Supporting Information

Supporting Figure Legends

Figure S1. Mean annual air temperature explains variation in body size, early fecundity and lifespan. The plots show regression of (A) thorax length and (B) early daily per capita fecundity between days 1-5 (B) against temperature; the third plot (C) shows the range risk ratio between the lowest and highest temperature as estimated from Cox regression. Risk ratios < 1 indicate a decrease in the hazard ratio with increasing values of temperature (i.e., a negative slope), whereas risk ratios > 1 correspond to an increase in the hazard ratio (i.e., a positive slope). Error bars represent 95% confidence intervals.

Figure S1

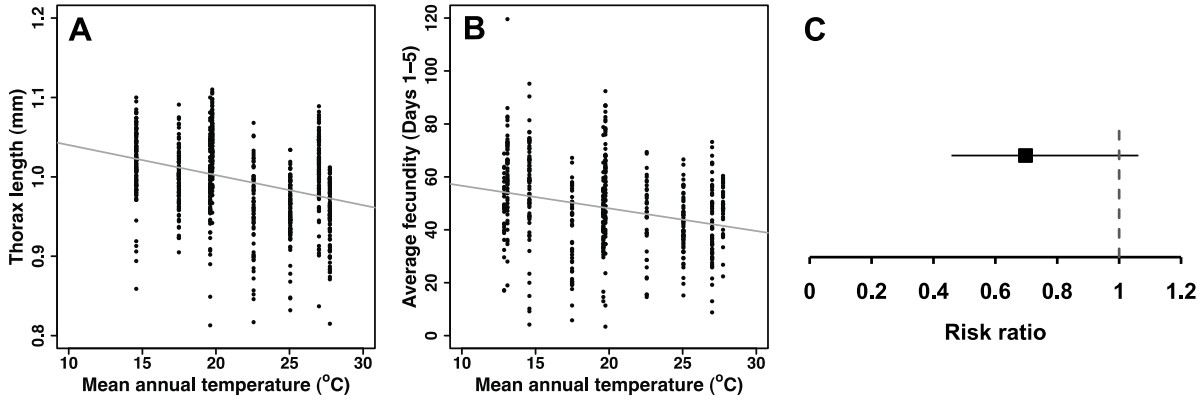
A
Thorax length (mm)
0.8
0.9
1.0
1.1
1.2
10
15
20
25
30
Mean annual temperature (°C)
B
Average fecundity (Days 1–5)
0
20
40
60
80
100
120
10
15
20
25
30
Mean annual temperature (°C)
C
0
0.2
0.4
0.6
0.8
1
1.2
Risk ratio

Table S1. Sub-Saharan African populations of *D. melanogaster* used in this study. Abbreviations: ID (population identifier); V, viability; T, thorax length; FL, fecundity and lifespan; D, diapause. Asterisks (*) denote populations for which whole-genome data are available for individual lines (Pool *et al*. 2012; http://www.johnpool.net/genomes.html). See Materials and Methods and Table S2 for more details.[1]

ID	Country	Location	Altitude (m)	Latitude (°N)	Longitude (°E)	Collection date	Collector	Trait (no. of lines measured)
EF*	Ethiopia	Fiche	3070	9.81	38.63	Dec. 2011	J. Pool	V(10), FL(9)
ED*	Ethiopia	Dodola	2492	6.98	39.18	Dec. 2008	J. Pool	V(5), FL(5), D(2)
CO*	Cameroon	Oku	2169	6.25	10.43	Apr. 2004	J. Pool	V(7), T(6), FL(9), D(7)
RG*	Rwanda	Gikongoro	1927	-2.49	28.92	Dec. 2008	J. Pool	V(7), T(7), FL(12), D(8)
SF*	South Africa	Fouriesburg	1800	-28.60	28.05	Dec. 2011	J. Pool	V(10), T(10), FL(10)
KN	Kenya	Nairobi	1661	-1.34	36.82	2002	B. Ballard	D(14)
ZW	Zimbabwe	Victoria Falls	900	-17.92	25.84	2002	B. Ballard	D(21)
ZI*	Zambia	Siavonga	530	-16.54	28.72	Jul. 2010	R. Corbett-Detig	D(37)
EA*	Ethiopia	Gambella	525	8.25	34.59	Dec. 2011	J. Pool	V(10), T(9), FL(10)
SP*	South Africa	Phalaborwa	375	-23.94	31.14	Jul. 2010	R. Corbett-Detig	V(6), T(5), FL(6), D(5)

