

Supplementary Information

accompanying the paper

**Eurasian Spoonbill chicks receive parental care up to several months after fledging,
but not into migration**

Behavioral Ecology and Sociobiology

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24 **Table S1.**

25 Information about GPS-tagged parents and chicks, nests and joined GPS data. The number of days with nearly complete data used in the
 26 analyses is specified separately for modelling overall contact and (between brackets) behaviour-specific contact.

Parent info			Chick info						Nest info			GPS data info	
ID	Sex	Deploy- ment date	ID	Sex	Deployment date	Deploy- ment age (d)	Chick order	Mortality date	Latitude	Longitude	# fledg- lings	# days	Last date with
												used in the analyses	(some) joined data
6288	m	12/05/2016	6295	f	15/06/2016	35	1		53.4865	6.23798	1	97 (89)	31/12/2016
6289	f	15/05/2016	6295	f	15/06/2016	35	1		53.4865	6.23798	1	98 (91)	31/12/2016
656	m	27/04/2016	6296	m	06/07/2016	35	1	03/10/2016	53.49024	6.26037	1	51 (48)	03/10/2016
6118	m	30/04/2014	6298.1	m	07/07/2016	33	1	27/10/2016	53.48836	6.25927	2	86 (85)	28/10/2016
6284	f	28/04/2016	6299	f	14/07/2016	33	1		53.49356	6.27743	2	77 (75)	31/12/2016
6285	f	02/05/2016	6301	f	15/07/2016	32	1	01/11/2016	53.49354	6.27751	1	63 (61)	01/11/2016
6067	m	13/05/2014	6302	f	15/07/2016	33	1	25/11/2017	53.4864	6.26722	1	75 (70)	29/12/2016
6291	f	16/05/2016	6304	m	28/07/2016	33	1	05/10/2016	53.48679	6.26757	1	65 (65)	04/10/2016
763	m	25/05/2012	6304	m	28/07/2016	33	1	05/10/2016	53.48679	6.26757	1	65 (65)	04/10/2016
6298	f	06/05/2017	6354	f	11/06/2017	31	1		53.4862	6.25041	1	85 (81)	31/12/2017
6066	m	05/05/2014	6358.1	f	12/06/2017	31	1	27/02/2018	53.48378	6.24165	1	54 (53)	31/12/2017
6287	m	03/05/2016	6292	f	13/07/2017	32	2	06/10/2017	53.47796	6.24427	2	67 (57)	06/10/2017
6284.2	f	01/05/2017	6374.1	m	17/07/2017	31	1	03/01/2018	53.48367	6.23753	1	74 (65)	31/12/2017
6288	m	12/05/2016	6374.1	m	17/07/2017	31	1	03/01/2018	53.48367	6.23753	1	0 (0)	31/12/2017
6358	m	14/05/2018	6381	m	21/06/2018	34	2		53.48696	6.25897	2	27 (23)	31/12/2018
6284.2	f	01/05/2017	1607	m	25/06/2018	30	1		53.47805	6.24248	1	0 (0)	02/07/2018
6289	f	15/05/2016	6315	m	25/06/2018	31	1		53.48611	6.2353	1	90 (79)	31/12/2018
6288	m	12/05/2016	6315	m	25/06/2018	31	1		53.48611	6.2353	1	0 (0)	-
6291	f	16/05/2016	6385	m	10/07/2018	32	1		53.48726	6.26056	1	70 (50)	31/12/2018

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Table S2.

F-measures for pooled behaviours, where ‘forage’ includes the behaviours ‘search’, ‘handle’ and ‘ingest’ from Lok et al. 2023, ‘rest’ includes ‘sit’ and ‘stand’, also when the bird is moving its body while standing (i.e. when shaking feathers, preening or drinking) and ‘fly’ includes active and passive flight. The random-forest model was trained on the accelerometer dataset (20 Hz 3D data) with unpooled annotated behaviours ‘search’, ‘handle’, ‘ingest’, ‘sit’, ‘stand’, ‘fly-active’, ‘fly-passive’, ‘walk’ and ‘beg’. Reported values are means calculated from 100 runs of 70% training and 30% test data, randomly sampled from the annotated dataset.

