Supporting Information

Supporting Figure Legends

Figure S1. Example of a thermal performance curve. T_{opt} is the optimal temperature, the temperature at which performance is maximal (u_{max}); CT_{min} and CT_{max} are the critical thermal limits that permit performance; B is the performance breadth, the range over which performance is above some arbitrary level. Modified after Gilchrist (1995). Also see Introduction and Materials and Methods.

Figure S2. Mean temperatures for all locations-of-origin (± 10-40 km) for the populations examined in this study. The dashed horizontal line represents the 12°C limit for the development of *D. melanogaster*. For details see Material and Methods.

Figure S3. The area of the wing used for wing area measurements. For details see Material and Methods.

Figure S1.

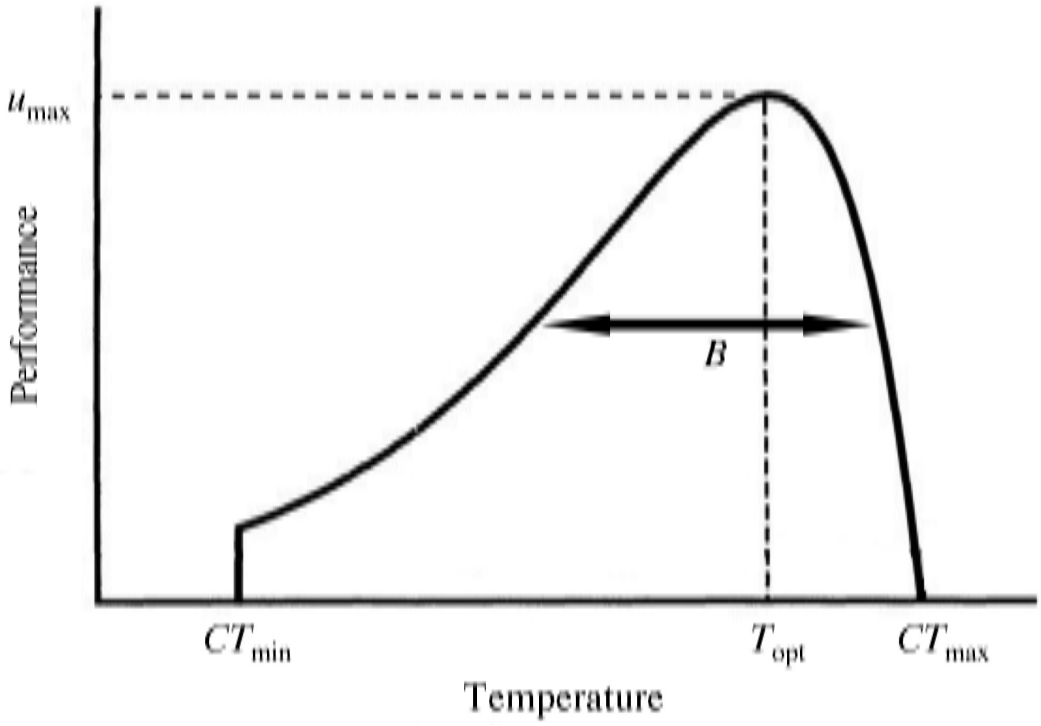

Figure S2.

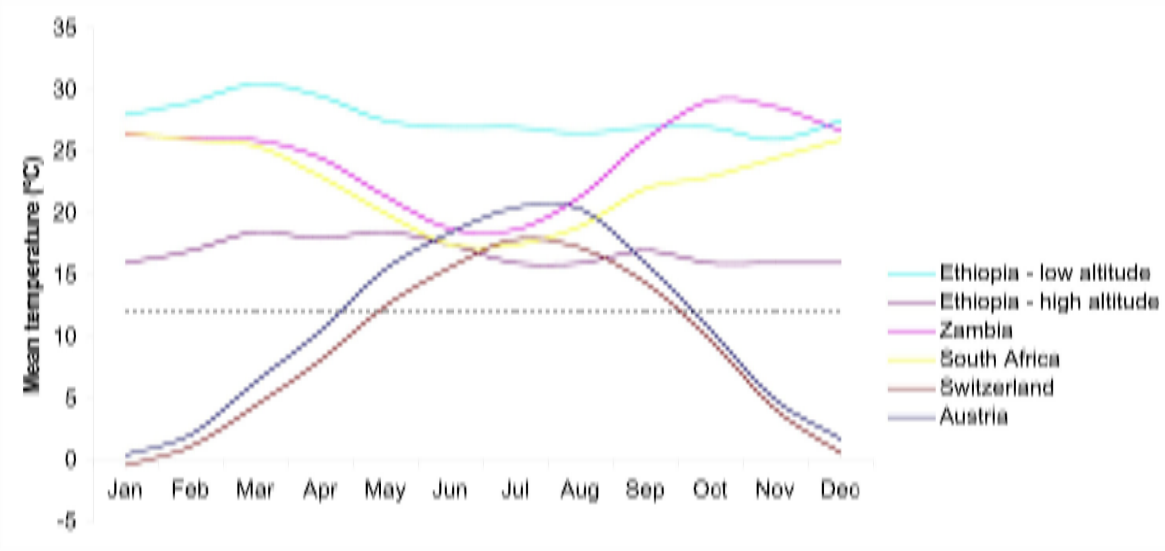
Mean temperature (°C)
35
30
25
20
15
10
5
0
-5
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Ethiopia - low altitude
Ethiopia - high altitude
Zambia
South Africa
Switzerland
Austria

Figure S3.

Table S1. Populations, collection dates, collectors and the number of isofemale lines for each of the populations used in this study. Also see Table 1 and Materials and Methods for further details.

Population	**Collection date**	**Collector**	**Number of lines**
Ethiopia (low altitude)	December 2011	J. Pool	15
Ethiopia (high altitude)	December 2011	J. Pool	15
Zambia	July 2010	R. Corbett-Detig (courtesy of J. Pool)	30
South Africa	July 2010	R. Corbett-Detig (courtesy of J. Pool)	7
Switzerland	August 2007	L. Wilfert	10
Austria	October 2010	P. Klepsatel	-

Table S2. Climate data. Average daily minimum, maximum and mean air temperatures for all locations-of-origin (±10-40 km). Data obtained from the World Meteorological Organization (worldweather.wmo.int). See Materials and Methods for further details; also see Table 1 and Figure S2.