GA*	Gabon	Franceville	332	-1.65	13.60	Mar. 2002	B. Ballard and S. Charlat	V(8), T(7), FL(10), D(7)
NG*	Nigeria	Maiduguri	295	11.85	13.16	Sept. 2004	D. Gwary and B. Sastawa	V(6), T(7), FL(6), D(5)
SE*	South Africa	Port Edward	50	-31.06	30.22	Dec. 2011	J. Pool	V(10), T(11), FL(10)
GN	Gabon	Ntoum	17	0.38	9.75	2002	B. Ballard	D(13)
							Total no. of lines:	**V(79), T(62), FL(87), D(119)**

[1]We thank all original collectors mentioned in the table for their major efforts in the field; the lines from KN, ZW and GN were kindly made available to us by P. Andolfatto (Princeton).

Table S2. Sample sizes for life history assays. The table gives the range (across isofemale lines), mean (average number of flies per isofemale line) and total number of flies (or vials in the case of viability) measured for a given population (also see Table 1). Fecundity 6-10 days and 1-10 days were equal with respect to sample sizes.

Pop ID	Stats	Viability	Thorax length	Fec. 1-5 days	Fec. 6-10 days 1-10 days	Lifespan	Diapause
EF	Range	2-4		2-8	1-7	2-8	
	Mean	3.7	NA	6.4	3.7	6.6	NA
	Total	37		58	33	59	
ED	Range	2-5		5-6	5-6	5-6	10
	Mean	4.4	NA	5.6	5.6	5.6	10
	Total	22		28	28	28	20
CO	Range	2-5	13-16	5-6	5-6	5-6	10
	Mean	3.9	14.7	5.7	5.7	5.7	10
	Total	27	88	51	51	51	70
RG	Range	5	10-16	5-6	5-6	5-6	10
	Mean	5	13.1	5.8	5.8	5.9	10
	Total	35	92	70	70	71	80
SF	Range	4	6-17	3-8	0-8	3-8	
	Mean	4	11.3	6.9	6.3	6.9	NA
	Total	40	113	69	63	69	
KN	Range						10-31
	Mean	NA	NA	NA	NA	NA	13.4
	Total						187

	Range						10-26
ZW	Mean	NA	NA	NA	NA	NA	11
	Total						239
	Range						10-73
ZI	Mean	NA	NA	NA	NA	NA	22.9
	Total						847
	Range	4-5	7-16	3-8	3-8	3-8	
EA	Mean	4.1	9.9	5.8	5.3	6	NA
	Total	41	89	58	53	60	
	Range	2-5	11-18	5-6	5-6	5-6	10
GA	Mean	4.4	14.1	5.8	5.8	5.9	10
	Total	35	99	58	58	59	70
	Range	5	10-16	6	5-6	6	10
SP	Mean	5	13.2	6	5.7	6	10
	Total	30	66	36	34	36	50
	Range	2-5	14-18	5-6	5-6	5-6	10
NG	Mean	4	15.4	5.8	5.8	5.8	10
	Total	24	108	35	35	35	50
	Range	4	5-16	4-8	1-7	5-8	
SE	Mean	4	9.7	7.1	4.8	7.2	NA
	Total	40	107	71	48	72	
	Range						10-28
GN	Mean	NA	NA	NA	NA	NA	17.4
	Total						226

	Range	2-5	5-18	2-8	0-8	2-8	10-73
Total	Mean	4.2	12.3	6.1	5.4	6.2	15.5
	Total	331	762	534	473	540	1839

Table S3. Within-population frequency of reproductive diapause (*n* = 10 populations). In total, among populations, only 2 out of 10 populations showed a diapause response (2/10 = 20% of all populations). Within populations, among isofemale lines, the frequency of diapause was also low (on average, across populations, 2%). Only 2 isofemale lines across 2 populations exhibited a diapause phenotype: the ZI406 line from the Zambian ZI population (= 1 line out of 37 lines measured for the ZI population; 1/37 = 0.027) and the SP254 line from the South African SP population (= 1 line out 5 lines measured for the SP population; 1/5 = 0.2). Pop ID, population identifier.

