

Supplementary material of Tomotani, B.M., Gienapp, P., Beersma, D.G.M., Visser, M.E. Climate change relaxes the time constraints for late-born offspring in a long-distance migrant. Proceedings of the Royal Society B. DOI: 10.1098/rspb. 2016.1366.

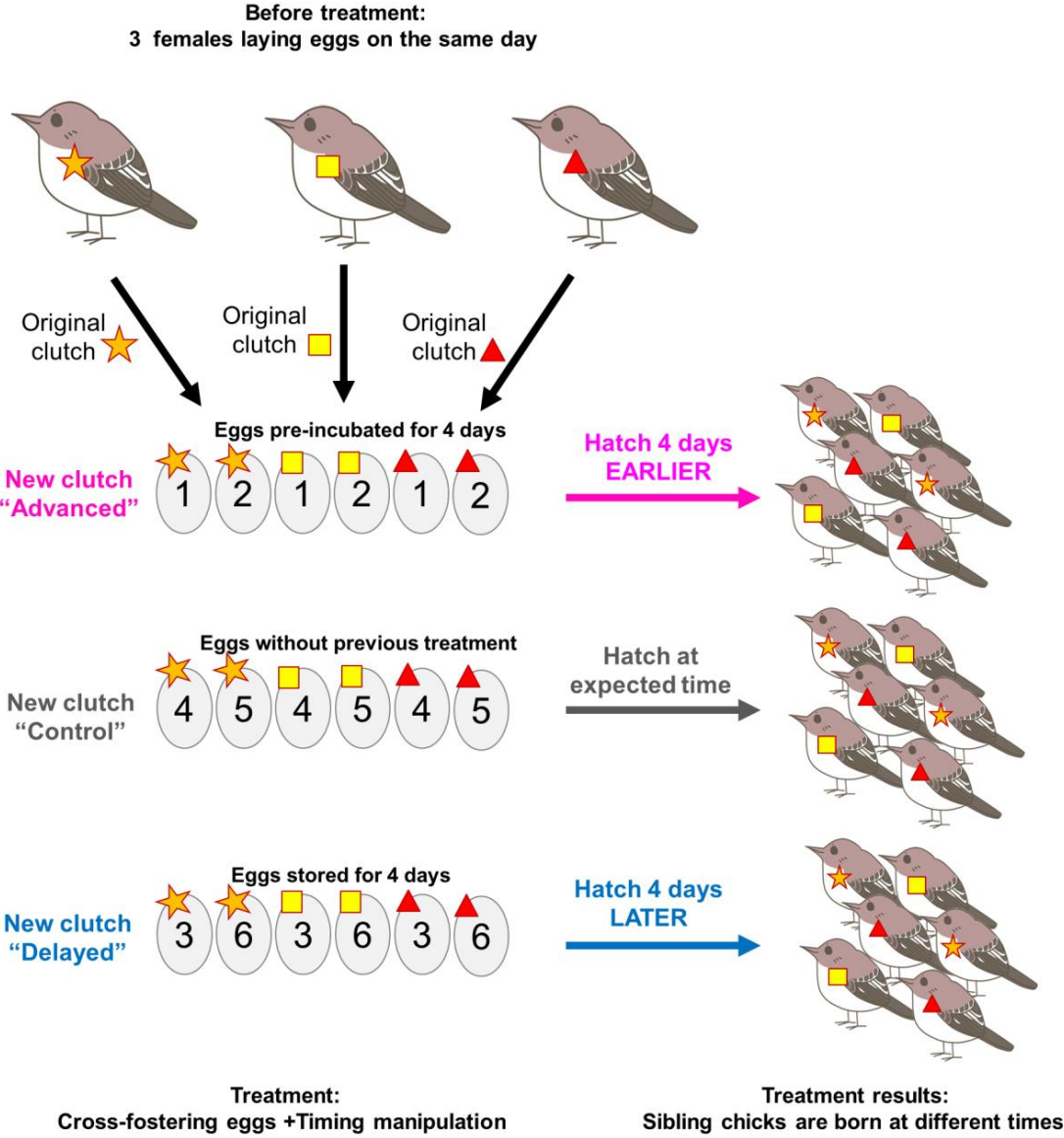


Figure S1: Illustration summarizing the experimental design, numbers on eggs represent egg-lay order, different symbols (stars, squares and triangles) represent distinct families (genetic parents) from which the original clutch came.