Population (Meteorological station)	**Temperature (ºC)**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Ethiopia – low altitude (Gambela)	Minimum	18	20	22	22	20	21	22	21	21	20	19	19
	Maximum	38	38	39	37	35	33	32	32	33	34	33	36
	Mean	28	29	30.5	29.5	27.5	27	27	26.5	27	27	26	27.5
Ethiopia – high altitude (Addis Ababa)	Minimum	9	10	12	12	13	12	11	11	12	10	9	9
	Maximum	23	24	25	24	24	23	21	21	22	22	23	23
	Mean	16	17	18.5	18	18.5	17.5	16	16	17	16	16	16
Zambia (Kariba, Zimbabwe)	Minimum	21.8	21.4	20.7	18.5	14.3	11.2	11.1	13.9	19.1	23.2	23.4	22.1
	Maximum	31	30.8	31.2	30.5	28.5	26.3	26.3	28.9	32.9	35.1	33.9	31.3
	Mean	26.4	26.1	25.95	24.5	21.4	18.75	18.7	21.4	26	29.15	28.65	26.7
South Africa (Phalaborwa)	Minimum	21	21	20	17	13	10	10	12	15	17	19	20
	Maximum	32	31	31	29	27	25	25	26	29	29	30	32
	Mean	26.5	26	25.5	23	20	17.5	17.5	19	22	23	24.5	26
Switzerland (Zürich)	Minimum	-2.8	-1.9	0.6	3.7	7.7	10.8	12.8	12.4	10	6.2	1.4	-1.7
	Maximum	2	4.2	8.3	12.6	17.3	20.5	23	22	18.8	13.3	6.9	2.9
	Mean	-0.4	1.15	4.45	8.15	12.5	15.65	17.9	17.2	14.4	9.75	4.15	0.6
Austria (Vienna)	Minimum	-2	-0.9	2.4	5.8	10.5	13.5	15.4	15.3	11.7	7	2.4	-0.5
	Maximum	2.9	5.1	10.3	15.2	20.5	23.4	25.6	25.4	20.3	14.2	7.5	4
	Mean	0.45	2.1	6.35	10.5	15.5	18.45	20.5	20.35	16	10.6	4.95	1.75

Table S3. Number of replicate cages used in fecundity experiments. See Materials and Methods for further details.

Population	**14°C (9-19°C)**	**18°C (13-23°C)**	**22°C (17-27°C)**	**24°C (19-29°C)**	**26°C (21-31°C)**	**28°C (23-33°C)**	**30°C (25-35°C)**	**18°C (constant)**	**24°C (constant)**	**30°C (constant)**
Ethiopia (low altitude)	2	2	3	2	3	3	2	-	-	-
Ethiopia (high altitude)	2	2	2	2	3	3	2	-	-	-
Zambia	2	2	2	4	5	3	4	3	3	3
South Africa	3	2	3	4	4	3	4	3	3	3
Switzerland	2	4	3	2	3	3	2	-	-	-
Austria	3	2	4	5	4	3	4	3	3	3

Table S4. Sums of squared errors (SSE) and values of Bayesian Information Criterion (BIC) for different functions (quadratic, cubic, Gaussian, functions (6) and (10) from Logan *et al*. (1976)) fitted to fecundity data. See Materials and Methods for further details.

	Population	Quadratic	Cubic	Gaussian	Equation 6	Equation 10
SSE	Ethiopia (low altitude)	52604.12	4820.93	8612.16	20690.03	3804.44
	Ethiopia (high altitude)	62686.98	10583.74	16047.04	19835.26	8367.34
	Zambia	133593.98	31108.36	28679.65	71329.27	26176.72
	South Africa	109106.40	13369.47	14458.23	54222.49	12269.28
	Switzerland	121033.73	32007.17	26684.24	85045.89	23638.93
	Austria	241399.38	39154.22	27545.09	164003.55	18070.05
	SUM	720424.59	131043.88	122026.41	415126.49	92326.76
BIC	Ethiopia (low altitude)	145.13	107.34	114.37	132.10	106.15
	Ethiopia (high altitude)	140.69	115.00	118.89	125.05	114.02
	Zambia	200.93	171.96	167.08	190.21	171.25
	South Africa	204.09	158.94	157.61	191.15	160.10
	Switzerland	167.31	146.26	140.10	163.85	143.70
	Austria	247.31	203.28	190.88	240.52	186.43
	SUM	1105.47	902.78	888.92	1042.89	881.65

Table S5. Means and standard errors of the mean for absolute fecundity, measured at different (mean) temperatures. For ANOVA results see main text; values not connected by the same letter are significantly different (Tukey's HSD test; $P < 0.05$).

Population	**Thermal Regime**						
	14°C (9-19°C)	**18°C (13-23°C)**	**22°C (17-27°C)**	**24°C (19-29°C)**	**26°C (21-31°C)**	**28°C (23-33°C)**	**30°C (25-35°C)**
Ethiopia (low altitude)	16.1 ± 0.7 (Q, R)	114.8 ± 20.7 (O, P, Q)	333.8 ± 9.8 (L, M, N)	397.6 ± 5.1 (H, I, J, K, L)	445.0 ± 4.8 (F, G, H, I, J)	423.8 ± 17.6 (G, H, I, J, K)	261.7 ± 1.2 (N)
Ethiopia (high altitude)	24.8 ± 1.8 (P, Q, R)	158.1 ± 13.7 (O)	345.1 ± 16.9 (K, L, M, N)	457.8 ± 9.3 (E, F, G, H, I, J)	486.5 ± 10.5 (C, D, E, F, G, H)	468.0 ± 24.9 (E, F, G, H)	280.6 ± 28.6 (N)
Zambia	20.8 ± 9.8 (Q, R)	109.5 ± 2.0 (O, P, Q)	319.8 ± 17.2 (L, M, N)	558.4 ± 6.3 (A, B, C)	533.2 ± 4.9 (B, C, D, E)	542.0 ± 16.6 (A, B, C, D, E)	387.0 ± 13.2 (I, J, K, L)
South Africa	28.5 ± 5.8 (Q, R)	90.5 ± 22.7 (O, P, Q, R)	373.7 ± 5.7 (J, K, L, M)	482.0 ± 12.0 (D, E, F, G, H)	516.7 ± 12.5 (B, C, D, E, F)	487.7 ± 11.5 (C, D, E, F, G, H)	343.1 ± 21.6 (L, M, N)
Switzerland	28.6 ± 3.3 (P, Q, R)	109.2 ± 10.4 (O, P)	371.9 ± 3.3 (J, K, L, M)	564.3 ± 0.8 (A, B, C, D)	460.4 ± 5.6 (F, G, H, I)	455.8 ± 22.4 (F, G, H, I)	309.5 ± 2.4 (L, M, N)
Austria	3.9 ± 0.6 (R)	50.9 ± 6.6 (P, Q, R)	417.2 ± 17.0 (H, I, J, K)	598.7 ± 17.0 (A)	576.1 ± 8.8 (A, B)	504.0 ± 17.6 (B, C, D, E, F, G)	306.0 ± 7.6 (M, N)

