

Table S1. Microsatellite loci primer information.

Locus	Forward 5' to 3'	Reverse 5' to 3'	Range (bp)	Species of Origin
Jh_mm4.1	[VIC]-TATCTGGTAATGTCTCTTGTC	AATTCCTGGACATGAATGAAG	185-240	<i>Junco hyemalis</i> [1]
Jh_mm4.2	[6-FAM]-GAATGAAATTACTGGTGCATG	AGATAGGTAGAAGGCAGAAGC	110-150	<i>Junco hyemalis</i> [1]
Jh_mmA03	[6-FAM]-ATGCTCCCCGCTCTCTCCTGC	TGCATCAAGTCCTTGAAGCAC	230-290	<i>Junco hyemalis</i> [2]
Jh_mmJu05	[PET]-TGACCATGCCTTGGATATG	CATGGGAAACATGGACACTG	150-190	<i>Junco hyemalis</i> [2]
Cuμ28	[PET]-GAGGCACAGAAATGTGAATT	TAAGTAGAAGGACTTGATGGCT	150-200	<i>Catharus ustulatus</i> [3]
Dpμ01	[VIC]-TGGATTCACACCCCAAATT	AGAAGTATATAGTGCCCGTTGC	130-180	<i>Dendroica petechia</i> [4]
Dpμ16	[6-FAM]-ACAGCAAGGTCAGAATAAA	AACTGTTGTGTCTGAGCCT	150-180	<i>Dendroica petechia</i> [4]
GF05	[6-FAM]-AAACACTGGGAGTGAAGTCT	AACTATTCTGTGATCCTGTTACAC	170-240	<i>Geospiza fortis</i> [5]
Gf01b	[VIC]-AGAGGAAAACTCCTGTGG	CTGCATGCAGACTGAAATTCT	210-270	<i>Geospiza fortis</i> / <i>Junco hyemalis</i> [6]

Table S2. Microsatellite loci allelic variation, population genetics, and estimated error rates.

Locus	No. of alleles	No. of typed individuals	H _o	Percent of mother-offspring pairs mismatching due to error	Percent of mother-offspring pairs mismatching due to null allele	Detection probability	Estimated error rate
Jh_mm4.1	27	1600	0.818*	3.31	1.87	0.6766	0.0383
Jh_mm4.2	17	1618	0.826	1.07	0.11	0.5237	0.0112
Jh_mmA03	31	1600	0.933	2.88	0	0.7754	0.0185
Jh_mmJu05	14	1598	0.548 nd	1.54	7.05	0.3170	0.1355
Cuμ28	17	1468	0.723 nd	9.37	3.65	0.4631	0.1406
Dpμ01	25	1639	0.574*	4.18	7.82	0.3165	0.1896
Dpμ16	15	1631	0.695*	1.60	4.59	0.4278	0.0723
GF05	33	1535	0.951	11.67	0	0.7869	0.0741
Gf01b	30	1622	0.905	2.96	0.33	0.7231	0.0228

* = Observed heterozygosity (H_o) significantly different from expected heterozygosity based on Hardy-Weinberg equilibrium. nd = Hardy-Weinberg statistics not calculated by CERVUS.

Table S3. Generalized Linear Model Full Results: Sexes Combined

Fitness Component	<i>n</i>	Effect	Random Effects		Fixed Effects			
			Variance Component	<i>t</i>	β	Wald <i>F</i>	<i>df</i>	<i>p</i>
Total F ₂ Offspring	143	Year	0	0				
		Mother ID	0	0				
		Nest ID	2.61	5.2				
		Intercept			1.26	0.48	1, 123.3	0.487
		Hatch Date			-0.01	1.96	1, 126.4	0.167
		Mother Age			-0.05	0.11	1, 136	0.732
		% Years T			-0.06	0.02	1, 136	0.897
		Sex			0.42	0.40	1, 136	0.527
		Paternity			1.54	16.71	1, 136	<0.001
		Sex × Paternity			-0.44	0.78	1, 136	0.380
		Sex × % Years T					removed	
Fledged F ₂ Offspring	143	Year	0.11	0.46				
		Mother ID	0	0				
		Nest ID	2.33	4.43				
		Intercept			0.23	0.08	1, 125	0.774
		Hatch Date			-0.01	1.30	1, 128	0.259
		Mother Age			0.47	0.08	1, 136	0.768
		% Years T			-0.58	1.05	1, 136	0.308
		Sex			0.47	1.52	1, 136	0.222
		Paternity			1.10	6.57	1, 136	0.012
		Sex × Paternity			-0.22	0.15	1, 136	0.690
		Sex × % Years T					removed	
Longevity*	143	Year	0	0				
		Mother ID	0	0				
		Nest ID	0	0				