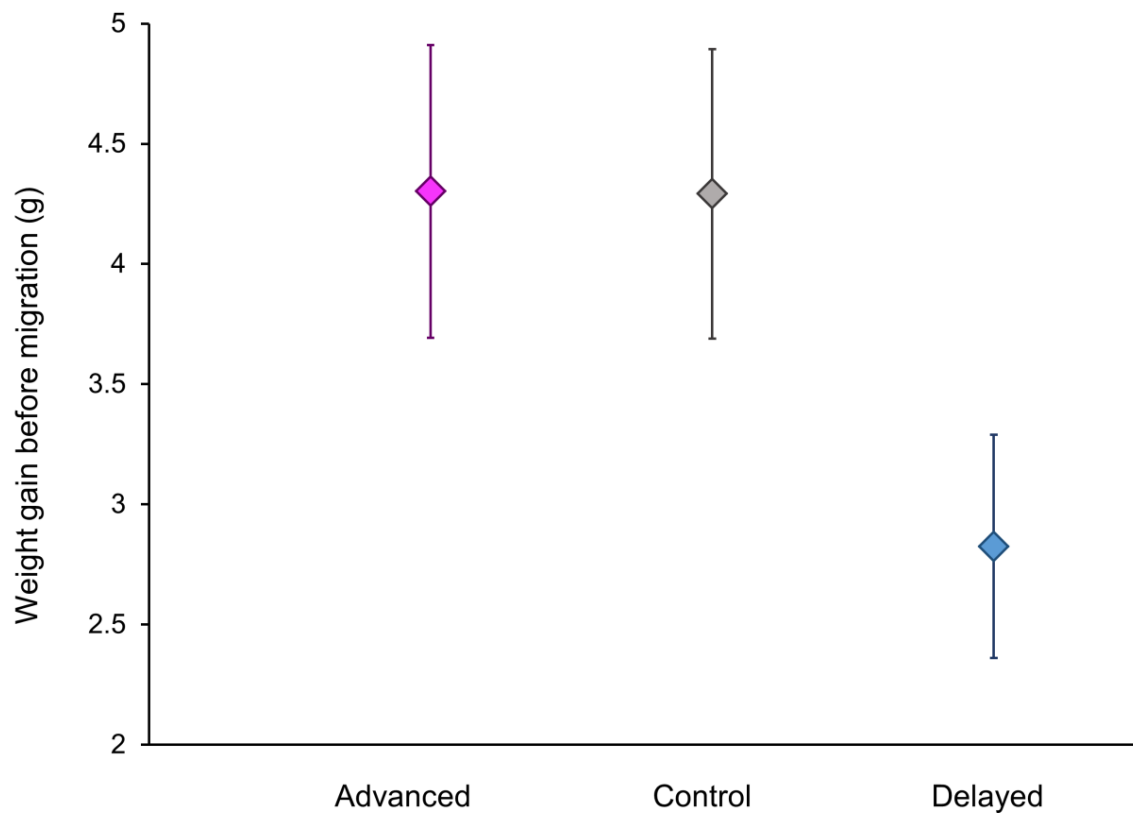


Figure S2: Difference in weight gained (mean and standard errors) before migration in relation to treatment.

Calendar date as reference (earlier or later)

Age as reference (older or younger)

2a) Offset of post-juvenile moult	Calendar date as reference (earlier or later)							Age as reference (older or younger)						
	Estimate	s.e.	F-test	ndf	ddf	P-value	OH test (rsPc)	OH test (P-value)	Estimate	s.e.	F-test	ndf	ddf	P-value
Treatment (Advanced)	84.51	5.12	13.03	2	4.77	0.01 *	0.99	< 0.01 *			0.54	2	3.72	0.62
Treatment (Control)	87.60	4.99												
Treatment (Delayed)	94.28	4.93												
Egg-laying date	1.01	0.14	51.79	1	4.15	< 0.01 *					0.11	1	2.86	0.77
Treatment : Egg-laying date			0.18	2	0.93	0.86					0.15	2	0.84	0.88
Sex of the chick (Male)	3.55	1.24	7.17	1	38.49	0.01 *			73.21	0.85	8.93	1	41.41	< 0.01 *
Sex of the chick (Female)									69.58	0.73				
Treatment : Sex			1.88	2	33.18	0.17					1.74	2	33.18	0.19
Fledgling weight			0.59	1	9.79	0.46					1.15	1	11.44	0.31
2b) Offset of post-juvenile moult (univariate)	Estimate	s.e.	F-test	ndf	ddf	P-value	OH test (rsPc)	OH test (P-value)						
Treatment (Advanced)	121.50	3.97	1.39	2	5.99	0.32	0.68	> 0.05						
Treatment (Control)	123.22	3.97												
Treatment (Delayed)	130.39	4.01												
3) Duration of post-juvenile moult	Estimate	s.e.	F-test	ndf	ddf	P-value								
Treatment			2.68	2	4.80	0.17								
Egg-laying date			0.91	1	3.26	0.41								
Treatment : Egg-laying date			1.34	2	0.74	0.57								
Sex of the chick (Male)	34.38	0.79	5.16	1	41.58	0.03 *								
Sex of the chick (Female)	32.07	0.68												
Treatment : Sex			0.60	2	33.04	0.56								
Fledgling weight			0.51	1	9.60	0.49								

