



**Fig. S1. Thermal-metabolic traits in adult male *Podarcis muralis* lizards.** Tukey boxplots show median, interquartile range, and range of raw data values. (A) Preferred body temperature, (B) Selected temperature range, (C) Critical thermal minimum ( $CT_{min}$ ), (D) Critical thermal maximum ( $CT_{max}$ ), (E) Haematocrit, (F) Blood haemoglobin concentration, (G) Running endurance, (H) RMR, resting metabolic rate ( $\dot{V}CO_2$ ), and (I) MMR, maximum metabolic rate ( $\dot{V}CO_{2peak}$ ). L-L-T1: Low-elevation lizards measured at low elevation at first timepoint; L-L-T2: Low-elevation lizards measured at low elevation at second timepoint; L-EH-T2: Low-elevation lizards measured at extreme high elevation at second timepoint; H-H-T1: High-elevation lizards measured at high elevation at first timepoint; H-H-T2: High-elevation lizards measured at high elevation at second timepoint; H-EH-T2: High-elevation lizards measured at extreme high elevation at second timepoint.

**Table S1.** Geographic location and description of lizard collection sites and locations of experimental measures.

	Name	Field $T_b$ Sample Size	Experiment Sample size (Metabolic Measures)	Latitude	Longitude	Elevation (m ASL)	Elevation category	Habitat type	Partial pressure of $O_2$ (kPa; average)
<b>Field sites</b>									
	Aubert	90	15 (12)	42°57'52" N	001°6'10" E	425	Low	Rock wall and bridge	20.2
	Engomer	--	10 (0)	42°56'46" N	001°3'20" E	473	Low	Cemetery	20.1
	La Mongie	111	16 (11)	42°54'35" N	0°10'12" E	1812	High	Natural outcrops and rock wall	17.1
	L'Adour du Tourmalet	--	8 (0)	42°55'14" N	0°11'18" E	1557	High	Natural rock outcrops	17.6
<b>Laboratories</b>									
	Moulis			42°57'27" N	001°5'8" E	436	Low	Lab	20.1
	La Mongie			42°54'35" N	001°10'54" E	1735	High	Lab	17.4
	Pic du Midi			42°56'11" N	008°5'33" E	2877	Extreme High	Lab	15.3

**Table S2. Results of linear mixed model analyses and results of *a priori* hypothesis tests of thermal-metabolic traits in adult male *Podarcis muralis* lizards.** Tests were constructed using linear contrasts of estimated marginal means. Estimate represents the differences in observed values between groups, taking into account covariates included in the model (see text for statistical details). Significant contrasts shown in bold with one ( $P < 0.05$ ), two ( $P < 0.01$ ), or three ( $P < 0.001$ ) asterisks. Abbreviations:  $T_{pref}$ , thermal preference;  $T_{sel}$ , selected thermal range;  $CT_{min}$ , critical thermal minimum;  $CT_{max}$ , critical thermal maximum; Hct, haematocrit; [Hb], blood haemoglobin concentration; Endurance, running endurance; RMR, resting metabolic rate ( $V CO_2$ ); MMR, maximal post-exhaustion metabolic rate ( $V CO_{2PEAK}$ ); dfn: numerator degrees of freedom for  $F$ -test; dfd: denominator degrees of freedom for  $F$ -test;  $Pr > F$  is the probability that the observed value is greater than that predicted by the  $F$ -distribution (P-value).

