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Supplementar Material

Loss of Extra-pair Paternity is not Associated with Decreased Paternal Investment in Mixed-paternity Broods or Unrelated Nestlings in the Varied Tit, *Parus varius*

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Supplementary Fig. R1. Parental feeding recorded by using the micro-video camera system, nestlings are marked individually with color patterns; adult parents are identified by color bands.

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Supplementary Table S1. Model summaries of parental varied tit provisioning (male, female feeding rate and male's relative feeding rate) to broods containing EPY and not. The seven best candidate models are shown based on ΔAICc values.

Response factors	Explanatory factors	df	logLik	AICc	delta AICc	weight
Male feeding	Null model (intercept only)	4	-94.56	197.47	0	0.49
	Clutch initiation date	5	-94.87	200.29	2.82	0.12
	Nestling stages	6	-93.92	200.6	3.13	0.1
	Female body condition	5	-95.31	201.16	3.69	0.08
	Brood size	5	-95.35	201.24	3.77	0.07
	EPP	5	-95.35	201.25	3.78	0.07
	Male body condition	5	-95.62	201.78	4.31	0.06
Female feeding	Nestling stage	6	17.73	-22.7	0	**0.78**
	Nestling stage+male body condition	7	16.42	-17.81	4.89	0.07
	EPP+nestling stage	7	15.93	-16.82	5.88	0.04
	Nestling stage+brood size	7	15.76	-16.48	6.22	0.03
	Nestling stage+female body condition	7	15.64	-16.24	6.46	0.03
	Nestling age+ clutch initiation date	7	15.63	-16.22	6.47	0.03
	Null model (intercept only)	4	11.28	-14.21	8.49	0.01
Male share	Null model (intercept only)	4	57.65	-106.95	0	0.83
	Female body condition	5	55.53	-100.52	6.43	0.03
	Clutch initiation date	5	55.51	-100.48	6.47	0.03
	Male body condition	5	55.45	-100.36	6.59	0.03
	EPP	5	55.33	-100.12	6.83	0.03
	Brood size	5	55.22	-99.9	7.05	0.02
	Nestling stage	6	56.16	-99.55	7.4	0.02

Supplementary Table S2. Model summaries of varied tit provisioning (male, female feeding rate and male's relative feeding rate of feeding trips) to EPY and their own chicks within the mixed nests. The eight best candidate models are shown based on ΔAICc values.

Response factors	Explanatory factors	df	logLik	AICc	delta AICc	weight
	Null model (intercept only)	4	2.73	3.35	0	0.48
Male feeding	Clutch initiation date	5	2.21	6.84	3.49	0.08
	Brood size	5	2.01	7.22	3.87	0.07
	Nestling stage	6	3.25	7.28	3.93	0.07
	EPY ratio	5	1.94	7.37	4.03	0.06
	Female body condition	5	1.79	7.66	4.32	0.06
	Male body condition	5	1.65	7.94	4.59	0.05
Female feeding	Null model (intercept only)	4	-18.39	45.59	0	0.41
	Female body condition	5	-18.73	48.71	3.12	0.09
	Clutch initiation date	5	-18.95	49.15	3.56	0.07
	Male body condition	5	-19.04	49.33	3.74	0.06
	Female body condition	5	-19.08	49.41	3.83	0.06
	EPY	5	-19.2	49.64	4.05	0.05
	Brood size	5	-19.38	50.02	4.43	0.05
Male share	Null model (intercept only)	4	7.86	-6.91	0	0.45
	Brood size	5	7.87	-4.5	2.41	0.13
	Female body condition	5	6.96	-2.67	4.24	0.05
	Clutch initiation date	5	6.94	-2.64	4.27	0.05
	EPY ratio	5	6.92	-2.59	4.32	0.05
	Male body condition	5	6.89	-2.54	4.37	0.05
	EPY	5	6.22	-1.19	5.72	0.03

Supplementary Table S3. Effect estimates and standard errors (SEs) for each parameter from global Linear Mixed Model of parental provisioning of broods during 2011-2013 and 2016-2018. Satterthwaite's method t-tests were used to compare the parameter estimation. Only *P* values ≤ 0.05 are highlighted in bold. The reference categories for "nestling stage" and "EPP" are "early" and "no," respectively.

