



Fig. S1. Linear regressions between pupal mass and adult mass for (a) females developed at 18°C, (b) females developed at 25°C, (c) males developed at 18°C, (d) males developed at 25°C. Developmental temperatures are represented by symbol (circle: 18°C, triangle: 25°C) and sexes by colour (open: females, filled: males).

Table S1. Mean values and standard deviations (SDs) of each trait for males and females at the two developmental temperatures. Different superscript letters within rows show significant differences among treatments (Tukey HSD).

Trait	Females		Males	
	18	25	18	25
	N = 35	N = 45	N = 34	N = 43
Developmental process				
Development time (days)	42.26±1.82 ^(a)	22.30±1.74 ^(b)	41.68±1.43 ^(a)	22.30±1.44 ^(b)
Larval time (days)	28.83±1.62 ^(a)	15.50±1.44 ^(b)	28.65±1.41 ^(a)	15.64±1.36 ^(b)
Pupal time (days)	13.43±0.85 ^(a)	6.80±1.02 ^(b)	13.03±0.58 ^(a)	6.71±0.50 ^(b)
Pupal mass (mg)	14.89±1.66 ^(a)	12.71±1.63 ^(b)	16.23±1.95 ^(c)	14.37±1.56 ^(d)
Weight loss	61.16±5.38 ^(a)	60.93±6.63 ^(a)	69.35±6.15 ^(b)	69.5±4.53 ^(b)
Adult mass				
Total mass (mg)	58.14±10.41 ^(a)	49.32±10.64 ^(b)	51.28±10.47 ^(a)	44.21±09.13 ^(c)
Thorax mass (mg)	18.82±2.53 ^(a)	15.3±3.03 ^(b)	20.73±2.69 ^(a)	17.740±3.39 ^(c)
Abdomen mass (mg)	27.72±8.08 ^(a)	24.3±8.08 ^(a)	17.87±8.96 ^(b)	15.31±5.21 ^(b)
Relative thorax mass	0.72±0.18 ^(a)	0.68±0.22 ^(a)	1.32±0.38 ^(b)	1.23±0.27 ^(b)

Wing morphology

Wing area (cm ²)	4.37±0.38 ^(a)	3.86±0.49 ^(b)	4.81±0.36 ^(c)	4.24±0.44 ^(d)
Forewing length (cm)	2.26±0.09 ^(a)	2.09±0.16 ^(b)	2.43±0.14 ^(c)	2.26±0.10 ^(d)
Aspect ratio Forewing	9.60±0.34 ^(a)	9.25±0.66 ^(a)	10.16±0.76 ^(b)	9.96±0.36 ^(b)
Wing surface ratio	0.95±0.02 ^(a)	0.97±0.02 ^(b)	0.94±0.02 ^(a)	0.94±0.01 ^(c)
Wing loading	13.33±1.60 ^(a)	13.03±2.36 ^(a)	10.41±1.53 ^(b)	10.38±1.36 ^(b)

Mobility

Endurance (sec)	248.03±170.8 ^(a)	169.60±165.92 ^(b)	197.67±159.06 ^(b)	227.23±188.47 ^(b)
Distance (score)	4.2±1.45 ^(a)	6.46±2.15 ^(b)	7.91±2.17 ^(c)	9.93±2.08 ^(d)

Physiology

Flight metabolic rate (ppm/min)	27.11±9.89 ^(a)	26.84±10.76 ^(a)	33.23±11.49 ^(b)	29.04±10.59 ^(b)
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Fecundity

Number of eggs	32.97±5.75 ^(a)	16.5±2.86 ^(b)
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Oxidative status

Total antioxidant capacity (OXY)	20.41±4.94 ^(a)	28.60±10.53 ^(b)	20.90±6.91 ^(a)	23.50±6.55 ^(a)
Superoxide dismutase (SOD)	7.91±2.38 ^(a)	14.09±7.31 ^(b)	7.84±3.42 ^(a)	10.71±4.30 ^(b)
8-OHdG (DNA damage)	444.29±227.04 ^(a)	1081.00±625.4 ^(b)	493.23±318.25 ^(a)	896.96±559.82 ^(b)

Table S2. Results of general linear models with PCs 1-4 coordinates for each developmental group. Significant *P*-values are shown in bold.

