

Supplementary material for: Merkel F.R., Johansen K.L., Nielsen R.D., Petersen I.K., Sterup J. & Mosbech A. 2019. Wintering seabirds in south-west Greenland, 2017. *Polar Research* 38. Correspondence: Flemming Ravn Merkel, Department of Bioscience, Aarhus University, Frederiksborgvej 399, 4000 Roskilde, Denmark, frm@bios.au.dk.

Supplementary Table S1. Distance sampling parameters and derived abundance estimates of wintering seabird populations off south-western Greenland based on aerial surveys in 2017 (2-17 March) in coastal areas, fjords and on the offshore bank Store Hellefiskebanke (St. HFB). Fjords were covered as total count surveys (see Materials and methods). Coefficients of variation, calculated as standard error in proportion to the mean, are indicated in parentheses.

Species and stratum	Area (km ²)	Effective strip width (km)	Right-truncation (m)	Key function + Series expan.	Effort L (km)	% Area surv.	Sighting (n)	Sighting rate (n/L)	Flock size S	Density (D) (no. km ⁻²)	Abundance estimate 2017 95% CI		
											N	Lower	Upper
Common eider													
Coastal, S < 10	22 250	0.229 (0.03)	1087	Hazard-rate ^a	1825	3.8	1343	0.74 (0.10)	2.7 (0.02) ^b	4.3 (0.10)	94 962	77 817	115 886
Coastal, 10 ≤ S < 100	22 250	0.444 (0.04)	1450	Half-normal ^a	1825	7.3	473	0.26 (0.13)	17.3 (0.03) ^b	5.1 (0.14)	112 373	85 389	147 885
Coastal, S ≥ 100	22 250	1.043 (0)	1087	Strip-census	1825	17.1	20	0.01 (0.36)	208.0 (0.17)	1.1 (0.40)	24 315	11 380	51 954
Coastal, total	22 250				1825		1836				231 651	194 065	276 517
Fjords				Total count	3163		1732		121.7 (-)		211 025	–	–
Total					4988		3568				442 676	405 090	487 542
King eider													
Coastal, north	9219	0.240 (0.11)	1087	Hazard-rate	780	4.1	220	0.28 (0.17)	3.7 (0.10) ^b	2.18 (0.23)	20 110	13 015	31 074
Coastal, south	13 031	0.240 (0.11)	1087	Hazard-rate	1045	3.8	6	0.006 (0.45)	3.7 (0.10) ^b	0.04 (0.48)	579	239	1402
Coastal, total	22 250				1825		226				20 689	13 539	31 615
Fjords				Total count	3163		35		26.7 (-)		1158	–	–
St. HFB, S < 250	11 124	0.401 (0.17)	1087	Half-normal + Cos	670	4.8	30	0.05 (0.35)	56.6 (0.20)	3.2 (0.44)	35 091	15 321	80 374
St. HFB, S ≥ 250	11 124	1.043 (0)	1087	Strip-census	670	12.6	37	0.06 (0.41)	3546 (0.19)	93.8 (0.46)	1043 670	445 988	2442 324

Species and stratum	Area (km ²)	Effective strip width (km)	Right-truncation (m)	Key function + Series expan.	Effort L (km)	% Area surv.	Sighting (n)	Sighting rate (n/L)	Flock size S	Density (D) (no. km ⁻²)	Abundance estimate 2017 95% CI		
											N	Lower	Upper
St. HFB (excl. coastal zone)	11 124				670		67				1078 761	472 611	2462 334
Total											1092 705	479 405	2487 204
Long-tailed duck													
Coastal, S < 5	22 250	0.222 (0.06)	1087	Half-normal	1825	3.6	260	0.14 (0.16)	2.1 (0.03)	0.69 (0.17)	15 271	10 945	21 308
Coastal, S ≥ 5	22 250	0.296 (0.08)	1087	Half-normal	1825	4.9	120	0.07 (0.20)	9.9 (0.06) ^b	1.10 (0.22)	24 555	15 997	37 692
Coastal, total	22 250				1825		380				39 826	29 650	53 495
Fjords				Total count	3163		124		14.1 (-)		1746	–	–
Total							504				41 572	31 396	55 241
Thicketed-billed murre													
Coastal	22 250	0.174 (0.17)	1087	Half-normal	1825	2.9	35	0.02 (0.25)	1.5 (0.03)	0.08 (0.31)	1821	1014	3271
Fjords				Total count	3406		0				0		
Black guillemot													
Coastal, north	9219	0.204 (0.10)	1087	Half-normal	780	3.5	87	0.11 (0.38)	1.8 (0.10) ^b	0.51 (0.40)	4657	2174	9973
Coastal, south	13 031				1044		0				0		
St. HFB	11 124	0.204 (0.10)	1087	Half-normal	670	2.5	8	0.01 (0.33)	1.8 (0.10) ^b	0.05 (0.36)	601	302	1196
Fjords				Total count	3163		6		2.7 (-)		16	–	–
Total					5657		101				5274	2669	10 437
Gl. gull + Icel. gull													
Coastal, north	9216	0.269 (0.04)	1087	^a Hazard-rate	780	4.6	423	0.54 (0.15)	5.7 (0.29)	5.75 (0.32)	53 009	28 314	99 241
Coastal, south	13 031	0.299 (0.07)	1087	^a Half-normal	1044	4.8	170	0.16 (0.14)	2.8 (0.17)	0.75 (0.23)	9760	6230	15 289
St. HFB	11 124	0.428 (0.14)	1087	Half-normal	670	5.2	50	0.16 (0.14)	2.8 (0.42)	0.25 (0.81)	2734	678	11 033
Fjords				Total count	3163		578		18.2 (-)		10 522		
Total					5657		1221				76 025	45 744	136 085