	Segment length (s)		
	0.4	0.8	1.6
forage	0.95	0.96	0.96
walk	0.53	0.60	0.61
fly	0.97	0.97	0.98
rest	0.97	0.96	0.95
beg	0.79	0.86	0.89

Table S3.

Model selection results. The most parsimonious models are indicated in bold. “age” refers to age of the chick and “c” to the intercept-only “constant” model. For modelling contact probabilities, year was always included as a categorical fixed effect.

Model	K	$\Delta\text{-2logL}$	ΔAIC_c	Akaike weight
<i>(a) Total contact</i>				
sex_{parent} + age	8	0.79	0.00	0.64
sex _{chick} + sex _{parent} + age	9	0.00	1.21	0.35
sex _{parent}	7	11.46	8.67	0.01
sex _{chick} + sex _{parent}	8	10.67	9.88	0.00
age	7	601.05	598.26	0.00
sex _{chick} + age	8	599.56	598.76	0.00
c	6	611.58	606.79	0.00
sex _{chick}	7	610.04	607.25	0.00
<i>(b) Contact while begging</i>				
sex_{parent} + age	8	0.71	0.00	0.65
sex _{chick} + sex _{parent} + age	9	0.00	1.29	0.34
sex _{chick} + age	8	10.53	9.81	0.00
sex _{parent}	7	13.55	10.83	0.00
age	7	13.99	11.28	0.00
sex _{chick} + sex _{parent}	8	12.95	12.24	0.00
sex _{chick}	7	23.55	20.84	0.00
c	6	26.77	22.06	0.00
<i>(c) Contact while foraging</i>				
sex_{parent} + age	8	0.57	0.00	0.60
sex _{chick} + sex _{parent} + age	9	0.00	1.43	0.29
sex _{parent}	7	6.80	4.23	0.07
sex _{chick} + sex _{parent}	8	6.06	5.49	0.04
age	7	35.64	33.07	0.00
sex _{chick} + age	8	34.77	34.20	0.00
c	6	42.77	38.20	0.00
sex _{chick}	7	41.54	38.97	0.00
<i>(d) Distance from nest during contact</i>				
sex_{parent} + age	7	0.13	0.00	0.72
sex _{chick} + sex _{parent} + age	8	0.00	1.87	0.28
sex _{parent}	6	25.71	23.57	0.00
sex _{chick} + sex _{parent}	7	25.54	25.41	0.00
age	6	38.90	36.76	0.00
sex _{chick} + age	7	38.78	38.65	0.00
c	5	64.26	60.13	0.00
sex _{chick}	6	64.13	62.00	0.00

Table S4.

Parameter estimates (on logit-scale) of the global model for overall contact probability.

Parameter	Estimate	s.e.
<i>Fixed effects</i>		
Intercept ¹	-2.06	0.36
Sex _{parent} (male)	-1.01	0.04
Sex _{chick} (male)	-0.46	0.43
Age _{chick}	-0.64	0.16
Year (2017)	-3.44	0.57
Year (2018)	-0.67	0.60
<i>Random effects</i>		
$\sigma_{\text{Intercept(chickID)}}$	0.81	-
$\sigma_{\text{Age(chickID)}}$	0.59	-
$\text{Cor}(\text{Intercept}_{\text{chickID}}, \text{Age}_{\text{chickID}})$	0.28	-

¹Reference levels are female for Sex_{parent} and Sex_{chick} and 2016 for Year.**Table S5.**

Parameter estimates (on logit-scale) of the global model for contact probability while the chick is begging.

Parameter	Estimate	s.e.
<i>Fixed effects</i>		
Intercept ¹	-6.17	0.22
Sex _{parent} (male)	-0.53	0.17
Sex _{chick} (male)	-0.21	0.25
Age _{chick}	-0.98	0.24
Year (2017)	-2.11	0.38
Year (2018)	0.16	0.31
<i>Random effects</i>		
$\sigma_{\text{Intercept(chickID)}}$	0.52	-
$\sigma_{\text{Age(chickID)}}$	0.74	-
$\text{Cor}(\text{Intercept}_{\text{chickID}}, \text{Age}_{\text{chickID}})$	0.92	-

¹Reference levels are female for Sex_{parent} and Sex_{chick} and 2016 for Year.