Responses	Variables	Estimated parameters mean±SE	95% confidence interval		T value	P value
			Lower	Upper		
Male feeding rate	(Intercept)	1.40 ± 0.12	1.18	1.62	12.02	<0.001
	EPP	0.10 ± 0.18	-0.24	0.43	0.54	0.590
	Nestling stage: medium	0.18 ± 0.10	-0.02	0.37	1.70	0.097
	Nestling stage: late	-0.08 ± 0.11	-0.29	0.14	-0.68	0.500
	Brood size	0.07± 0.14	-0.20	0.33	0.48	0.633
	Clutch initiation date	-0.22 ±0.18	-0.56	0.12	-1.24	0.218
	Female body condition	-0.14 ± 0.14	-0.41	0.13	-1.02	0.311
	Male body condition	-0.00± 0.15	-0.29	0.28	-0.02	0.982
	EPP (yes): nestling stage (medium)	0.08 ± 0.14	-0.19	0.36	0.57	0.573
	EPP (yes): nestling stage (late)	0.31 ± 0.16	0.01	0.62	1.97	0.056
Female feeding rate	(Intercept)	0.50 ± 0.05	0.41	0.58	10.81	< 0.001
	EPP	-0.07 ± 0.06	-0.19	0.06	-1.07	0.286
	Nestling stage: medium	0.19 ± 0.05	0.10	0.30	3.70	<0.001
	Nestling stage: late	0.08 ± 0.06	-0.03	0.19	1.43	0.159
	Brood size	0.05 ± 0.05	-0.04	0.15	1.03	0.305
	Clutch initiation date	0.02 ± 0.06	-0.09	0.12	0.30	0.769
	Female body condition	0.01 ± 0.05	-0.08	0.09	0.12	0.906
	Male body condition	-0.06 ± 0.05	-0.16	0.02	-1.40	0.167
	EPP (yes): nestling stage (medium)	0.03 ± 0.08	-0.12	0.17	0.36	0.720
	EPP (yes): nestling stage (late)	0.09 ± 0.08	-0.06	0.26	1.14	0.260
Male share	(Intercept)	0.42 ± 0.03	0.36	0.47	13.32	< 0.001
	EPP	0.02 ± 0.05	-0.07	0.11	0.39	0.701
	Nestling stage: medium	-0.06 ± 0.03	-0.13	0.00	-2.01	0.050
	Nestling stage: later	-0.06 ± 0.04	-0.13	0.01	-1.75	0.087
	Brood size	0.00 ± 0.03	-0.10	0.04	-0.75	0.450
	Clutch initiation date	-0.02 ± 0.04	-0.12	0.05	-0.86	0.392
	Female body condition	-0.03 ± 0.04	-0.10	0.03	-0.97	0.334
	Male body condition	0.04 ± 0.04	-0.03	0.11	1.02	0.309
	EPP (yes): nestling stage (medium)	0.00 ± 0.04	-0.08	0.09	0.08	0.940
	EPP (yes): nestling stage (late)	0.03 ± 0.05	-0.06	0.13	0.64	0.528

Supplementary Table S4. Effect estimates and standard errors (SE) for each parameter of the male varied tit strategy to feed EPY and their own nestling within mixed paternity broods from the global LMM during 2011-2013. Satterthwaite's method t-tests were used to compare the parameter estimation. Only *P* values ≤ 0.05 are highlighted in bold. The reference categories for "nestling stage" and "EPY" is "early" and "no," respectively.

Responses	Variables	Estimated parameters mean±SE	95% confidence interval		T value	P value
			Lower	Upper		
Male feeding rate	(Intercept)	0.67 ± 0.10	0.51	0.91	6.37	0.636
	EPY	0.03 ± 0.08	-0.12	0.18	0.39	0.697
	EPY ratio	0.12 ± 0.13	-0.09	0.34	0.92	0.383
	Nestling stage: medium	0.18 ± 0.08	0.03	0.34	2.22	0.033
	Nestling stage: late	0.17± 0.09	0.01	0.34	1.91	0.064
	Brood size	-0.13± 0.10	-0.29	0.05	-1.36	0.185
	Clutch initiation date	-0.35 ±0.18	-0.66	-0.07	-1.88	0.096
	Female body condition	0.10 ± 0.20	-0.26	0.44	0.52	0.676
	Male body condition	-0.11± 0.14	-0.34	0.11	-0.77	0.490
	EPY (yes): nestling stage (medium)	-0.06 ± 0.11	-0.27	0.15	-0.52	0.610
	EPY (yes): nestling stage (late)	-0.08 ± 0.12	-0.30	0.15	-0.64	0.529
Female feeding rate	(Intercept)	0.55 ± 0.16	0.30	0.81	3.45	0.007
	EPY	-0.07 ± 0.13	-0.32	0.17	-0.57	0.570
	EPY ratio	0.05 ± 0.24	-0.32	0.50	0.23	0.827
	Nestling stage: medium	0.10 ± 0.13	-0.08	0.29	0.77	0.445
	Nestling stage: late	0.21 ± 0.14	-0.04	0.49	1.48	0.148
	Brood size	0.15 ± 0.16	-0.10	0.46	0.97	0.337
	Clutch initiation date	0.18 ± 0.33	-0.33	0.72	0.55	0.600
	Female body condition	0.25 ± 0.35	-0.28	0.80	0.72	0.503
	Male body condition	0.01 ± 0.25	-0.37	0.40	0.04	0.969
	EPY (yes): nestling stage (medium)	0.03 ± 0.18	-0.31	0.36	0.15	0.883
	EPY (yes): nestling stage (late)	-0.11 ± 0.19	-0.47	0.24	-0.58	0.563
Male share	(Intercept)	0.44 ± 0.11	0.28	0.62	4.20	< 0.001
	EPY	0.09 ± 0.08	-0.05	0.24	1.23	0.227
	EPY ratio	0.05 ± 0.16	-0.26	0.30	0.35	0.733
	Nestling stage: medium	0.09 ± 0.08	-0.05	0.24	1.14	0.261
	Nestling stage: late	0.06 ± 0.08	-0.11	0.21	0.68	0.504
	Brood size	-0.15 ± 0.10	-0.35	0.00	-1.61	0.115
	Clutch initiation date	-0.18 ± 0.22	-0.54	0.15	-0.81	0.452
	Female body condition	-0.05 ± 0.24	-0.41	0.31	-0.19	0.855
	Male body condition	-0.07 ± 0.17	-0.32	0.19	-0.38	0.719
	EPY (yes): nestling stage (medium)	-0.08 ± 0.10	-0.28	0.12	-0.78	0.442
	EPY (yes): nestling stage (late)	-0.06 ± 0.11	-0.26	0.15	-0.51	0.617