OMNH-45799	CDS8459	KAD02
Brachymeles kadwa	OMNH-45800	CDS8460	KAD11
Brachymeles kadwa	OMNH-45801	CDS8461	KAD09
Brachymeles kadwa	OMNH-45802	CDS8651	KADB
Brachymeles kadwa	OMNH-45803	CDS8652	KADA
Brachymeles kadwa	OMNH-45804	CDS8653	KADC
Brachymeles kadwa	OMNH-45805	CDS8654	KADF
Brachymeles kadwa	OMNH-45806	CDS8655	KADD
Brachymeles kadwa	OMNH-45807	CDS8656	KADE
Brachymeles lukbani	OMNH-45810	CDS8305	LUK04
Brachymeles lukbani	OMNH-45811	CDS8363	LUK16
Brachymeles lukbani	OMNH-45812	CDS8364	LUK49
Brachymeles lukbani	OMNH-45813	CDS8366	LUK05
Brachymeles lukbani	OMNH-45814	CDS8367	LUK13
Brachymeles lukbani	OMNH-45815	CDS8369	LUK10
Brachymeles lukbani	OMNH-45816	CDS8371	LUK21
Brachymeles lukbani	OMNH-45817	CDS8372	LUK08
Brachymeles lukbani	OMNH-45818	CDS8373	LUK27
Brachymeles lukbani	OMNH-45819	CDS8374	LUK15
Brachymeles lukbani	OMNH-45820	CDS8375	LUK50
Brachymeles lukbani	OMNH-45821	CDS8376	LUK48
Brachymeles lukbani	OMNH-45822	CDS8377	LUK20
Brachymeles lukbani	OMNH-45823	CDS8378	LUK44
Brachymeles lukbani	OMNH-45824	CDS8379	LUK07
Brachymeles lukbani	OMNH-45689	ESF107	LUK01
Brachymeles miriamae	No voucher	ESF436	MIR01
Brachymeles miriamae	No voucher	ESF439	MIR02
Brachymeles miriamae	No voucher	ESF445	MIR03
Brachymeles miriamae	No voucher	ESF446	MIR04
Brachymeles miriamae	OMNH-46511	ESF451	MIR05
Brachymeles miriamae	OMNH-46512	ESF547	MIR06
Brachymeles miriamae	OMNH-46514	ESF579	MIR07
Brachymeles muntingkamay	OMNH-46713	CDS9132	MUT02
Brachymeles muntingkamay	OMNH-46714	CDS9133	MUT21
Brachymeles muntingkamay	OMNH-46715	CDS9134	MUT04

Species	Museum ID	Field ID	Trial ID
Brachymeles muntingkamay	OMNH-46716	CDS9135	MUT01
Brachymeles muntingkamay	OMNH-46717	CDS9136	MUT15
Brachymeles muntingkamay	OMNH-46718	CDS9137	MUT14
Brachymeles muntingkamay	OMNH-46719	CDS9138	MUT06
Brachymeles muntingkamay	OMNH-46720	CDS9139	MUT05
Brachymeles muntingkamay	OMNH-46721	CDS9140	MUT03
Brachymeles muntingkamay	OMNH-46722	CDS9145	MUTA
Brachymeles muntingkamay	OMNH-46723	CDS9148	MUT09
Brachymeles muntingkamay	OMNH-46724	CDS9149	MUT07
Brachymeles muntingkamay	OMNH-46725	CDS9150	MUT12
Brachymeles muntingkamay	OMNH-46726	CDS9151	MUT13
Brachymeles muntingkamay	OMNH-46727	CDS9152	MUT18
Brachymeles muntingkamay	OMNH-46728	CDS9153	MUT17
Brachymeles orientalis	KU-337148	CDS6522	ORI02
Brachymeles orientalis	KU-337152	CDS6694	ORI03
Brachymeles orientalis	KU-337153	CDS6695	ORI01
Brachymeles orientalis	KU-337154	CDS6698	ORI05
Brachymeles orientalis	KU-337156	CDS6700	ORI04
Brachymeles orientalis	KU-337164	CDS6757	ORI07
Brachymeles orientalis	OMNH-44660	CDS6761	ORI10
Brachymeles orientalis	KU-337166	CDS6790	ORI06
Brachymeles orientalis	KU-337167	CDS6791	ORI09
Brachymeles orientalis	OMNH-44661	CDS6894	ORI08
Brachymeles orientalis	KU-337169	CDS6895	ORI11
Brachymeles orientalis	KU-337170	CDS6896	ORI12
Brachymeles samad	KU-337182	CDS6514	SMD04
Brachymeles samad	KU-337183	CDS6516	SMD05
Brachymeles samad	KU-337184	CDS6518	SMD02
Brachymeles samad	OMNH-44666	CDS6520	SMD08
Brachymeles samad	KU-337186	CDS6521	SMD03
Brachymeles samad	KU-337191	CDS6583	SMD01
Brachymeles samad	KU-337192	CDS6585	SMD06
Brachymeles samad	KU-337193	CDS6588	SMD07
Brachymeles samad	OMNH-44669	CDS6693	SMD09
Brachymeles samad	KU-337197	CDS6697	SMD11
Brachymeles samad	KU-337198	CDS6703	SMD10
Brachymeles samad	OMNH-44670	CDS6704	SMD12
Brachymeles samad	KU-337201	CDS6759	SMD13
Brachymeles samad	KU-337203	CDS6892	SMD15
Brachymeles samad	KU-337204	CDS6893	SMD14
Brachymeles taylori	OMNH-46427	CDS9017	TAY08
Brachymeles taylori	OMNH-46428	CDS9018	TAY07

