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Supplementary material

Appendix I. Model selection results of the multistate models describing resighting, survival and transition probabilities of black-tailed godwits.

In the first selection step of the mark-resighting multistate model, the step for resighting probability, two models were within 2 ΔAICc, however one model had only one extra parameter without lowering the AICc and was therefore not competitive (Arnold 2010). Consequently, the best model showed only an effect of age and markings on resighting probability (Table A1a). In the next selection step, in which apparent survival was modelled, two models were within 2 ΔAICc. The best supported model showed, in addition to the predicted grassland type effect, a year-dependent survival on chicks ringed in the nest. The second best supported model did not show this year-dependent effect for chicks ringed in the nest. Both models showed an effect of grassland type on survival of the chicks ringed at an older age and a time-dependent survival for adults, but adult survival was not affected by grassland type (Table A1b). At the last step, in which transitions between grassland types were modelled, two models were within 2 ΔAICc. Both models included an age and grassland type dependent transition probability (Table A1c).

Reference

Arnold, T. W. 2010. Uninformative parameters and model selection using Akaike's Information Criterion. - J. Wildl. Manag. 74: 1175-1178.

Table AIa. Model selection of the first step, resighting probability structure, of the multistate mark-recapture models of black-tailed godwits breeding on meadows and monocultures. The model structure for apparent survival and transition probability were kept with fullest parameterization. The two models shown in bold are within 2 ΔAICc and were used for the second step, modelling apparent survival structure.

Resighting probability	npar	AICc	ΔAICc	weight	Deviance
a2 - ring+hab/ring+hab	**52**	**3042.46**	**0.00**	**0.50**	**410.72**
a2 - ring/ring	**51**	**3042.87**	**0.40**	**0.41**	**413.20**
a2 - ring+hab+time/ring+hab+time	56	3046.07	3.60	0.08	406.00
a2 – ring×hab/ring×hab	56	3049.59	7.13	0.01	409.53
a2 – ring×hab+time/ring×hab+time	60	3053.24	10.77	0.00	404.82
a2 – ring×time+hab/ring×time+hab	71	3074.07	31.61	0.00	402.58
a2 - ring×hab×time/ring×hab×time	94	3111.11	68.65	0.00	390.74

Model notations: a2 is two age classes, ring is effect of marking (engraved codeflag or colour ring combination), hab is effect of grassland type, time is year effect. Additional effects are notated with + and interaction effects with ×. Notations before the slash are for birds in their second year and after the slash for birds older than two years old.

Table AIb. Model selection in the second step, apparent survival structure, of the multistate mark-recapture models of black-tailed godwits breeding on meadows and monocultures. The model structure for transition probability were kept with fullest parameterization. The four models shown in bold are within 2 ΔAICc and were used for the second step, modelling apparent survival structure.

model	npar	AICc	DeltaAICc	weight	Deviance
a3 - hab*time/hab/time	**27**	**3000.98**	**0.00**	**0.39**	**420.71**
a3 - hab/hab/time	**21**	**3002.09**	**1.11**	**0.22**	**434.04**
a3 - hab*time/./time	26	3003.14	2.16	0.13	424.91
a3 - hab/./time	20	3004.27	3.30	0.07	438.25
a3 - hab/hab/.	17	3004.95	3.98	0.05	445.02
a3 - hab*time/time/time	30	3006.40	5.42	0.03	420.01
a3 - hab*time/./hab	23	3006.44	5.46	0.03	434.32
a3 - hab/./.	16	3007.27	6.29	0.02	449.35
a3 - hab/time/time	24	3007.45	6.47	0.02	433.30
a3 - hab*time/hab/.	23	3008.31	7.33	0.01	436.20
a3 - hab/hab/hab	19	3008.65	7.67	0.01	444.65
a3 - hab/./hab	17	3008.86	7.88	0.01	448.92
a3 - hab*time/time/hab	27	3009.84	8.86	0.00	429.57
a3 - hab*time/./.	22	3010.62	9.64	0.00	440.53
a3 - hab/time/.	20	3010.62	9.64	0.00	444.60
a3 - hab/hab/hab*time	26	3010.71	9.73	0.00	432.48
a3 - hab*time/./hab*time	31	3011.73	10.75	0.00	423.29
a3 - hab*time/hab/hab*time	33	3011.73	10.75	0.00	419.20
a3 - hab/time/hab	21	3012.22	11.24	0.00	444.17
a3 - hab*time/hab/hab	25	3012.31	11.33	0.00	436.12
a3 - hab/hab*time/time	29	3012.36	11.38	0.00	428.01
a3 - hab/./hab*time	25	3012.79	11.81	0.00	436.60
a3 - hab*time/time/.	26	3014.00	13.02	0.00	435.78
a3 - hab*time/time/hab*time	35	3015.02	14.04	0.00	418.38
a3 - hab/hab*time/.	25	3015.50	14.52	0.00	439.31
a3 - hab/time/hab*time	29	3015.98	15.01	0.00	431.63
a3 - hab*time/hab*time/.	31	3018.93	17.95	0.00	430.49
a3 - hab/hab*time/hab	27	3019.21	18.23	0.00	438.94
a3 - hab*time/hab*time/hab	33	3022.95	21.97	0.00	430.41
a3 - hab/hab*time/hab*time	35	3023.09	22.11	0.00	426.45
a3 - hab*time/hab*time/time	41	3029.97	28.99	0.00	420.99
a3 - hab*time/hab*time/hab*time	51	3042.87	41.89	0.00	413.20

Model notations: a3 is three age classes, . is constant, hab is effect of grassland type, time is year effect. Interaction effects with ×. The slashes marks the different age classes.

