Supplemental Information for:

Cool, dry nights and short heatwaves during growth result in longer telomeres in temperate songbird nestlings

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(I)   Supplementary tables

Table S1: Linear mixed effects model (*model 1*) investigating the relationship between nestling superb fairy-wren telomere length (standardised relative telomere length) and pre-hatching climate variables identified in Kruuk et al., (2015).

Fixed effects	Parameter estimate	SE	t-statistic	P-value
Intercept	0.76	0.24	3.17	0.002
$T_{max-pre}$	0.008	0.03	0.26	0.80
$Rainfall_{pre}$	-0.04×10^{-2}	0.002	-0.26	0.80
Hatch Month (relative to January)				
October	-0.42	0.33	-1.26	0.21
November	-0.56	0.24	-2.35	0.02
December	-0.43	0.18	-2.41	0.02
Chick age (relative to 6 days)				
7 days	-0.50	0.19	-2.68	0.008
8 days	-0.53	0.25	-2.11	0.04
Sex male (relative to female)	0.17	0.10	1.67	0.10
Brood size	-0.07	0.10	-0.70	0.49
Body mass	0.05	0.07	0.65	0.51
Helpers yes (relative to no)	-0.09	0.12	-0.73	0.47
Random effects	Variance	s.d.		
Nest identity	0.10	0.32		
Mother	0.08	0.28		
True sire	0.06	0.25		
Residual	0.66	0.81		

AIC_c = 957.78; including fixed predictors only marginal R^2 = 0.09; including random and fixed predictors conditional R^2 = 0.34.

Table S2: Linear mixed effects model (*model 3*) investigating the relationship between nestling superb fairy-wren telomere length (standardised relative telomere length) and climate during the nestling period between hatching and sampling measurement (mean daily maximum temperature, rainfall, and the frequency of days above 35°C).

Fixed effects	Parameter estimate	SE	t-statistic	P-value
Intercept	0.77	0.22	3.50	<0.001
$T_{max-nestling}$	-0.04	0.03	-1.51	0.13
$Rainfall_{nestling}$	-0.004	0.004	-1.03	0.30
$T_{35-nestling}$	0.29	0.11	2.62	0.01
Hatch Month (relative to January)				
October	-0.54	0.29	-1.87	0.06
November	-0.57	0.20	-2.79	0.006
December	-0.30	0.18	-1.63	0.11
Chick age (relative to 6 days)				
7 days	-0.56	0.18	-3.11	0.002
8 days	-0.59	0.25	-2.40	0.02
Sex male (relative to female)	0.15	0.10	1.56	0.12
Brood size	-0.05	0.10	-0.55	0.59
Body mass	0.04	0.07	0.58	0.56
Helpers yes (relative to no)	-0.05	0.12	-0.44	0.66
Random effects	Variance	s.d.		
Nest identity	0.11	0.33		
Mother	0.06	0.25		
True sire	0.06	0.25		
Residual	0.65	0.81		

AIC_c = 953.41; including fixed predictors only marginal R^2 = 0.12; including random and fixed predictors conditional R^2 = 0.35.

Table S3: Linear mixed effects model (*model 4*) investigating the relationship between nestling superb fairy-wren telomere length (standardised relative telomere length) and climate during the nestling period between hatching and sampling measurement ($T_{var\text{-}nestling}$, mean diurnal temperature variability; $T_{min\text{-}nestling}$, mean daily minimum temperature; and $T_{35\text{-}nestling}$, the frequency of days above 35°C). This was the second-best model predicting nestling TL (23% probability this is the best model; Table 1).

Fixed effects	Parameter estimate	SE	t-statistic	P-value
Intercept	0.90	0.22	4.04	<0.001
$T_{var\text{-}nestling}$	0.01	0.03	0.31	0.76
$T_{min\text{-}nestling}$	-0.09	0.03	-2.74	0.007
$T_{35\text{-}nestling}$	0.29	0.11	2.78	0.006
Hatch Month (relative to January)				
October	-0.75	0.30	-2.52	0.01
November	-0.68	0.20	-3.34	0.001
December	-0.38	0.18	-2.06	0.04
Chick age (relative to 6 days)				
7 days	-0.59	0.18	-3.32	0.001
8 days	-0.65	0.24	-2.69	0.008
Sex male (relative to female)	0.15	0.10	1.55	0.12
Brood size	-0.05	0.09	-0.56	0.58
Body mass	0.04	0.07	0.60	0.55
Helpers yes (relative to no)	-0.06	0.12	-0.52	0.60
Random effects	Variance	s.d.		
Nest identity	0.08	0.29		
Mother	0.08	0.28		
True sire	0.05	0.22		
Residual	0.66	0.81		

$AIC_c = 947.51$; including fixed predictors only marginal $R^2 = 0.14$; including random and fixed predictors conditional $R^2 = 0.35$.

