SEAPOP Short Report 1-2018

Key-site monitoring in Norway 2017, including Svalbard and Jan Mayen

Tycho Anker-Nilssen, Rob Barrett, Signe Christensen-Dalsgaard, Sveinn Are Hanssen, Tone K. Reiertsen, Jan Ove Bustnes, Sébastien Descamps, Kjell-Einar Erikstad, Arne Follestad, Magdalene Langset, Svein-Håkon Lorentsen, Erlend Lorentzen, Hallvard Strøm, Geir H. Systad

NINA Norwegian Institute for Nature Research
NORSK POLARINSTITUTT
UNIVERSITETET I TROMSØ

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The 2017 breeding season in the colonies monitored (Fig. 1) was yet another of poor production for Norwegian seabirds and thus continued the negative trend seen in previous years. Only a little more than a third of the populations had a good breeding season (contra 40% in 2016), while the others had a moderate or bad season (Table 1). All in all, the pelagic species fared best, while the coast-bound species had a high degree of failure. Changes in population numbers of pelagic species varied greatly with declines in the north and stable or increasing numbers further south. Population trends among coastal species were also very variable but with no spatial pattern.

Breeding success

An encouraging note for 2017 was that the critically endangered common guillemots had a good breeding season at all the colonies monitored by SEAPOP for the second year running. Only those at Runde failed. With the exception of Hornøya, the guillemots monitored on the mainland have stopped breeding on open shelves, and this has apparently been beneficial for chick production with those breeding hidden among boulder screes being sheltered against predation. Black guillemots also seemed to do well in the three colonies where breeding success is monitored. In the case of puffins, the three northernmost colonies did best, while for the 11th consecutive year, there was a near failure at Røst. Admittedly, the breeding success (0.24 chicks/pair) was the best since 2006, but the chicks were in a very poor condition and many died already on their way to the sea. For kittiwakes, 2017 was yet another of a long series of bad production years for this red-listed species. Of extra concern is that they, in contrast to in previous years, also had a bad season on Spitsbergen, probably due to increased predation from the glaucous gull. Kittiwakes on Anda, however, had the best breeding season since the monitoring began in 2007 (1.0 chicks/pair). This may be linked to a massive cull of crows carried out on the nearby mainland during the previous winter that may have led to reduced predatory pressure on Anda in 2017.

With the exception of the lesser black-backed gull in Hordaland, 2017 was a disaster for gulls on the mainland. Sixty-five percent of all the populations monitored had a bad season, while 30% had moderate success. Herring gull chicks were scarcely produced in the colonies north of Hordaland. In contrast to this, the great skua had yet another good breeding season in all the monitored sites. The glaucous gull also had a good season on Jan Mayen, but only moderate on Bjørnøya. The coastal-bound, diving species (shag, cormorant and eider) also had a moderate to bad breeding season in 2017. Only the eiders on Grindøya and the southernmost cormorant and shag colonies had good success.

Overall, there were no clear geographical trends in breeding success in 2017. On the contrary, some species like common guillemots, great skuas and black guillemots did well on virtually all the sites