Table S6.

Parameter estimates (on logit-scale) of the global model for contact probability while the chick is foraging.

Parameter	Estimate	s.e.
<i>Fixed effects</i>		
Intercept ¹	-4.76	0.66
Sex _{parent} (male)	-1.49	0.28
Sex _{chick} (male)	-0.78	0.96
Age _{chick}	0.65	0.22
Year (2017)	-3.67	1.05
Year (2018)	-1.00	1.18
<i>Random effects</i>		
$\sigma_{\text{Intercept(chickID)}}$	1.41	-
$\sigma_{\text{Age(chickID)}}$	0.66	-
$\text{Cor}(\text{Intercept}_{\text{chickID}}, \text{Age}_{\text{chickID}})$	0.27	-

¹Reference levels are female for Sex_{parent} and Sex_{chick} and 2016 for Year.

Table S7.

Parameter estimates of the global model for distance to the nest (in km, on log-scale) during contact.

Parameter	Estimate	s.e.
<i>Fixed effects</i>		
Intercept ¹	0.97	0.29
Sex _{parent} (male)	0.25	0.04
Sex _{chick} (male)	-0.13	0.37
Age _{chick}	1.87	0.23
<i>Random effects</i>		
$\sigma_{\text{Intercept(chickID)}}$	0.81	-
$\sigma_{\text{Age(chickID)}}$	0.83	-
σ_{Residual}	1.05	-
$\text{Cor}(\text{Intercept}_{\text{chickID}}, \text{Age}_{\text{chickID}})$	0.53	-

¹Reference levels are female for Sex_{parent} and Sex_{chick} and 2016 for Year.

Table S8.

Model selection results for probability of contact, (a) overall, (b) while the chick is begging or (c) while the chick is foraging when using a contact distance of 50 m instead of 10 m (for which results are shown in Table 1). The most parsimonious models are indicated in bold. “age” refers to age of the chick and “c” to the intercept-only “constant” model. For modelling contact probabilities, year was always included as a categorical fixed effect.

Model	K	Δ -2logL	Δ AIC _c	Akaike weight
<i>(a) Total contact</i>				
sex_{parent} + age	8	0.98	0.00	0.48
sex _{chick} + sex _{parent} + age	9	0.00	1.02	0.29
sex _{parent}	7	5.40	2.42	0.14
sex _{chick} + sex _{parent}	8	4.41	3.43	0.09
age	7	758.46	755.47	0.00
sex _{chick} + age	8	757.33	756.34	0.00
c	6	762.89	757.91	0.00
sex _{chick}	7	761.76	758.78	0.00
<i>(b) Contact while begging</i>				
sex _{chick} + sex _{parent} + age	9	0.00	0.00	0.58
sex_{parent} + age	8	2.79	0.79	0.39
sex _{chick} + sex _{parent}	8	9.30	7.30	0.02
sex _{parent}	7	12.08	8.08	0.01
sex _{chick} + age	8	27.92	25.92	0.00
age	7	32.62	28.62	0.00
sex _{chick}	7	37.40	33.39	0.00
c	6	42.06	36.06	0.00
<i>(c) Contact while foraging</i>				
sex _{chick} + sex _{parent} + age	9	0.00	0.00	0.40
sex_{parent} + age	8	2.65	0.65	0.29
sex _{chick} + sex _{parent}	8	3.60	1.60	0.18
sex _{parent}	7	6.09	2.09	0.14
sex _{chick} + age	8	82.74	80.74	0.00
age	7	86.02	82.02	0.00
sex _{chick}	7	86.18	82.18	0.00
c	6	89.24	83.23	0.00
<i>(d) Distance from nest during contact</i>				
sex_{parent} + age	7	0.01	0.00	0.73
sex _{chick} + sex _{parent} + age	8	0.00	1.99	0.27
sex _{parent}	6	19.79	17.78	0.00
sex _{chick} + sex _{parent}	7	19.75	19.74	0.00
age	6	44.83	42.82	0.00
sex _{chick} + age	7	44.82	44.81	0.00
c	5	64.56	60.55	0.00
sex _{chick}	6	64.53	62.52	0.00

Table S9.