	$T_{PREF}$ N = 88 obs.	$T_{SEL}$ (log <sub>10</sub> ) N = 88 obs.	$CT_{MIN}$ N = 90 obs.	$CT_{MAX}$ N = 88 obs.	Hct N = 95 obs.	[Hb] N = 93 obs.	Endurance (log <sub>10</sub> ) N = 43 obs.	RMR (log <sub>10</sub> ) N = 42 obs.	MMR (log <sub>10</sub> ) N = 41 obs.
<b>Full Model Result</b>									
<b>Measurement Group</b>									
$F (df_n, df_d)$	1.77 (5, 66.5)	1.40 (5, 66.7)	2.11 (5, 63.7)	2.11 (5, 67.8)	<b>15.70</b> ( <b>5, 72.2</b> )	2.24 (5, 71.0)	<b>4.53</b> ( <b>5, 25.7</b> )	0.850 (5, 28.3)	<b>4.36</b> ( <b>5, 27.4</b> )
$Pr > F$	0.132	0.236	0.076	0.075	<b>&lt;</b> <b>0.0001***</b>	0.0593	<b>0.0043***</b>	0.526	<b>0.0048**</b>
<b>Body Size</b>									
						SVL	SVL	log <sub>10</sub> Mass	log <sub>10</sub> Mass
$F (df_n, df_d)$	--	--	--	--	--	3.61 (1, 47.0)	4.00 (1, 18.7)	<b>10.99</b> ( <b>1, 19.5</b> )	<b>16.9</b> ( <b>1, 23.0</b> )
$Pr > F$						0.063	0.060	<b>0.0036**</b>	<b>0.0004***</b>
<b>Hypothesis Test</b>									
<b>Low-elevation lizards vs. High-elevation lizards at elevation of origin</b>									
Estimate (SE)	-1.19 (1.596)	-0.25 (0.1675)	-0.31 (1.063)	-1.62 (0.764)	0 (0.0238)	-12.43 (15.85)	-0.09 (0.1262)	0.23 (0.1634)	<b>0.21</b> ( <b>0.0543</b> )
$t$ -statistic (df)	-0.75 (58.9)	-1.5 (58.8)	-0.29 (61.6)	-2.12 (61.9)	-0.05 (62.4)	-0.78 (57.9)	-0.72 (21.9)	1.41 (20.3)	<b>3.95</b> ( <b>19.9</b> )
$Pr > t$	0.986	0.652	> 0.999	0.24	> 0.999	0.982	0.99	0.74	<b>0.006**</b>
<b>Low-elevation lizards vs. High-elevation lizards at extreme high elevation</b>									
Estimate (SE)	-0.93 (1.223)	0.09 (0.1289)	1.41 (0.755)	-1.09 (0.586)	0.04 (0.0191)	16.59 (12.82)	-0.15 (0.0993)	0.03 (0.1524)	0.08 (0.0501)
$t$ -statistic (df)	-0.76 (82)	0.67 (82)	1.86 (84)	-1.86 (82)	1.97 (89)	1.29 (86)	-1.54 (36)	0.22 (34.8)	1.52 (34)
$Pr > t$	0.984	0.993	0.379	0.38	0.311	0.789	0.633	> 0.999	0.644
<b>Low-elevation lizards at elevation of origin vs. Low-elevation lizards at extreme high elevation</b>									
Estimate (SE)	-0.15 (1.023)	-0.22 (0.108)	0.07 (0.586)	0.41 (0.502)	-0.03 (0.0157)	-23.21 (10.34)	0.07 (0.0736)	0.03 (0.1199)	0.06 (0.0393)
$t$ -statistic (df)	-0.15 (76.4)	-2.08 (76.8)	0.12 (65.3)	0.82 (79.3)	-1.72 (83.7)	-2.25 (84)	0.99 (27.7)	0.23 (34.9)	1.61 (33.4)
$Pr > t$	> 0.999	0.253	> 0.999	0.976	0.483	0.177	0.941	> 0.999	0.583