Pop ID	Country	Frequency
ED	Ethiopia	0
CO	Cameroon	0
RG	Rwanda	0
KN	Kenya	0
ZW	Zimbabwe	0
ZI	Zambia	0.027
GA	Gabon	0
SP	South Africa	0.2
NG	Nigeria	0
GN	Gabon	0
	Africa	0.02

Table S4. Variance components of the random effect 'line' nested in population from the model: 'Trait ~ Population + line[Population]' (A, upper table); and of the random effect 'line' from the model: 'Trait ~ Altitude + Latitude + Longitude + line' (B, lower table). First column, traits; 'Random Effect', random effects of the model; 'Var Ratio', ratio of the random effect's to the residual's variance component; 'Var Component', variance component of random effect, residual and the total defined as the sum of positive variance components; 'SE', standard error of variance component; '95% Lower', lower 95% confidence interval of variance component; '95% Upper', upper 95% confidence interval of variance component; '% of Total', ratio of variance component of the random effect or residual to total in percent.

(A)	Random Effect	Var Ratio	Var Component	SE	95% Lower	95% Upper	% of Total
Egg to adult survival (viability)	line[Population]	1.69	0.04	0.01	0.02	0.05	62.77
	Residual		0.02	0.00	0.02	0.03	37.23
	Total		0.06	0.01	0.05	0.08	100
Body size (thorax length)	line[Population]	0.29	0.00	0.00	0.00	0.00	22.30
	Residual		0.00	0.00	0.00	0.00	77.70
	Total		0.00	0.00	0.00	0.00	100
Fecundity	line[Population]	0.45	70.47	15.66	39.78	101.16	31.24

1-5 Days	Residual		155.08	10.37	136.61	177.60	68.76
	Total		225.55	17.80	194.37	264.94	100
Fecundity 6-10 Days	line[Population]	0.26	114.57	33.69	48.54	180.60	20.89
	Residual		433.99	31.36	378.53	502.67	79.11
	Total		548.57	41.20	476.00	639.20	100
Fecundity 10 Days	line[Population]	0.36	85.03	21.78	42.34	127.71	26.63
	Residual		234.28	16.85	204.46	271.16	73.37
	Total		319.31	25.30	274.99	375.34	100

(B)	**Random Effect**	**Var Ratio**	**Var Component**	**SE**	**95% Lower**	**95% Upper**	**% of Total**
Egg to adult survival (viability)	Line	1.83	0.04	0.01	0.03	0.06	64.62
	Residual		0.02	0.00	0.02	0.03	35.38
	Total		0.07	0.01	0.05	0.08	100
Body size (thorax	Line	0.56	0.00	0.00	0.00	0.00	35.96
	Residual		0.00	0.00	0.00	0.00	64.04

length)	Total		0.00	0.00	0.00	0.00	100
Fecundity 1-5 Days	Line	0.55	85.84	17.46	51.63	120.06	35.63
	Residual		155.06	10.37	136.59	177.57	64.37
	Total		240.91	19.40	206.99	283.95	100
Fecundity 6-10 Days	Line	0.33	143.02	37.03	70.45	215.59	24.79
	Residual		433.82	31.36	378.36	502.51	75.21
	Total		576.84	43.88	499.65	673.50	100
Fecundity 10 Days	Line	0.42	98.87	23.18	53.44	144.29	29.68
	Residual		234.28	16.86	204.46	271.17	70.32
	Total		333.15	26.49	286.76	391.84	100