Species	Museum ID	Field ID	Trial ID
Brachymeles taylori	OMNH-46429	CDS9019	TAY11
Brachymeles taylori	OMNH-46434	ESF295	TAY05
Brachymeles taylori	OMNH-46435	ESF297	TAY01
Brachymeles taylori	OMNH-46436	ESF299	TAY03
Brachymeles taylori	OMNH-46424	ESF364	TAY14
Brachymeles taylori	OMNH-46425	ESF366	TAY13
Brachymeles taylori	OMNH-46426	ESF367	TAY12
Brachymeles taylori	No voucher	ESF390	TAY16
Brachymeles taylori	No voucher	ESF391	TAY18
Brachymeles taylori	No voucher	ESF397	TAY15
Brachymeles taylori	No voucher	ESF398	TAY19
Brachymeles taylori	No voucher	ESF402	TAY21
Brachymeles taylori	No voucher	ESF404	TAY17
Brachymeles taylori	No voucher	ESF407	TAY20
Brachymeles tridactylus	OMNH-46437	CDS9020	TRI15
Brachymeles tridactylus	OMNH-46438	CDS9021	TRI14
Brachymeles tridactylus	OMNH-46439	CDS9022	TRI19
Brachymeles tridactylus	OMNH-46440	CDS9023	TRI18
Brachymeles tridactylus	OMNH-46441	CDS9024	TRI17
Brachymeles tridactylus	OMNH-46442	CDS9025	TRI13
Brachymeles tridactylus	OMNH-46443	CDS9026	TRI16
Brachymeles tridactylus	OMNH-46446	ESF274	TRI01
Brachymeles tridactylus	OMNH-46452	ESF294	TRI04
Brachymeles tridactylus	OMNH-46453	ESF296	TRI07
Brachymeles tridactylus	OMNH-46454	ESF298	TRI03
Brachymeles tridactylus	OMNH-46455	ESF300	TRI02
Brachymeles tridactylus	OMNH-46456	ESF301	TRI08
Brachymeles tridactylus	OMNH-46457	ESF319	TRI11
Lygosoma bowringii	OMNH-46521	ESF419	LBO01
Lygosoma bowringii	OMNH-46522	ESF442	LBO02
Lygosoma bowringii	ZMKU-R-00814	ESF498	LBO03
Lygosoma bowringii	ZMKU-R-00815	ESF499	LBO04
Lygosoma bowringii	ZMKU-R-00816	ESF500	LBO05
Lygosoma bowringii	ZMKU-R-00819	ESF504	LBO06
Lygosoma bowringii	ZMKU-R-00820	ESF506	LBO07
Lygosoma bowringii	OMNH-46424	ESF519	LBO08
Lygosoma bowringii	No voucher	ESF538	LBO09
Lygosoma bowringii	No voucher	ESF561	LBO10
Lygosoma bowringii	No voucher	ESF569	LBO11
Lygosoma bowringii	No voucher	ESF570	LBO12

Supplementary Table S3: Variable loadings, eigenvalues and percent variance explained by the first two PCs from a phylogenetic PCA on morphometric variables for species average data. Only pPC-1 is interpreted in the study, representing an index of how lizard-like (low values) or snake-like (high values) a species is. (a) pPCA using a correlation matrix, the PCA that is used in the main study (phylogenetic signal, $\lambda = 0.755$), (b) pPCA using a covariance matrix for comparison ($\lambda = 0.755$), (c) pPCA using a correlation matrix and decomposing the hindlimb into segments, also for comparison ($\lambda = 0$).

