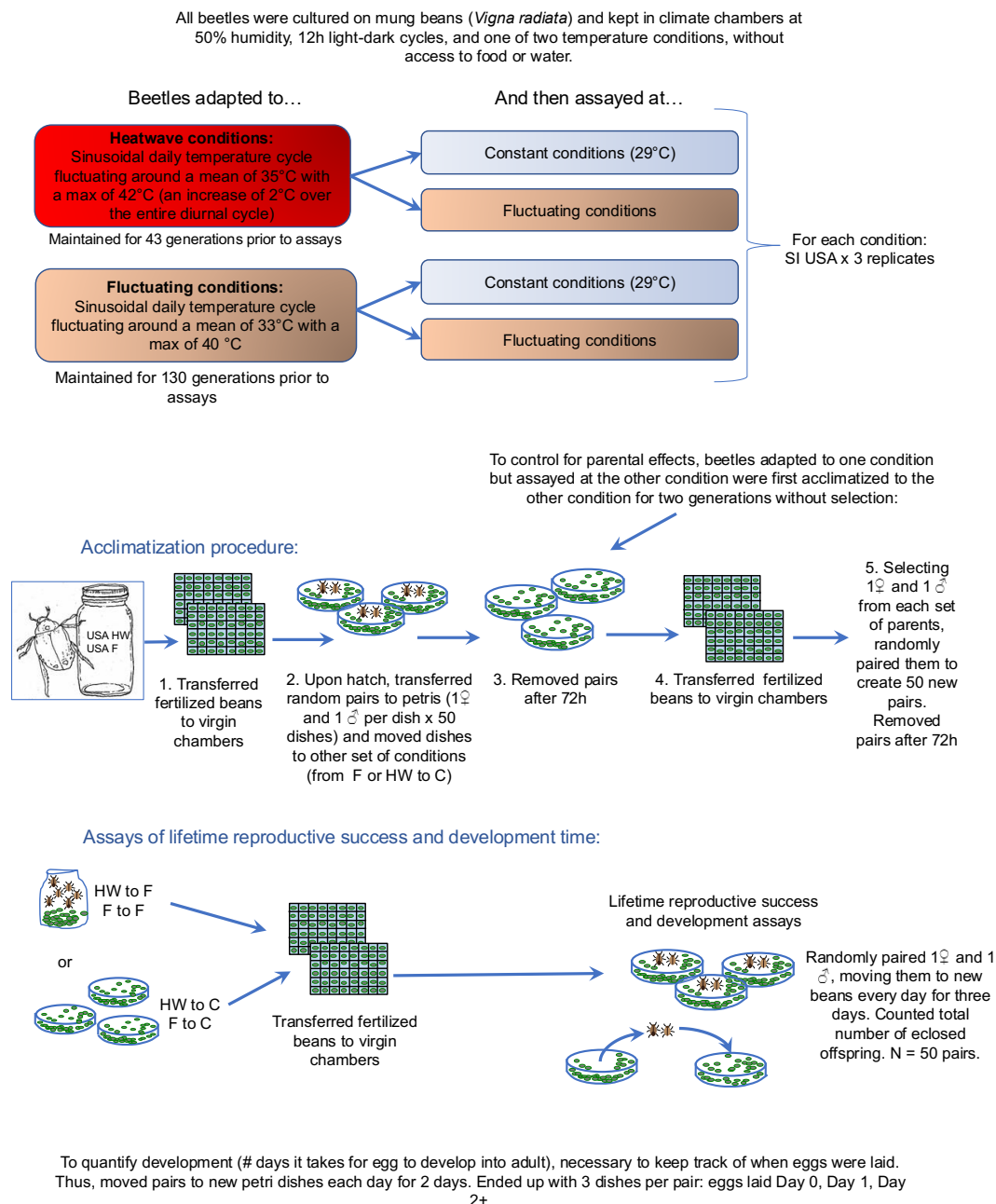


# Supplementary material: Evolution under fluctuating conditions and exposure to heatwaves in the seed beetle, *Callosobruchus maculatus*

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**Figure S1.** Experimental design for the thermal evolution lines, acclimatization procedure, and the reproductive success and development time assays.

**Table S1.** Model selection for the best fitting model for lifetime reproductive success (LRS). Showing the top 5 best fitting models ranked by AIC. C-M-P stands for Conway-Maxwell Poisson. The best model is denoted in bold.