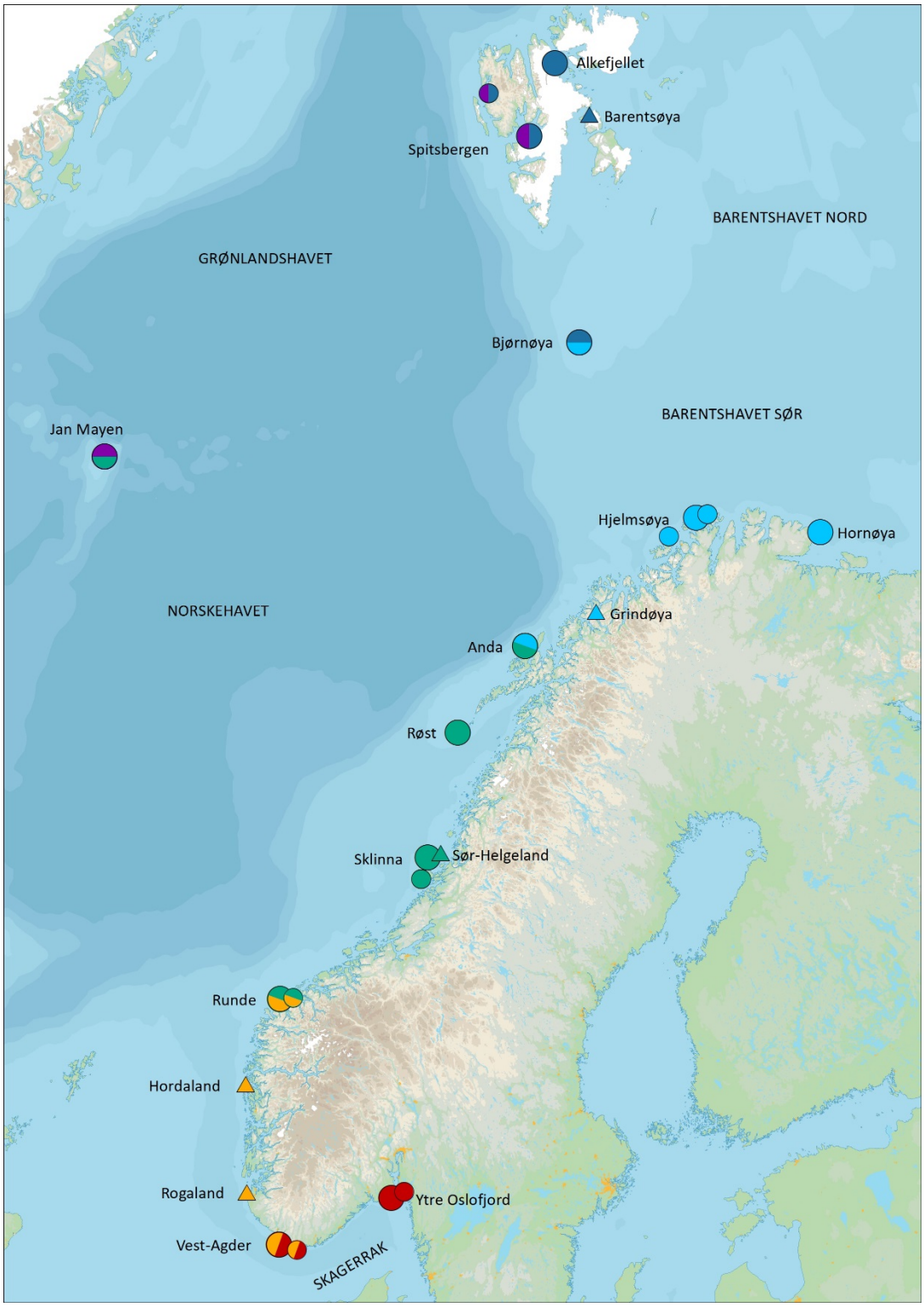
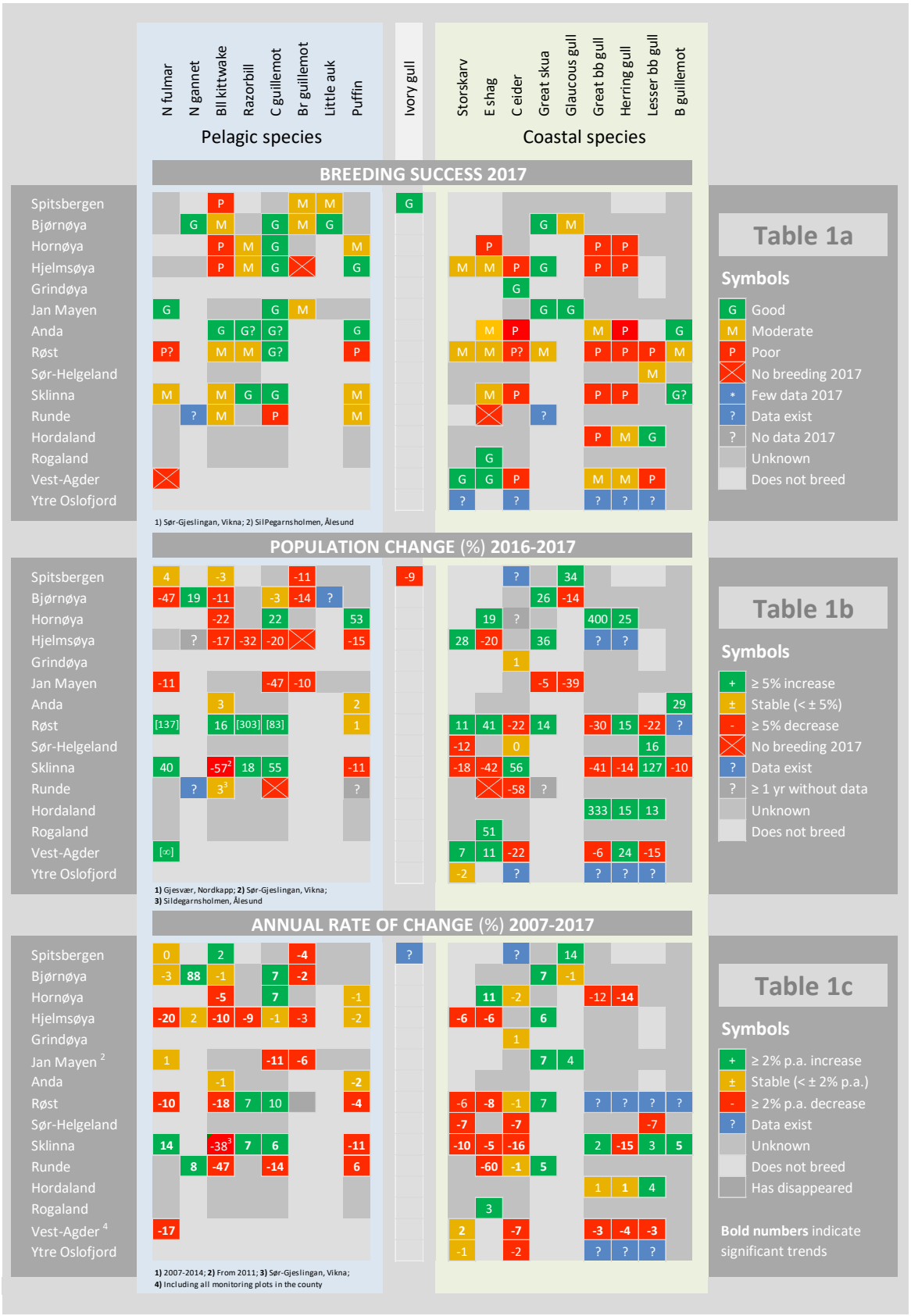