Intercept	1.30	6.32	1, 136	0.014
Hatch Date	-0.01	2.13	1, 136	0.149
Mother Age	-0.01	0.07	1, 136	0.792
% Years T	-0.22	1.10	1, 136	0.299
Sex	0.10	0.64	1, 136	0.424
Paternity	0.16	1.15	1, 136	0.287
Sex × Paternity	-0.02	0.00	1, 136	0.954
Sex × % Years T		removed		

Bold values are significant at $p < 0.05$. For random effects, significance could not be calculated directly using likelihood-ratio tests (7); we show effects with $t > 1.96$ in bold. For fixed effect slopes, female = 0 and male = 1; WPO = 0 and EPO = 1. *Rounding error in df calculations due to no significant random effects. The model without random effects gave the same results for the fixed effects, with 136 df.

Table S4. Generalized Linear Model Full Results: Males Only

Fitness Component	<i>n</i>	Effect	Random Effects		Fixed Effects			
			Variance Component	<i>t</i>	β	Wald <i>F</i>	<i>df</i>	<i>p</i>
Total F ₂ Offspring	78	Year	0.13	0.35				
		Mother ID	0	0				
		Nest ID	1.95	3.33				
		Intercept			3.74	2.30	1, 70.2	0.136
		Hatch Date			-0.02	3.11	1, 72.8	0.084
		Mother Age			-0.56	4.60	1, 73	0.037
		% Years T			0.54	0.59	1, 41.8	0.448
		Paternity			1.24	5.60	1, 45.2	0.022
Fledged F ₂ Offspring	78	Year	0.31	0.68				
		Mother ID	0	0				
		Nest ID	1.88	3.07				
		Intercept			2.42	0.81	1, 71.9	0.372
		Hatch Date			-0.02	1.68	1, 73	0.201
		Mother Age			-0.41	2.56	1, 73	0.117
		% Years T			0.51	0.45	1, 53.7	0.504
		Paternity			1.1	4.02	1, 50.7	0.05
F ₂ EPO Sired	78	Year	0	0				
		Mother ID	0	0				
		Nest ID	1.63	2.2				
		Intercept			4.69	1.41	1, 57.6	0.239
		Hatch Date			-0.03	3.57	1, 64.1	0.065
		Mother Age			-1.1	6.52	1, 73	0.013
		% Years T			-0.08	0.01	1, 32.3	0.919
		Paternity			1.63	8.15	1, 24.1	0.009

F ₂ WPO Sired	78	Year	0.3	0.65				
		Mother ID	0	0				
		Nest ID	1.89	3.05				
		Intercept			2.72	1.23	1, 70.8	0.273
		Hatch Date			-0.02	1.81	1, 73	0.186
		Mother Age			-0.47	3.17	1, 73	0.081
		% Years T			0.47	0.37	1, 51.7	0.547
		Paternity			0.81	2.04	1, 55.6	0.158
Number of Mates	78	Year	0.31	0.92				
		Mother ID	0	0				
		Nest ID	0.28	0.97				
		Intercept			2.67	2.44	1, 68.8	0.126
		Hatch Date			-0.02	3.56	1, 71.5	0.065
		Mother Age			-0.42	4.17	1, 73	0.046
		% Years T			0.59	1.12	1, 58.3	0.295
		Paternity			0.76	3.87	1, 44	0.055

Bold values are significant at $p < 0.05$. For random effects, significance could not be calculated using likelihood-ratio tests (7); we show effects with $t > 1.96$ in bold. For fixed effect slopes, WPO = 0 and EPO = 1.

Table S5. Generalized Linear Model Full Results: Females Only

Fitness Component	<i>n</i>	Effect	Random Effects		Fixed Effects			
			Variance Component	<i>t</i>	β	Wald <i>F</i>	<i>df</i>	<i>p</i>
Total F ₂ Offspring	65	Year	0	0				
		Mother ID	0	0				
		Nest ID	3.06	3.51				
		Intercept			-0.31	0.01	1, 48.4	0.924
		Hatch Date			-0.01	0.15	1, 48.4	0.699
		Mother Age			0.17	0.73	1, 52.1	0.396
		% Years T			-0.64	0.47	1, 60	0.494
		Paternity			1.93	16.21	1, 60	<0.001
Fledged F ₂ Offspring	65	Year	0	0				
		Mother ID	0	0				
		Nest ID	2.58	3.16				
		Intercept			-0.56	0.07	1, 48.9	0.800
		Hatch Date			-0.01	0.12	1, 48.5	0.732
		Mother Age			0.13	0.41	1, 56.7	0.522
		% Years T			-1.10	1.13	1, 60	0.293
		Paternity			1.38	6.27	1, 60	0.015
F ₂ EPO Produced	65	Year	0	0				
		Mother ID	0	0				
		Nest ID	3.01	2.53				
		Intercept			-0.12	0.00	60	0.967
		Hatch Date			-0.01	0.38	60	0.542
		Mother Age			0.19	0.57	57.5	0.453
		% Years T			0.25	0.05	60	0.83
		Paternity			-1	0.80	60	0.374

