

Table A.1. Model selection statistics for the best hierarchical models (all sharing the same random effects Plot, Island, and Year) for predicting hatching success of thick-billed murres using climate and reproductive parameters on St. Paul and St. George Islands, Alaska in 1978-2009. Models are listed in order of best fit based on Akaike's information criterion (ΔAIC); only models with AIC model weight $W > 0$ are shown. See Table 1 for abbreviations of Fixed Effects.

Model	Fixed Effects	K ^a	ΔAIC^b	W ^c	LL ^d
Hatch7	PYS	5	0.00	0.17	-11281.31
Hatch6	PYS, SST	6	0.40	0.14	-11280.51
Hatch33	PYS, AO	6	0.95	0.11	-11280.78
Hatch37	PYS, PDO	6	0.98	0.10	-11280.80
Hatch22	PYS, WS	6	1.33	0.09	-11280.97
Hatch42	PYS, IRI	6	1.65	0.07	-11281.13
Hatch40	PYS, TIM	6	1.84	0.07	-11281.22
Hatch28	PYS, WM	6	2.00	0.06	-11281.30
Hatch5	PYS, SST, IRI,	7	2.39	0.05	-11280.50
Hatch4	PYS, SST, IRI, TIM	8	4.20	0.02	-11280.40
Hatch3	PYS, SST, IRI, TIM, PDO	9	5.16	0.01	-11279.88
Hatch9	SST	5	5.84	0.01	-11284.22
HatchNull		4	6.11	0.01	-11285.36
Hatch2	PYS, SST, IRI, TIM, PDO, AO	10	6.34	0.01	-11279.47
Hatch32	SST, AO	6	6.52	0.01	-11283.57
Hatch21	SST, WS	6	6.99	0.01	-11283.80

^aNumber of parameters in the model.

^bDifference in AIC values between each model and the top model.

^cAIC model weight.

^dModel log-likelihood.

Table A.2. Model averaged parameter estimates for predicting hatching success of thick-billed murres using climate and reproductive parameters on St. Paul and St. George Islands, Alaska in 1978-2009. Parameters are listed in order of importance values; only parameters appearing in models with AIC model weight (W)>0 are shown. Asterisks indicate significance of fixed effects based on 90% confidence intervals not overlapping with zero.

Parameter	Coefficient	SE	90% CI		Importance ^a
			Lower	Upper	
PYS	0.083	0.031	0.032	0.134 **	0.970
SST	-0.022	0.050	-0.104	0.060	0.270
IRI	0.002	0.029	-0.046	0.050	0.180
AO	0.008	0.030	-0.041	0.057	0.130
PDO	-0.007	0.026	-0.050	0.036	0.130
TIM	0.002	0.014	-0.021	0.025	0.120
WS	0.005	0.025	-0.036	0.046	0.100
WM	0.000	0.017	-0.028	0.028	0.070
(Intercept)	0.322	0.081	0.189	0.455	

^aRelative variable importance based on AIC weights.

Table A.3. Model selection statistics for the four best hierarchical models for predicting fledging success of thick-billed murres using climate and reproductive parameters on St. Paul and St. George Islands, Alaska in 1978-2009. Models are listed in order of best fit based on Akaike's information criterion (ΔAIC); only models with AIC model weight (W)>0 are shown.

Model	Fixed Effects	K ^a	ΔAIC^b	W^c	LL ^d
Fledge57	TIM, WS, HS	7	0.00	0.83	-4853.23
Fledge19	IRI, TIM, PDO, AO, WM, WS, HS	11	4.04	0.11	-4851.24
Fledge18	SST, IRI, TIM, PDO, AO, WM, WS, HS	12	5.79	0.05	-4851.11
FledgeFull	PYS, SST, IRI, TIM, PDO, AO, WM, WS, HS	13	7.53	0.02	-4850.98

^aNumber of parameters in the model.

^bDifference in AIC values between each model and the top model.

^cAIC model weight.

^dModel log-likelihood.