A. pPCA using correlation matrix

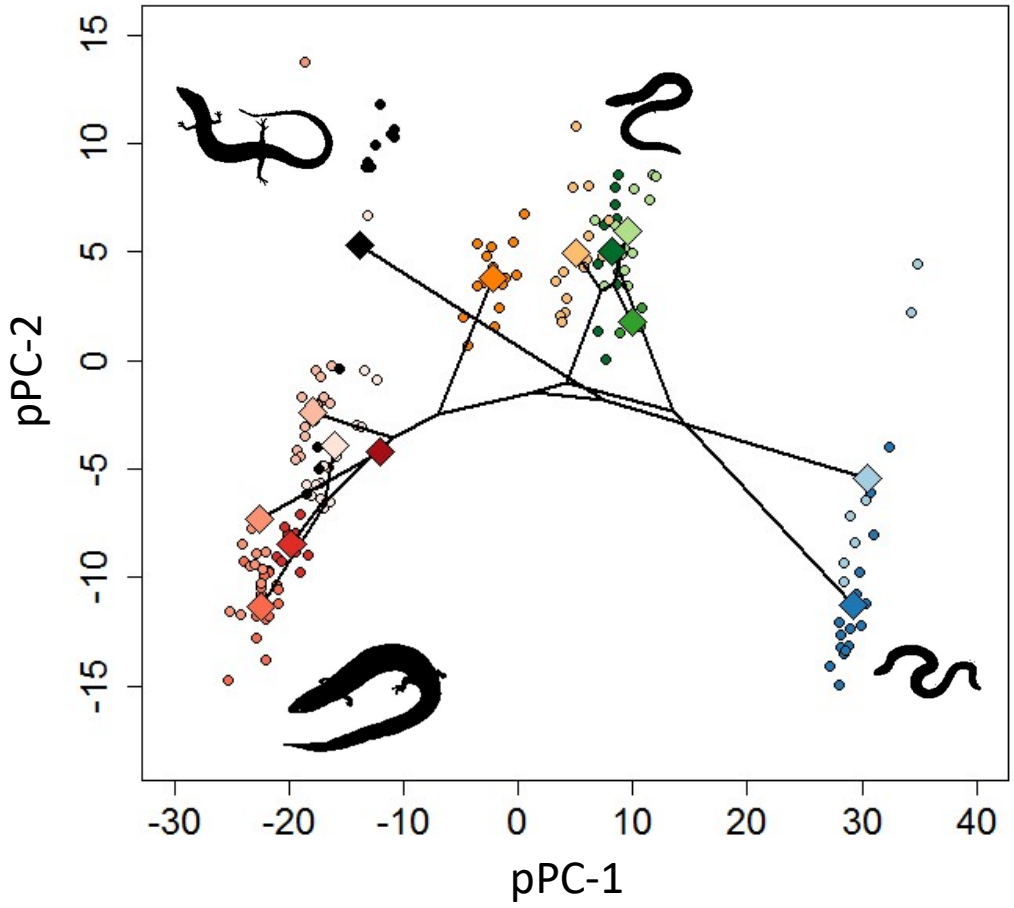
Variable	pPC-1	pPC-2
# Digits	-0.959	0.216
Head Length	-0.768	-0.595
Relative Snout–vent Length	0.836	0.382
Relative Body Width	-0.802	-0.083
Relative Fore-Limb Length	-0.932	0.345
Relative Hind Limb Length	-0.938	0.335
Eigenvalue	4.598	0.786
% Variance	76.63	13.10

B. pPCA using covariance matrix

Variable	pPC-1	pPC-2
# Digits	-0.975	0.120
Head Length	-0.539	0.831
Relative Snout–vent Length	0.671	-0.578
Relative Body Width	-0.690	0.365
Relative Fore-Limb Length	-0.998	-0.024
Relative Hind Limb Length	-0.999	-0.011
Eigenvalue	0.088	0.001
% Variance	97.73	1.54

C. pPCA using correlation matrix with hind limb decomposed

Variable	pPC-1	pPC-2
# Digits	-0.971	-0.189
Head Length	-0.805	0.448
Relative Snout–vent Length	0.906	-0.315
Relative Body Width	-0.862	0.170
Relative Fore-Limb Length	-0.942	-0.325
Relative Thigh Length	-0.937	-0.341
Relative Crus Length	-0.944	-0.323
Relative Foot Length	-0.970	0.150
Relative Digit IV Length	-0.937	0.188
Eigenvalue	7.630	0.748
% Variance	84.77	8.31