Table S6. Means and standard errors of the mean for relative fecundity, measured at different (mean) temperatures. For ANOVA results see main text; values not connected by the same letter are significantly different (Tukey's HSD test; $P < 0.05$).

Population	Thermal Regime						
	14°C (9-19°C)	**18°C (13-23°C)**	**22°C (17-27°C)**	**24°C (19-29°C)**	**26°C (21-31°C)**	**28°C (23-33°C)**	**30°C (25-35°C)**
Ethiopia (low altitude)	3.6 ± 0.2 (O, P)	25.8 ± 4.7 (M, N)	75.0 ± 2.2 (E, F, G, H, I)	89.3 ± 1.1 (A, B, C, D, E)	100.0 ± 1.1 (A)	95.2 ± 4.0 (A, B, C, D)	58.8 ± 0.3 (I, J, K, L)
Ethiopia (high altitude)	5.1 ± 0.4 (O, P)	32.5 ± 2.8 (M)	71.0 ± 3.5 (E, F, G, H, I, J, K)	94.1 ± 1.9 (A, B, C, D)	100.0 ± 2.2 (A)	96.2 ± 5.1 (A, B, C)	57.7 ± 5.9 (J, K, L)
Zambia	3.7 ± 1.8 (O, P)	19.6 ± 0.3 (M, N, O)	57.3 ± 3.1 (J, K, L)	100.0 ± 1.1 (A)	95.5 ± 0.9 (A, B)	97.1 ± 3.0 (A, B)	69.3 ± 2.4 (G, H, I, J, K)
South Africa	5.5 ± 1.1 (O, P)	17.5 ± 4.4 (M, N, O, P)	72.3 ± 1.1 (F, G, H, I, J)	93.3 ± 2.3 (A, B, C, D)	100.0 ± 2.4 (A)	94.4 ± 2.2 (A, B, C, D)	66.4 ± 4.2 (I, J, K)
Switzerland	5.1 ± 0.6 (O, P)	19.4 ± 1.7 (M, N, O)	65.9 ± 1.8 (H, I, J, K)	100.0 ± 0.2 (A, B)	81.6 ± 1.0 (C, D, E, F, G)	80.8 ± 4.0 (D, E, F, G, H)	54.9 ± 0.4 (K, L)
Austria	0.7 ± 0.1 (P)	8.5 ± 1.1 (N, O, P)	69.7 ± 2.8 (G, H, I, J, K)	100.0 ± 2.8 (A)	96.2 ± 1.5 (A, B)	84.2 ± 2.9 (B, C, D, E, F)	51.1 ± 1.3 (L)

Table S7. Bootstrap *P*-values for pairwise comparisons of different parameters of fecundity performance curves. T_{opt} is the optimal temperature, the temperature at which performance is maximal (u_{max}); B_{75} and B_{50} are the 75% and 50% performance breadths, respectively. *P*-values were corrected for multiple testing using the Benjamini-Hochberg procedure.

Population 1	Population 2	*P*-value			
		T_{opt}	u_{max}	B_{75}	B_{50}
Ethiopia (low altitude)	Ethiopia (high altitude)	0.99	< 0.001	0.605	0.914
Ethiopia (low altitude)	Zambia	0.528	< 0.001	0.463	0.746
Ethiopia (low altitude)	South Africa	0.528	< 0.001	0.761	0.902
Ethiopia (low altitude)	Switzerland	0.108	0.003	0.975	0.597
Ethiopia (low altitude)	Austria	0.023	< 0.001	0.009	0.0002
Ethiopia (high altitude)	Zambia	0.528	< 0.001	0.874	0.724
Ethiopia (high altitude)	South Africa	0.528	0.103	0.797	0.847
Ethiopia (high altitude)	Switzerland	0.129	0.517	0.709	0.678
Ethiopia (high altitude)	Austria	0.03	< 0.001	0.164	0.047
Zambia	South Africa	0.99	0.011	0.643	0.822
Zambia	Switzerland	0.276	0.014	0.596	0.501
Zambia	Austria	0.05	0.021	0.176	0.074
South Africa	Switzerland	0.276	0.517	0.855	0.564
South Africa	Austria	0.031	< 0.001	0.031	0.008
Switzerland	Austria	0.528	< 0.001	0.082	0.02

Table S8. Fully-factorial, two-way fixed-effects ANOVA models for morphological traits.

Trait	Source of variation	*df*	SS	*F*	*P*
Thorax length	Population	4	0.2425	58.3	< 0.0001
	Temperature	6	0.5457	87.5	< 0.0001
	Population × Temperature	24	0.1148	4.6	< 0.0001
	Error	982	1.0209	-	-
Wing area	Population	4	9.92	216.9	< 0.0001
	Temperature	6	46.89	683.2	< 0.0001
	Population × Temperature	24	1.48	5.4	< 0.0001
	Error	915	10.47	-	-
Ovariole number	Population	4	1039.2	13.3	< 0.0001
	Temperature	6	4742.5	40.5	< 0.0001
	Population × Temperature	24	940.9	2.0	0.003
	Error	929	18131.0	-	-

Wing loading	Population	4	0.171	18.4	< 0.0001
	Temperature	6	1.469	105.4	< 0.0001
	Population × Temperature	24	0.186	3.3	< 0.0001
	Error	914	2.124	-	-
Ovariole index	Population	4	1527.8	19.8	< 0.0001
	Temperature	6	8592.6	74.1	< 0.0001
	Population × Temperature	24	1646.3	3.6	< 0.0001
	Error	926	17896.6	-	-

Table S9. Means and standard errors of the mean for morphological traits, measured at different (mean) temperatures. For ANOVA results see Table S8; values not connected by the same letter are significantly different (Tukey's HSD test; $P < 0.05$).

