

# Appendices

## Appendix 1 - mapping dates for each colony

Table A1.1. Mapping dates for each colony. Green shading indicate that maps were collected for that date and grey shading indicates that no maps were collected for that date.

<b>2012-2016, 2019</b>								
Colony	26/07/12	31/05/13	28/08/13	26/05/14	25/08/14	25/08/15	22/08/16	27/06/19
2a								
2b								
3								
4								
6								
7								
8								
9								
10								
12								
<b>2017</b>								
Colony	23/05	01/06	14/06	25/06	12/07	28/07	10/08	22/08
2a								
2b								
3								
4								
6								
7								
8								
9								
10								
12								
<b>2018</b>								
Colony	08/05	23/05	12/06	28/06	20/07	02/08	17/08	30/08
2a								
2b								
3								
4								
6								
7								
8								
9								
10								
12								

## Appendix 2 - model details

**Table A2.1 Description of models fitted**

<b>Model</b>	<b>Data used</b>	<b>Model type</b>	<b>Response variable</b>	<b>Fixed effects</b>	<b>Random effects (groups)</b>	<b>Samples</b>	<b>Levene's test for equal variances</b>
1	17/18 4 colony subset	LMM	Log(Proportion of sub-colony population on foraging trails)	Stage of season	Colony (4), year (2)	84	F = 2.33 p = 0.13
2	17/18 4 colony subset	LMM	Log(Proportion of sub-colony population on interest trails)	Stage of season	Colony (4), year (2)	84	F = 1.09 p = 0.30
3	17/18 4 colony subset	LMM	Log(Proportion of sub-colony population on any trails)	Stage of season	Colony (4), year (2)	84	F = 0.25 p = 0.62
4	17/18 4 colony subset	Poisson GLMM	Number of nests founded by colonies	Stage of season	Colony (4), year (2)	16	F = 3.46 p = 0.084
5	17/18 4 colony subset	Poisson GLMM	Number of nests abandoned by colonies	Stage of season	Colony (4), year (2)	14	F = 0.69 p = 0.42
6	17/18 4 colony subset	Poisson GLMM	Number of trails added in colonies	Stage of season	Colony (4), year (2)	16	F = 0.0018 p = 0.97
7	17/18 4 colony subset	Poisson GLMM	Number of trails removed in colonies	Stage of season	Colony (4), year (2)	16	F = 1.06 p = 0.32
8	Full dataset	Binomial GLMM	Binomial indicating if a sub-colony was a founder	Log (Population size of sub-colony)	NestId (293), timepoint (10)	1024	N/A (numeric fixed effect)
9	Full dataset	Binomial GLMM	Binomial indicating if a sub-colony had abandoned their nest	Log (Population size of sub-colony)	NestId (293), timepoint (10)	993	N/A (numeric fixed effect)
10	17/18 4 colony subset	Binomial GLMM	Binomial indicating if new sub-colonies had abandoned their nest over the winter	Stage of season	Colony (4), year (2)	37	F = 1.13 p = 0.29

**Table A2.2 Description of model results**

<b>Model</b>	<b>Effect</b>	<b>Estimate</b>	<b>Standard Error</b>	<b>Test statistic</b>	<b>p-value</b>
1	Intercept	-6.46	0.62	T = 10.48	< 0.01
	Stage of season	-0.79	0.86	T = -0.92	0.36
2	Intercept	-3.67	0.42	T = -8.78	< 0.001
	Stage of season	0.59	0.58	T = 1.02	0.31
3	Intercept	-2.70	0.36	T = -7.47	< 0.01
	Stage of season	0.070	0.41	T = 0.17	0.86
4	Intercept	1.00	0.33	Z = 3.05	0.0023
	Stage of season	-0.61	0.34	Z = -1.80	0.072
5	Intercept	0.25	0.35	Z = 0.70	0.49
	Stage of season	0.80	0.40	Z = 1.99	0.046
6	Intercept	2.39	0.46	Z = 5.16	< 0.001
	Stage of season	-0.62	0.16	Z = -3.94	< 0.001
7	Intercept	2.35	0.42	Z = 5.60	< 0.001
	Stage of season	-0.33	0.15	Z = -2.1	0.027
8	Intercept	-4.93	0.66	Z = -7.42	< 0.001
	Log(Population size of sub-colony)	0.32	0.064	Z = 4.94	< 0.001
9	Intercept	-4.65	0.70	Z = -6.63	< 0.001
	Log(Population size of sub-colony)	0.61	0.075	Z = 8.11	< 0.001
10	Intercept	-0.93	1.21	Z = -0.77	0.44
	Stage of season	3.02	1.18	Z = 2.55	0.011