Figure 1

SEAPOP key-sites, as of 2017. Symbol colours indicate which seas they represent: the northern (dark blue) and southern (pale blue) Barents Sea, the Greenland Sea (violet), the Norwegian Sea (green), the North Sea (orange) and the Skagerrak (red). Split colours indicate sites associated with two seas. Large circles indicate the main localities, with some work carried out on nearby sub-localities (small circles). Triangles indicate single-species key-sites for ivory gull (Barentsøya), common eider (Grindøya), lesser black-backed gull (Sør-Helgeland) and shag (Rogaland).

Table 1

Schematic summary of breeding success (1a) and change in breeding numbers (1b) for focal seabird species at the regular SEAPOP monitoring sites in 2017, and their mean population trend over the last ten years (1c).



monitored. In addition, a few sites like Jan Mayen, Anda and Bjørnøya had excellent breeding success for several species. In view of the rapid population declines observed for many of the Norwegian seabirds, it is, nevertheless, very worrying that so many species have had extensive and repeated poor breeding success. There are probably both geographical and population-specific reasons for this negative trend. For example, a recent study at Anda has shown that food access in the surrounding waters coupled with prevailing weather conditions primarily determined the breeding success of kittiwakes for the period 2007-2016. There is a need for further studies of this kind to reveal the ultimate causes of poor production.

Summer 2017 was a late and poor breeding season for kittiwakes on Hornøya. This pair, also known as "to be or not to be" from NRK's slow-TV programme "The Bird Cliff" (Fuglefjellet) in 2016, did not manage to produce any young.
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Population changes

The short-term population changes among pelagic seabirds were very variable in 2017 with many negative changes in the north and many stable or increasing breeding numbers from Anda and southwards. At Jan Mayen, all auks and fulmars declined from 2016 to 2017, and at Hjelmsøya all the pelagic species declined. In the longer term (2007-2017), the trend in most Norwegian seabirds has been negative. From being a problem among the mainland populations, and especially in the Norwegian Sea, the negative trend has spread both northwards to Svalbard and southwards along the coast. Kittiwakes are still struggling with a continued decline in the vast majority of populations. A small bright spot is Anda and Røst, where the kittiwakes did not decline and, in addition, had better breeding success than for many years in parts of the colonies that are sheltered from predation.