Table A.4. Model averaged parameter estimates for predicting fledging success of thick-billed murrelets using climate and reproductive parameters on St. Paul and St. George Islands, Alaska in 1978-2009. Parameters are listed in order of importance values; only parameters appearing in models with AIC model weight (W)_i>0 are shown. Asterisks indicate significance of fixed effects based on 90% confidence intervals not overlapping with zero.

Variable	Coefficient	SE	90% CI		Importance ^a
			Lower	Upper	
HS	0.250	0.042	0.181	0.319 **	1.000
TIM	-0.228	0.047	-0.305	-0.151 **	1.000
WS	0.006	0.063	-0.097	0.109	1.000
AO	-0.015	0.041	-0.082	0.052	0.170
IRI	0.008	0.033	-0.046	0.062	0.170
WM	0.008	0.041	-0.059	0.075	0.170
PDO	0.004	0.026	-0.039	0.047	0.170
SST	0.003	0.026	-0.040	0.046	0.060
PYS	0.000	0.006	-0.010	0.010	0.020
(Intercept)	1.530	0.070	1.415	1.645	

^aRelative variable importance based on AIC weights.

Table A.5. Model selection statistics for hierarchical models for predicting fledging success of thick-billed murres using diet on St. Paul and St. George Islands, Alaska in 1978-2010. Models are listed in order of best fit based on Akaike's information criterion (ΔAIC); all models are shown.

Model	Fixed Effects	K ^a	ΔAIC^b	W ^c	LL ^d
Fledge3	HS, MYCT	6	0.00	0.77	-1544.20
Fledge2	HS, SAND	6	4.80	0.07	-1546.60
Fledge9	HS	5	5.97	0.04	-1548.18
Fledge8	HS, EUPH	6	6.39	0.03	-1547.39
Fledge5	HS, FISH	6	7.42	0.02	-1547.91
Fledge4	HS, CAPE	6	7.53	0.02	-1547.96
Fledge6	HS, SQD	6	7.72	0.02	-1548.06
Fledge1	HS, POLL	6	7.92	0.01	-1548.16
Fledge7	HS, AMPH	6	7.97	0.01	-1548.18
FledgeFull	HS, POLL, SAND, MYCT, CAPE, FISH, SQD, AMPH, EUPH	13	10.26	0.00	-1542.29
FledgeNull		4	10.38	0.00	-1551.39

^aNumber of parameters in the model.

^bDifference in AIC values between each model and the top model.

^cAIC model weight.

^dModel log-likelihood.

Table A.6. Parameter estimates for models predicting fledging success of thick-billed murres using diet on St. Paul and St. George Islands, Alaska in 1978-2010. Only models with $\Delta AIC < 2$ are shown. Asterisks indicate significance of fixed effects based on 90% confidence intervals not overlapping with zero.

Model	Variable	Coefficient	SE	90% CI	
				Lower	Upper
Fledge3	HS	0.217	0.071	0.101	0.333 **
	MYCT	-0.180	0.060	-0.278	-0.082 **
	(Intercept)	1.478	0.104	1.307	1.649

Table A.7. Model selection statistics for the best hierarchical models for predicting laying success of black-legged kittiwakes using climate and reproductive parameters on St. Paul and St. George Islands, Alaska in 1978-2009. Models are listed in order of best fit based on Akaike's information criterion (ΔAIC); only models with AIC model weight (W)>0 are shown.

Model	Fixed Effects	K ^a	ΔAIC ^b	W ^c	LL ^d
Lay24	TIM, WM	6	0.00	0.32	-5456.84
Lay10	TIM	5	1.57	0.15	-5458.62
Lay18	TIM, WS	6	2.70	0.08	-5458.19
Lay29	TIM, AO	6	3.01	0.07	-5458.34
Lay39	TIM, PYS	6	3.08	0.07	-5458.38
Lay37	TIM, IRI	6	3.17	0.07	-5458.43
Lay38	TIM, SST	6	3.36	0.06	-5458.52
Lay33	TIM, PDO	6	3.44	0.06	-5458.56
Lay48	TIM, WM, WS	8	3.46	0.06	-5456.56
Lay44	TIM, PDO, AO, WM, WS	9	5.44	0.02	-5456.55
Lay4	TIM, PYS, SST, IRI	8	5.67	0.02	-5457.67
Lay43	TIM, IRI, PDO, AO, WM, WS	10	7.44	0.01	-5456.55
Lay3	TIM, PYS, SST, IRI, PDO	9	7.66	0.01	-5457.67

^aNumber of parameters in the model.