Calendar date as reference (earlier or later)

Age as reference (older or younger)

4) Onset of weight gain	Calendar date as reference (earlier or later)						Age as reference (older or younger)					
	Estimate	s.e.	F-test	ndf	ddf	P-value	OH test (rsPc)	OH test (P-value)	F-test	ndf	ddf	P-value
Treatment (Advanced)	118.98	2.93	7.10	2	3.34	0.06	0.94	< 0.01 *	0.44	2	3.28	0.68
Treatment (Control)	125.70	2.88										
Treatment (Delayed)	130.49	3.05										
Egg-laying date			4.52	1	6.04	0.08			0.61	1	6.40	0.46
Treatment : Egg-laying date			0.84	2	0.13	0.84			0.94	2	0.14	0.83
Sex of the chick			0.65	1	35.05	0.43			0.89	1	38.31	0.35
Treatment : Sex			0.11	2	24.74	0.90			0.08	2	24.75	0.92
Fledgling weight			0.01	1	10.21	0.92			0.03	1	10.87	0.87

5) Maximum weight reached (Nov)	Calendar date as reference (earlier or later)			
	F-test	ndf	ddf	P-value
Treatment	0.12	2	2.17	0.90
Egg-laying date	0.71	1	7.47	0.43
Treatment : Egg-laying date	0.10	2	0.92	0.91
Sex of the chick	0.00	1	28.66	0.97
Treatment : Sex	1.17	2	24.69	0.33
Fledgling weight	2.61	1	9.56	0.14

Calendar date as reference (earlier or later)

Age as reference (older or younger)

6a) Onset of fat deposition	Calendar date as reference (earlier or later)						OH test (rsPc)		Age as reference (older or younger)							
	Estimate	s.e.	F-test	ndf	ddf	P-value	OH test (rsPc)	OH test (P-value)	F-test	ndf	ddf	P-value				
Treatment (Advanced)	112.17	6.94	5.72	2	3.77	0.07	0.93	< 0.01 *	0.11	2	2.34	0.90				
Treatment (Control)	116.49	6.95														
Treatment (Delayed)	118.79	6.81														
Egg-laying date	0.46	0.20	3.18	1	7.41	0.12			6.63	1	5.36	0.05				
Treatment : Egg-laying date			0.28	2	0.32	0.85			0.28	2	0.31	0.85				
Sex of the chick			0.02	1	33.74	0.89			0.04	1	35.30	0.84				
Treatment : Sex			1.11	2	29.19	0.34			1.09	2	29.12	0.35				
Fledgling weight			0.11	1	7.99	0.75			0.50	1	10.87	0.50				
6b) Onset of fat deposition (univariate)	Estimate	s.e.	F-test	ndf	ddf	P-value	OH test (rsPc)	OH test (P-value)								
Treatment (Advanced)	127.97	1.72	5.32	2	3.71	0.08	0.92	< 0.01 *								
Treatment (Control)	132.35	1.74														
Treatment (Delayed)	134.33	1.83														
7) Timing of migration									Estimate	s.e.	F-test	ndf	ddf	P-value	OH test (rsPc)	OH test (P-value)
Treatment (Advanced)									125.67	3.60	1.81	2	3.53	0.29	0.71	< 0.05 *
Treatment (Control)									121.76	3.53						
Treatment (Delayed)									116.48	3.69						
Egg-laying date											0.06	1	5.49	0.82		
Treatment : Egg-laying date											0.19	2	0.34	0.88		
Sex of the chick											0.21	1	33.86	0.65		
Treatment : Sex											2.82	2	25.20	0.08		
Fledgling weight											0.06	1	17.14	0.81		

Calendar date as reference (earlier or later)

Age as reference (older or younger)