Among the auks, the season on Hjelmsøya was a disaster, with all populations declining sharply in relation to 2016. Unfortunately, it seems that the auks on Spitsbergen, Bjørnøya and Jan Mayen also had problems in 2017. This is interesting as these species have performed significantly better here than in the colonies on the mainland over recent years. A positive, but not very surprising note from

Bjørnøya was a continued, albeit slow increase in gannet numbers (from 50 pairs in 2016 to 52 pairs in 2017). For the fulmar, there was a decline on both Bjørnøya and Jan Mayen, while in Spitsbergen there appears to have been a slight increase in breeding numbers from 2016 to 2017. The small populations on the mainland increased slightly in 2017 after a steep decline in 2016, but their numbers are marginal and large variations are therefore to be expected. After the peak year in 2016 for the great skua on Jan Mayen, the species dropped by 5% in 2017. On Bjørnøya, Hjelmsøya and Røst, on the other hand, great skua populations are still growing and 2017 was one of the best years in the three colonies. In eastern Svalbard, a 9% decline was reported for the vulnerable ivory gull.

For the coastal species, the picture was relatively complex. Lesser black-backed gulls increased on Sklinna and Horsvær while great black-backeds and herring gulls declined. On Hornøya, both herring gulls and great black-backeds increased in numbers, as did herring gulls on Anda. The decline of glaucous gulls on Bjørnøya continued and on Jan Mayen the population declined by 39% after a peak year in 2016. One bright spot was at Kongsfjord on Spitsbergen where the glaucous gull population increased. Changes among shags and cormorants were variable in 2017. With the exception of the shags at Hjelmsøya, where numbers declined by 20% from 2016 to 2017, both species increased in both southern and northern Norway, but decreased in central Norway. Since 2007, the trend for both species is negative, except at Hornøya where shag numbers have increased significantly. The decline of the eider population along the Norwegian coast seems to continue in most places, although the populations on Grindøya and in southern Helgeland were stable, and a sharp increase was recorded on Sklinna.

Whereas common guillemots have been driven off open ledges on all other mainland colonies by marauding eagles, those on Hornøya survive this threat and numbers increase rapidly, in some places even crowding out other species. © Tycho Anker-Nilssen

Adult survival

SEAPOP monitors changes in the annual survival rates of adults of 16 species. This encompasses 47 time series spread along the Norwegian coast and on Bjørnøya, Jan Mayen and Spitsbergen. The population dynamics of seabirds are particularly sensitive to changes in adult survival, which often reflect the conditions the seabirds experience in their autumn and winter areas. The following synthesis therefore focuses primarily on the most recent year in which survival rates can be estimated (from 2015 to 2016), and compares them with figures from earlier years.

For gulls, positive changes were observed in 2017, especially for herring gulls in Vest-Agder, where there was a marked increase in adult survival on both Rauna (from 70% to 82%) and Lyngøy (from 61% to 88%) while it was stable in Mandal. Farthest north, there was a slight improvement for the Hornøya herring gulls (from 56% to 61%), but these rates are still disturbingly low. There were no significant changes for the lesser black-backeds that were monitored. The same applies to great black-backeds that are only monitored on Hornøya. For kittiwakes, the declines in survival rates continued on Runde (from 87% to 81%), Hjelmsøya (from 77% to 66%), and Hornøya (from 72% to 66%), and rates at several of the other sites were still of concern (Sør-Gjeslingan 68%, Røst 75%). There was no significant change in the survival of the glaucous gull on Bjørnøya, while it declined in Kongsfjorden on Spitsbergen from 89% to 84%.

Among the auks, either an increase or no change in adult survival was observed for all species and sites being monitored, except for the little auk on Feiringfjellet on Spitsbergen where it decreased from 91% to 78% and for common guillemots on Jan Mayen where it decreased from 92% to 86%. By comparison, survival of little auks on Bjørnøya increased strongly from 71% to 91%. For Brünnich's guillemots on Bjørnøya, it increased from 91% to 97%, and on Jan Mayen from 84% to 94%. At Spitsbergen, the survival of Brünnich's guillemots is monitored in two colonies and these showed surprisingly different rates. At Ossian Sars, it was relatively high (92%), while at Diabasodden it was only 82%. This is despite the fact that the results from SEATRACK indicate that the populations have very similar wintering strategies. Survival rates of common guillemots on Hjelmsøya increased from 75% to 81%, while they were stable at Sklinna and Hornøya (90% and 97% resp.). All puffin populations, apart from that on Runde that remained stable, had an increase in adult survival. In particular, puffins on Hjelmsøya and Hornøya, where both populations have been plagued by mink predation, had a strong improvement in survival rates from 44% to 79% for Hjelmsøya and from 63% to 91% for Hornøya. Mink have been actively removed from Hornøya, which may explain some of the strong increase.