Trait	**Population**	**14°C (9-19°C)**	**18°C (13-23°C)**	**22°C (17-27°C)**	**24°C (19-29°C)**	**26°C (21-31°C)**	**28°C (23-33°C)**	**30°C (25-35°C)**
Thorax length (mm)	Ethiopia (low altitude)	1.040 ± 0.006 (C, D, E)	1.019 ± 0.008 (C, D, E, F, G, H, I)	1.029 ± 0.007 (C, D, E, F, G)	1.030 ± 0.005 (C, D, E, F, G)	1.024 ± 0.005 (C, D, E, F, G, H)	1.008 ± 0.006 (E, F, G, H, I, J)	0.983 ± 0.008 (I, J, K, L)
	Ethiopia (high altitude)	1.107 ± 0.006 (A, B)	1.114 ± 0.007 (A)	1.115 ± 0.007 (A)	1.094 ± 0.005 (A, B)	1.105 ± 0.005 (A, B)	1.083 ± 0.006 (A, B)	1.042 ± 0.008 (C, D, E)
	Zambia	1.037 ± 0.004 (C, D)	1.031 ± 0.007 (C, D, E, F)	1.011 ± 0.006 (D, E, F, G, H, I, J)	1.025 ± 0.005 (C, D, E, F, G)	1.002 ± 0.005 (F, G, H, I, J)	0.992 ± 0.006 (H, I, J, K)	0.943 ± 0.007 (M, N)
	South Africa	0.989 ± 0.006 (I, J, K, L)	1.022 ± 0.007 (C, D, E, F, G,	0.959 ± 0.006 (L, M)	0.996 ± 0.005 (G, H, I, J, K)	0.991 ± 0.005 (H, I, J, K)	0.980 ± 0.006 (J, K, L)	0.926 ± 0.007 (N)

			H)					
	Austria	1.078 ± 0.006 (B)	1.041 ± 0.007 (C, D)	1.046 ± 0.006 (C)	1.036 ± 0.005 (C, D, E)	1.034 ± 0.005 (C, D, E, F)	1.017 ± 0.006 (C, D, E, F, G, H, I)	0.966 ± 0.007 (K, L, M)
Wing area (mm^2)	Ethiopia (low altitude)	2.156 ± 0.022 (E)	2.026 ± 0.026 (F, G, H)	1.889 ± 0.021 (I, J, K, L)	1.794 ± 0.019 (K, L, M)	1.750 ± 0.024 (M, N)	1.639 ± 0.018 (N, O)	1.554 ± 0.024 (O, P, Q, R)
	Ethiopia (high altitude)	2.651 ± 0.022 (A)	2.504 ± 0.023 (B)	2.350 ± 0.022 (C)	2.203 ± 0.019 (D, E)	2.148 ± 0.024 (E, F)	2.037 ± 0.017 (G)	1.839 ± 0.023 (J, K, L, M)
	Zambia	1.853 ± 0.027 (J, K, L, M)	1.901 ± 0.021 (I, J, K)	1.625 ± 0.019 (O, P)	1.643 ± 0.018 (N, O)	1.531 ± 0.022 (P, Q, R)	1.485 ± 0.017 (Q, R)	1.263 ± 0.019 (S)
	South Africa	1.986 ± 0.022 (G, H, I)	1.915 ± 0.021 (H, I, J)	1.584 ± 0.02 (O, P, Q)	1.641 ± 0.018 (N, O)	1.542 ± 0.022 (O, P, Q, R)	1.453 ± 0.017 (R)	1.277 ± 0.019 (S)
	Austria	2.301 ± 0.022 (C, D)	2.166 ± 0.021 (E)	1.881 ± 0.019 (I, J, K, L)	1.835 ± 0.019 (J, K, L, M)	1.784 ± 0.022 (L, M)	1.642 ± 0.017 (N, O)	1.483 ± 0.019 (Q, R)
	Ethiopia	28.2 ± 0.9	34.8 ± 1.1	35.2 ± 0.8	36.6 ± 0.8	33.9 ± 0.8	34.7 ± 0.6	30.5 ± 1.3

Ovariole number	(low altitude)	(O)	(F, G, H, I, J, K, L, M, N)	(F, G, H, I, J, K, L, M, N)	(D, E, F, G, H, I, J, K, L)	(H, I, J, K, L, M, N)	(G, H, I, J, K, L, M, N)	(M, N, O)
	Ethiopia (high altitude)	32.5 ± 0.9 (L, M, N, O)	36.1 ± 0.9 (E, F, G, H, I, J, K, L)	39.3 ± 0.8 (A, B, C, D, E, F)	40.0 ± 0.8 (A, B, C, D, E)	39.6 ± 0.8 (A, B, C, D, E, F)	38.6 ± 0.6 (B, C, D, E, F, G, H)	35.8 ± 1.2 (E, F, G, H, I, J, K, L, M)
	Zambia	31.0 ± 0.8 (N, O)	33.6 ± 0.9 (I, J, K, L, M, N)	36.7 ± 0.8 (D, E, F, G, H, I, J, K, L)	38.4 ± 0.8 (B, C, D, E, F, G, H)	37.9 ± 0.8 (C, D, E, F, G, H, I)	38.8 ± 0.6 (B, C, D, E, F, G)	34.1 ± 1.0 (H, I, J, K, L, M, N)
	South Africa	32.8 ± 0.9 (K, L, M, N)	37.0 ± 0.9 (C, D, E, F, G, H, I, J, K)	35.8 ± 0.8 (E, F, G, H, I, J, K, L)	36.4 ± 0.8 (D, E, F, G, H, I, J, K, L)	38.4 ± 0.8 (B, C, D, E, F, G, H)	37.4 ± 0.6 (C, D, E, F, G, H, I, J)	33.1 ± 1.0 (J, K L, M, N)
	Austria	37.4 ± 1.1 (C, D, E, F, G, H, I, J, K, L)	38.8 ± 0.9 (B, C, D, E, F, G)	42.8 ± 0.8 (A, B)	41.2 ± 0.8 (A, B, C)	43.9 ±0.7 (A)	40.8 ± 0.6 (A, B, C, D)	38.7 ± 1.0 (B, C, D, E, F, G)
	Ethiopia	0.523 ± 0.007	0.523 ± 0.011	0.578 ± 0.008	0.611 ± 0.008	0.616 ± 0.013	0.626 ± 0.009	0.617 ± 0.012

