

### **Supplementary Materials for the manuscript:**

Developmental instability, body mass, and reproduction predict immunological response in short-tailed bats.

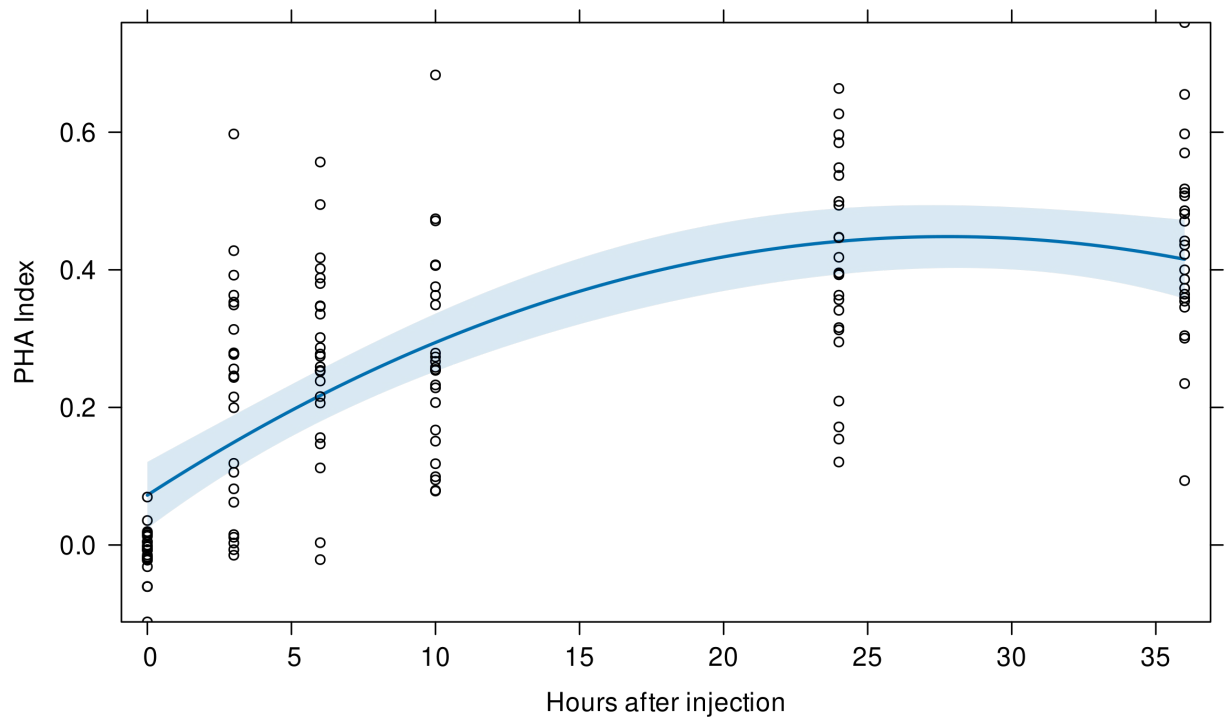
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**Supplementary Table S1** – Study design with sample sizes in each experiment

Breeding Season	Female	Male
Early (2018-Nov)	3	21
Late (2019-May)	22	6
Early (2020-Oct)	22	22
Late (2021-May)	18	25



**Supplementary Figure S2** – Caliper measurements of (A) left and (B) right forearms of *Carollia perspicillata*.



**Supplementary Figure S3** – Immunological response measured in 24 individuals (3, females, 21 males, November 2018) by the PHA index at each time interval after injection. Line fitted by a quadratic mixed model as  $PHA \sim Hour + I(Hour^2) + (1 | Individual)$ , with Hours after injection as a fixed effect and individual as random effect.

**Supplementary Table S4** – Model selection results for linear models predicting immune response ( $I_{PHA}$ ) variation for *Carollia perspicillata* at Reserva Biológica União. Abbreviated terms are: Int. – intercept, BM – Body mass, BS – Breeding season period, ForA – Forearm asymmetry. Each line corresponds to a fitted model, and columns show estimates of coefficients for numeric variables or plus signs to indicate inclusion of factors or interactions, and minus signs to indicate exclusion of terms. Model result columns were: df – degrees of freedom, AICc – Akaike information criterion corrected for small samples,  $\Delta AICc$  – AICc differences in relation to the best fitted model, wAICc – Akaike weights.