The adult survival rates of the three shag populations that were monitored showed great variation. At Sklinna in the south it was stable at 85%. On Røst, it declined strongly from 87% to 74%, while on Hornøya, it increased from 70% to 86%.

For the eider on Grindøya in Troms, there was a strong decline in adult survival, from 90% to 58%. New of the year is that SEAPOP has worked up and analysed survival data for fulmars on Jan Mayen and ivory gulls on Barentsøya. Both species seemed to have relatively low survival rates (75% and 57% respectively), but these are probably not real due to low resighting rates in the first few years.

APPENDIX – Key parameters from all key-sites in 2017

Key to Tables A1-A13

Key population parameters (SE, n) of seabirds breeding on the key-sites indicated above each table. The start year of most data series are listed in Table 3.1.1 of Anker-Nilssen et al. (2008). Population change (expressed as percentage) is the numeric change in size of the breeding population registered between 2016 and 2017 on the basis of plot counts (p) or total censuses (t). In all cases the listed survival estimate was derived from the basic CJS model(s) that fitted the data set best (i.e. the one with the lowest AICc or QAICc value). If the analysis indicated survival varied between years the given estimate applies for the last estimable time step only (yrs=1), whereas it applies for the whole monitoring period indicated (yrs>1) if the analysis indicated a constant survival.

Ref.: Anker-Nilssen, T. (ed.), Barrett, R.T., Bustnes, J.O., Christensen-Dalsgaard, S., Erikstad, K.E., Fauchald, P., Lorentsen, S.-H., Steen, H., Strøm, H., Systad, G.H. & Tveraa, T. (2008) SEAPOP studies in the Barents and Norwegian Seas in 2007. **NINA Report 363**, 92 pp.

Table A1 *Key population parameters (SE, n) of seabirds on* ***Svalbard*** *in 2017 (excl. Bjørnøya, cf. Table A2).*

Species	Colony	Population change %	Annual adult survival		Reproductive performance	
			Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	*Nøisdalen*	+ 5 p				
Ivory gull	*54 colonies*	– 9 p				
	Barentsøya		2015-16 (1)	56.7 (12.0, 218)	Chicks >10d/nest	1.16 (*n*=55)
Glaucous gull	*Kongsfjorden*	+ 34 p	2015-16 (1)	83.8 (10.3, 113)	Hatching success [1]	0.72 (*n*=68)
Kittiwake	*Ossian Sars*	+ 29 p				
	Grumantbyen	*No data*	2008-17 (9)	81.7 (1.6, 247)	Chicks ≥ 15d/nest [2]	0.06 (*n*=35)
	Fuglehuken	– 5 p				
Brünnich's guillemot	*Ossian Sars*	– 6 p	2015-16 (1)	91.5 (2.8, 222)	Chicks ≥ 15d/egg	0.69 (0.07, 45)
	Diabasodden	+ 7 t	2015-16 (1)	82.1 (2.0, 453)	Chicks ≥ 15d/egg	0.63 (0.05, 89)
	Fuglehuken	– 12 p				
Little auk	*Bjørndalen*	*No data*	2005-17 (12)	86.6 (1.4, 568)	Chicks ≥ 15d/egg	0.58 (0.10, 24)
	Feiringfjellet	*No data*	2006-17 (11)	77.7 (1.6, 771)		

1) *Proportion of nests with at least one chick hatching.* ***2)*** *Proportion of nests with at least one chick surviving to 15 days of age.*

Table A2 *Key population parameters (SE, n) of seabirds on* ***Bjørnøya*** *in 2017.*

Species	Population change %	Annual adult survival		Reproductive performance	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	– 47 p			*No data*	
Gannet	+ 19 p [1]			Large chicks/nets	0.90 (0.04, 62)
Great skua	+ 26 p	2015-2016 (1)	79.9 (4.2, 228)	Large chicks/nest	1.30 (0.07, 157)
Glaucous gull	– 14 p	2009-2016 (7)	75.9 (2.2, 175)	Large chicks/nest	1.18 (0.12, 22)
Kittiwake	– 11 p	2005-2017 (12)	87.5 (0.7, 395)	Large chicks/nest	0.73 (0.02, 503)
Common guillemot	– 3 p	*Results not yet available*		Fledging success [2]	0.72 (0.05, 122)
Brünnich's guillemot	– 14 p	2015-2016 (1)	96.5 (3.9, 354)	Fledging success [2]	0.40 (0.07, 52)
Little auk	p [3]	2015-2016 (1)	90.9 (1.7, 941)	Fledging success	0.86 (0.05, 50)