Family	Formula	zi	dispersion	AIC	df
<b>C-M-P</b>	<b>regime + env + regime:env + (1   group)</b>	<b>~1</b>	<b>~group</b>	<b>4965.18</b>	<b>18</b>
C-M-P	regime + env + regime:env + (1   group)	~1	~env	4987.24	8
C-M-P	regime + env + regime:env + (1   group)	~1	~env + regime	4988.94	9
C-M-P	regime + env + regime:env + (1   group)	~1	~env * regime	4989.70	10
C-M-P	regime + env + regime:env + (1   group)	~1	~1	5002.79	7

**Table S2.** Output of the final model for LRS. Significant predictors are bolded.

<b>Predictors</b>	<b>Estimates</b>	<b>std. Error</b>	<b>Statistic</b>	<b>p</b>
(Intercept)	4.29	0.02	260.28	<b>&lt;0.001</b>
regime [Heatwave]	0.02	0.02	1.00	0.319
env [Fluctuating]	-0.11	0.03	-4.18	<b>&lt;0.001</b>
regime [Heatwave] × env [Fluctuating]	-0.18	0.04	-5.02	<b>&lt;0.001</b>
<b>Dispersion Component</b>				

(Intercept)	0.84	0.21	4.09	<b>&lt;0.001</b>
groupF-C-2	0.01	0.29	0.03	0.978
groupF-C-3	0.67	0.30	2.25	<b>0.024</b>
groupF-F-1	0.73	0.29	2.50	<b>0.013</b>
groupF-F-2	0.21	0.29	0.74	0.462
groupF-F-3	0.84	0.29	2.88	<b>0.004</b>
groupH-C-1	-0.01	0.29	-0.03	0.973
groupH-C-2	0.52	0.29	1.77	0.076
groupH-C-3	-0.61	0.29	-2.10	<b>0.036</b>
groupH-H-1	0.30	0.29	1.03	0.304
groupH-H-2	0.25	0.29	0.87	0.384
groupH-H-3	1.24	0.30	4.10	<b>&lt;0.001</b>
<b><i>Zero-Inflated Component</i></b>				
(Intercept)	-5.01	0.50	-9.95	<b>&lt;0.001</b>
<b><i>Random Effects</i></b>				
$\sigma^2$	NA			
T00 group	0.00			

N <sub>group</sub>	12
Observations	600

**Table S3.** Pairwise interactions of estimated marginal means from the final model of LRS. Significant comparisons are bolded.

Env	Regime	Contrast	Ratio	<i>std. Error</i>	LCL	UCL	z	p
Constant	.	Fluctuating / Heatwave	0.979	0.021	0.929	1.03	-0.996	0.701
<b>Fluctuating</b>	.	<b>Fluctuating / Heatwave</b>	<b>1.176</b>	<b>0.035</b>	<b>1.094</b>	<b>1.265</b>	<b>5.475</b>	<b>&lt;0.001</b>
.	<b>Fluctuating</b>	<b>Constant / Fluctuating</b>	<b>1.116</b>	<b>0.029</b>	<b>1.047</b>	<b>1.190</b>	<b>4.182</b>	<b>0.0001</b>
.	<b>Heatwave</b>	<b>Constant / Fluctuating</b>	<b>1.341</b>	<b>0.034</b>	<b>1.260</b>	<b>1.427</b>	<b>11.54</b>	<b>&lt;0.001</b>

**Table S4.** Output of the final model for development time (robust linear mixed model). Significant predictors are bolded.

<i>Predictors</i>	<i>Estimates</i>	<i>std. Error</i>	<i>Statistic</i>	<i>p</i>
(Intercept)	3.10	0.00	797.81	<b>&lt;0.001</b>
regime [Heatwave]	0.01	0.01	2.41	<b>0.016</b>
env [Fluctuating]	-0.01	0.01	-2.45	<b>0.014</b>
regime [Heatwave] × env [Fluctuating]	-0.03	0.01	-3.24	<b>0.001</b>

Random Effects	
$\sigma^2$	0.00
T00 id:group	0.00
T00 group	0.00
N <sub>id</sub>	596
N <sub>group</sub>	12
Observations	39876

**Table S5.** Pairwise interactions of estimated marginal means from the final model of development time. Significant comparisons are bolded.

<i>Env</i>	<i>Regime</i>	<i>Contrast</i>	<i>Ratio</i>	<i>std. Error</i>	<i>LCL</i>	<i>UCL</i>	<i>z</i>	<i>p</i>
Constant	.	Fluctuating / Heatwave	0.987	0.005	0.974	1.000	-2.405	0.057
Fluctuating	.	Fluctuating / Heatwave	1.012	0.006	0.999	1.026	2.183	0.098
.	<b>Fluctuating</b>	<b>Constant / Fluctuating</b>	<b>1.014</b>	<b>0.006</b>	<b>1.000</b>	<b>1.027</b>	<b>2.454</b>	<b>0.050</b>
.	<b>Heatwave</b>	<b>Constant / Fluctuating</b>	<b>1.039</b>	<b>0.006</b>	<b>1.026</b>	<b>1.054</b>	<b>7.035</b>	<b>0.000</b>