Supplementary Figure S1: Phylomorphospace defined by the first two pPCs. pPC-1 represents an index of how pentadactyl versus snake-like each individual and species was. Species pPC scores are represented with large diamonds, and individuals with small diamonds. The phylogeny is mapped on, connecting the species scores. Species are uniquely color-coded, with pentadactyl species being shades of red, those with three digits being orange and yellow, those with two digits being shades of green, limbless ones being shades of blue, and *Lygosoma bowringii* being black. Representative species silhouettes are provided for ease of interpretation. Note that more pentadactyl species are also larger.

Supplementary Table S4: Models of trait evolution fitted to *Brachymeles* head length data, which were used as a proxy for size. The two optimum Ornstein-Uhlenbeck (OU) model assigned one optimum to the pentadactyl clade and another to the rest of the phylogeny. The three optimum OU model assigned one optimum to the pentadactyl clade, another to the paraphyletic group including all species with reduced limbs, and another to all limbless species. Data were included for 40 species of *Brachymeles* and the phylogeny from Wagner et al. (2018) was used. K is the number of model parameters, Δ_{AIC} is the difference in AIC from the best model, and w_i is the model weight, summing to one. The best model is in bold and its parameters are given under the table.

Model	**K**	**lnL**	**AICc**	**Δ_{AIC}**	**w_i**
Brownian motion	2	-80.2	164.7	27.8	<0.001
OU - single optimum	3	-68.4	143.4	6.6	0.027
OU - two optima*	**4**	**-63.8**	**136.8**	**0.0**	**0.718**
OU - three optima	5	-63.6	138.9	2.1	0.255

* Best model: evolutionary rate (σ^2) = 3.901, strength of selection (α) = 0.278, pentadactyl optimum (θ_p) = 25.6±5.7mm, optimum for other species (θ_o) = 5.1±0.9mm.

Supplementary Table S5: Results from phylogenetic generalized least squares (PGLS) regressions. The phylogenetic signal (λ), R^2, intercept and slope, their standard errors, and p-values are presented for each analysis. Loco stands for locomotion, with S-B indicating relationships between surface locomotion and burying. The substrate type is included for each analysis with locomotion variables. p-values in bold are <0.05, and p-values significant after correction for multiple comparisons are also underlined.

Abbreviations: Est – estimate, SE – standard error of the estimate, P – p-value. Vavg – average velocity, Vmax – maximum velocity, mid – mid-body point, pec – pectoral point, pel – pelvic point, amp – amplitude, freq – frequency, wl – wavelength, FLuse – front limb use, HLuse – hind limb use, Fmax – maximum burrowing force, D – dorsal, L – lateral, point – pointiness of snout, slope – slope of snout, LBC – load-bearing capacity of soil, S.moist – Soil moisture.

A: Relationships between surface locomotion and burying performance

				Intercept				Slope			
Subst	**Variable**	**λ**	**R^2**	**Est**	**SE**	**t**	**P**	**Est**	**SE**	**t**	**P**
Coarse	Vavg	0	0.413	-0.009	0.028	-0.30	0.7665	0.191	0.066	2.91	**0.0131**
Fine	Vavg	0	0.292	0.059	0.019	3.06	**0.0099**	0.092	0.041	2.23	**0.0459**
Coarse	Vmax	0	0.296	-0.144	0.205	-0.70	0.4950	0.613	0.273	2.24	**0.0445**
Fine	Vmax	0	0.243	0.070	0.123	0.57	0.5796	0.340	0.173	1.96	0.0732

Supplementary Table S5: Continued.

