

## Supplementary material

Table S1. Results of goodness-of-fit tests of the seven capture-resighting (capture-recapture for Iceland) data sets. Besides basic summary data, the table shows the results of the four components of the U-CARE goodness-of-fit test, and the two directional tests for trap-dependence and transience. The summed goodness-of-fit test (excluding trap-dependence) is also shown, along with the median c-hat test in MARK.

Dataset		Coats	Bjørnøya	Diabasodden	Ossian Sars	Jan Mayen	Kippaku	Iceland
Years		1990-2019	1986-2019	2005-2019	2009-2019	2011-2019	2009-2018	2013-2020
Years missed		2	2	0	0	0	0	0
Birds		288	357	454	204	158	142	105
N_effect		1882	1545	1663	906	585	401	219
Mean annual N		70	50	128	101	84	50	37
3.SR	Chi2	9.83	12	34.5	15.6	2.83	2.49	7.61
	df	25	24	12	9	7	4	5
	p	0.997	0.98	0.0006	0.077	0.9	0.65	0.179
Transience	z	0.017	0.49	2.76	0.86	-0.94	0.023	2.28
	p	0.49	0.31	0.0028	0.19	0.83	0.49	0.011
3.SM	Chi2	33.4	19.4	18.7	2.37	5.66	1.54	2.75
	df	24	21	15	8	6	3	4
	p	0.095	0.56	0.23	0.97	0.46	0.67	0.6
2.CT	Chi2	205	129	90.8	75.6	42.4	11.1	18.6
	df	23	29	12	8	6	6	5
	p	0	1.20E-14	3.50E-14	3.80E-13	1.50E-07	8.70E-02	2.30E-03
Trap-happiness	z	-9.62	-7.07	-8.9	-8.15	-5.75	-2.43	-3.14
	p	0	1.50E-12	0	3.33E-16	9.20E-09	0.015	0.0017
2.CL	Chi2	7.34	51.6	24.4	4.69	14.8	0.29	0
	df	17	34	20	7	5	5	3
	p	0.98	0.027	0.22	0.7	0.011	0.998	1

Overall test without trapdep	Chi2	50.57	83	77.6	22.66	23.29	4.32	10.36
	df	66	79	47	24	18	12	12
	p	0.92	0.36	0.0033	0.54	0.18	0.98	0.58
Median c-hat, trap-dep model		1	1	1.07	1.12	1.17	1	1.24