Trait	Females		Males	
	18	25	18	25
Distance				
PC1	$F_{1,43}=4.99$, P=0.04	$F_{1,0.1}=0.02$, P=0.88	$F_{1,0.1}=0.01$, P=0.96	$F_{1,21}=3.6$, P=0.07•
PC2	$F_{1,0.1}=0.02$, P=0.89	$F_{1,1}=0.20$, P=0.66	$F_{1,1.4}=0.01$, P=0.76	$F_{1,0.1}=0.01$, P=0.98
PC3	$F_{1,44}=5.15$, P=0.03	$F_{1,0.1}=0.01$, P=0.96	$F_{1,0.1}=0.01$, P=0.97	$F_{1,8}=1.41$, P=0.25
PC4	$F_{1,4}=0.50$, P=0.49	$F_{1,0.7}=0.12$, P=0.73	$F_{1,4}=0.29$, P=0.59	$F_{1,5}=0.92$, P=0.35
Endurance				
PC1	$F_{1,44624}=1.30$, P=0.27	$F_{1,4041}=0.15$, P=0.71	$F_{1,59}=0.01$, P=0.96	$F_{1,1847}=0.05$, P=0.82
PC2	$F_{1,4121}=0.12$, P=0.73	$F_{1,1478}=0.05$, P=0.82	$F_{1,100601}=3.39$, P=0.08•	$F_{1,1036}=0.03$, P=0.87
PC3	$F_{1,1408}=0.04$, P=0.84	$F_{1,22915}=0.83$, P=0.37	$F_{1,4627}=0.16$, P=0.69	$F_{1,12289}=0.34$, P=0.57
PC4	$F_{1,45136}=1.31$, P=0.27	$F_{1,60350}=2.18$, P=0.15	$F_{1,72349}=2.44$, P=0.14	$F_{1,58966}=1.62$, P=0.22

Table S3. Results of the principal component analyses for females at (a) 18°C and at (b) 25°C and for males at (c) 18°C and at (d) 25°C with Eigen values, proportion of variance explained, cumulative proportions of variance explained, and r-values of the correlations between morphological variables and principal components. Significant correlations $P < 0.05$ in bold.

Table S3a

	PC1	PC2	PC3	PC4
Eigen value	3.430	2.010	1.157	0.993
Variance explained (%)	42.9	25.1	14.5	12.4
Cumulative variance (%)	42.9	68	82.5	94.9
Thorax mass	0.767	0.459	-0.251	0.249
Abdomen mass	0.899	-0.412	-0.097	0.026
Relative thorax mass	-0.483	0.807	-0.064	0.165
Mean wing area	0.807	0.522	0.220	-0.030
Forewing length	0.742	0.340	0.542	0.169
Forewing aspect ratio	-0.136	-0.531	0.754	0.206
Wing surface ratio	-0.371	-0.076	-0.102	0.893
Wing loading	0.666	-0.550	-0.399	0.186

Table S3b

	PC1	PC2	PC3	PC4
Eigen value	2.845	2.430	1.224	0.967
Variance explained (%)	35.6	30.4	15.3	12.1
Cumulative variance (%)	35.6	65.9	81.2	93.3
Thorax mass	0.732	0.275	0.569	0.096
Abdomen mass	0.770	-0.595	0.093	-0.138
Relative thorax mass	-0.323	0.784	0.356	0.195
Mean wing area	0.689	0.639	0.082	-0.149
Forewing length	0.789	0.521	-0.223	0.179
Forewing aspect ratio	0.413	-0.01	-0.688	0.545
Wing surface ratio	0.538	0.784	0.356	0.893
Wing loading	0.690	0.640	0.082	0.186

Table S3c

	PC1	PC2	PC3	PC4
Eigen value	3.022	2.177	1.274	0.988
Variance explained (%)	37.8	27.2	15.9	12.4
Cumulative variance (%)	37.8	65	80.9	93.3
Thorax mass	0.784	0.075	-0.476	0.476
Abdomen mass	0.939	-0.293	-0.002	-0.098
Relative thorax mass	-0.655	0.362	-0.159	0.596
Mean wing area	0.366	0.603	-0.554	-0.403
Forewing length	0.447	0.886	-0.030	-0.087
Forewing aspect ratio	0.295	0.708	0.409	0.324
Wing surface ratio	0.076	0.274	0.825	-0.223
Wing loading	0.818	-0.480	0.163	0.266

Table S3d

	PC1	PC2	PC3	PC4
Eigen value	4.312	1.452	1.240	0.519
Variance explained (%)	53.9	18.1	15.5	6.492
Cumulative variance (%)	53.9	72	87.5	94
Thorax mass	0.912	0.266	-0.297	0.297
Abdomen mass	0.915	-0.360	0.113	0.078
Relative thorax mass	-0.215	0.834	-0.410	0.286
Mean wing area	0.854	0.380	0.294	-0.199
Forewing length	0.687	0.389	0.582	-0.108
Forewing aspect ratio	-0.663	-0.187	0.485	0.282
Wing surface ratio	-0.559	0.170	0.613	0.269
Wing loading	0.803	-0.442	-0.122	0.374

Table S4. Full citation of R packages used for the statistical analyses

Title	Author	Year	Note	URL
survival: A Package for Survival Analysis in R	Terry M Therneau	2021	R package version 3.2-13	https://CRAN.R-project.org/package=survival
lme4: Linear mixed-effects models using Eigen and S4	Douglas Bates and Martin Maechler and Ben Bolker and Steven Walker	2015	R package version 1.1-8	http://CRAN.R-project.org/package=lme4
emmeans: Estimated Marginal Means, aka Least-Squares Means	Russell V. Lenth and Paul Buerkner and Maxime Herve and Jonathon Love and Hannes Riebl and Henrik Singmann	2021	R package version 1.7.0	https://CRAN.R-project.org/package=emmeans
factoextra: Extract and Visualize the Results of Multivariate Data Analyses	Alboukadel Kassambara and Fabian Mundt	2020	R package version 1.0.7.	https://CRAN.R-project.org/package=factoextra