Table S4: Linear mixed effects model (*model 5*) investigating the relationship between nestling superb fairy-wren telomere length (standardised relative telomere length) and both pre-hatching and nestling period climate variables.

Fixed effects	Parameter estimate	SE	t-statistic	P-value
Intercept	0.87	0.24	3.60	<0.001
$T_{max\text{-}pre}$	-0.04	0.03	-1.26	0.21
$Rainfall_{pre}$	-0.001	0.002	-0.89	0.38
$Rainfall_{nestling}$	0.001	0.004	0.35	0.73
$T_{35\text{-}nestling}$	0.78	0.24	3.33	0.001
$T_{max\text{-}pre}*T_{35\text{-}nestling}$	-0.12	0.04	-2.67	0.008
Hatch Month (relative to January)				
October	-0.29	0.33	-0.89	0.38
November	-0.47	0.24	-1.97	0.05
December	-0.25	0.18	-1.38	0.17
Chick age (relative to 6 days)				
7 days	-0.59	0.18	-3.18	0.001
8 days	-0.64	0.25	-2.55	0.01
Sex male (relative to female)	0.13	0.10	1.35	0.18
Brood size	-0.03	0.09	-0.29	0.77
Body mass	0.05	0.07	0.71	0.48
Helpers yes (relative to no)	-0.07	0.12	-0.61	0.54
Random effects	Variance	s.d.		
Nest identity	0.11	0.33		
Mother	0.05	0.23		
True sire	0.06	0.24		
Residual	0.65	0.81		

AIC_c = 952.85; including fixed predictors only marginal R^2 = 0.13; including random and fixed predictors conditional R^2 = 0.35.

Table S5: The null linear mixed effects model (*model 6*) investigating the relationship between nestling superb fairy-wren telomere length (standardised relative telomere length) and potential biological covariates.

Fixed effects	Parameter estimate	SE	t-statistic	P-value
Intercept	0.79	0.21	3.76	<0.001
Hatch Month (relative to January)				
October	-0.51	0.24	-2.15	0.03
November	-0.61	0.18	-3.48	0.001
December	-0.44	0.17	-2.54	0.01
Chick age (relative to 6 days)				
7 days	-0.49	0.18	-2.74	0.007
8 days	-0.54	0.25	-2.17	0.03
Sex male (relative to female)	0.17	0.10	1.71	0.09
Brood size	-0.07	0.10	-0.74	0.46
Body mass	0.05	0.07	0.66	0.51
Helpers yes (relative to no)	-0.08	0.12	-0.66	0.51
Random effects	Variance	s.d.		
Nest identity	0.11	0.33		
Mother	0.08	0.28		
True sire	0.06	0.25		
Residual	0.66	0.81		

AIC_c = 953.71; including fixed predictors only marginal R^2 = 0.09; including random and fixed predictors conditional R^2 = 0.34.

Table S6: The top linear mixed effects model after model selection predicting nestling relative telomere length (rTL; z-standardised) removing hatch month to determine the influence of covariation on the climate coefficients.

Fixed effects	Parameter estimate	SE	t-statistic	P-value
Intercept	0.48	0.18	2.69	0.008
$T_{min\text{-}nestling}$	-0.04	0.02	-1.51	0.13
$Rainfall_{nestling}$	-0.001	0.004	-0.38	0.71
$T_{min\text{-}nestling} \times Rainfall_{nestling}$	0.003	0.001	2.21	0.03
$T_{35\text{-}nestling}$	0.33	0.10	3.39	<0.001
Chick age (relative to 6 days)				
7 days	-0.62	0.18	-3.54	<0.001
8 days	-0.69	0.25	-2.82	0.005
Sex male (relative to female)	0.15	0.10	1.51	0.13
Brood size	-0.01	0.09	-0.15	0.88
Body mass	0.06	0.07	0.82	0.42
Helpers yes (relative to no)	-0.08	0.12	-0.70	0.48
Random effects	Variance	s.d.		
Nest identity	0.11	0.33		
Mother	0.07	0.26		
True sire	0.05	0.22		
Residual	0.67	0.82		