B: Relationships between body form and surface locomotion

					Intercept				Slope			
Subst	**X**	**Y**	**λ**	**R^2**	**Est**	**SE**	**t**	**P**	**Est**	**SE**	**t**	**P**
Coarse	pPC-1	mid.amp	0	0.051	0.014	0.002	6.86	**<0.0001**	<0.001	0.000	0.81	0.4361
Fine	pPC-1	mid.amp	0	0.018	0.017	0.004	4.49	**0.0007**	<0.001	0.000	0.47	0.6433
Coarse	pPC-1	mid.freq	1	0.118	5.978	1.736	3.44	**0.0049**	-0.042	0.033	-1.26	0.2302
Fine	pPC-1	mid.freq	1	0.358	6.025	1.651	3.61	**0.0033**	-0.081	0.031	-2.59	**0.0238**
Coarse	pPC-1	mid.wl	0	0.314	0.073	0.007	10.33	**<0.0001**	-0.001	0.000	-2.35	**0.0370**
Fine	pPC-1	mid.wl	0	0.277	0.074	0.010	7.64	**<0.0001**	-0.001	0.001	-2.14	0.0533
Coarse	pPC-1	pec.amp	0	0.085	0.012	0.002	7.03	**<0.0001**	<0.001	0.000	1.05	0.3109
Fine	pPC-1	pec.amp	0	0.001	0.014	0.004	3.97	**0.0018**	<0.001	0.000	0.09	0.9263
Coarse	pPC-1	pec.freq	0.98	0.120	5.489	1.584	3.46	**0.0047**	-0.039	0.031	-1.28	0.2249
Fine	pPC-1	pec.freq	1	0.326	6.080	1.774	3.43	**0.0050**	-0.081	0.034	-2.41	**0.0331**
Coarse	pPC-1	pec.wl	0	0.301	0.079	0.005	15.86	**<0.0001**	-0.001	0.000	-2.27	**0.0423**
Fine	pPC-1	pec.wl	0	0.120	0.083	0.011	7.32	**<0.0001**	-0.001	0.001	-1.28	0.2253
Coarse	pPC-1	pel.amp	0	0.059	0.018	0.003	6.10	**0.0001**	<0.001	0.000	0.87	0.4014
Fine	pPC-1	pel.amp	0	0.040	0.055	0.041	1.33	0.2082	-0.002	0.002	-0.71	0.4913
Coarse	pPC-1	pel.freq	1	0.190	5.790	1.698	3.41	**0.0052**	-0.054	0.032	-1.68	0.1196
Fine	pPC-1	pel.freq	1	0.358	5.910	1.555	3.80	**0.0025**	-0.076	0.029	-2.59	**0.0238**
Coarse	pPC-1	pel.wl	0	0.197	0.077	0.009	8.23	**<0.0001**	-0.001	0.001	-1.72	0.1116
Fine	pPC-1	pel.wl	0	0.347	0.077	0.006	12.67	**<0.0001**	-0.001	0.000	-2.52	**0.0267**
Coarse	pPC-1	Vavg	0.96	0.297	0.457	0.145	3.15	**0.0084**	-0.006	0.003	-2.25	**0.0437**
Fine	pPC-1	Vavg	0	0.461	0.385	0.050	7.73	**<0.0001**	-0.009	0.003	-3.21	**0.0076**
Coarse	pPC-1	Vmax	0	0.444	0.683	0.054	12.54	**<0.0001**	-0.010	0.003	-3.09	**0.0093**
Fine	pPC-1	Vmax	0.97	0.416	0.785	0.202	3.89	**0.0021**	-0.011	0.004	-2.93	**0.0127**

Supplementary Table S5: Continued.

C: Relationships between body form and burying locomotion

					Intercept				Slope			
Subst	**X**	**Y**	**λ**	**R^2**	**Est**	**SE**	**t**	**P**	**Est**	**SE**	**t**	**P**
Coarse	pPC-1	Vavg	0	0.320	0.060	0.014	4.39	**0.0009**	-0.002	0.001	-2.38	**0.0349**
Fine	pPC-1	Vavg	0	0.094	0.095	0.011	8.65	**<0.0001**	-0.001	0.001	-1.12	0.2858
Coarse	pPC-1	Vmax	0	0.264	0.268	0.071	3.80	**0.0025**	-0.008	0.004	-2.08	0.0600
Fine	pPC-1	Vmax	0	0.117	0.279	0.056	5.01	**0.0003**	-0.004	0.003	-1.26	0.2319
Coarse	pPC-1	Fmax	0	0.332	0.225	0.027	8.35	**<0.0001**	-0.004	0.002	-2.23	**0.0498**
Fine	pPC-1	Fmax	0	0.462	0.247	0.047	5.29	**0.0004**	-0.008	0.003	-2.93	**0.0150**
Coarse	pPC-1	FLuse	0	0.878	0.640	0.056	11.42	**<0.0001**	-0.019	0.003	-7.10	**0.0002**
Fine	pPC-1	FLuse	0	0.724	0.699	0.069	10.15	**<0.0001**	-0.017	0.004	-4.85	**0.0009**
Coarse	pPC-1	HLuse	0	0.474	0.479	0.120	3.99	**0.0053**	-0.014	0.006	-2.51	**0.0404**
Fine	pPC-1	HLuse	0	0.362	0.569	0.109	5.21	**0.0006**	-0.013	0.006	-2.26	0.0501

Supplementary Table S5: Continued.

