

Supplementary material

Materials methods : We first identified the best model structure for the resighting probability (upper section), then for survival (middle section) and finally fidelity (lower section). Dots represent interactions between two effects. Sex = female or male; state = dead, alive within the colony during the breeding season monitoring, alive "elsewhere" (outside the breeding period, and/or outside the breeding colony); time = year; period = temporal variable in two periods during the regulation campaign (2010 – 2017) and after egg removal campaigns (2018 – 2022); sterilisation = the proportion of sterilized nests on the total number of counted nests of Herring Gulls. np is the number of parameters of each model used to calculate weight (w_i) and the QAICc. The **"best" model with best estimates and the lowest QAICc is marked in bold**, *poorly estimated models although the QAICc were lower are in italics* and # gives the number of the model.

Table S1: Model selection procedure for colour-ringed adult Herring Gulls, examining the effect of sex, state, time, period and sterilisation on the parameters ϕ = survival ; ψ = fidelity ; p = resighting.

#	Model parameterization	np	Deviance	QAICc	wi
model31	ϕ (i) ψ (i) p (i)	3	3457.25	3166.21	0.00
model69	ϕ (i) ψ (i) p (state)	4	3368.649	3087.2338	0.00
model70	ϕ (i) ψ (i) p (sex)	4	3375.5783	3093.5676	0.00
<i>model74</i>	<i>ϕ (i) ψ (i) p (time)</i>	##	<i>3354.7547</i>	<i>3092.7775</i>	<i>0.00</i>
<i>model75</i>	<i>ϕ (i) ψ (i) p (state.time)</i>	##	<i>3320.9354</i>	<i>3084.5011</i>	<i>0.00</i>
model78	ϕ (i) ψ (i) p (state.sex)	6	3366.998	3089.7576	0.00
model77	ϕ (state) ψ (i) p (state)	5	3344.4987	3067.1735	0.00
model79	ϕ (period) ψ (i) p (state)	5	3326.9071	3051.0935	0.00
model80	ϕ (time) ψ (i) p (state)	14	3313.4892	3057.1001	0.00
model81	ϕ (sex) ψ (i) p (state)	5	3368.1279	3088.7724	0.00
model82	ϕ (sterilisation) ψ (i) p (state)	5	3487.177	3197.5924	0.00
model85	ϕ (state.period) ψ (i) p (state)	7	3313.6732	3043.0357	0.00
model86	ϕ (sex.period) ψ (i) p (state)	7	3325.2846	3053.6494	0.00
model87	ϕ (state.period.sex) ψ (i) p (state)	11	3310.1446	3047.9248	0.00
model94	ϕ (state.period) ψ (state) p (state)	8	3295.4777	3028.4277	0.00
model88	ϕ (state.period) ψ (period) p (state)	8	3275.8316	3010.4696	0.00
model89	ϕ (state.period) ψ (time) p (state)	17	3262.8977	3017.0012	0.00
model90	ϕ (state.period) ψ (sex) p (state)	8	3313.6098	3045.0018	0.00
model98	ϕ (state.period) ψ (sterilisation) p (state)	8	3381.2053	3106.7892	0.00
model96	ϕ (state.period) ψ (state.period) p (state)	10	3249.9067	2990.8295	0.88
model93	ϕ (state.period) ψ (sex.period) p (state)	10	3717.8739	3418.5875	0.00
model97	ϕ (state.period) ψ (state.period.sex) p (state)	14	3245.2886	2994.7595	0.12

Table S2: Model selection procedure for colour-ringed adult Lesser Black-backed Gulls examining the effect of sex, state, time, period and sterilisation on the parameters ϕ = survival ; ψ = fidelity ; p = resighting.