Int	BM	BS	ForA	Sex	BM:BS	BM:Sex	BS:ForA	BS:Sex	ForA:Sex	BM:BS:Sex	BS:ForA:Sex	R <sup>2</sup>	df	AICc	$\Delta AICc$	wAICc
1.389	-0.062	+	0.420	+	+	-	-	-	+	-	-	0.320	8	-91.03	0.00	0.381
1.369	-0.060	+	0.410	+	+	-	-	+	+	-	-	0.322	9	-89.12	1.91	0.147
1.396	-0.062	+	0.378	+	+	-	+	-	+	-	-	0.320	9	-88.80	2.23	0.125
1.381	-0.062	+	0.419	+	+	+	-	-	+	-	-	0.320	9	-88.74	2.29	0.122
1.224	-0.049	+	0.395	+	+	+	-	+	+	-	-	0.323	10	-87.01	4.02	0.051
1.376	-0.060	+	0.363	+	+	-	+	+	+	-	-	0.322	10	-86.87	4.16	0.048
1.395	-0.062	+	0.378	+	+	+	+	-	+	-	-	0.320	10	-86.48	4.55	0.039
1.347	-0.060	+	0.573	+	+	-	+	+	+	-	+	0.326	11	-85.34	5.69	0.022
1.099	-0.041	+	0.401	+	+	+	-	+	+	+	-	0.324	11	-84.81	6.22	0.017
1.237	-0.050	+	0.357	+	+	+	+	+	+	-	-	0.323	11	-84.70	6.33	0.016
1.226	-0.052	+	0.563	+	+	+	+	+	+	-	+	0.327	12	-83.09	7.94	0.007
1.100	-0.040	+	0.350	+	+	+	+	+	+	+	-	0.324	12	-82.50	8.53	0.005
0.388	0.009	+	0.434	+	-	+	-	+	+	-	-	0.284	9	-81.55	9.48	0.003
0.511	-	+	0.458	+	-	-	-	+	+	-	-	0.257	7	-80.93	10.11	0.002
1.099	-0.043	+	0.552	+	+	+	+	+	+	+	+	0.328	13	-80.83	10.21	0.002
0.773	-0.019	+	0.510	+	-	-	-	+	+	-	-	0.267	8	-80.57	10.47	0.002
0.467	-	+	0.512	+	-	-	-	-	+	-	-	0.241	6	-80.15	10.88	0.002
0.720	-0.019	+	0.563	+	-	-	-	-	+	-	-	0.250	7	-79.66	11.37	0.001
0.395	0.009	+	0.412	+	-	+	-	+	+	-	-	0.284	10	-79.24	11.79	0.001
0.522	-	+	0.400	+	-	-	+	+	+	-	-	0.257	8	-78.78	12.25	0.001
0.782	-0.019	+	0.456	+	-	-	+	+	+	-	-	0.267	9	-78.37	12.66	0.001
0.557	-0.007	+	0.543	+	-	+	-	-	+	-	-	0.253	8	-78.04	12.99	0.001
0.476	-	+	0.466	+	-	-	+	-	+	-	-	0.241	7	-77.99	13.04	0.001
0.727	-0.018	+	0.521	+	-	-	+	-	+	-	-	0.250	8	-77.47	13.57	0.000
0.372	0.009	+	0.491	+	-	+	+	+	+	+	+	0.285	11	-76.99	14.04	0.000
1.527	-0.061	+	-0.467	-	+	-	+	-	-	-	-	0.235	7	-76.93	14.11	0.000
0.503	-	+	0.502	+	-	-	+	+	+	-	+	0.258	9	-76.67	14.37	0.000
1.497	-0.061	+	-0.275	-	+	-	-	-	-	-	-	0.220	6	-76.41	14.62	0.000
0.764	-0.019	+	0.524	+	-	-	+	+	+	+	+	0.268	10	-76.13	14.90	0.000
0.564	-0.007	+	0.517	+	-	+	+	-	+	-	-	0.254	9	-75.77	15.26	0.000
1.531	-0.061	+	-0.467	+	+	-	+	-	-	-	-	0.235	8	-74.68	16.35	0.000
1.499	-0.061	+	-0.276	+	+	-	-	-	-	-	-	0.220	7	-74.19	16.84	0.000
0.908	-0.037	-	0.683	+	-	-	-	-	+	-	-	0.207	6	-74.07	16.96	0.000
1.489	-0.057	+	-0.464	+	+	-	+	+	-	-	-	0.242	9	-73.59	17.44	0.000
1.453	-0.062	+	-	-	+	-	-	-	-	-	-	0.191	5	-73.51	17.52	0.000
1.458	-0.057	+	-0.273	+	+	-	-	+	-	-	-	0.227	8	-73.12	17.91	0.000
0.743	-0.025	-	0.663	+	-	+	-	-	+	-	-	0.210	7	-72.45	18.58	0.000
1.577	-0.064	+	-0.466	+	+	+	+	-	-	-	-	0.235	9	-72.43	18.60	0.000
1.503	-0.062	+	-0.275	+	+	+	-	-	-	-	-	0.220	8	-71.94	19.09	0.000
1.309	-0.044	+	-0.467	+	+	+	+	+	+	-	-	0.243	10	-71.55	19.48	0.000
1.214	-0.040	+	-0.288	+	+	+	-	+	-	-	-	0.230	9	-71.36	19.67	0.000
1.456	-0.062	+	-	+	+	-	-	-	-	-	-	0.191	6	-71.33	19.71	0.000
1.413	-0.057	+	-	+	+	-	-	+	-	-	-	0.198	7	-70.35	20.68	0.000
1.105	-0.029	+	-0.471	+	+	+	+	+	-	+	-	0.245	11	-69.59	21.45	0.000
1.548	-0.068	+	-	+	+	+	-	-	-	-	-	0.192	7	-69.23	21.80	0.000
1.103	-0.032	+	-0.283	+	+	+	-	+	-	+	-	0.230	10	-69.15	21.88	0.000
0.378	-	-	0.620	+	-	-	-	-	+	-	-	0.161	5	-68.40	22.63	0.000
1.302	-0.050	+	-	+	+	+	-	+	-	-	-	0.199	8	-68.20	22.83	0.000
1.102	-0.036	+	-	+	+	+	-	+	-	+	-	0.201	9	-66.25	24.78	0.000
0.686	-	+	-0.471	+	-	-	+	+	-	-	-	0.163	7	-64.39	26.65	0.000
0.322	0.026	+	-0.481	+	-	+	+	+	-	-	-	0.190	9	-64.33	26.70	0.000
0.223	0.030	+	-0.299	+	-	+	-	-	+	-	-	0.175	8	-64.21	26.82	0.000
0.645	-	+	-0.252	+	-	-	-	+	-	-	-	0.143	6	-63.38	27.65	0.000
0.642	-	+	-0.479	-	-	-	+	-	-	-	-	0.125	5	-62.64	28.39	0.000
0.794	-0.008	+	-0.470	+	-	-	+	+	-	-	-	0.165	8	-62.41	28.62	0.000
0.597	-	+	-	+	-	-	-	+	-	-	-	0.119	5	-61.63	29.40	0.000
0.598	-	+	-0.251	-	-	-	-	-	-	-	-	0.104	4	-61.42	29.62	0.000
0.734	-0.006	+	-0.249	+	-	-	-	+	-	-	-	0.144	7	-61.34	29.69	0.000
0.290	0.022	+	-	+	-	+	+	+	-	-	-	0.142	7	-60.95	30.08	0.000
0.636	-	+	-0.480	+	-	-	+	-	-	-	-	0.126	6	-60.56	30.47	0.000
0.686	-0.003	+	-0.478	-	-	-	+	-	-	-	-	0.125	6	-60.50	30.53	0.000
0.550	-	+	-	-	-	-	-	-	-	-	-	0.079	3	-59.83	31.20	0.000
0.712	-0.008	+	-	+	-	-	-	+	-	-	-	0.121	6	-59.74	31.29	0.000
0.591	-	+	-0.252	+	-	-	-	-	-	-	-	0.104	5	-59.38	31.65	0.000
0.623	-0.002	+	-0.250	-	-	-	-	-	-	-	-	0.104	5	-59.28	31.75	0.000
0.711	-0.005	+	-0.479	+	-	-	+	-	-	-	-	0.127	7	-58.48	32.55	0.000
0.544	-	+	-	+	-	-	-	-	-	-	-	0.080	4	-57.78	33.25	0.000
0.602	-0.004	+	-	-	-	-	-	-	-	-	-	0.080	4	-57.77	33.26	0.000
0.647	-0.004	+	-0.250	+	-	-	-	-	-	-	-	0.105	6	-57.26	33.77	0.000
0.552	0.005	+	-0.484	+	-	+	+	-	-	-	-	0.130	8	-56.71	34.32	0.000
0.446	0.010	+	-0.269	+	-	+	-	-	-	-	-	0.110	7	-55.84	35.19	0.000
0.625	-0.006	+	-	+	-	-	-	-	-	-	-	0.081	5	-55.77	35.26	0.000
0.496	0.003	+	-	+	-	+	-	-	-	-	-	0.083	6	-53.91	37.12	0.000
0.492	-	-	-	-	-	-	-	-	-	-	-	0.000	2	-50.42	40.61	0.000