Wing loading	(low altitude)	(K, L, M)	(J, K, L, M)	(F, G, H, I, J)	(B, C, D, E, F, G, H)	(A, B, C, D, E, F)	(A, B, C, D, E, F)	(A, B, C, D, E, F, G)
	Ethiopia (high altitude)	0.513 ± 0.007 (L, M)	0.558 ± 0.008 (H, I, J, K, L)	0.590 ± 0.009 (E, F, G, H, I)	0.598 ± 0.008 (D, E, F, G, H)	0.640 ± 0.013 (A, B, C, D, E)	0.625 ± 0.008 (A, B, C, D, E, F)	0.618 ± 0.012 (A, B, C, D, E, F)
	Zambia	0.600 ± 0.009 (C, D, E, F, G, H)	0.578 ± 0.008 (F, G, H, I)	0.637 ± 0.008 (A, B, C, D, E)	0.660 ± 0.008 (A, B)	0.660 ± 0.012 (A, B)	0.659 ± 0.008 (A, B)	0.665 ± 0.01 (A)
	South Africa	0.485 ± 0.007 (M)	0.559 ± 0.008 (H, I, J, K, L)	0.563 ± 0.008 (G, H, I, J, K)	0.599 ± 0.008 (D, E, F, G, H)	0.634 ± 0.012 (A, B, C, D, E)	0.650 ± 0.008 (A, B, C)	0.625 ± 0.01 (A, B, C, D, E, F)
	Austria	0.545 ± 0.007 (I, J, K, L)	0.524 ± 0.009 (K, L, M)	0.610 ± 0.008 (C, D, E, F, G)	0.607 ± 0.008 (C, D, E, F, G, H)	0.620 ± 0.012 (A, B, C, D, E, F)	0.643 ± 0.008 (A, B, C, D)	0.612 ± 0.01 (B, C, D, E, F)
	Ethiopia	25.3 ± 0.9	33.9 ± 1.1	32.3 ± 0.9	33.5 ± 0.8	31.4 ± 1.0	34.0 ± 0.8	34.2 ± 1.7

Ovariole index	(low altitude)	(N, O)	(F, G, H, I, J)	(G, H, I, J, K)	(F, G, H, I, J)	(H, I, J, K, L)	(F, G, H, I)	(E, F, G, H, I, J)
	Ethiopia (high altitude)	24.0 ± 0.9 (O)	26.1 ± 1.0 (M, N, O)	28.5 ± 0.9 (K, L, M, N, O)	30.5 ± 0.8 (I, J, K, L, M, N)	29.4 ± 1.0 (J, K, L, M, N)	30.6 ± 0.8 (I, J, K, L, M, N)	31.9 ± 1.5 (G, H, I, J, K, L)
	Zambia	27.7 ± 0.9 (L, M, N, O)	30.7 ± 0.9 (I, J, K, L, M)	35.6 ± 0.8 (D, E, F, G, H)	35.8 ± 0.7 (D, E, F, G, H)	36.1 ± 0.9 (B, C, D, E, F)	39.9 ± 0.8 (A, B, C, D)	40.9 ± 1.3 (A, B, C)
	South Africa	33.5 ± 0.9 (F, G, H, I)	34.7 ± 0.9 (E, F, G, H, I)	40.8 ± 0.8 (A, B, C)	36.8 ± 0.7 (C, D, E, F, G)	39.8 ± 0.9 (A, B, C, D)	39.9 ± 0.8 (A, B, C, D)	40.3 ± 1.3 (A, B)
	Austria	28.8 ± 1.1 (I, J, K, L, M)	34.3 ± 0.9 (F, G, H, I)	37.4 ± 0.8 (B, C, D, E, F)	37.0 ± 0.7 (C, D, E, F)	39.8 ± 0.9 (A, B, C, D)	38.8 ± 0.8 (A, B, C, D, E)	43.0 ± 1.3 (A)

Table S10. Multiple nonlinear (for thorax length, wing area, ovariole number) and linear (for wing loading, ovariole index) regression. See Materials and Methods for further details.

Trait	Source of variation	*df*	SS	*F*	*P*
Thorax length	Population	4	1.4	294.0	< 0.0001
	Temperature	1	0.03	17.3	< 0.0001
	$(\text{Temperature})^2$	1	0.1	92.7	< 0.0001
	Population × Temperature	4	0.01	1.7	0.15
	Population × $(\text{Temperature})^2$	4	0.01	1.2	0.31
	Error	1002	1.2	-	-
Wing area	Population	4	48.2	940.8	< 0.0001
	Temperature	1	1.5	119.2	< 0.0001
	$(\text{Temperature})^2$	1	0.5	41.8	< 0.0001
	Population × Temperature	4	0.3	5.2	0.0004
	Population × $(\text{Temperature})^2$	4	0.2	3.3	0.01
	Error	935	12.0	-	-
Ovariole number	Population	4	5028.8	62.3	< 0.0001
	Temperature	1	4125.8	204.3	< 0.0001
	$(\text{Temperature})^2$	1	3153.5	156.1	< 0.0001
	Population × Temperature	4	122.6	1.5	0.2
	Population × $(\text{Temperature})^2$	4	104.3	1.3	0.27
	Error	949	19166.2	-	-
Wing loading	Population	4	0.3	32.3	< 0.0001
	Temperature	1	1.4	537.9	< 0.0001
	Population × Temperature	4	0.04	4.3	0.002
	Error	939	2.4	-	-
Ovariole index	Population	4	11502.5	142.2	< 0.0001
	Temperature	1	8609.6	425.8	< 0.0001
	Population × Temperature	4	704.2	8.7	< 0.0001
	Error	951	19227.6	-	-

Table S11. Estimated parameters from multiple nonlinear regression for thorax length; also see Table S10.