F ₂ WPO Produced	65	Year	0	0				
		Mother ID	0	0				
		Nest ID	2.73	3.29				
	Intercept			-0.88	0.12	47.7	0.732	
	Hatch Date			-0.002	0.02	48.7	0.884	
	Mother Age			0.084	0.18	55.1	0.676	
	% Years T			-0.79	0.71	60	0.401	
	Paternity			2.03	17.84	60	< 0.001	
	Number of Mates	65	Year	0	0			
Mother ID			0	0				
Nest ID			0.97	2.19				
Intercept				-0.51	0.10	60	0.752	
Hatch Date				-0.004	0.15	60	0.705	
Mother Age				0.14	0.89	59.2	0.35	
% Years T				-0.15	0.05	60	0.819	
Paternity				0.68	2.25	60	0.139	

Bold values are significant at $p < 0.05$. For random effects, significance could not be calculated using likelihood-ratio tests [7]; we show effects with $t > 1.96$ in bold. For fixed effect slopes, WPO = 0 and EPO = 1.

Table S6: Generalized Linear Model Full Results: Males and Females with at Least One Genotyped Social Offspring

Fitness Component	<i>n</i>	Effect	Random Effects		Fixed Effects			
			Variance Component	<i>t</i>	β	Wald <i>F</i>	<i>df</i>	<i>p</i>
Males								
F ₂ WPO Sired	27	Year	0.39	1.12				
		Mother ID*	---	---				
		Nest ID	0.13	0.78				
		Intercept			4.06	9.85	1, 18.6	0.005
		Hatch Date			-0.01	2.74	1, 19.7	0.113
		Mother Age			-0.37	4.08	1, 18	0.059
		% Years T			-0.4	0.57	1, 22	0.458
		Paternity			0.61	0.03	1, 13.5	0.869
EPP Lost	27	Year	0	0				
		Mother ID*	---	---				
		Nest ID	1.8	2.09				
		Intercept			-0.55	0.00	1, 20.5	0.976
		Hatch Date			0.009	0.22	1, 21.3	0.641
		Mother Age			-0.44	0.92	1, 22	0.349
		% Years T			0.08	0.01	1, 22	0.939
		Paternity			-0.78	0.77	1, 22	0.39
Females								
F ₂ EPO Produced	23	Year	0	0				
		Mother ID	0	0				
		Nest ID	2.15	1.68				
		Intercept			0.21	0.02	1, 15.2	0.877
		Hatch Date			0.00	0.01	1, 14.9	0.936
		Mother Age			0.04	0.01	1, 14.3	0.905
		% Years T			3.40	1.60	1, 18	0.223

		Paternity			-3.90	2.64	1, 18	0.121
F ₂ WPO Produced	23	Year	0	0				
		Mother ID	0.419	1.81				
		Nest ID	0	0				
		Intercept			0.46	0.09	1, 18	0.764
		Hatch Date			0.01	0.58	1, 18	0.456
		Mother Age			-0.13	0.92	1, 18	0.350
		% Years T			0.08	0.01	1, 17.6	0.909
		Paternity			0.27	0.48	1, 16.5	0.497
Number of Mates	23	Year	0.27	0.98				
		Mother ID	0	0				
		Nest ID	0	0				
		Intercept			0.33	0.11	1, 18	0.742
		Hatch Date			0.00	0.07	1, 18	0.789
		Mother Age			-0.01	0.01	1, 18	0.943
		% Years T			0.67	0.66	1, 10.2	0.435
		Paternity			-0.45	0.87	1, 18	0.364

Bold values are significant at $p < 0.05$. For random effects, significance could not be calculated using likelihood-ratio tests [7]; we show effects with $t > 1.96$ in bold. For fixed effect slopes, WPO = 0 and EPO = 1. *In these models, Mother ID and Nest ID were confounded; models converged when Mother ID was dropped.