AIC_c = 950.26; including fixed predictors only marginal R^2 = 0.11; including random and fixed predictors conditional R^2 = 0.33.
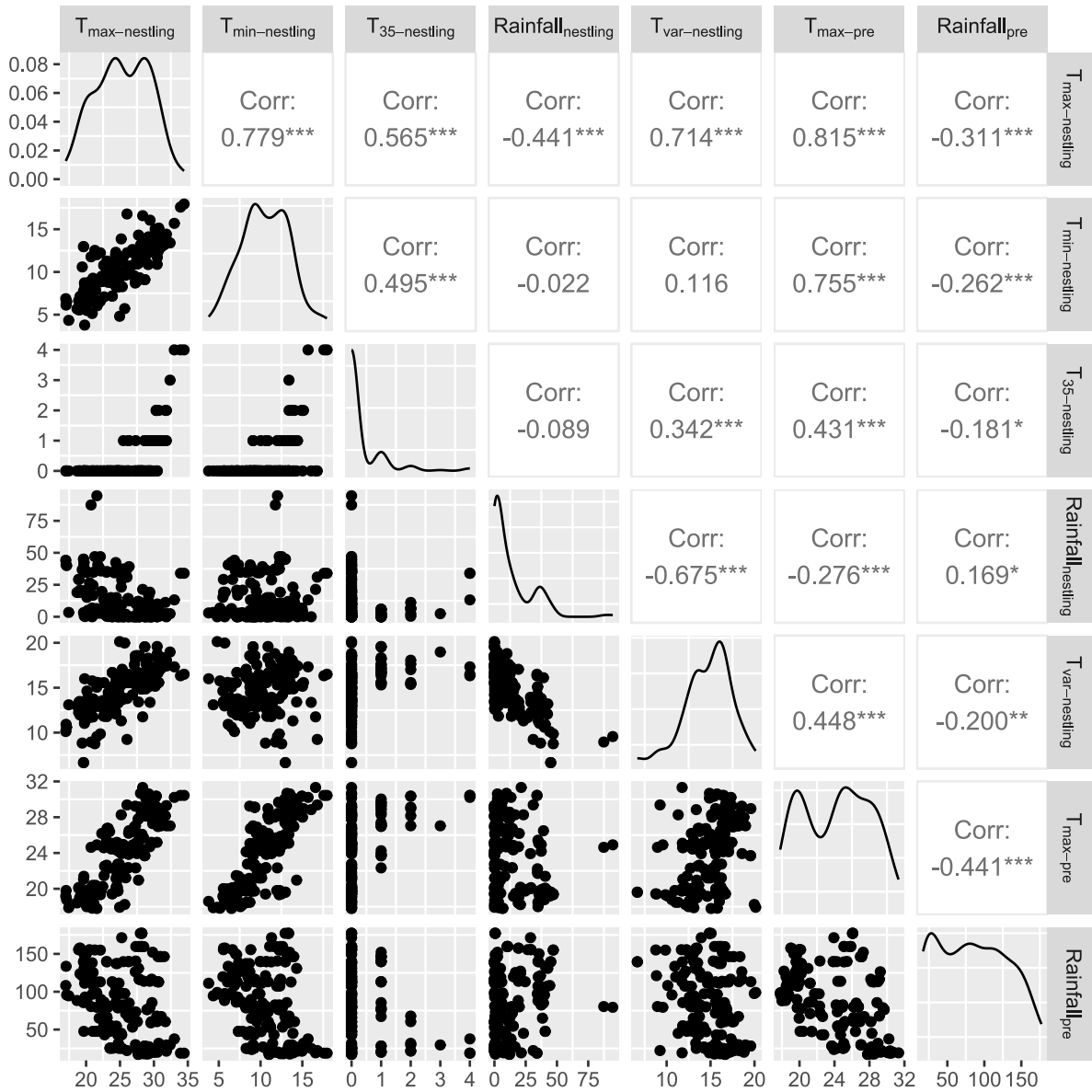
(II)   Supplementary figures

Figure S1: Correlation matrix between each of the pre- and nestling period climate variables included in this study.
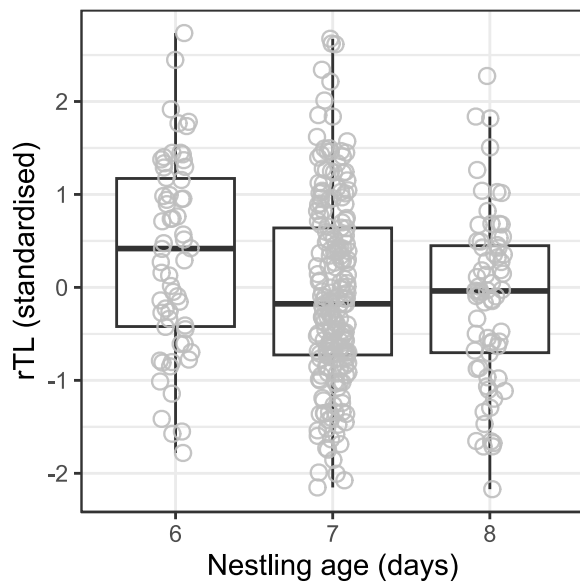
Figure S2: Younger (day 6) nestlings had longer telomeres (standardised relative telomere length, rTL) compared to those measured at 7-8 days of age.