D: Analyses using relative locomotion variables (divided by HL)

						Intercept				Slope			
Loco	**Subst**	**X**	**Y**	**λ**	**R^2**	**Est**	**SE**	**t**	**P**	**Est**	**SE**	**t**	**P**
S-B	Coarse		Vavg	0	0.413	1.394	4.648	-0.30	0.7694	0.190	0.066	2.90	**0.0133**
S-B	Fine		Vavg	0	0.212	3.099	4.860	0.64	0.5357	0.112	0.062	1.79	0.0979
Surface	Coarse	pPC-1	Vavg	0.96	0.298	75.92	24.09	3.15	**0.0084**	-1.076	0.477	-2.26	**0.0434**
Surface	Fine	pPC-1	Vavg	0	0.461	63.95	8.272	7.73	**<0.0001**	-1.495	0.467	-3.20	**0.0076**
Surface	Coarse	pPC-1	Vmax	0	0.444	113.4	9.039	12.54	**<0.0001**	-1.581	0.510	-3.10	**0.0092**
Surface	Fine	pPC-1	Vmax	0.97	0.417	130.2	33.46	3.89	**0.0021**	-1.908	0.651	-2.93	**0.0126**
Surface	Coarse	pPC-1	mid_amp	0	0.052	2.403	0.351	6.86	**<0.0001**	0.016	0.020	0.81	0.4337
Surface	Fine	pPC-1	mid_amp	0	0.018	2.892	0.644	4.49	**0.0007**	0.017	0.036	0.47	0.6442
Surface	Coarse	pPC-1	mid_wl	0	0.315	12.18	1.178	10.34	**<0.0001**	-0.156	0.067	-2.35	**0.0369**
Surface	Fine	pPC-1	mid_wl	0	0.277	12.30	1.610	7.64	**<0.0001**	-0.195	0.091	-2.14	0.0534
Bury	Coarse	pPC-1	Vavg	0	0.320	9.926	2.260	4.39	**0.0009**	-0.304	0.128	-2.38	**0.0348**
Bury	Fine	pPC-1	Vavg	0	0.094	15.81	1.828	8.65	**<0.0001**	-0.115	0.103	-1.12	0.2860
Bury	Coarse	pPC-1	Vmax	0	0.264	44.55	11.72	3.80	**0.0025**	-1.373	0.662	-2.08	0.0601
Bury	Fine	pPC-1	Vmax	0	0.117	46.36	9.247	5.01	**0.0003**	-0.657	0.522	-1.26	0.2320
Bury	Coarse	pPC-1	Fmax	0	0.335	37.19	4.490	8.28	**<0.0001**	-0.610	0.272	-2.24	**0.0489**
Bury	Fine	pPC-1	Fmax	0	0.461	40.70	7.822	5.20	**0.0004**	-1.385	0.474	-2.92	**0.0152**

Supplementary Table S5: Continued.

E: Relationships between head and body shape

				Intercept				Slope			
X	**Y**	**λ**	**R^2**	**Est**	**SE**	**t**	**P**	**Est**	**SE**	**t**	**P**
pPC-1	D_point	0	0.009	0.330	0.006	57.862	**<0.0001**	<0.001	0.000	-0.34	0.7411
pPC-1	L_point	0.7	0.022	0.404	0.021	19.329	**<0.0001**	<0.001	0.000	0.52	0.6143
pPC-1	D_slope	0	0.413	0.475	0.008	59.145	**<0.0001**	-0.001	0.000	-2.91	**0.0131**
pPC-1	L_slope	0	0.145	0.251	0.006	42.959	**<0.0001**	<0.001	0.000	-1.43	0.1792
pPC-1	D_HW	0	0.681	6.280	0.396	15.872	**<0.0001**	-0.113	0.022	-5.06	**0.0003**
D_point	D_slope	0	0.018	0.559	0.173	3.23	**0.0072**	-0.247	0.523	-0.47	0.6459
D_HW	D_slope	0	0.335	0.421	0.025	17.14	**<0.0001**	0.009	0.004	2.46	**0.0301**

Supplementary Table S5: Continued.