#	Model parameterization	np	Deviance	QAICc	wi
model29	ϕ (i) ψ (i) p (i)	3	6039.53	3114.36	0.00
model33	ϕ (i) ψ (i) p (state)	4	5776.6005	2981.0508	0.00
model34	ϕ (i) ψ (i) p (sex)	4	5851.276	3019.4839	0.00
model35	ϕ (i) ψ (i) p (time)	13	5820.8751	3021.993	0.00
model38	ϕ (i) ψ (i) p (state.sex)	6	6354.6499	3282.5754	0.00
<i>model36</i>	<i>ϕ (i) ψ (i) p (state.time)</i>	<i>##</i>	<i>5678.3644</i>	<i>2971.0516</i>	<i>0.00</i>
model39	ϕ (state) ψ (i) p (state)	5	5768.4919	2978.8871	0.00
<i>model41</i>	<i>ϕ (time) ψ (i) p (state)</i>	<i>##</i>	<i>5720.8838</i>	<i>2972.5577</i>	<i>0.00</i>
model42	ϕ (sex) ψ (i) p (state)	5	5775.6232	2982.5574	0.00
model43	ϕ (sterilisation) ψ (i) p (state)	5	6107.8512	3153.5445	0.00
model40	ϕ (period) ψ (i) p (state)	5	5747.7872	2968.231	0.00
model45	ϕ (state.period) ψ (i) p (state)	7	5721.9288	2958.9475	0.00
model47	ϕ (sex.period) ψ (i) p (state)	7	5746.4923	2971.5895	0.00
model48	ϕ (state.period.sex) ψ (i) p (state)	11	5719.2391	2965.6361	0.00
model49	ϕ (state.period) ψ (state) p (state)	8	5705.8826	2952.7044	0.00
model52	ϕ (state.period) ψ (sex) p (state)	8	5721.1951	2960.5852	0.00
model50	ϕ (state.period) ψ (period) p (state)	8	5655.1641	2926.6012	0.09
model51	ϕ (state.period) ψ (time) p (state)	17	5626.4946	2930.0712	0.02
model56	ϕ (state.period) ψ (sterilisation) p (state)	8	5763.917	2982.5728	0.00
model54	ϕ (state.period) ψ (sex.period) p (state)	10	5654.1951	2930.1389	0.02
model7	ϕ (state.period) ψ (state.period) p (state)	10	5638.61	2922.11	0.84
model11	ϕ (state.period) ψ (state.period.sex) p (state)	14	5634.44	2928.06	0.04

Table S3: Model selection procedure on ringed adult Great Black-backed Gulls examining the effect of sex, state, time, period and sterilisation on the parameters ϕ = survival ; ψ = fidelity ; p = resighting.

#	Model parameterization	np	Deviance	QAICc	wi
model155	ϕ (i) ψ (i) p (i)	3	877.03	883.09	0.00
model127	ϕ (i) ψ (i) p (state)	4	872.7224	880.8274	0.00
model128	ϕ (i) ψ (i) p (sex)	4	864.9087	873.0137	0.03
model129	ϕ (i) ψ (i) p (time)	13	851.2559	878.2344	0.00
model132	ϕ (i) ψ (i) p (state.sex)	6	861.8143	874.036	0.02
model154	ϕ (i) ψ (i) p (sex.time)	24	830.7784	882.1025	0.00
model133	ϕ (state) ψ (i) p (sex)	5	862.5701	872.728	0.04
model135	ϕ (time) ψ (i) p (sex)	##	839.0521	868.1841	0.39
model136	ϕ (sex) ψ (i) p (sex)	5	864.7983	874.9562	0.01
model137	ϕ (sterilisation) ψ (i) p (sex)	5	1100.0133	1110.1712	0.00
model134	ϕ (period) ψ (i) p (sex)	5	862.4004	872.5583	0.04
model140	ϕ (state.period) ψ (i) p (sex)	7	859.9358	874.2321	0.02
model141	ϕ (sex.period) ψ (i) p (sex)	7	862.0784	876.3747	0.01
model158	ϕ (period) ψ (state) p (sex)	6	857.9224	870.144	0.15
model159	ϕ (period) ψ (sex) p (sex)	6	862.0363	874.2579	0.02
model160	ϕ (period) ψ (period) p (sex)	6	860.6115	872.8332	0.04
model161	ϕ (period) ψ (time) p (sex)	##	838.8741	870.1714	0.14
model167	ϕ (period) ψ (sterilisation) p (sex)	9	872.8892	891.3679	0.00
model162	ϕ (period) ψ (state.sex) p (sex)	8	857.4023	873.7843	0.02
model163	ϕ (period) ψ (state.period) p (sex)	8	855.7405	872.1225	0.05
model165	ϕ (period) ψ (state.period.sex) p (sex)	12	853.94	878.78	0.00