



Movie S1. CT scan of respiratory system in *P. tricolor*.

Table S1. Correlation matrix (*r*-values) between all estimated physiology, morphology and behaviour parameters (*p*<0.05 in bold, *n*=9 except tracheal volume *n*=4).

	log ₁₀ mass	log ₁₀ MR	log ₁₀ mean C-phase length	log ₁₀ mean O-phase length	log ₁₀ mean diving duration	log ₁₀ tracheal volume
log ₁₀ mass	1.00					
log ₁₀ MR	0.92	1.00				
log ₁₀ mean C-phase length	0.71	0.77	1.00			
log ₁₀ mean O-phase length	0.33	0.55	0.48	1.00		
log ₁₀ mean diving duration	0.89	0.90	0.89	0.50	1.00	
log ₁₀ tracheal volume	0.97	0.99	0.67	0.59	0.89	1.00

Table S2. Comparison between tracheal volume (cm³) as an internal oxygen stores, oxygen consumption rates (mL h⁻¹) calculated using an RQ=0.85 and maximal diving time (min) and C-phase length (min); assuming 21% O₂ in tracheal gas.

ID	sex	tracheal volume (cm ³)	O ₂ consumption rates (mL h ⁻¹)	maximal diving time (min)	maximal C-phase length (min)	potential maximal time without open spiracles (min)
5	M	0.097	0.049	4.21	7.4	24.9
14	M	0.155	0.089	11.19	14.5	21.9
11	F	0.470	0.308	31.47	31.7	19.2
12	F	0.382	0.213	7.34	9.5	22.6

Table S3. Comparison between tracheal volume for *P.tricolor* and other grasshopper species reported in Huang et al. (2015) (after body mass correction).

species	tracheal volume (mm ³ g ⁻¹)
<i>P. tricolor</i> (F)	513.25
<i>P. tricolor</i> (M)	484.62
<i>T. pulchripennis</i>	350.98
<i>O. bethlemita</i>	241.67
<i>O. lividipes</i>	275.51