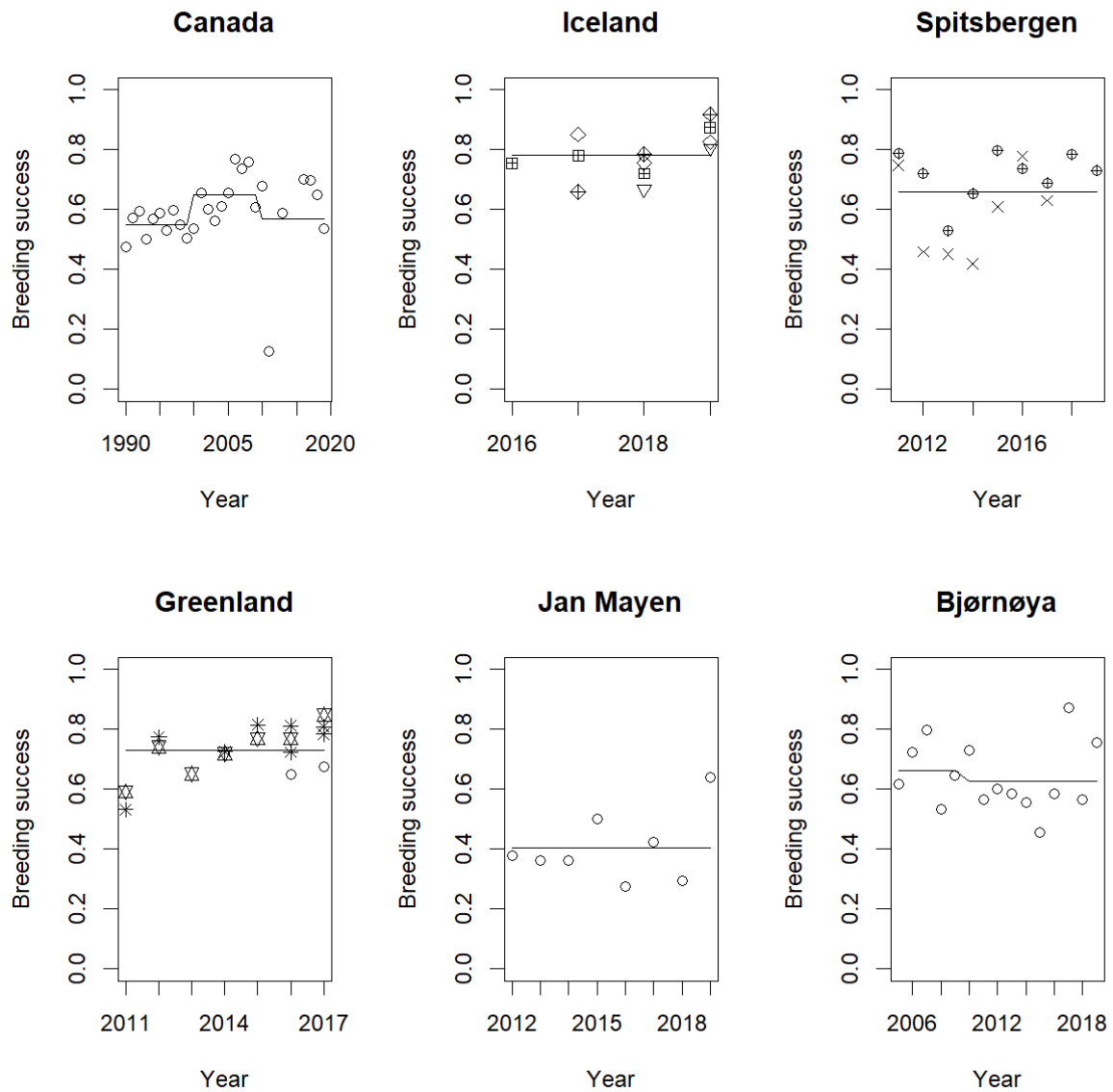


Fig S1. Estimated mean breeding success ('fledged' chicks per occupied nest site) in the 12 study colonies, grouped by region. Symbols show annual means for each colony (or plot, in the case of Kippaku), and lines show decadal means for each region.

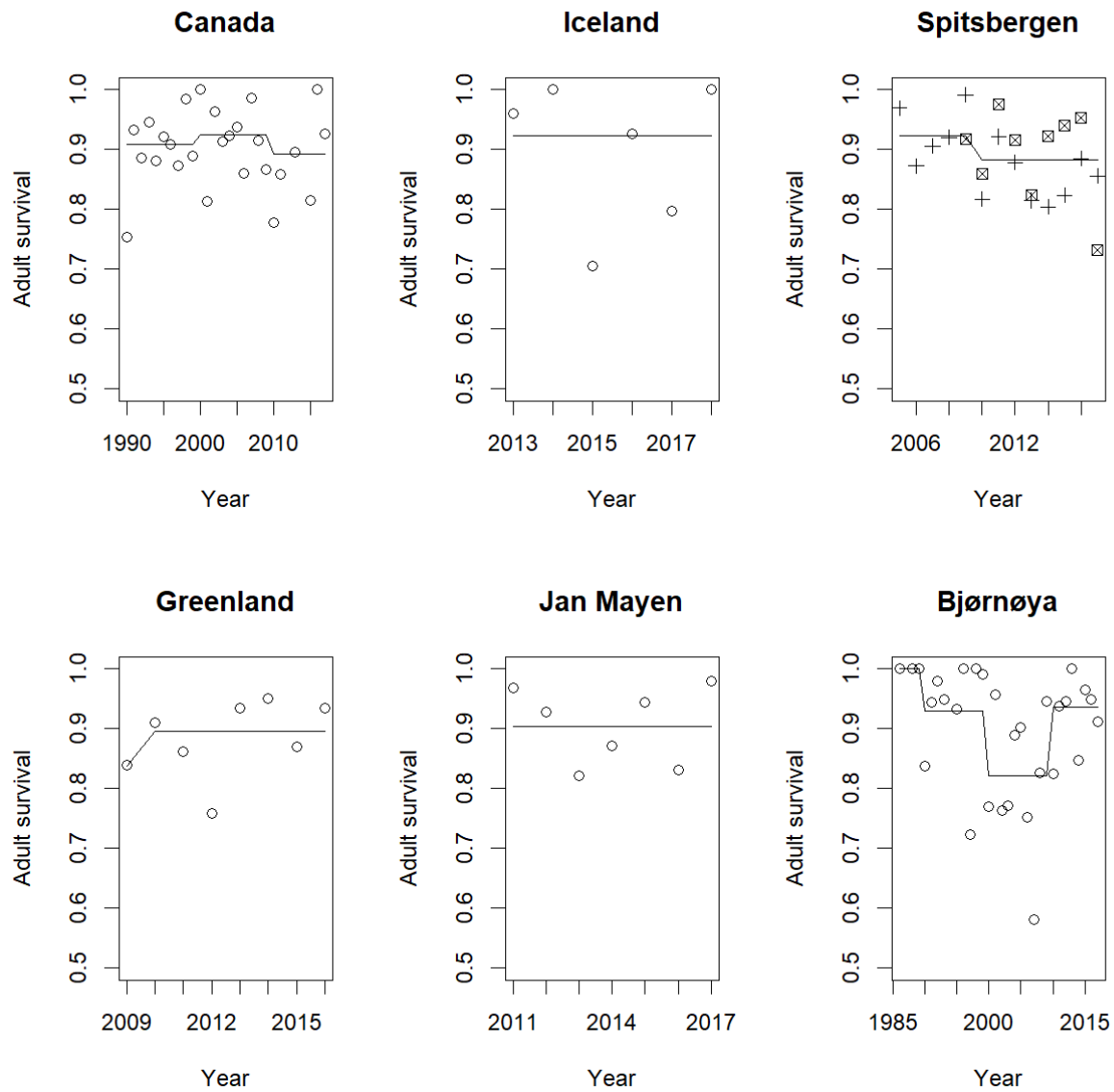


Fig S2. Estimated mean adult survival in the seven study colonies (counting Iceland as one colony), grouped by region. Symbols show annual means for each colony, and lines show decadal means for each region. The last estimate in each time series is not shown, as the final survival estimate in a fully time-dependent CMR model is not estimable.