Term	**Estimate**	***P***
Intercept	1.046 ± 0.003	<0.0001
Population[Ethiopia – low altitude]	-0.007 ± 0.002	0.003
Population[Ethiopia – high altitude]	0.068 ± 0.002	<0.0001
Population[Zambia]	-0.02 ± 0.002	<0.0001
Population[South Africa]	-0.046 ± 0.002	<0.0001
Population[Austria]	0.005 ± 0.002	0.02
Temperature	0.0029 ± 0.0007	<0.0001
$(\text{Temperature})^2$	-0.0004 ± 0.00004	<0.0001
Population[Ethiopia – low altitude] × (Temperature-8.84366)	-0.0011 ± 0.0015	0.47
Population[Ethiopia – high altitude] × (Temperature-8.84366)	0.0025 ± 0.0015	0.09
Population[Zambia] × (Temperature-8.84366)	-0.0003 ± 0.0013	0.85
Population[South Africa] × (Temperature-8.84366)	0.0016 ± 0.0014	0.25
Population[Austria] × (Temperature-8.84366)	-0.0028 ± 0.0014	0.05
Population[Ethiopia – low altitude] × $((\text{Temperature})^2$-106.93)	0.0001 ± 9.3e-5	0.11
Population[Ethiopia – high altitude] × $((\text{Temperature})^2$-106.93)	-0.0001 ± 9.3e-5	0.2
Population[Zambia] × $((\text{Temperature})^2$-106.93)	-5.5e-5 ± 8.2e-5	0.51
Population[South Africa] × $((\text{Temperature})^2$-106.93)	-6.0e-5 ± 8.6e-5	0.49
Population[Austria] × $((\text{Temperature})^2$-106.93)	8.6e-5 ± 8.6e-5	0.32

Table S12. Estimated parameters from multiple nonlinear regression for wing area; also see Table S10.

Term	**Estimate**	***P***
Intercept	2.198 ± 0.009	<0.0001
Population[Ethiopia – low altitude]	-0.009 ± 0.008	0.23
Population[Ethiopia – high altitude]	0.411 ± 0.008	<0.0001
Population[Zambia]	-0.223 ± 0.007	<0.0001
Population[South Africa]	-0.21 ± 0.007	<0.0001
Population[Austria]	0.031 ± 0.007	<0.0001
Temperature	-0.027 ± 0.003	<0.0001
$(\text{Temperature})^2$	-0.001 ± 0.0002	<0.0001
Population[Ethiopia – low altitude] × (Temperature-9.15579)	-0.003 ± 0.005	0.63
Population[Ethiopia – high altitude] × (Temperature-9.15579)	-0.0004 ± 0.005	0.94
Population[Zambia] × (Temperature-9.15579)	0.022 ± 0.005	<0.0001
Population[South Africa] × (Temperature-9.15579)	-0.005 ± 0.005	0.29
Population[Austria] × (Temperature-9.15579)	-0.014 ± 0.005	0.006
Population[Ethiopia – low altitude] × $((\text{Temperature})^2$-110.893)	0.0005 ± 0.0003	0.11
Population[Ethiopia – high altitude] × $((\text{Temperature})^2$-110.893)	-0.0003 ± 0.0003	0.34
Population[Zambia] × $((\text{Temperature})^2$-110.893)	-0.001 ± 0.0003	0.002
Population[South Africa] × $((\text{Temperature})^2$-110.893)	0.0003 ± 0.0003	0.26
Population[Austria] × $((\text{Temperature})^2$-110.893)	0.0004 ± 0.0003	0.16

Table S13. Estimated parameters from multiple nonlinear regression for ovariole number; also see Table S10.

Term	**Estimate**	***P***
Intercept	32.0 ± 0.4	<0.0001
Population[Ethiopia – low altitude]	-3.17 ± 0.3	<0.0001
Population[Ethiopia – high altitude]	0.86 ± 0.3	0.004
Population[Zambia]	-0.8 ± 0.28	0.005
Population[South Africa]	-0.77 ± 0.29	0.007
Population[Austria]	3.88 ± 0.29	<0.0001
Temperature	1.4 ± 0.1	<0.0001
$(\text{Temperature})^2$	-0.07 ± 0.01	<0.0001
Population[Ethiopia – low altitude] × (Temperature-9.12241)	0.33 ± 0.2	0.09
Population[Ethiopia – high altitude] × (Temperature-9.12241)	0.16 ± 0.2	0.44
Population[Zambia] × (Temperature-9.12241)	0.01 ± 0.2	0.97
Population[South Africa] × (Temperature-9.12241)	-0.4 ± 0.2	0.05
Population[Austria] × (Temperature-9.12241)	-0.12 ± 0.21	0.55
Population[Ethiopia – low altitude] × $((\text{Temperature})^2$-110.469)	-0.02 ± 0.01	0.06
Population[Ethiopia – high altitude] × $((\text{Temperature})^2$-110.469)	-0.01 ± 0.01	0.65
Population[Zambia] × $((\text{Temperature})^2$-110.469)	0.01 ± 0.01	0.53
Population[South Africa] × $((\text{Temperature})^2$-110.469)	0.02 ± 0.01	0.16
Population[Austria] × $((\text{Temperature})^2$-110.469)	0.01 ± 0.01	0.59

Table S14. Estimated parameters from multiple linear regression for wing loading; also see Table S10.

Term	**Estimate**	***P***
Intercept	0.532 ± 0.003	<0.0001
Population[Ethiopia – low altitude]	-0.013 ± 0.003	0.0002
Population[Ethiopia – high altitude]	-0.007 ± 0.003	0.03
Population[Zambia]	0.037 ± 0.003	<0.0001
Population[South Africa]	-0.011 ± 0.003	0.0004
Population[Austria]	-0.005 ± 0.003	0.12
Temperature	0.007 ± 0.0003	<0.0001
Population[Ethiopia – low altitude] × (Temperature-9.16122)	0.0002 ± 0.0007	0.78
Population[Ethiopia – high altitude] × (Temperature-9.16122)	0.0002 ± 0.0006	0.74
Population[Zambia] × (Temperature-9.16122)	-0.0017 ± 0.0007	0.008
Population[South Africa] × (Temperature-9.16122)	0.0022 ± 0.0006	0.0005
Population[Austria] × (Temperature-9.16122)	-0.0008 ± 0.0006	0.17

Table S15. Estimated parameters from multiple linear regression for ovariole index; also see Table S10.