Model selection results with chick-parentID as levels for the random effects. The most parsimonious models are indicated in bold. “age” refers to age of the chick and “c” to the intercept-only “constant” model. For modelling contact probabilities, year was always included as a categorical fixed effect.

Model	K	Δ -2logL	Δ AIC _c	Akaike weight
<i>(a) Total contact</i>				
sex _{chick} + sex _{parent} + age	9	0.00	0.00	0.32
sex _{parent} + age	8	2.36	0.35	0.27
sex _{chick} + age	8	2.67	0.67	0.23
age	7	5.12	1.12	0.18
sex _{chick} + sex _{parent}	8	14.06	12.06	0.00
sex _{parent}	7	16.39	12.39	0.00
sex _{chick}	7	16.77	12.77	0.00
c	6	19.19	13.19	0.00
<i>(b) Contact while begging</i>				
sex_{chick} + age	8	1.32	0.00	0.40
sex _{chick} + sex _{parent} + age	9	0.00	0.68	0.28
sex _{parent} + age	8	2.73	1.41	0.20
age	7	5.63	2.31	0.12
sex _{chick}	7	17.27	13.95	0.00
sex _{chick} + sex _{parent}	8	15.81	14.49	0.00
sex _{parent}	7	18.20	14.88	0.00
c	6	21.33	16.01	0.00
<i>(c) Contact while foraging</i>				
age	7	0.05	0.00	0.50
sex _{parent} + age	8	0.00	1.95	0.19
sex _{chick} + age	8	0.05	2.00	0.19
sex _{chick} + sex _{parent} + age	9	0.00	3.95	0.07
c	6	8.01	5.95	0.03
sex _{parent}	7	7.86	7.80	0.01
sex _{chick}	7	7.90	7.85	0.01
sex _{chick} + sex _{parent}	8	7.74	9.69	0.00
<i>(d) Distance from nest during contact</i>				
age	6	0.12	0.00	0.53
sex _{parent} + age	7	0.00	1.88	0.21
sex _{chick} + age	7	0.12	2.00	0.19
sex _{chick} + sex _{parent} + age	8	0.00	3.88	0.08
c	5	30.88	28.75	0.00
sex _{parent}	6	30.82	30.70	0.00
sex _{chick}	6	30.88	30.75	0.00
sex _{chick} + sex _{parent}	7	30.82	32.70	0.00