^bDifference in AIC values between each model and the top model.

^cAIC model weight.

^dModel log-likelihood.

Table A.8. Model averaged parameter estimates for predicting laying success of black-legged kittiwakes using climate and reproductive parameters on St. Paul and St. George Islands, Alaska in 1978-2009. Parameters are listed in order of importance values; only parameters appearing in models with AIC model weight (W)>0 are shown. Asterisks indicate significance of fixed effects based on 90% confidence intervals not overlapping with zero.

Variable	Coefficient	SE	90% CI		Importance ^a
			Lower	Upper	
TIM	-0.641	0.102	-0.808	-0.474 **	1.00
WM	0.108	0.158	-0.151	0.367	0.48
WS	0.013	0.072	-0.105	0.131	0.20
AO	-0.015	0.061	-0.115	0.085	0.18
PDO	0.002	0.038	-0.060	0.064	0.11
SST	-0.008	0.052	-0.093	0.077	0.10
IRI	-0.009	0.052	-0.094	0.076	0.04
PYS	0.007	0.038	-0.055	0.069	0.03
(Intercept)	1.050	0.200	0.722	1.378	

^aRelative variable importance based on AIC weights.

Table A.9. Model selection statistics for the best hierarchical models for predicting hatching success of black-legged kittiwakes using climate and reproductive parameters on St. Paul and St. George Islands, Alaska in 1978-2009. Models are listed in order of best fit based on Akaike's information criterion (ΔAIC); only models with AIC model weight (W)>0 are shown.

Model	Fixed Effects	K ^a	ΔAIC ^b	W ^c	LL ^d
Hatch30	PYS, LS	6	0.00	0.98	-4102.08
HatchFull	PYS, LS, SST, IRI, TIM, PDO, AO, WM, WS, LS	13	9.34	0.01	-4099.73

^aNumber of parameters in the model.

^bDifference in AIC values between each model and the top model.

^cAIC model weight.

^dModel log-likelihood.

Table A.10. Model averaged parameter estimates for predicting hatching success of black-legged kittiwakes using climate and reproductive parameters on St. Paul and St. George Islands, Alaska in 1978-2009. Parameters are listed in order of importance values; only parameters appearing in models with AIC model weight (W)>0 are shown. Asterisks indicate significance of fixed effects based on 90% confidence intervals not overlapping with zero.

Variable	Coefficient	SE	90% CI		Importance ^a
			Lower	Upper	
LS	0.652	0.091	0.503	0.801 **	1.00
PYS	0.595	0.150	0.349	0.841 **	1.00
IRI	-0.007	0.084	-0.145	0.131	0.01
SST	-0.006	0.079	-0.136	0.124	0.01
WS	0.005	0.068	-0.107	0.117	0.01
WM	-0.004	0.065	-0.111	0.103	0.01
TIM	-0.002	0.027	-0.046	0.042	0.01
PDO	0.002	0.038	-0.060	0.064	0.01
AO	0.000	0.028	-0.046	0.046	0.01
(Intercept)	-0.250	0.283	-0.714	0.214	

^aRelative variable importance based on AIC weights.

Table A.11. Model selection statistics for the best hierarchical models for predicting fledging success of black-legged kittiwakes using climate and reproductive parameters on St. Paul and St. George Islands, Alaska in 1978-2009. Models are listed in order of best fit based on Akaike's information criterion (ΔAIC); only models with AIC model weight (W)>0 are shown.

