

Multi-colony tracking reveals spatio-temporal variation in carry-over effects between breeding success and winter movements in a pelagic seabird

Maria I. Bogdanova*, Adam Butler, Sarah Wanless, Børge Moe, Tycho Anker-Nilssen, Morten Frederiksen, Thierry Boulinier, Lorraine S. Chivers, Signe Christensen-Dalsgaard, Sébastien Descamps, Michael P. Harris, Mark Newell, Bergur Olsen, Richard A. Phillips, Deryk Shaw, Harald Steen, Hallvard Strøm, Thorkell L. Thórarinsson, Francis Daunt

*Corresponding author: marib@ceh.ac.uk

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TABLE S1. Timing and distance of migratory movements in relation to breeding success in 2009 and colony location. Linear mixed models testing for relationships between breeding success in 2009 (BS), colony latitude (ColLat) and colony longitude (ColLon), and timing of subsequent migratory movements or winter residency period in the NW Atlantic. Best model shown in bold; models ordered by AICc (lowest to highest); NA indicates non-convergence. See Materials and methods for full details of analysis.

Model no.	Model	Number of parameters	AICc	AICc weight
a) Departure from colony area				
1	BS+ColLat+ColLong+ColLat:ColLong	6	504.6	0.28
2	BS+ColLat+ColLon+BS:ColLat+ColLat:ColLon	7	505.7	0.16
3	BS+ColLat+ColLon+BS:ColLon+ColLat:ColLon	7	505.7	0.16
4	BS+ColLat+ColLong	5	505.9	0.14
5	BS+ColLat+ColLon+BS:ColLat	6	506.8	0.09
6	BS+ColLat+ColLon+BS:ColLon	6	506.8	0.09
7	ColLat+ColLong+ColLat:ColLong	5	507.3	0.07
8	ColLat+ColLong	4	514.2	0.00
9	BS+ColLat	4	515.5	0.00
10	BS	3	515.8	0.00
11	BS+ColLat+BS:ColLat	5	516.1	0.00
12	Intercept only	2	516.4	0.00
13	ColLat	3	516.7	0.00
14	BS+ColLong	4	517.1	0.00
15	ColLong	3	517.6	0.00
16	BS+ColLon+BS:ColLon	5	518.1	0.00
17	BS+ColLat+ColLon+BS:ColLat+BS:ColLon+ColLat:ColLon+BS:ColLon:ColLat	9	NA	NA
18	BS+ColLat+ColLon+BS:ColLat+BS:ColLon+ColLat:ColLon	8	NA	NA
19	BS+ColLat+ColLon+BS:ColLat+BS:ColLon	7	NA	NA
b) Arrival at post-breeding area				
1	BS+ColLat+ColLon+BS:ColLat+BS:ColLon	7	392.5	0.43
2	BS+ColLat+ColLon+BS:ColLat+BS:ColLon+ColLat:ColLon	8	393.4	0.27
3	ColLat+ColLong+ColLat:ColLong	5	395.3	0.10
4	BS+ColLat+ColLong+ColLat:ColLong	6	395.7	0.09
5	BS+ColLat+ColLon+BS:ColLat+ColLat:ColLon	7	397.4	0.04
6	BS+ColLat+ColLon+BS:ColLon+ColLat:ColLon	7	397.4	0.04
7	BS+ColLat+ColLong	5	401.1	0.01
8	ColLat+ColLong	4	401.1	0.01
9	ColLat	3	402.0	0.00

10	BS+ColLat+ColLon+BS:ColLat	6	402.1	0.00
11	BS+ColLat+ColLon+BS:ColLon	6	402.6	0.00
12	Intercept only	2	402.7	0.00
13	BS+ColLat	4	403.1	0.00
14	ColLong	3	403.6	0.00
15	BS	3	403.9	0.00
16	BS+ColLat+BS:ColLat	5	404.1	0.00
17	BS+ColLong	4	404.9	0.00
18	BS+ColLon+BS:ColLon	5	405.9	0.00
19	BS+ColLat+ColLon+BS:ColLat+BS:ColLon+ColLat:ColLon+BS:ColLon:ColLat	9	NA	NA
c) Arrival at main wintering area				
1	BS+ColLat+ColLon+BS:ColLat+BS:ColLon+ColLat:ColLon+BS:ColLon:ColLat	9	861.5	0.20
2	BS+ColLat+ColLong+ColLat:ColLong	6	862.2	0.14
3	ColLat+ColLong+ColLat:ColLong	5	862.6	0.11
4	BS+ColLat+ColLon+BS:ColLat+ColLat:ColLon	7	863.3	0.08
5	BS+ColLat+ColLon+BS:ColLon+ColLat:ColLon	7	863.4	0.08
6	BS	3	864.1	0.05
7	BS+ColLat+ColLon+BS:ColLat+BS:ColLon+ColLat:ColLon	8	864.6	0.04
8	BS+ColLong	4	864.7	0.04
9	BS+ColLat	4	864.8	0.04
10	ColLong	3	865.1	0.03
11	ColLat	3	865.2	0.03
12	Intercept only	2	865.6	0.03
13	BS+ColLat+BS:ColLat	5	865.8	0.02
14	BS+ColLon+BS:ColLon	5	865.9	0.02
15	BS+ColLat+ColLong	5	865.9	0.02
16	ColLat+ColLong	4	866.3	0.02
17	BS+ColLat+ColLon+BS:ColLat	6	867.0	0.01
18	BS+ColLat+ColLon+BS:ColLon	6	867.1	0.01
19	BS+ColLat+ColLon+BS:ColLat+BS:ColLon	7	868.3	0.01
d) Winter residency period				
1	BS+ColLat+ColLon+BS:ColLat+BS:ColLon+ColLat:ColLon+BS:ColLon:ColLat	9	1158.9	0.11
2	BS+ColLat+ColLon+BS:ColLat+ColLat:ColLon	7	1159.1	0.10
3	ColLat+ColLong+ColLat:ColLong	5	1159.5	0.08
4	ColLong	3	1159.9	0.07
5	BS+ColLat+BS:ColLat	5	1160.0	0.06
6	Intercept only	2	1160.1	0.06
7	BS+ColLat+ColLon+BS:ColLon+ColLat:ColLon	7	1160.2	0.06
8	BS+ColLat+ColLon+BS:ColLat+BS:ColLon+ColLat:ColLon	8	1160.3	0.05
9	BS+ColLon+BS:ColLon	5	1160.5	0.05
10	BS+ColLat+ColLon+BS:ColLat	6	1160.5	0.05
11	ColLat	3	1160.5	0.05
12	BS+ColLat+ColLong+ColLat:ColLong	6	1160.7	0.04
13	BS+ColLong	4	1160.9	0.04
14	ColLat+ColLong	4	1161.0	0.04
15	BS	3	1161.1	0.04
16	BS+ColLat	4	1161.6	0.03
17	BS+ColLat+ColLon+BS:ColLat+BS:ColLon	7	1161.6	0.03
18	BS+ColLat+ColLon+BS:ColLon	6	1161.7	0.03
19	BS+ColLat+ColLong	5	1162.1	0.02
e) Departure from main wintering area				
1	BS+ColLat+ColLon+BS:ColLat+ColLat:ColLon	7	804.1	0.53
2	BS+ColLat+ColLon+BS:ColLat+BS:ColLon+ColLat:ColLon	8	805.3	0.30
3	BS+ColLat+ColLon+BS:ColLat+BS:ColLon+ColLat:ColLon+BS:ColLon:ColLat	9	806.6	0.16
4	BS+ColLat+ColLon+BS:ColLon+ColLat:ColLon	7	811.6	0.01
5	ColLat+ColLong+ColLat:ColLong	5	815.4	0.00
6	BS+ColLat+BS:ColLat	5	816.3	0.00
7	BS+ColLat+ColLon+BS:ColLat	6	816.5	0.00
8	BS+ColLat+ColLong+ColLat:ColLong	6	816.7	0.00