Int	BM	BS	ForA	Sex	BM:BS	BM:Sex	BS:ForA	BS:Sex	ForA:Sex	BM:BS:Sex	BS:ForA:Sex	R <sup>2</sup>	df	AICc	ΔAICc	wAICc
0.790	-0.020	-	-	-	-	-	-	-	-	-	-	0.015	3	-50.40	40.63	0.000
0.839	-0.025	-	-	+	-	-	-	-	-	-	-	0.027	4	-50.08	40.96	0.000
0.518	-	-	-0.152	-	-	-	-	-	-	-	-	0.009	3	-49.63	41.41	0.000
0.818	-0.020	-	-0.154	-	-	-	-	-	-	-	-	0.024	4	-49.63	41.41	0.000
0.874	-0.025	-	-0.168	+	-	-	-	-	-	-	-	0.039	5	-49.54	41.49	0.000
0.476	-	-	-	+	-	-	-	-	-	-	-	0.006	3	-49.16	41.88	0.000
0.501	-	-	-0.161	+	-	-	-	-	-	-	-	0.016	4	-48.49	42.54	0.000
0.684	-0.014	-	-	+	-	+	-	-	-	-	-	0.030	5	-48.36	42.68	0.000
0.668	-0.011	-	-0.187	+	-	+	-	-	-	-	-	0.044	6	-48.13	42.90	0.000