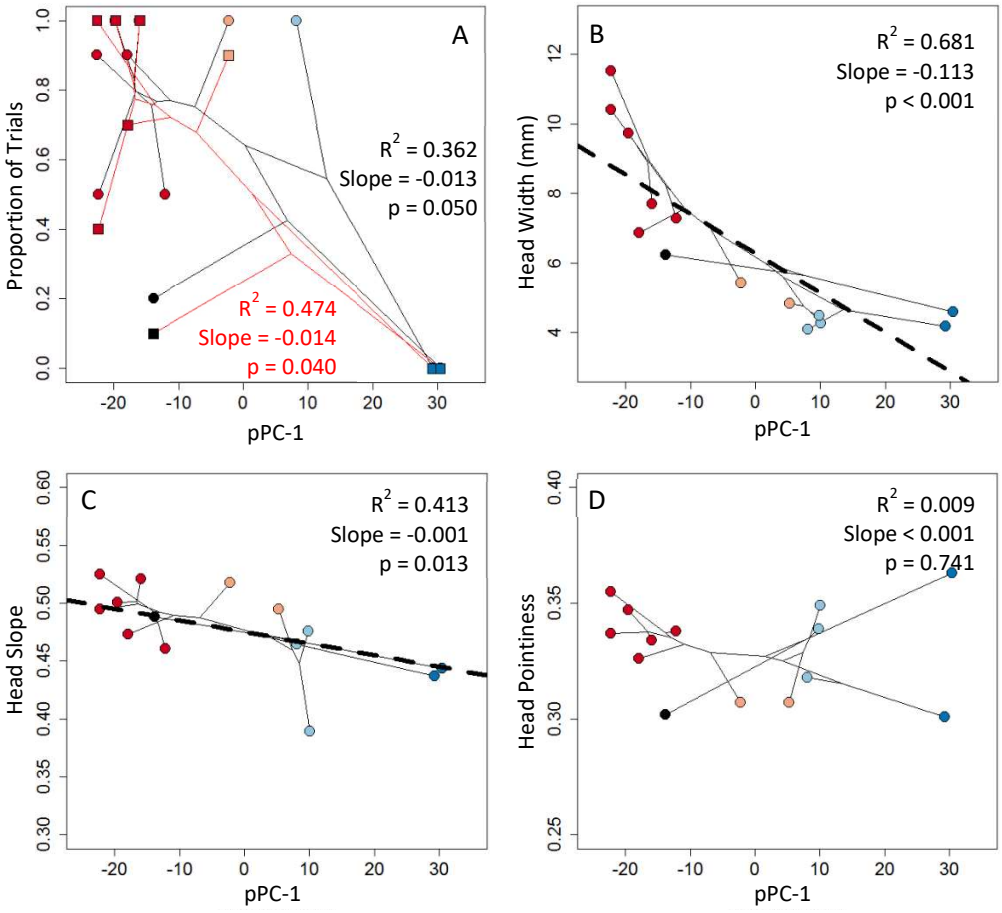
F: Relationships between head shape and burying performance