Term	**Estimate**	***P***
Intercept	29.03 ± 0.3	< 0.0001
Population[Ethiopia – low altitude]	-2.28 ± 0.3	< 0.0001
Population[Ethiopia – high altitude]	-5.64 ± 0.3	< 0.0001
Population[Zambia]	1.11 ± 0.28	< 0.0001
Population[South Africa]	3.85 ± 0.29	< 0.0001
Population[Austria]	2.95 ± 0.29	< 0.0001
Temperature	0.58 ± 0.03	< 0.0001
Population[Ethiopia – low altitude] × (Temperature-9.16122)	-0.18 ± 0.06	0.003
Population[Ethiopia – high altitude] × (Temperature-9.16122)	-0.1 ± 0.06	0.07
Population[Zambia] × (Temperature-9.16122)	0.26 ± 0.05	< 0.0001
Population[South Africa] × (Temperature-9.16122)	-0.09 ± 0.05	0.11
Population[Austria] × (Temperature-9.16122)	0.1 ± 0.06	0.07

Table S16. Parameter estimates for reaction norms of morphological traits, with standard errors of the mean. Values in bold are significantly different from the overall mean ($\alpha = 0.05$) (analysis of means, ANOM; see Materials and Methods for further details).

Trait	Population	Intercept	Slope	Quadratic coefficient	Optimal temperature (°C)	Maximum value
Thorax length	Ethiopia (low altitude)	1.033 ± 0.006	0.0019 ± 0.0017	-0.0003 ± 0.0001	17.43 ± 1.83	**1.037 ± 0.004**
	Ethiopia (high altitude)	**1.105 ± 0.006**	0.0055 ± 0.0017	-0.0005 ± 0.0001	19.08 ± 0.68	**1.119 ± 0.004**
	Zambia	1.034 ± 0.004	0.0027 ± 0.0014	-0.0005 ± 8.9 e-5	16.87 ± 0.93	**1.038 ± 0.003**
	South Africa	**0.992 ± 0.006**	0.0046 ± 0.0016	-0.0005 ± 9.6 e-5	18.73 ± 0.79	**1.003 ± 0.003**
	Austria	**1.067 ± 0.006**	0.0001 ± 0.0016	-0.0003 ± 9.6 e-5	14.25 ± 2.26	**1.067 ± 0.006**
Wing area	Ethiopia (low altitude)	**2.155 ± 0.02**	-0.030 ± 0.006	-0.0005 ± 0.0004	- 0.44 ± 9.43	2.367 ± 0.208
	Ethiopia (high altitude)	**2.645 ± 0.02**	-0.028 ± 0.006	-0.0013 ± 0.0004	7.95 ± 2.82	**2.719 ± 0.07**
	Zambia	**1.884 ± 0.023**	**-0.006 ± 0.006**	**-0.0019 ± 0.0003**	13.98 ± 1.21	**1.879 ± 0.023**
	South Africa	**1.999 ± 0.02**	-0.033 ± 0.005	-0.0007 ± 0.0003	3.47 ± 5.1	2.16 ± 0.132
	Austria	**2.306 ± 0.02**	-0.041 ± 0.005	-0.0006 ± 0.0003	0.55 ± 5.91	**2.576 ± 0.186**

Ovariole number	Ethiopia (low altitude)	**28.43 ± 0.78**	1.74 ± 0.22	-0.098 ± 0.014	22.92 ± 0.39	**36.14 ± 0.53**
	Ethiopia (high altitude)	32.08 ± 0.79	1.56 ± 0.22	-0.080 ± 0.014	23.81 ± 0.52	39.74 ± 0.49
	Zambia	30.37 ± 0.71	1.41 ± 0.2	-0.067 ± 0.012	24.54 ± 0.61	37.84 ± 0.44
	South Africa	32.86 ± 0.78	1.03 ± 0.21	-0.058 ± 0.013	22.91 ± 0.58	**37.41 ± 0.48**
	Austria	**36.31 ± 0.93**	1.28 ± 0.24	-0.068 ± 0.013	23.49 ± 0.53	**42.38 ± 0.47**
Wing loading	Ethiopia (low altitude)	0.518 ± 0.008	0.0076 ± 0.0007			
	Ethiopia (high altitude)	0.523 ± 0.008	0.0076 ± 0.0007			
	Zambia	**0.585 ± 0.008**	0.0056 ± 0.0007			
	South Africa	**0.501 ± 0.007**	**0.0095 ± 0.0007**			
	Austria	0.535 ± 0.007	0.0065 ± 0.0007			
Ovariole index	Ethiopia (low altitude)	28.36 ± 0.66	**0.40 ± 0.07**			
	Ethiopia (high altitude)	**24.32 ± 0.66**	0.48 ± 0.06			
	Zambia	27.75 ± 0.60	**0.84 ± 0.06**			
	South Africa	**33.68 ± 0.64**	0.49 ± 0.06			
	Austria	**31.03 ± 0.71**	0.68 ± 0.07			

Table S17. Analysis of Means (ANOM) of estimated reaction norm parameters for thorax length ($\alpha = 0.05$). See Materials and Methods for further details.