**Supplementary Table S5** – Parameter estimates (betas) for best fitting model (adjusted  $R^2 = 0.29$ ) predicting PHA index variation for *Carollia perspicillata* at Reserva Biológica União. SE – standard error of estimate, LCL: lower confidence limit (95%), UCL: upper confidence limit (95%). Random effect estimates (identified with \*) are standard deviations (sigma). Betas are differences between factor levels and the intercept, or partial regression coefficients for numerical predictors. Standardized estimates and confidence levels (preceded by Std.) were obtained by refitting the models with standardized variables.

Effect	Estimate	SE	LCL	UCL	Std.Estimate	Std. LCL	Std. UCL
Intercept	1.389	0.264	0.867	1.912	0.15	-0.16	0.45
Body Mass	-0.062	0.018	-0.098	-0.026	-0.38	-0.60	-0.16
Breeding Season (Late)	-1.532	0.391	-2.305	-0.759	-0.52	-0.85	-0.19
Forearm Asymmetry	0.420	0.196	0.032	0.807	0.27	0.02	0.51
Sex (Male)	0.194	0.054	0.088	0.301	0.07	-0.25	0.38
Body Mass : Breeding Season (Late)	0.095	0.026	0.044	0.145	0.58	0.27	0.9
Forearm Asymmetry : Sex (Male)	-1.082	0.245	-1.568	-0.597	-0.69	-0.99	-0.38

**Supplementary Table S6** – Model selection results for linear models predicting immune response ( $I_{PHA}$ ) variation for male *Carollia perspicillata* at Reserva Biológica União. Abbreviated terms are: Int. – intercept, BM – Body mass, BS – Breeding season period, ForA – Forearm asymmetry, TL – testicle length. Each line corresponds to a fitted model, and columns show estimates of coefficients for numeric variables or plus signs to indicate inclusion of factors or interactions, and minus signs to indicate exclusion of terms.. Model result columns were: df – degrees of freedom, AICc – Akaike information criterion corrected for small samples,  $\Delta AICc$  – AICc differences in relation to the best fitted model, wAICc – Akaike weights.