Supplementary Information

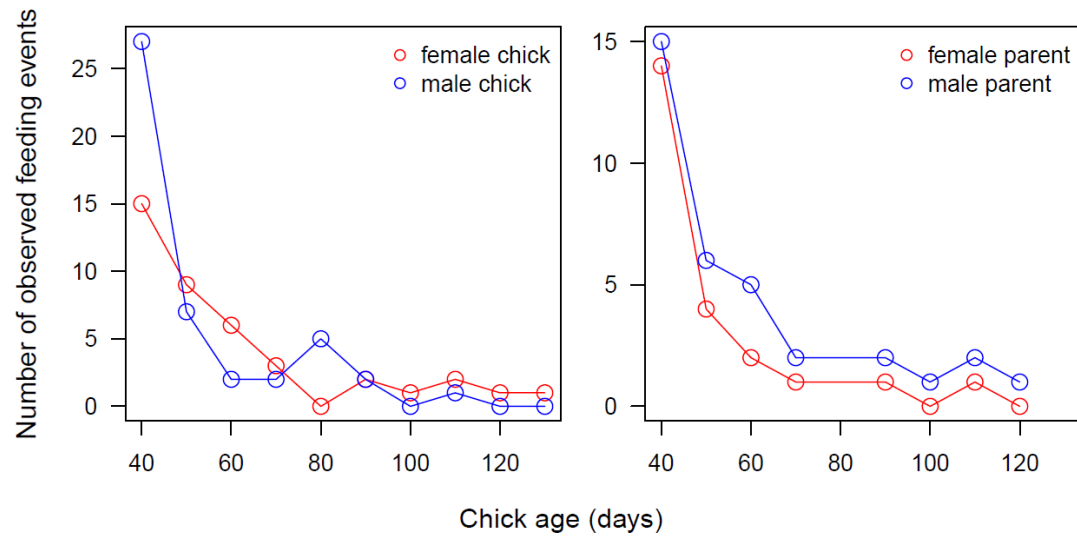
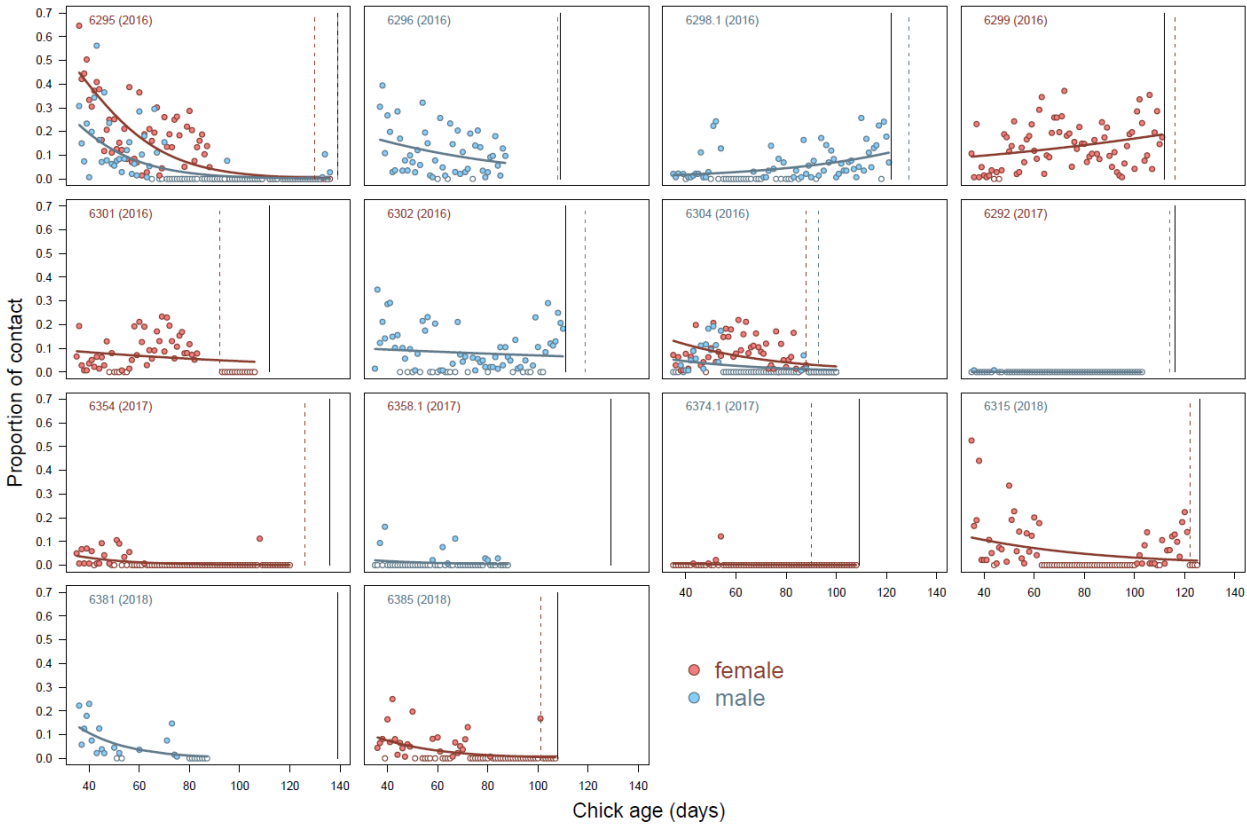


Figure S1.