Parameter	Population	Lower limit	Estimate	Upper limit	Limit exceeded
Intercept	Ethiopia (low altitude)	1.03	1.03	1.06	
	Ethiopia (high altitude)	1.03	1.1	1.06	upper
	Zambia	1.03	1.03	1.06	
	South Africa	1.03	0.99	1.06	lower
	Austria	1.03	1.07	1.06	upper
Slope	Ethiopia (low altitude)	-0.001	0.002	0.007	
	Ethiopia (high altitude)	-0.001	0.006	0.007	
	Zambia	-0.001	0.003	0.007	
	South Africa	-0.001	0.005	0.007	
	Austria	-0.001	0.0001	0.007	
Quadratic coefficient	Ethiopia (low altitude)	-0.001	-0.0003	-0.0002	
	Ethiopia (high altitude)	-0.001	-0.0005	-0.0002	
	Zambia	-0.001	-0.0005	-0.0002	
	South Africa	-0.001	-0.0005	-0.0002	
	Austria	-0.001	-0.0003	-0.0002	
Optimal temperature	Ethiopia (low altitude)	13.56	17.43	22.91	
	Ethiopia (high altitude)	16.5	19.08	19.98	
	Zambia	15.86	16.87	20.62	
	South Africa	16.21	18.73	20.27	

(°C)	Austria	12.46	14.25	24.01	
Maximum value	Ethiopia (low altitude)	1.04	1.04	1.06	lower
	Ethiopia (high altitude)	1.04	1.12	1.06	upper
	Zambia	1.04	1.04	1.06	lower
	South Africa	1.04	1.00	1.06	lower
	Austria	1.03	1.07	1.06	upper

Table S18. Analysis of Means (ANOM) of estimated reaction norm parameters for wing area ($\alpha = 0.05$). See Materials and Methods for further details.

Parameter	Population	Lower limit	Estimate	Upper limit	Limit exceeded
Intercept	Ethiopia (low altitude)	2.16	2.16	2.27	lower
	Ethiopia (high altitude)	2.16	2.65	2.27	upper
	Zambia	2.16	1.88	2.27	lower
	South Africa	2.16	2.0	2.27	lower
	Austria	2.17	2.31	2.27	upper
Slope	Ethiopia (low altitude)	-0.04	-0.03	-0.01	
	Ethiopia (high altitude)	-0.04	-0.03	-0.01	
	Zambia	-0.04	-0.006	-0.01	upper
	South Africa	-0.04	-0.03	-0.01	
	Austria	-0.04	-0.04	-0.01	
Quadratic coefficient	Ethiopia (low altitude)	-0.002	-0.0005	-0.00001	
	Ethiopia (high altitude)	-0.002	-0.0013	-6.43e-5	
	Zambia	-0.002	-0.002	-0.0001	lower
	South Africa	-0.002	-0.0007	-0.0001	
	Austria	-0.002	-0.0006	-0.0001	
Optimal temperature	Ethiopia (low altitude)	-12.06	-0.44	36.15	
	Ethiopia (high altitude)	4.83	7.95	19.27	
	Zambia	8.95	13.98	15.14	
	South Africa	-0.99	3.47	25.09	

(°C)	Austria	-3.05	0.55	27.14	
Maximum value	Ethiopia (low altitude)	1.45	2.37	2.51	
	Ethiopia (high altitude)	1.80	2.72	2.16	upper
	Zambia	1.92	1.88	2.04	lower
	South Africa	1.64	2.16	2.32	
	Austria	1.51	2.58	2.46	upper

Table S19. Analysis of Means (ANOM) of estimated reaction norm parameters for ovariole number ($\alpha = 0.05$). See Materials and Methods for further details.

Parameter	Population	Lower limit	Estimate	Upper limit	Limit exceeded
Intercept	Ethiopia (low altitude)	29.68	28.43	33.68	lower
	Ethiopia (high altitude)	29.67	32.08	33.69	
	Zambia	29.87	30.37	33.48	
	South Africa	29.69	32.86	33.67	
	Austria	29.3	36.31	34.06	upper
Slope	Ethiopia (low altitude)	0.83	1.74	1.97	
	Ethiopia (high altitude)	0.83	1.56	1.97	
	Zambia	0.88	1.41	1.91	
	South Africa	0.85	1.03	1.94	
	Austria	0.8	1.28	2.0	
Quadratic coefficient	Ethiopia (low altitude)	-0.11	-0.1	-0.04	
	Ethiopia (high altitude)	-0.11	-0.08	-0.04	
	Zambia	-0.11	-0.07	-0.04	
	South Africa	-0.11	-0.06	-0.04	
	Austria	-0.11	-0.07	-0.04	
Optimal temperature	Ethiopia (low altitude)	22.42	22.92	24.41	
	Ethiopia (high altitude)	22.09	23.81	24.73	
	Zambia	21.85	24.54	24.97	
	South Africa	21.94	22.91	24.88	

(°C)	Austria	22.07	23.49	24.75	
Maximum value	Ethiopia (low altitude)	37.44	36.14	40.13	lower
	Ethiopia (high altitude)	37.52	39.74	40.05	
	Zambia	37.66	37.84	39.91	
	South Africa	37.55	37.41	40.02	lower
	Austria	37.59	42.38	39.98	upper

Table S20. Analysis of Means (ANOM) of estimated reaction norm parameters for wing loading ($\alpha = 0.05$). See Materials and Methods for further details.

Parameter	Population	Lower limit	Estimate	Upper limit	Limit exceeded
Intercept	Ethiopia (low altitude)	0.51	0.52	0.55	
	Ethiopia (high altitude)	0.51	0.52	0.55	
	Zambia	0.51	0.59	0.55	upper
	South Africa	0.51	0.5	0.55	lower
	Austria	0.51	0.54	0.55	
Slope	Ethiopia (low altitude)	0.006	0.008	0.009	
	Ethiopia (high altitude)	0.006	0.008	0.009	
	Zambia	0.006	0.006	0.009	
	South Africa	0.006	0.01	0.009	upper
	Austria	0.006	0.007	0.009	

Table S21. Analysis of Means (ANOM) of estimated reaction norm parameters for ovariole index ($\alpha = 0.05$). See Materials and Methods for further details.

Parameter	Population	Lower limit	Estimate	Upper limit	Limit exceeded
Intercept	Ethiopia (low altitude)	27.25	28.36	30.72	
	Ethiopia (high altitude)	27.3	24.32	30.67	lower
	Zambia	27.45	27.75	30.52	
	South Africa	27.35	33.68	30.62	upper
	Austria	27.16	31.03	30.81	upper
Slope	Ethiopia (low altitude)	0.42	0.4	0.76	lower
	Ethiopia (high altitude)	0.43	0.48	0.75	
	Zambia	0.44	0.84	0.74	upper
	South Africa	0.43	0.49	0.74	
	Austria	0.42	0.68	0.76	