9	BS+ColLat+ColLon+BS:ColLat+BS:ColLon	7	817.6	0.00
10	BS	3	822.8	0.00
11	BS+ColLat+ColLon+BS:ColLon	6	823.1	0.00
12	BS+ColLon+BS:ColLon	5	823.4	0.00
13	BS+ColLat	4	823.7	0.00
14	Intercept only	2	823.9	0.00
15	BS+ColLong	4	824.0	0.00
16	BS+ColLat+ColLong	5	824.0	0.00
17	ColLat	3	824.5	0.00
18	ColLat+ColLong	4	824.7	0.00
19	ColLong	3	825.1	0.00
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f) Arrival in colony area				
1	ColLat+ColLong+ColLat:ColLong	5	804.4	0.39
2	BS+ColLat+ColLong+ColLat:ColLong	6	805.6	0.22
3	BS+ColLat+ColLon+BS:ColLon+ColLat:ColLon	7	806.7	0.13
4	BS+ColLat+ColLon+BS:ColLat+ColLat:ColLon	7	806.9	0.11
5	BS+ColLat+ColLon+BS:ColLat+BS:ColLon+ColLat:ColLon+BS:ColLon:ColLat	9	807.5	0.08
6	BS+ColLat+ColLon+BS:ColLat+BS:ColLon+ColLat:ColLon	8	807.8	0.07
7	Intercept only	2	822.9	0.00
8	ColLong	3	823.0	0.00
9	ColLat+ColLong	4	823.8	0.00
10	ColLat	3	823.8	0.00
11	BS	3	824.1	0.00
12	BS+ColLong	4	824.2	0.00
13	BS+ColLat	4	825.0	0.00
14	BS+ColLat+ColLong	5	825.0	0.00
15	BS+ColLon+BS:ColLon	5	825.3	0.00
16	BS+ColLat+ColLon+BS:ColLon	6	826.1	0.00
17	BS+ColLat+BS:ColLat	5	826.2	0.00
18	BS+ColLat+ColLon+BS:ColLat	6	826.3	0.00
19	BS+ColLat+ColLon+BS:ColLat+BS:ColLon	7	827.4	0.00

TABLE S2. Breeding success in 2010 in relation to breeding success in 2009 and timing of migratory movements in the 2009/10 winter. Exploratory analysis testing for relationships between breeding success in 2009 and individual migration timing, and breeding success in 2010. Generalised linear mixed models with colony identity as random effect were used; the analysis involved a comparison of the model containing the respective explanatory variable with the intercept only model.

Model no.	Model	Number of parameters	AICc
Breeding success in 2009 (n=97 individuals)			
1	Breeding success 2009	3	96.9
2	Intercept only	2	95.8
Departure from colony area (n=66 individuals)			
1	Timing (departure date)	3	39.6
2	Intercept only	2	38.9
Arrival in post-breeding area (n=50 individuals)			
1	Timing (arrival date)	3	41.8
2	Intercept only	2	40.6
Arrival in main wintering area (n=92 individuals)			
1	Timing (arrival date)	3	83.2
2	Intercept only	2	85.1
Winter residency period (n=113 individuals)			
1	Time (number of days)	3	106.2
2	Intercept only	2	105.4
Departure from main wintering area (n=92 individuals)			
1	Timing (arrival date)	3	84.3
2	Intercept only	2	85.1
Arrival in the colony area (n=103 individuals)			
1	Timing (arrival date)	3	98.7
2	Intercept only	2	97.6