Table S5. Categorical grouping (nominal classification) of populations used in MANOVA and pairwise genetic correlation analysis with respect to geographic variables. In these analyses (see Materials and Methods), each geographical effect (i.e., altitude, latitude, or longitude) was analyzed separately, classifying data as 'low' (50 m - 525 m AMSL) or 'high' (1800 m - 3070 m AMSL) for the nominal effect of altitude; as 'above' (6.25°N - 11.85°N), 'at' (1.65°S - 2.49°S) or 'below' (23.94°S - 31.06°S) the equator for the nominal effect of latitude; or as 'east' (39.18°E - 28.05°E) or 'west' (10.43°E - 13.60°E) for the nominal effect of longitude.

Pop ID	Altitude	Latitude	Longitude
EF	high	above equator	east
ED	high	above equator	east
CO	high	above equator	west
RG	high	at equator	east
SF	high	below equator	east
EA	low	above equator	east
GA	low	at equator	west
SP	low	below equator	east
NG	low	above equator	west
SE	low	below equator	east

Table S6. Pearson's product-moment correlation coefficients using isofemale line means, separately for each level within a geographic variable. Upper table (A), altitude: 'high altitude' above, 'low altitude' below diagonal; middle table (B) latitude: 'above equator' above, 'at equator' above in parenthesis, 'below equator' below diagonal; lower table (C), longitude: 'east' above, 'west' below diagonal. **P* < 0.05, ***P* < 0.01, *** *P* < 0.0001.

(A)	Thorax Length	Fec. 1-5 Days	Fec. 6-10 Days	Fec. 1-10 Days	Lifespan	Viability
Thorax Length	1	**0.50****	0.00	0.25	-0.27	0.20
Fec. 1-5 Days	0.31	1	**0.60*****	**0.84*****	0.03	0.10
Fec. 6-10 Days	-0.05	**0.69*****	1	**0.93*****	**0.38***	0.17
Fec. 1-10 Days	0.16	**0.88*****	**0.94*****	1	0.21	0.15
Lifespan	-0.09	**-0.53****	-0.30	**-0.40****	1	0.16
Viability	-0.17	-0.10	0.26	0.12	0.06	1

(B)	Thorax Length	Fec. 1-5 Days	Fec. 6-10 Days	Fec. 1-10 Days	Lifespan	Viability
Thorax Length	1	**0.52**** (-0.05)	-0.08 (0.14)	0.20 (0.05)	-0.10 (-0.03)	-0.10 (0.14)
Fec. 1-5 Days	0.29	1	**0.63*** (0.65**)**	**0.84*** (0.90***)**	-0.19 (-0.23)	0.27 (**-0.63***)

Fec. 6-10 Days	0.05	**0.68****	1	**0.95*** (0.91***)**	0.00 (0.16)	**0.47**** (-0.23)
Fec. 1-10 Days	0.20	**0.87*****	**0.94*****	1	-0.08 (-0.03)	**0.45**** (-0.46)
Lifespan	-0.25	-0.37	-0.08	-0.26	1	-0.12 (0.36)
Viability	0.26	0.14	0.01	0.04	0.20	1

(C)	**Thorax Length**	**Fec. 1-5 Days**	**Fec. 6-10 Days**	**Fec. 1-10 Days**	**Lifespan**	**Viability**
Thorax Length	1	**0.47****	-0.01	0.23	**-0.38****	0.28
Fec. 1-5 Days	**-0.55***	1	**0.56*****	**0.81*****	**-0.36****	0.10
Fec. 6-10 Days	**-0.68****	**0.85*****	1	**0.93*****	-0.04	0.08
Fec. 1-10 Days	**-0.65****	**0.94*****	**0.98*****	1	-0.21	0.09
Lifespan	-0.15	-0.13	0.10	0.02	1	-0.03
Viability	-0.38	0.11	**0.50***	0.37	0.37	1

Table S7. Results of MANOVA performed on multi-trait life history (i.e., on the combination of dependent life history variables: viability, thorax length, early fecundity and lifespan). MANOVA was performed separately for each geographic factor (Table S2) and each estimator of early fecundity (i.e., fecundity between days 1-5, 6-10, and 1-10). Statistical significance was determined using Pillai's trace test statistic (Wilk's λ yielded qualitatively similar results). *P < 0.01, **P < 0.001, ***P < 0.0001.