Number of observed feeding events in relation to sex of the chick and the parent.

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76 **Figure S2.**

77 The probability of contact between chick and parent in relation to chick age and coloured
78 according to the chick's (chick number's color) and parent's sex (symbol color). Solid colored lines
79 represent model estimates from the most parsimonious model, the vertical lines represent the
80 moments of departure of the chick (black line) and the parent (colored dashed line). Days without
81 any contact are plotted as white-filled circles.

Supplementary Information

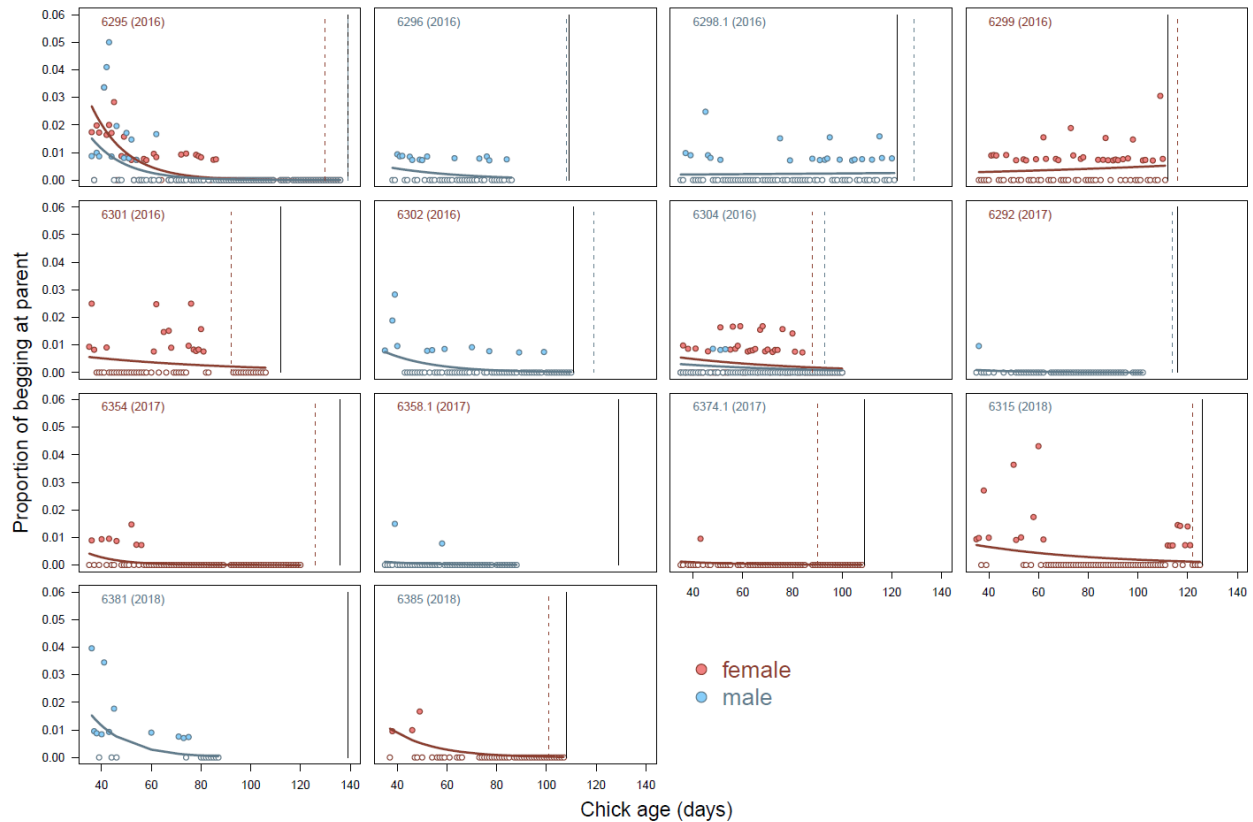


Figure S3.