Species and stratum	Area (km ²)	Effective strip width (km)	Right-truncation (m)	Key function + Series expan.	Effort L (km)	% Area surv.	Sighting (n)	Sighting rate (n/L)	Flock size S	Density (D) (no. km ⁻²)	Abundance estimate 2017 95% CI		
											N	Lower	Upper
Great black-backed gull													
Coastal	22 250	0.232 (0.07)	1087	Half-normal ^a	1825	3.8	179	0.10 (0.10)	1.2 (0.05)	0.25 (0.13)	5491	4275	7053
Fjords				Total count	3163		172		3.6 (-)		620		
Total					4988		351				6111	4895	7673
Great cormorant													
Coastal	22 250	0.228 (0.18)	1450	Half-normal + Cos ^a	1825	3.7	48	0.03 (0.23)	5.7 (0.23)	0.33 (0.37)	7327	3651	14 703
Fjords				Total count	3163		67		5.6 (-)		374		
Total					4988		115				7701	4025	15 077
Mallard													
Coastal	22 250	0.377 (0.16)	1087	Half-normal	1825	6.2	37	0.02 (0.28)	9.7 (0.18)	0.26 (0.37)	5785	2880	11 621
Fjords				Total count	3163		180		10.1 (-)		1821		
Total					4988		217				7606	4701	13 442
Red-breasted merganser													
Coastal	22 250	0.294 (0.18)	1087	Half-normal	1825	4.8	27	0.02 (0.28)	3.3 (0.17)	0.08 (0.37)	1843	910	3731
Fjords				Total count	3163		209		6.5 (-)		1356		
Total					4988		236				3199	2266	5087

^a Observer included as a covariate. ^b Expected flock size used in preference to mean flock size (see Materials and methods).

Supplementary Table S2. Distance sampling parameters and derived abundance estimates for key wintering sites in south-west Greenland (see species figures for boundaries) for common eider, king eider and long-tailed duck, based on aerial surveys in 2017 (2-17 March). Coefficients of variation calculated as standard error in proportion to the mean, are indicated in parentheses.

Species and stratum	Area (km ²)	Effective strip width (km)	Right-truncation (m)	Key function + Series expan.	Effort L (km)	% Area surv.	Sighting (n)	Sighting rate (n/L)	Flock size S	Density (D) (no. km ⁻²)	Abundance estimate 2017 95% CI		
											N	Lower	Upper
Common eider													
Kangaatsiaq, coastal, S < 100	2960	0.334 (0.06)	1087	Half-normal ^a	222	5.0	185	0.83 (0.31)	8.2 (0.12) ^b	10.2 (0.34)	30 220	15 837	57 667
Kangaatsiaq, coastal, S ≥ 100	2960	1.043 (0)	1087	Strip-census	222	15.6	13	0.06 (0.44)	252 (0.20) ^b	7.1 (0.48)	20 899	8510	51 326
Kangaatsiaq, coastal, total	2960		1087		222		198				51 120	29 756	87 823
Kangaatsiaq, fjords				Total count	402		360		241 (–)		86 755	–	–
Kangaatsiaq, total					624		558				137 875	116 511	174 578
Nuuk, coastal	1285	0.247 (0.07)	1087	Half-normal ^a	124	4.8	191	1.54 (0.31)	4.4 (0.09) ^b	13.7 (0.33)	17 555	9301	33 132
Nuuk, fjords				Total count	798		544		127 (–)		68 980	–	–
Nuuk, total					922		735				86 535	78 281	102 112
Jul. Bugt, coastal	3524	0.251 (0.07)	1087	Half-normal ^a	276	3.9	154	0.56 (0.18)	5.1 (0.10) ^b	5.7 (0.22)	19 904	13 023	30 420
Jul. Bugt, fjords				Total count	677		303		90.6 (–)		27 449	–	–
Jul. Bugt, total					953		457				47 353	40 472	57 869
King eider													
St. HFB, S < 250	12 964	0.386 (0.10)	1087	Half-normal + Cos	784	4.7	80	0.10 (0.41)	28.3 (0.28) ^b	3.7 (0.51)	48 535	18 955	124 274
St. HFB S ≥ 250	12 964	1.043 (0)	1087	Strip-census	784	12.6	41	0.05 (0.39)	3255 (0.19)	81.6 (0.44)	1058 405	468 443	2391 371
St. HFB, total	12 964				784		121				1106 940	505 829	2422 393
Long-tailed duck													
Nuuk, coastal	1285	0.249 (0.09)	1087	Half-normal	124	4.8	100	0.81 (0.39)	6.6 (0.17)	10.7 (0.44)	13 686	6042	30 999
Nuuk, fjords				Total count	798		14		5.9 (–)		82		
Nuuk, total							114				13 768	6124	31 081

Species and stratum	Area (km ²)	Effective strip width (km)	Right-truncation (m)	Key function + Series expan.	Effort L (km)	% Area surv.	Sighting (n)	Sighting rate (n/L)	Flock size S	Density (D) (no. km ⁻²)	Abundance estimate 2017 95% CI		
											N	Lower	Upper
Jul. Bugt, coastal	3524	0.189 (0.13)	1087	Half-normal ^a	276	3.0	55	0.20 (0.25)	5.3 (0.17)	2.8 (0.33)	9909	5287	18 574
Jul. Bugt, fjords				Total count	677		62		21.0 (–)		1303	–	–
Jul. Bugt, total					953		117				11 212	6590	19 877

^a Observer included as a covariate. ^b Expected flock size used in preference to mean flock size (see Materials and methods).