8a) Weight gain before migration	Estimate	s.e.	F-test	ndf	ddf	P-value	OH test (rsPc)	OH test (P-value)
Treatment (Advanced)	10.29	3.46	2.23	2	3.29	0.24	0.76	0.04 *
Treatment (Control)	9.98	3.40						
Treatment (Delayed)	7.97	3.18						
Egg-laying date	-0.17	0.10	2.93	1	5.19	0.15		
Treatment : Egg-laying date			0.06	2	1.63	0.94		
Sex of the chick			0.02	1	30.13	0.90		
Treatment : Sex			0.01	2	21.52	0.99		
Tarsus length			0.00	1	20.64	0.95		
8b) Weight gain before migration (univariate)	Estimate	s.e.	F-test	ndf	ddf	P-value	OH test (rsPc)	OH test (P-value)
Treatment (Advanced)	4.48	0.88	1.03	2	4.00	0.44	0.56	> 0.05
Treatment (Control)	4.22	0.86						
Treatment (Delayed)	2.71	1.03						
9) Growth rate of flight feathers	Estimate	s.e.	F-test	ndf	ddf	P-value		
Treatment			3.02	2	5.21	0.13		
Egg-laying date			0.03	1	6.22	0.86		
Treatment : Egg-laying date			0.32	2	1.12	0.78		
Sex of the chick			0.24	1	40.42	0.62		
Treatment : Sex			0.20	2	35.90	0.82		
Fledgling weight			1.36	1	9.51	0.27		

Table S2: P-values and variance components for random effects given as absolute values and also as a percentage of the total variance. P-values were obtained at the point of exclusion of each random effect from the minimal model (retaining the significant fixed effects shown in Table S1, also including the treatment effects if significant in the OH test).

	Calendar date as reference (earlier or later)			Age as reference (older or younger)		
	Variance	Variance (%)	P-value	Variance	Variance (%)	P-value
a) Onset of post-juvenile moult						
Random effect (true parents) : Treatment			0.72			0.74
Random effect (true parents)	0.56	10.48%	0.69	0.48	11.01%	0.40
Random effect (foster parents)	1.91	35.44%	0.30	1.11	25.25%	0.05
Residual	2.91	54.07%		2.80	63.74%	
Total	5.38	100.00%		4.39	100.00%	
b) Offset of post-juvenile moult						
Random effect (true parents) : Treatment			0.72			0.79
Random effect (true parents)	0.00	0.00%	1.00	0.00	0.00%	1.00
Random effect (foster parents)	2.37	14.20%	1.00	0.00	0.00%	1.00
Residual	14.32	85.80%		13.80	100.00%	
Total	16.69	100.00%		13.80	100.00%	
c) Duration of post-juvenile moult						
Random effect (true parents) : Treatment			0.99			
Random effect (true parents)	0.00	0.00%	1.00			
Random effect (foster parents)	0.94	9.20%	0.61			
Residual	9.24	90.80%				
Total	10.18	100.00%				
d) Onset of weight gain						
Random effect (true parents) : Treatment			0.06			0.02*
Random effect (true parents)	43.10	45.15%	< 0.01*	25.12	32.47%	0.01*
Random effect (foster parents)	0.88	0.92%	1.00	0.27	0.34%	1.00
Residual	51.48	53.92%		51.96	67.18%	
Total	95.46	100.00%		77.34	100.00%	
e) Maximum weight reached (Nov)						
Random effect (true parents) : Treatment			0.77			
Random effect (true parents)	12969.80	55.01%	< 0.01*			
Random effect (foster parents)	932.70	3.96%	0.59			
Residual	9672.60	41.03%				
Total	23575.10	100.00%				

	Calendar date as reference (earlier or later)			Age as reference (older or younger)		
	Variance	Variance (%)	P-value	Variance	Variance (%)	P-value
f) Onset of fat deposition						
Random effect (true parents) : Treatment			0.97			1.00
Random effect (true parents)	11.45	29.79%	0.03 *	5.97	17.70%	0.35
Random effect (foster parents)	0.00	0.00%	1.00	0.00	0.00%	1.00
Residual	26.99	70.21%		27.73	82.30%	
Total	38.44	100.00%		33.69	100.00%	
g) Timing of migration						
Random effect (true parents) : Treatment			0.86			0.73
Random effect (true parents)	63.96	36.63%	0.01 *	27.79	18.63%	0.32
Random effect (foster parents)	0.00	0.00%	1.00	0.00	0.00%	0.33
Residual	110.67	63.37%		121.40	81.37%	
Total	174.63	100.00%		149.19	100.00%	