Factor	Fecundity 1-5 Days	Fecundity 6-10 Days	Fecundity 1-10 Days
Altitude	$F_{4,41}$ = 1.46	$F_{4,40}$ = 1.44	$F_{4,40}$ = 1.41
Population[Altitude]	$\boldsymbol{F_{24,176}}$ **= 4.16*** **	$\boldsymbol{F_{24,172}}$ **= 4.00*** **	$\boldsymbol{F_{24,172}}$ **= 4.00*** **
Latitude	$\boldsymbol{F_{8,84}}$ **= 4.14** **	$\boldsymbol{F_{8,82}}$ **= 3.36***	$\boldsymbol{F_{8,82}}$ **= 3.60***
Population[Latitude]	$\boldsymbol{F_{20,176}}$ **= 3.78*** **	$\boldsymbol{F_{20,172}}$ **= 3.56*** **	$\boldsymbol{F_{20,172}}$ **= 3.59*** **
Longitude	$\boldsymbol{F_{4,41}}$ **= 12.75*** **	$\boldsymbol{F_{4,40}}$ **= 9.44*** **	$\boldsymbol{F_{4,40}}$ **= 10.38*** **
Population[Longitude]	$\boldsymbol{F_{24,176}}$ **= 3.00*** **	$\boldsymbol{F_{24,172}}$ **= 2.80*** **	$\boldsymbol{F_{24,172}}$ **= 2.83*** **

Table S8. Details of Q_{ST}-F_{ST} comparisons between populations. Genetic differentiation is represented by average F_{ST} values calculated across windows and their variance (in parentheses), and phenotypic differentiation by Q_{ST} values for all pairwise population comparisons, shown for all traits except diapause. Ranges and means of F_{ST} and Q_{ST} values calculated across all pairwise comparisons are shown at the bottom of the table. ***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.

Pop1	Pop2	F_{ST}	Viability	Thorax length	Fecundity 1-5 days	Fecundity 6-10 days	Fecundity 1-10 day	Lifespan
CO	EA	0.09 (0.01)	**0.72****	0.35	0.13	0.01	0.02	**0.73****
CO	ED	0.16 (0.02)	0.46	**NA**	0.44	0.15	0.26	0.10
CO	EF	0.14 (0.02)	0.05	**NA**	**0.88****	0.21	**0.65***	0.40
CO	GA	0.03 (0.01)	0.03	**0.82*****	0.21	**0.51****	**0.43***	**0.42***
CO	NG	0.04 (0.01)	0.21	**0.84*****	**0.58****	**0.68****	**0.66****	**0.52****
CO	RG	0.06 (0.01)	0.01	0.12	**0.46***	**0.69****	**0.64****	**0.44***
CO	SE	0.10 (0.02)	0.27	**0.92****	**0.85****	**0.61***	**0.76****	0.21
CO	SF	0.11 (0.02)	0.16	**0.70****	**0.85****	**0.68****	**0.76****	0.17
CO	SP	0.11 (0.02)	0.11	**0.64****	0.33	**0.50***	**0.46***	**0.56***