					Intercept				Slope			
Subst	**X**	**Y**	**λ**	**R^2**	**Est**	**SE**	**t**	**P**	**Est**	**SE**	**t**	**P**
Coarse	D_point	Vavg	0	0.031	-0.104	0.271	-0.38	0.7087	0.509	0.819	0.62	0.5461
Fine	D_point	Vavg	0	0.145	-0.157	0.178	-0.88	0.3953	0.770	0.539	1.43	0.1787
Coarse	L_point	Vavg	0	0.134	0.373	0.226	1.65	0.1256	-0.775	0.567	-1.36	0.1972
Fine	L_point	Vavg	0	0.284	0.411	0.144	2.85	**0.0146**	-0.789	0.361	-2.18	**0.0496**
Coarse	D_slope	Vavg	0	0.158	-0.235	0.200	-1.17	0.2626	0.627	0.418	1.50	0.1591
Fine	D_slope	Vavg	0	0.118	-0.084	0.143	-0.58	0.5679	0.379	0.299	1.27	0.2291
Coarse	L_slope	Vavg	0	0.028	-0.045	0.188	-0.24	0.8132	0.436	0.745	0.59	0.5690
Fine	L_slope	Vavg	0	0.244	-0.131	0.116	-1.13	0.2824	0.905	0.460	1.97	0.0727
Coarse	D_point	Vmax	0	0.002	0.060	1.369	0.04	0.9660	0.694	4.140	0.17	0.8697
Fine	D_point	Vmax	0	0.042	-0.411	0.966	-0.43	0.6784	2.119	2.921	0.73	0.4821
Coarse	L_point	Vmax	0	0.224	2.270	1.067	2.13	0.0548	-4.981	2.676	-1.86	0.0874
Fine	L_point	Vmax	0	0.150	1.455	0.804	1.81	0.0955	-2.931	2.017	-1.45	0.1719
Coarse	D_slope	Vmax	0	0.265	-1.642	0.931	-1.76	0.1031	4.042	1.943	2.08	0.0596
Fine	D_slope	Vmax	0	0.046	-0.289	0.764	-0.38	0.7118	1.210	1.595	0.76	0.4625
Coarse	L_slope	Vmax	0	0.232	-1.290	0.834	-1.55	0.1477	6.271	3.299	1.90	0.0816
Fine	L_slope	Vmax	0	0.090	-0.420	0.653	-0.64	0.5329	2.814	2.585	1.09	0.2977
Coarse	D_point	Fmax	0	0.060	-0.233	0.595	-0.39	0.7037	1.434	1.801	0.80	0.4445
Fine	D_point	Fmax	1	0.024	-0.244	1.044	-0.23	0.8201	1.569	3.197	0.49	0.6343
Coarse	L_point	Fmax	0	0.036	0.550	0.511	1.08	0.3071	-0.778	1.281	-0.61	0.5571
Fine	L_point	Fmax	1	0.039	0.865	0.947	0.91	0.3825	-1.490	2.340	-0.64	0.5387
Coarse	D_slope	Fmax	0	0.131	-0.228	0.382	-0.60	0.5647	0.975	0.795	1.23	0.2479
Fine	D_slope	Fmax	1	0.012	0.044	0.636	0.07	0.9458	0.465	1.316	0.35	0.7312
Coarse	L_slope	Fmax	0	0.060	-0.040	0.353	-0.11	0.9123	1.108	1.391	0.80	0.4442
Fine	L_slope	Fmax	1	0.016	0.553	0.721	0.77	0.4604	-1.153	2.858	-0.40	0.6952
Coarse	D_HW	Fmax	0	0.361	0.078	0.073	1.08	0.3065	0.024	0.010	2.38	**0.0387**
Fine	D_HW	Fmax	0	0.357	-0.029	0.141	-0.20	0.8428	0.046	0.020	2.36	**0.0403**

Supplementary Table S5: Continued.

G: Relationships between body form and soil characteristics

				Intercept				Slope			
X	**Y**	**λ**	**R^2**	**Est**	**SE**	**t**	**P**	**Est**	**SE**	**t**	**P**
pPC-1	LBC	0	0.010	1.864	0.158	11.80	**0.0000**	-0.003	0.010	-0.27	0.7949
pPC-1	S.moist	1	0.040	52.815	9.100	5.80	**0.0007**	-0.258	0.475	-0.54	0.6047
D_point	LBC	0	0.059	-0.158	3.076	-0.05	0.9606	6.231	9.443	0.66	0.5304
D_point	S.moist	1	0.057	-17.12	107.71	-0.16	0.8782	216.36	333.42	0.65	0.5371
L_point	LBC	0	0.242	5.259	2.274	2.31	0.0540	-8.423	5.641	-1.49	0.1790
L_point	S.moist	1	0.174	-68.50	100.09	-0.68	0.5157	298.02	245.59	1.21	0.2643
D_slope	LBC	0	0.180	-1.389	2.636	-0.53	0.6146	6.712	5.422	1.24	0.2557
D_slope	S.moist	1	0.015	88.05	110.91	0.79	0.4533	-73.61	229.02	-0.32	0.7573
L_slope	LBC	0	0.176	-0.543	1.978	-0.27	0.7918	9.456	7.735	1.22	0.2611
L_slope	S.moist	1	0.009	77.78	98.26	0.79	0.4546	-99.92	387.13	-0.26	0.8038



Supplementary Figure S2: Phylomorphospaces relating the proportion of trials during which the hind limbs were used during burying (A) and head shape variables (B–D) to body form. Hind limb is presented for fine (diamonds and black lines) and coarse (circles and red lines) substrates. Note that the slope and pointiness of the head are unitless (see Methods). Number of digits is indicated by symbol color: 5 – red, 3 – pink, 2 – light blue, 0 – dark blue, *Lygosoma bowringii* – black. Dashed lines show significant PGLS regressions between variables; no line indicates no significant relationship after correction for multiple comparisons.