	T <sub>PREF</sub> N = 88 obs.	T <sub>SEL</sub> (log <sub>10</sub> ) N = 88 obs.	CT <sub>MIN</sub> N = 90 obs.	CT <sub>MAX</sub> N = 88 obs.	Hct N = 95 obs.	[Hb] N = 93 obs.	Endurance (log <sub>10</sub> ) N = 43 obs.	RMR (log <sub>10</sub> ) N = 42 obs.	MMR (log <sub>10</sub> ) N = 41 obs.
<b>High-elevation lizards at elevation of origin vs. High-elevation lizards at extreme high elevation</b>									
Estimate (SE)	-0.49 (1.012)	-0.01 (0.1067)	1.63 (0.6)	0.13 (0.496)	0.01 (0.0159)	-0.4 (10.52)	-0.03 (0.0689)	-0.05 (0.114)	0.03 (0.0372)
t-statistic (df)	-0.48 (77.4)	-0.12 (77.7)	2.72 (68.7)	0.26 (78.7)	0.71 (83.3)	-0.04 (82.5)	-0.5 (26.7)	-0.47 (33.6)	0.87 (31.7)
Pr > t	0.999	> 0.999	0.057	> 0.999	0.99	> 0.999	0.999	0.999	0.97
<b>All Low-elevation lizards vs. all high-elevation lizards, irrespective of measurement location</b>									
Estimate (SE)	-2.13 (2.042)	-0.16 (0.214)	1.1 (1.414)	<b>-2.71</b> <b>(0.954)</b>	0.04 (0.0308)	4.16 (20.82)	-0.24 (0.1819)	0.26 (0.233)	<b>0.29</b> <b>(0.0776)</b>
t-statistic (df)	-1.04 (49.8)	-0.77 (49.9)	0.78 (48.9)	<b>-2.84</b> <b>(52.8)</b>	1.19 (52.5)	0.2 (52.5)	-1.34 (20.2)	1.13 (20.9)	<b>3.75</b> <b>(20.4)</b>
Pr > t	0.92	0.984	0.983	<b>0.044*</b>	0.855	> 0.999	0.782	0.891	<b>0.009**</b>
<b>All lizards at second timepoint measured at elevation of origin vs. lizards measured at extreme high elevation</b>									
Estimate (SE)	-0.64 (0.883)	0.12 (0.0931)	-0.72 (0.525)	-0.04 (0.439)	<b>0.06</b> <b>(0.0135)</b>	22.2 (8.89)	0.05 (0.0612)	-0.03 (0.0989)	-0.05 (0.0324)
t-statistic (df)	-0.72 (80.8)	1.29 (81)	-1.37 (72.1)	-0.09 (82)	<b>4.15</b> <b>(88.4)</b>	2.5 (86)	0.79 (28.8)	-0.31 (35)	-1.47 (33.9)
Pr > t	0.989	0.791	0.737	> 0.999	<b>0.001**</b>	0.097	0.982	> 0.999	0.679
<b>Lizards at first timepoint at elevation of origin vs. lizards at second timepoint at elevation of origin</b>									
Estimate (SE)	1.91 (0.739)	0 (0.0781)	-0.26 (0.413)	-0.46 (0.382)	<b>-0.1</b> <b>(0.0113)</b>	-20.78 (7.69)	<b>-0.14</b> <b>(0.0435)</b>	0.09 (0.0797)	0 (0.0264)
t-statistic (df)	2.59 (55.9)	-0.04 (56.1)	-0.62 (53.9)	-1.22 (61.9)	<b>-8.54</b> <b>(61.3)</b>	-2.7 (60.8)	<b>-3.11</b> <b>(21.3)</b>	1.1 (24.7)	0.01 (24.3)
Pr > t	0.083	> 0.999	0.996	0.837	<b>&lt;</b> <b>0.0001***</b>	0.061	<b>0.036*</b>	0.90	> 0.999

**Table S3.** Pairwise comparisons of estimated least-squares means among all measurement group combinations from NP-MANOVA with RRPP (see text for statistical details). *d* is the distance between means in multivariate space (effect size of difference). Significant differences shown in bold with one ( $P < 0.05$ ), two ( $P < 0.01$ ), or three ( $P < 0.001$ ) asterisks.