EA	ED	0.04 (0.01)	**0.92*** **	**NA**	0.38	**0.41***	**0.40***	**0.72****
EA	EF	0.03 (0.01)	**0.75****	**NA**	**0.90****	**0.44***	**0.78****	**0.82****
EA	GA	0.08 (0.01)	**0.75****	**0.92*** **	0.01	**0.83*** **	**0.60****	**0.41***
EA	NG	0.09 (0.01)	**0.85*** **	**0.93*** **	**0.57****	**0.91*** **	**0.84*** **	**0.81****
EA	RG	0.07 (0.01)	**0.83****	**0.58****	0.27	**0.90*** **	**0.78****	**0.57****
EA	SE	0.10 (0.02)	**0.67***	**0.89****	**0.86****	**0.79****	**0.84****	**0.78****
EA	SF	0.11 (0.02)	**0.63****	0.42	**0.86*** **	**0.87*** **	**0.86*** **	**0.61***
EA	SP	0.11 (0.01)	**0.55***	**0.84****	0.19	**0.81****	**0.66****	0.33
ED	EF	0.02 (0.01)	**0.70****	**NA**	**0.81****	0.00	0.34	0.19
ED	GA	0.14 (0.02)	0.33	**NA**	0.42	0.20	0.00	**0.49***
ED	NG	0.16 (0.02)	0.14	**NA**	0.08	**0.57***	0.46	0.32
ED	RG	0.14 (0.02)	**0.56***	**NA**	0.10	**0.50***	0.21	**0.58***
ED	SE	0.16 (0.03)	**0.83****	**NA**	**0.70***	0.36	0.56	0.06
ED	SF	0.16 (0.02)	**0.74****	**NA**	**0.69***	0.51	**0.58***	0.31
ED	SP	0.16 (0.02)	**0.63***	**NA**	0.10	0.26	0.09	**0.67***
EF	GA	0.13 (0.02)	0.16	**NA**	**0.92****	0.20	**0.53***	**0.68****

EF	NG	0.15 (0.02)	0.45	**NA**	**0.80****	**0.61***	0.02	0.07
EF	RG	0.13 (0.02)	0.13	**NA**	**0.89****	**0.50***	0.25	**0.73****
EF	SE	0.15 (0.03)	0.18	**NA**	0.17	0.42	0.27	0.02
EF	SF	0.15 (0.02)	0.08	**NA**	0.15	**0.55***	0.20	**0.57***
EF	SP	0.15 (0.02)	0.06	**NA**	**0.86****	0.30	0.17	**0.74****
GA	NG	0.02 (0.00)	0.09	0.12	**0.63****	**0.73*****	**0.72*****	**0.70*****
GA	RG	0.05 (0.01)	0.01	**0.73****	0.25	**0.37***	**0.35***	0.03
GA	SE	0.08 (0.02)	0.40	**0.98*****	**0.88****	0.28	**0.72****	**0.58***
GA	SF	0.08 (0.01)	0.29	**0.96*****	**0.87*****	**0.52***	**0.76****	0.14
GA	SP	0.09 (0.01)	0.21	0.00	0.19	0.19	0.22	0.01
NG	RG	0.07 (0.01)	0.23	**0.77****	**0.33***	**0.51****	**0.48***	**0.77****
NG	SE	0.09 (0.02)	**0.66***	**0.98****	**0.67***	0.10	0.18	0.11
NG	SF	0.10 (0.01)	**0.55***	**0.96*****	**0.66****	0.07	0.13	**0.62****
NG	SP	0.11 (0.01)	**0.42***	0.06	0.34	0.31	0.33	**0.74****
RG	SE	0.04 (0.01)	**0.46***	**0.94*****	**0.83****	0.05	**0.61****	**0.61****
RG	SF	0.05 (0.01)	0.29	**0.80****	**0.83*****	0.22	**0.62****	0.09

RG	SP	0.06 (0.01)	0.21	**0.54****	0.00	0.00	0.00	0.10
SE	SF	0.01 (0.01)	0.02	**0.79****	0.00	0.02	0.03	**0.42***
SE	SP	0.03 (0.01)	0.01	**0.96****	**0.78****	0.03	**0.47***	**0.60***
SF	SP	0.01 (0.01)	0.00	**0.91*****	**0.78*****	0.13	**0.48***	0.23
Range		0.01-0.16	0.00-0.92	0.00-0.98	0.00-0.92	0.00-0.91	0.00-0.86	0.01-0.82
Mean		0.09	0.17	0.18	0.20	0.18	0.20	0.16