Table AIc: Last step in model selection, describing transition probabilities, of the multistate mark-recapture models of black-tailed godwits breeding on meadows and monocultures.

model	npar	AICc	ΔAICc	weight	Deviance
S(a3 - hab*time/hab/time) Psi(a2 - hab/hab+)	**25**	**2997.30**	**0.00**	**0.42**	**421.11**
S(a3 - hab/hab/time) Psi(a2 - hab/hab+)	**19**	**2998.43**	**1.13**	**0.24**	**434.44**
S(a3 - hab*time/hab/time) Psi(hab)	23	2999.60	2.30	0.13	427.48
S(a3 - hab/hab/time) Psi(hab)	17	3000.75	3.44	0.07	440.81
S(a3 - hab*time/hab/time) Psi(a2 - hab/hab)	27	3000.98	3.67	0.07	420.71
S(a3 - hab/hab/time) Psi(a2 - hab/hab)	21	3002.09	4.79	0.04	434.04
S(a3 - hab*time/hab/time) Psi(a2 - ./hab)	25	3003.45	6.15	0.02	427.26
S(a3 - hab/hab/time) Psi(a2 - ./hab)	19	3004.58	7.28	0.01	440.59
S(a3 - hab*time/hab/time) Psi(a2 - hab/.)	25	3051.06	53.76	0.00	474.87
S(a3 - hab/hab/time) Psi(a2 - hab/.)	19	3052.19	54.88	0.00	488.20
S(a3 - hab*time/hab/time) Psi(.)	22	3061.84	64.54	0.00	491.76
S(a3 - hab*time/hab/time) Psi(a2 - ./.)	24	3062.36	65.06	0.00	488.21
S(a3 - hab/hab/time) Psi(.)	16	3063.00	65.70	0.00	505.09
S(a3 - hab/hab/time) Psi(a2 - ./.)	18	3063.50	66.20	0.00	501.53

Model notations: a2 is two age classes, a3 is three age classes, . is constant, hab is effect of grassland type, time is year effect, ring is effect of marking (engraved codeflag or colour ring combination). Additional effects are notated with + and interaction effects with ×. The slashes marks the different age classes.

Appendix 2.

Table A2. Real parameter estimates of the three competing models from the last step. The estimates are probabilities per year for birds found with a nest.

	model 1		model 2	
	estimate ± SE	95% CI	estimate ± SE	95% CI
survival probability				
young chicks				
meadows			0.034 ± 0.016	0.013-0.084
meadows 2008	0.032 ± 0.022	0.008-0.116		
meadows 2009	0.024 ± 0.018	0.005-0.103		
meadows 2010	0.096 ± 0.065	0.024-0.317		
meadows 2011	0.000 ± 0.000	0.000-0.000		
monocultures			0.019 ± 0.013	0.005-0.071
monocultures 2008	0.000 ± 0.000	0.000-0.000		
monocultures 2009	0.000 ± 0.000	0.000-0.000		
monocultures 2010	0.085 ± 0.069	0.016-0.348		
monocultures 2011	0.000 ± 0.000	0.000-0.000		
old chicks				
meadows	0.304 ± 0.052	0.213-0.414	0.305 ± 0.052	0.213-0.414
monocultures	0.150 ± 0.051	0.075-0.279	0.150 ± 0.051	0.075-0.279
adults				
2007	0.764 ± 0.053	0.647-0.852	0.765 ± 0.053	0.647-0.852
2008	0.734 ± 0.043	0.641-0.810	0.735 ± 0.043	0.642-0.811
2009	0.779 ± 0.040	0.692-0.847	0.777 ± 0.040	0.690-0.846
2010	0.773 ± 0.040	0.686-0.842	0.764 ± 0.040	0.678-0.833
2011	0.932 ± 0.059	0.687-0.989	0.945 ± 0.059	0.647-0.994
resighting probability				
2nd year birds				
CC	0.149 ± 0.047	0.078-0.264	0.148 ± 0.047	0.078-0.264
CF	0.049 ± 0.040	0.009-0.215	0.066 ± 0.047	0.016-0.239
adults				
CC	0.566 ± 0.022	0.522-0.609	0.566 ± 0.022	0.522-0.609
CF	0.234 ± 0.143	0.060-0.593	0.325 ± 0.169	0.097-0.685
transition probabiltiy				
adults				
meadows to monocultures	0.041 ± 0.008	0.028-0.061	0.041 ± 0.008	0.028-0.061
monocultures to meadows	0.237 ± 0.031	0.182-0.304	0.237 ± 0.031	0.182-0.304
young				
meadows to monocultures	0.160 ± 0.062	0.071-0.320	0.160 ± 0.062	0.071-0.320
monocultures to meadows	0.581 ± 0.122	0.341-0.787	0.581 ± 0.122	0.341-0.787

CC: chicks marked with a colour ring combination, CF: chicks marked with a codeflag.