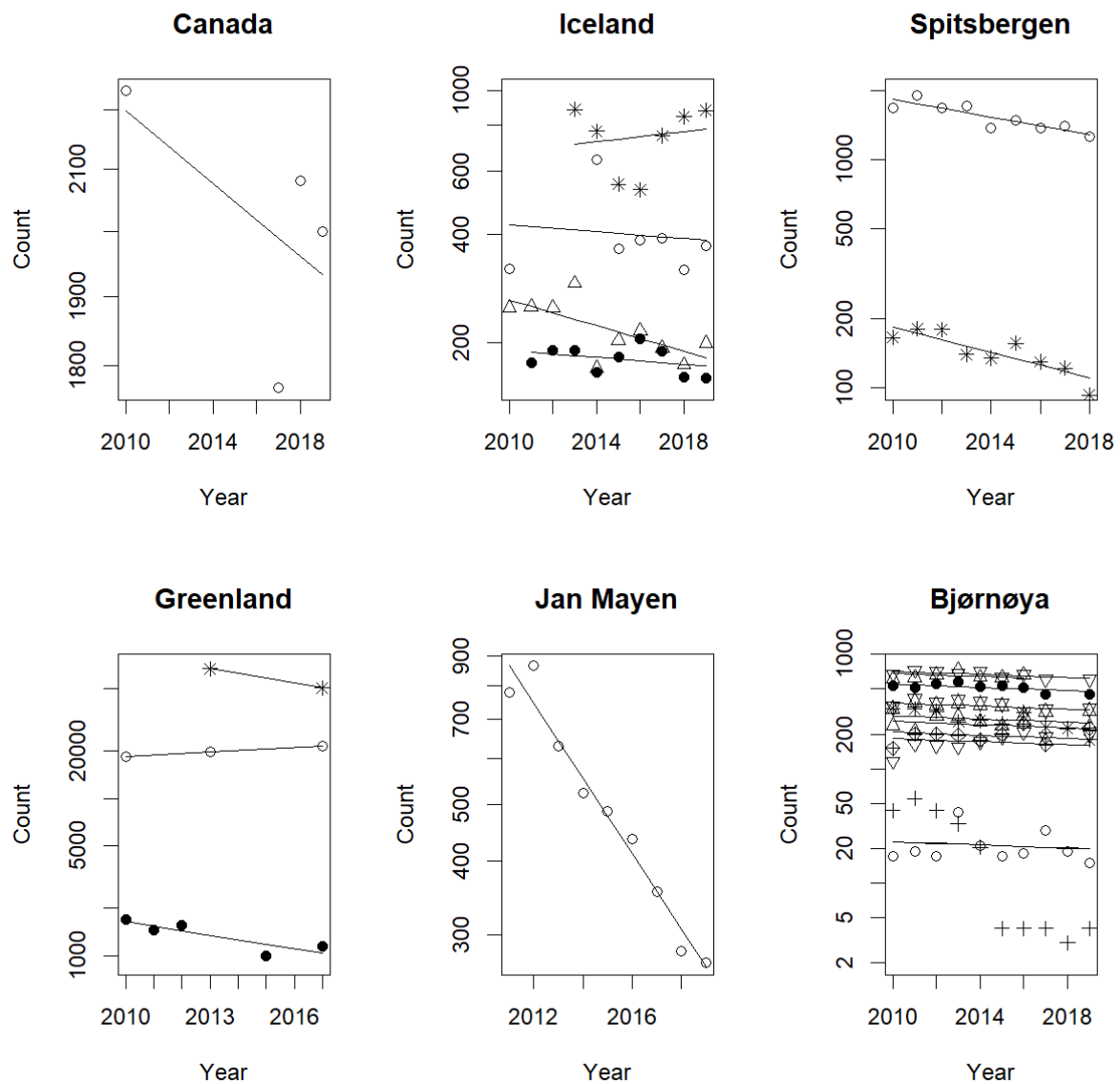


Fig S3. Counts and estimated growth rates of the 12 study colonies during the 2010s, grouped by region. Symbols show annual counts for each colony (except Bjørnøya where ten plots are shown with different symbols), and lines show fitted values from the quasi-Poisson regression. Note that y axes are on a log scale. Values shown are plot or transect counts, except for Greenland where they are total counts of birds present in the colony (corrected for diel and day-to-day variation in attendance, not converted to breeding pairs).