Table S7. Adult phenotypic measurements of returning F₁ offspring

		Mean ± SE (n)		GLM			
		EPO	WPO		β	Wald X ²	p
Mass	Females	21.91 ± 0.44 (13)	22.06 ± 0.26 (37)	Intercept	21.78	14761.822	< 0.001
				Sex	0.28	1.003	0.317
	Males	21.47 ± 0.26 (17)	21.78 ± 0.15 (52)	Paternity	-0.31	0.739	0.390
				Sex * Paternity	0.15	0.079	0.779
Wing	Females	77.26 ± 0.42 (13)	77.32 ± 0.28 (36)	Intercept	81.43	138171.358	< 0.001
				Sex	-4.11	147.502	< 0.001
	Males	81.87 ± 0.38 (17)	81.43 ± 0.22 (50)	Paternity	0.43	0.997	0.318
				Sex * Paternity	-0.49	0.548	0.459
Tail	Females	66.71 ± 0.43 (13)	66.24 ± 0.28 (36)	Intercept	68.31	5226.903	< 0.001
				Sex	-2.07	2.011	0.156
	Males	68.86 ± 0.53 (17)	68.31 ± 1.42 (50)	Paternity	0.55	0.087	0.769
				Sex * Paternity	-0.08	0.001	0.977
Tarsus	Females	21.58 ± 0.18 (12)	21.45 ± 0.11 (29)	Intercept	21.73	58547.386	< 0.001
				Sex	-0.28	3.851	0.050
	Males	22.05 ± 0.15 (16)	21.73 ± 0.09 (45)	Paternity	0.32	3.273	0.070
				Sex * Paternity	-0.19	0.470	0.493
Tail White	Females	1.81 ± 0.12 (12)	1.88 ± 0.05 (32)	Intercept	2.17	2037.593	< 0.001
				Sex	-0.29	14.554	< 0.001
	Males	2.2 ± 0.07 (17)	2.17 ± 0.05 (48)	Paternity	0.03	0.080	0.777
				Sex * Paternity	-0.09	0.416	0.519

Mass was measured to the nearest 0.1g using a Pesola spring scale. Wing and tail length were measured to the nearest 1 mm using a flexible ruler. Tarsus bone length was measured to the nearest 0.1 mm using calipers. Tail white score is determined by visually estimating the percentage of each rectrix that is white, a measure that is highly repeatable and correlates with digital image analysis measures [8]. Measurements were averaged from all capture events during an individual's first breeding year.

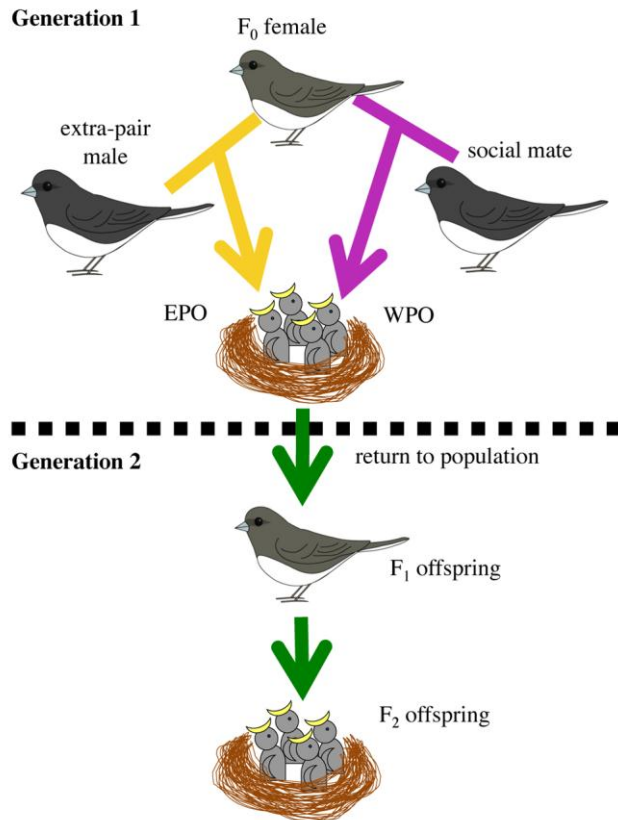


Figure S1: Multiple generations of reproductive behaviour. Females in socially monogamous species may produce offspring either with their socially pair-bonded mates (within-pair offspring; WPO) or with extra-pair males (extra-pair offspring; EPO). If these offspring return to the population as adults, they may then produce offspring of their own. Here, we designate the original females as F_0 , their offspring as F_1 , and their grand-offspring as F_2 . By comparing F_1 EPO and F_1 WPO on the number of F_2 offspring they produce, we can estimate the size of the average indirect benefit that accrues to a F_0 female from an extra-pair fertilization.

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