## Appendix 3 - distribution fitting of number of nests founded by each sub-colony

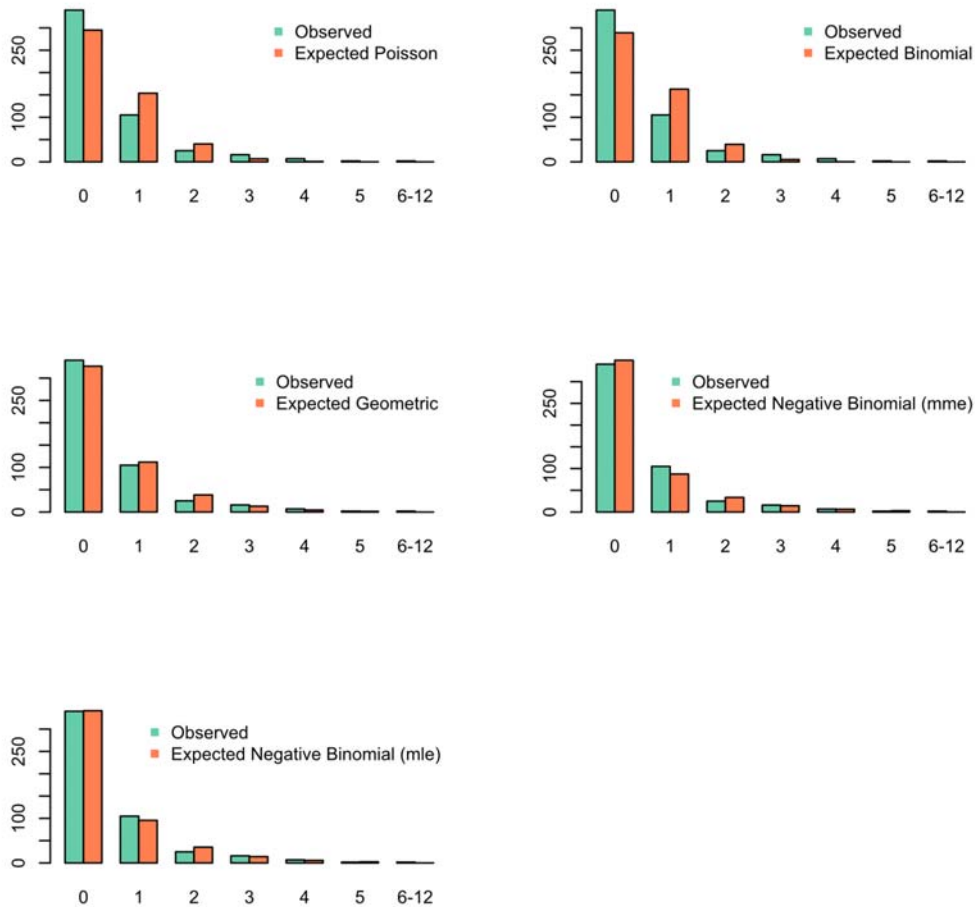


Figure A3.1 Results of fitting number of nests founded by each sub-colony in a season to established distributions. Negative binomial fit using MLE provides a very close fit to the real distribution.

Table A3.1 Results of fitting number of nests founded by each sub-colony in a season to established distributions. Negative binomial fit using MLE provides the best fit

	Distribution				
	Poisson	Binomial	Geometric	Negative Binomial (MME)	Negative Binomial (MLE)
Sum of residuals	0.01	0	0.78	2.64	1.85
Chi-squared statistic	27.85	34.95	6.12	4.86	4.25
p-value	0	0	0.41	0.56	0.64
MSE	678.28	899.5	60.13	67.76	29.67