Comparison	<i>d</i>	95% CL	Z	Pr > <i>d</i>
<b>L-L-T1:L-L-T2</b>	<b>2.388</b>	<b>2.103</b>	<b>2.555</b>	<b>0.013*</b>
L-L-T1:L-EH-T2	2.082	2.101	1.741	0.057
L-L-T1:H-H-T1	1.475	1.753	0.835	0.188
<b>L-L-T1:H-H-T2</b>	<b>2.582</b>	<b>2.170</b>	<b>2.885</b>	<b>0.01*</b>
<b>L-L-T1:H-EH-T2</b>	<b>2.374</b>	<b>2.210</b>	<b>2.093</b>	<b>0.024*</b>
<b>L-L-T2:L-EH-T2</b>	<b>2.431</b>	<b>2.417</b>	<b>1.770</b>	<b>0.046*</b>
<b>L-L-T2:H-H-T1</b>	<b>2.793</b>	<b>2.156</b>	<b>3.431</b>	<b>0.002**</b>
L-L-T2:H-H-T2	1.936	2.414	0.618	0.268
<b>L-L-T2:H-EH-T2</b>	<b>2.670</b>	<b>2.587</b>	<b>1.969</b>	<b>0.037*</b>
L-EH-T2:H-H-T1	2.026	2.155	1.434	0.09
L-EH-T2:H-H-T2	2.392	2.404	1.698	0.055
L-EH-T2:H-EH-T2	2.016	2.558	0.552	0.273
<b>H-H-T1:H-H-T2</b>	<b>2.710</b>	<b>2.125</b>	<b>3.343</b>	<b>0.003*</b>
H-H-T1:H-EH-T2	1.700	2.258	0.253	0.398
H-H-T2:H-EH-T2	2.257	2.604	1.035	0.146

L-L-T1: Low-elevation lizards measured at low elevation at first timepoint; L-L-T2: Low-elevation lizards measured at low elevation at second timepoint; L-EH-T2: Low-elevation lizards measured at extreme high elevation at second timepoint; H-H-T1: High-elevation lizards measured at high elevation at first timepoint; H-H-T2: High-elevation lizards measured at high elevation at second timepoint; H-EH-T2: High-elevation lizards measured at extreme high elevation at second timepoint.

**Table S4.** Least-squares means (z-standardized) and 95% confidence limits for each measurement group of adult male *Podarcis muralis* lizards.  $T_{\text{pref}}$ , thermal preference;  $T_{\text{sel}}$ , selected thermal range;  $CT_{\text{min}}$ , critical thermal minimum;  $CT_{\text{max}}$ , critical thermal maximum; Hct, haematocrit; [Hb], blood haemoglobin concentration; Endurance, running endurance; RMR, resting metabolic rate ( $\dot{V}CO_2$ ); MMR, maximal post-exhaustion metabolic rate ( $\dot{V}CO_{2\text{PEAK}}$ ).

Group	Trait	Lower 95% CL	LSmean	Upper 95% CL
H-EH-T2	$CT_{\text{max}}$	-0.371	0.400	1.161
H-EH-T2	$CT_{\text{min}}$	-1.503	-0.812	-0.057
H-EH-T2	Endurance	-0.660	0.100	0.786
H-EH-T2	[Hb]	-1.098	-0.319	0.471
H-EH-T2	Hct	-0.625	-0.058	0.567
H-EH-T2	$T_{\text{pref}}$	-0.733	0.139	0.871
H-EH-T2	$T_{\text{sel}}$	0.108	0.831	1.638
H-EH-T2	MMR	-1.469	-0.775	-0.075
H-EH-T2	RMR	-0.920	-0.149	0.631
H-H-T1	$CT_{\text{max}}$	-0.292	0.229	0.746
H-H-T1	$CT_{\text{min}}$	-0.362	0.182	0.722
H-H-T1	Endurance	0.292	0.754	1.266
H-H-T1	[Hb]	-0.485	0.052	0.616
H-H-T1	Hct	0.262	0.661	1.061
H-H-T1	$T_{\text{pref}}$	-0.700	-0.109	0.393
H-H-T1	$T_{\text{sel}}$	-0.405	0.105	0.684
H-H-T1	MMR	-0.880	-0.379	0.107
H-H-T1	RMR	-0.848	-0.312	0.220
H-H-T2	$CT_{\text{max}}$	-0.665	0.121	0.820
H-H-T2	$CT_{\text{min}}$	-0.309	0.345	1.074
H-H-T2	Endurance	-1.640	-0.982	-0.338
H-H-T2	[Hb]	-0.880	-0.185	0.561
H-H-T2	Hct	-1.807	-1.293	-0.713
H-H-T2	$T_{\text{pref}}$	-0.306	0.528	1.187
H-H-T2	$T_{\text{sel}}$	-0.713	-0.025	0.752
H-H-T2	MMR	-1.099	-0.416	0.216
H-H-T2	RMR	-0.834	-0.114	0.616
L-EH-T2	$CT_{\text{max}}$	-1.633	-0.912	-0.228
L-EH-T2	$CT_{\text{min}}$	-1.205	-0.518	0.229
L-EH-T2	Endurance	-0.951	-0.296	0.394
L-EH-T2	[Hb]	0.086	0.824	1.580
L-EH-T2	Hct	-0.421	0.116	0.677
L-EH-T2	$T_{\text{pref}}$	-0.633	0.156	0.811
L-EH-T2	$T_{\text{sel}}$	-0.513	0.189	0.934
L-EH-T2	MMR	-0.909	-0.245	0.416
L-EH-T2	RMR	-0.388	0.262	0.993
L-L-T1	$CT_{\text{max}}$	-0.441	0.080	0.579
L-L-T1	$CT_{\text{min}}$	-0.147	0.361	0.903