The probability of contact between chick and parent while the chick is classified to be begging in relation to chick age and coloured according to the chick's (chick number's color) and parent's sex (symbol color). Solid colored lines represent model estimates from the most parsimonious model, the vertical lines represent the moments of departure of the chick (black line) and the parent (colored dashed line). Days without any 'begging contact' are plotted as white-filled circles.

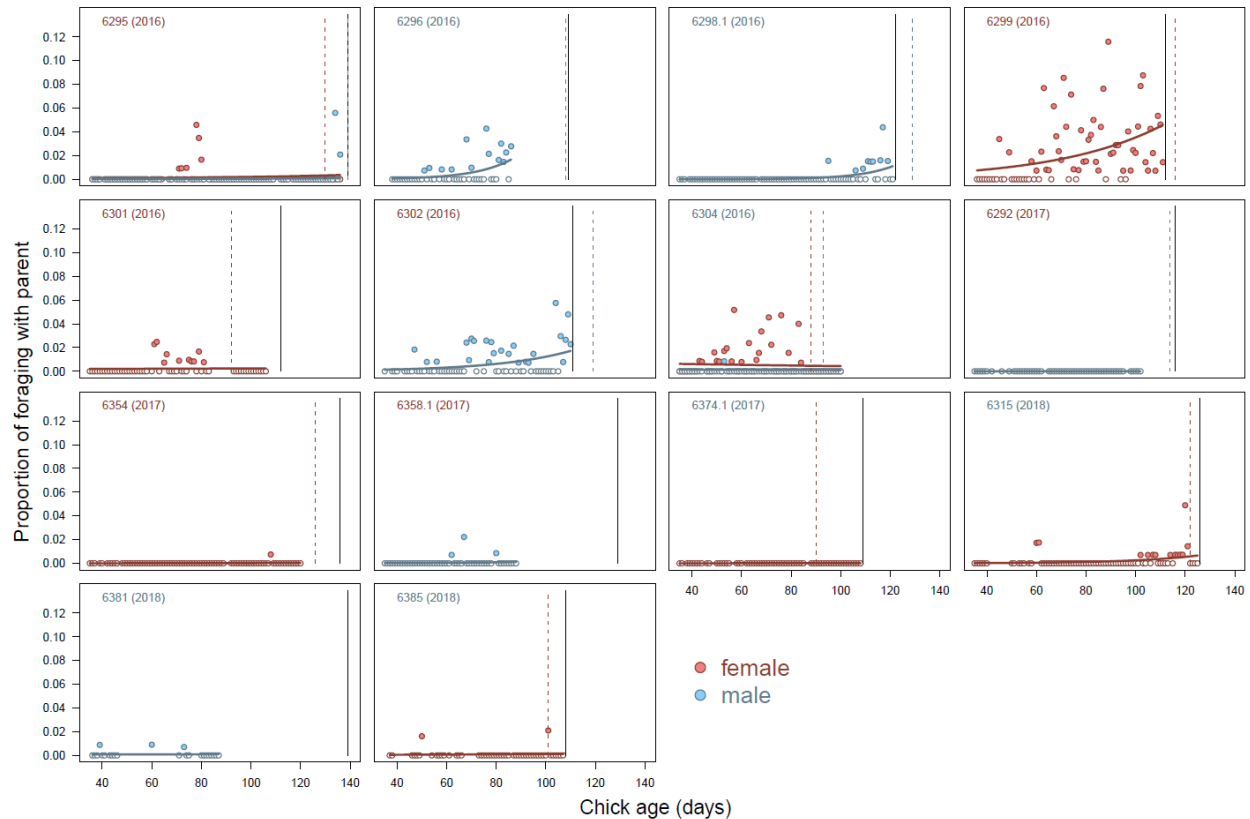


Figure S4.

The probability of contact between chick and parent while the chick is classified to be foraging in relation to chick age and coloured according to the chick's (chick number's color) and parent's sex (symbol color). Solid colored lines represent model estimates from the most parsimonious model, the vertical lines represent the moments of departure of the chick (black line) and the parent (colored dashed line). Days without any 'foraging' contact are plotted as white-filled circles.