Int	BM	BS	ForA	TL	BM:BS	ForA:BS	BS:TL	R <sup>2</sup>	df	AICc	$\Delta AICc$	wAICc
0.933	-	-	-0.540	-0.045	-	-	-	0.205	4	-31.31	0.00	0.224
0.587	-	-	-0.548	-	-	-	-	0.156	3	-30.66	0.65	0.162
0.946	-	+	-0.522	-0.049	-	-	-	0.209	5	-29.07	2.24	0.073
0.939	-0.022	-	-0.604	-	-	-	-	0.168	4	-29.04	2.27	0.072
1.586	-0.064	+	-0.609	-	+	-	-	0.246	6	-28.89	2.42	0.067
0.931	0.000	-	-0.539	-0.045	-	-	-	0.205	5	-28.83	2.47	0.065
1.594	-0.043	+	-0.540	-0.046	+	-	-	0.284	7	-28.74	2.57	0.062
0.588	-	+	-0.549	-	-	-	-	0.156	4	-28.29	3.02	0.050
1.030	-	+	-0.536	-0.060	-	-	+	0.213	6	-26.76	4.55	0.023
0.969	-0.024	+	-0.600	-	-	-	-	0.169	5	-26.63	4.68	0.022
0.928	-	+	-0.468	-0.048	-	+	-	0.210	6	-26.57	4.74	0.021
0.985	-0.003	+	-0.530	-0.047	-	-	-	0.209	6	-26.49	4.82	0.020
1.618	-0.066	+	-0.646	-	+	+	-	0.247	7	-26.21	5.10	0.018
0.569	-	+	-0.454	-	-	+	-	0.160	5	-26.08	5.23	0.016
1.574	-0.046	+	-0.530	-0.038	+	-	+	0.286	8	-26.04	5.27	0.016
1.647	-0.046	+	-0.601	-0.047	+	+	-	0.285	8	-26.00	5.31	0.016
0.855	-	-	-	-0.047	-	-	-	0.054	3	-24.98	6.33	0.009
0.491	-	-	-	-	-	-	-	0.000	2	-24.46	6.85	0.007
0.933	-0.023	+	-0.521	-	-	+	-	0.172	6	-24.21	7.10	0.006
1.015	-	+	-0.471	-0.059	-	+	+	0.215	7	-24.18	7.13	0.006
1.071	-0.003	+	-0.544	-0.058	-	-	+	0.214	7	-24.06	7.25	0.006
0.480	0.032	-	-	-0.064	-	-	-	0.078	4	-23.88	7.43	0.005
0.960	-0.003	+	-0.475	-0.047	-	+	-	0.211	7	-23.87	7.44	0.005
0.891	-	+	-	-0.055	-	-	-	0.074	4	-23.65	7.66	0.005
1.159	-0.012	+	-	-0.066	+	-	-	0.158	6	-23.34	7.97	0.004
1.641	-0.050	+	-0.611	-0.036	+	+	+	0.289	9	-23.24	8.06	0.004
0.479	-	+	-	-	-	-	-	0.005	3	-22.43	8.88	0.003
0.413	0.005	-	-	-	-	-	-	0.001	3	-22.23	9.08	0.002
0.579	0.026	+	-	-0.067	-	-	-	0.088	5	-21.94	9.37	0.002
1.047	-0.003	+	-0.478	-0.058	-	+	+	0.216	8	-21.34	9.97	0.002
1.064	-0.038	+	-	-	+	-	-	0.077	5	-21.33	9.98	0.002
1.133	-0.019	+	-	-0.048	+	-	+	0.167	7	-21.18	10.13	0.001
0.903	-	+	-	-0.057	-	-	+	0.074	5	-21.18	10.13	0.001
0.474	0.000	+	-	-	-	-	-	0.005	4	-20.06	11.25	0.001
0.596	0.026	+	-	-0.069	-	-	+	0.088	6	-19.37	11.94	0.001