Group	Trait	Lower 95% CL	LSmean	Upper 95% CL
L-L-T1	Endurance	-0.479	-0.017	0.441
L-L-T1	[Hb]	-0.476	0.044	0.557
L-L-T1	Hct	0.103	0.494	0.896
L-L-T1	$T_{pref}$	-1.121	-0.558	-0.069
L-L-T1	$T_{sel}$	-0.667	-0.197	0.335
L-L-T1	MMR	0.237	0.698	1.149
L-L-T1	RMR	-0.704	-0.199	0.345
L-L-T2	CT <sub>max</sub>	-0.924	-0.144	0.608
L-L-T2	CT <sub>min</sub>	-0.889	-0.191	0.523
L-L-T2	Endurance	-0.894	-0.212	0.443
L-L-T2	[Hb]	-1.275	-0.561	0.141
L-L-T2	Hct	-1.501	-0.976	-0.407
L-L-T2	$T_{pref}$	-0.178	0.582	1.200
L-L-T2	$T_{sel}$	-1.385	-0.692	0.073
L-L-T2	MMR	-0.097	0.583	1.212
L-L-T2	RMR	0.271	0.961	1.667

L-L-T1: Low-elevation lizards measured at low elevation at first timepoint; L-L-T2: Low-elevation lizards measured at low elevation at second timepoint; L-EH-T2: Low-elevation lizards measured at extreme high elevation at second timepoint; H-H-T1: High-elevation lizards measured at high elevation at first timepoint; H-H-T2: High-elevation lizards measured at high elevation at second timepoint; H-EH-T2: High-elevation lizards measured at extreme high elevation at second timepoint.

**Table S5.** Thermoregulatory behavior does not differ between low and high populations. Ambient field temperature data were recorded 1 meter above the ground at two locations within each study site, measured every 10 minutes during the month of September.  $T_e$ , operative temperature;  $E$ , thermoregulatory efficiency,  $T_b$ , field body temperature of lizards.

Site	Low Elevation	High Elevation
Field Mean Minimum Temperature (°C)	14.17	9.5
Field Mean Maximum Temperature (°C)	28.42	27.17
Mean $T_e$ (°C)	29.21	24.25
Mean Minimum $T_e$ (°C)	15.91	13.57
Mean Maximum $T_e$ (°C)	49.78	43.16
Mean $\bar{d}_e$	6.48	6.33
Mean $\bar{d}_b$	1.18	1.47
$E$ (95% CI)	0.82 (0.75 – 0.88)	0.77 (0.69 – 0.83)
Mean Field $T_b$ ( $\pm$ SE) (°C)	32.53 $\pm$ 0.36	29.92 $\pm$ 0.34
$T_b$ Range (°C)	19.9 – 38.1	17.4 – 36.9

NOTE:  $T_e$  and  $T_b$  measurements for each location were only measured for one day (see main text for details), therefore we cannot account for weather and seasonal variation between sites.