Model	Fixed Effects	K ^a	ΔAIC^s	W ^c	LL ^d
Fledge59	HS, Timing, WS	7	0.00	0.24	-2389
Fledge19	HS, IRI, Timing, PDO, AO, WM, WS	11	0.14	0.22	-2385
Fledge27	HS, Timing	6	0.84	0.16	-2390
Fledge18	HS, IRI, Timing, PDO, AO, WM, WS, SST	12	1.54	0.11	-2385
FledgeFull	HS, IRI, Timing, PDO, AO, WM, WS, SST, PYS	13	3.54	0.04	-2385
Fledge28	HS, IRI	6	3.55	0.04	-2392
Fledge23	HS, WS	6	4.04	0.03	-2392
Fledge17	HS	5	4.18	0.03	-2393
Fledge29	HS, SST	6	4.26	0.03	-2392
Fledge24	HS, WM	6	4.31	0.03	-2392
Fledge22	HS, WM, WS	7	5.24	0.02	-2392
Fledge26	HS, PDO	6	5.91	0.01	-2393
Fledge30	HS, PYS	6	6.08	0.01	-2393
Fledge25	HS, AO	6	6.14	0.01	-2393
Fledge60	HS, WM, AO	7	6.21	0.01	-2392
Fledge21	HS, WM, WS, AO	8	6.80	0.01	-2391

^aNumber of parameters in the model.

^bDifference in AIC values between each model and the top model.

^cAIC model weight.

^dModel log-likelihood.

Table A.12. Model averaged parameter estimates for predicting fledging success of black-legged kittiwakes using climate and reproductive parameters on St. Paul and St. George Islands, Alaska in 1978-2009. Parameters are listed in order of importance values; only parameters appearing in models with AIC model weight (W)>0 are shown. Asterisks indicate significance of fixed effects based on 90% confidence intervals not overlapping with zero.

Variable	Coefficient	SE	90% CI		Importance ^a
			Lower	Upper	
HS	1.040	0.105	0.868	1.212 **	1.00
Timing	0.234	0.163	-0.033	0.501	0.77
WS	0.166	0.187	-0.141	0.473	0.67
WM	0.025	0.134	-0.195	0.245	0.44
IRI	-0.120	0.176	-0.409	0.169	0.42
AO	-0.036	0.091	-0.185	0.113	0.40
PDO	-0.065	0.115	-0.254	0.124	0.39
SST	0.029	0.101	-0.137	0.195	0.18
PYS	0.000	0.027	-0.044	0.044	0.05
(Intercept)	-0.042	0.149	-0.286	0.202	

^aRelative variable importance based on AIC weights.

Table A.13. Model selection statistics for hierarchical models for predicting fledging success of black-legged kittiwakes using diet on St. Paul and St. George Islands, Alaska in 1978-2009.

Models are listed in order of best fit based on Akaike's information criterion (ΔAIC); all models are shown.

Model	Fixed Effects	K ^a	ΔAIC^b	W ^c	LL ^d
Fledge7	HS, AMPH	6	0.00	0.36	-1242.76
Fledge10	HS	5	2.34	0.11	-1244.94
Fledge1	HS, POLL	6	2.91	0.08	-1244.22
Fledge6	HS, SQD	6	3.18	0.07	-1244.36
Fledge8	HS, EUPH	6	3.22	0.07	-1244.38
Fledge4	HS, CAPE	6	3.33	0.07	-1244.43
Fledge2	HS, SAND	6	3.55	0.06	-1244.54
Fledge9	HS, NMDS	6	3.72	0.06	-1244.63
Fledge5	HS, FISH	6	4.20	0.04	-1244.86
Fledge3	HS, MYCT	6	4.31	0.04	-1244.92
FledgeFull	HS, POLL, SAND, MYCT, CAPE, FISH, SQD, AMPH, EUPH	13	5.60	0.02	-1238.49
FledgeNull		4	60.67	0.00	-1275.11

^aNumber of parameters in the model.

^bDifference in AIC values between each model and the top model.

^cAIC model weight.

^dModel log-likelihood.

Table A.14. Parameter estimates for models predicting fledging success of black-legged kittiwakes using diet on St. Paul and St. George Islands, Alaska in 1978-2009. Only models with $\Delta AIC < 2$ are shown. Asterisks indicate significance of fixed effects based on 90% confidence intervals not overlapping with zero.

Model	Variable	Coefficient	SE	90% CI	
				Lower	Upper
Fledge7	HS	0.987	0.128	0.777	1.197 **
	AMPH	-0.397	0.158	-0.656	-0.138 **
	(Intercept)	-0.289	0.165	-0.560	-0.018 **