1) *A minimum of 130 individuals observed, 62 nests built.* ***2)*** *Measured at the age of 20 days.* ***3)*** *Pilot project data under analysis.*

Table A3 *Key population parameters (SE, n) of seabirds on* ***Hornøya*** *in 2017.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	+ 35 [p]	2015-2016 (1)	85.7 (4.8, 294)	Clutch size	2.76 (0.16, 42)
				Breeding success [1]	1.64 (0.11, 42)
Herring gull	+ 25 [p]	2015-2016 (1)	61.1 (63.5, 137)	Clutch size	2.37 (0.12, 30)
				Breeding success [1]	0.53 (0.13, 30)
Great black-backed gull	+ 400 [p]	2001-2017 (16)	82.2 (1.2, 229)	Clutch size	2.43 (0.12, 30)
				Breeding success [1]	0.03 (0.03, 30)
Kittiwake	− 22 [p]	2015-2016 (1)	66.1 (4.5, 1406)	Clutch size	1.60 (0.13, 20)
				Large chicks/nest [1]	0.30 (0.13, 20)
Common guillemot	+ 22 [p]	1988-2017 (29)	96.5 (0.4, 255)	Breeding success [1]	0.86 (0.07, 29)
Razorbill	*No data*	1995-2017 (22)	93.6 (0.7, 327)	Breeding success [1]	0.76 (0.07, 37)
Puffin	+ 50 [p]	2015-2016 (1)	91.0 (3.2, 885)	Breeding success [1]	0.72 (0.07, 37)

1) *Medium-sized chicks/egg laid.*

Table A4 *Key population parameters (SE, n) of seabirds on* ***Hjelmsøya*** *in 2017.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant	+ 28 [t]			*No data*	
Shag *Lille Kamøy*	− 20 [p]			Clutch size [1]	1.86 (0.10, 74)
				Clutch size [2]	2.42 (0.09, 45)
Gannet *Gjesværstappan*	*No data*				
Common eider	[t 3]				
Great skua	+ 36 [t]			Clutch size	1.82 (0.12, 11)
				Large chicks/nest	1.33 (0.28, 9)
Arctic skua	− 35 [t]				
Common gull	+ 3 [t]			Clutch size [1]	2.38 (0.22, 16)
Herring gull	[p 3]	*No data*		Clutch size [1]	0.60 (0.12, 59)
				Large chicks/nest [1]	0.00 (0.00, 59)
Great black-backed gull	[p 3]	*No data*		Clutch size [1]	1.25 (0.25, 24)
				Large chicks/nest [1]	0.00 (0.00, 24)
Kittiwake	− 25 [p]	2015-2016 (1)	70.9 (5.7, 341)	Clutch size [1]	0.67 (0.05, 206)
				Clutch size [2]	1.23 (0.04, 112)
Common guillemot				Large chicks/nest	0.33 (0.05, 114)
Open ledges (inds.)	+ 43 [P]	*No data*		Breeding success [4]	0.00
Crevices (eggs)	− 20 [p]	2015-2016 (1)	81.3 (8.0, 282)	Breeding success [5]	0.67 (0.10, 21)
Brünnich's guillemot	− 99 [P 6]	*No data*		Breeding success [5]	0.00
Razorbill					
Open ledges (inds.)	+ 178 [P]	*Too small sample*		*No data*	
Crevices not predated (eggs)	− 32 [P]			Breeding success [5]	0.33 (0.21, 6)
Puffin *Gjesværstappan*	− 12 [P 7]				
Hjelmsøya	− 38 [P 8]	2015-2016 (1)	78.6 (11.3, 261)	Hatching success	0.35 (0.04, 118)
				Fledging success [9]	0.85 (0.06, 41)

1) *Including empty nests.* ***2)*** *Excluding empty nests.* ***3)*** *Results not yet available.* ***4)*** *No eggs produced, or eggs predated immediately after laying.* ***5)*** *Medium-sized chicks/egg laid.* ***6)*** *Very few birds attending the colony.* ***7)*** *250 plots.* ***8)*** *25 plots.* ***9)*** *Chicks fledged/egg hatched.*

Table A5 *Key population parameters (SE, n) of seabirds on* ***Jan Mayen*** *in 2017.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	− 11 [p]	2015-16 (1)	74.6 (12.1, 64)	Chicks/nest [1]	0.78 (0.04, 89)
Common guillemot	− 47 [p]	2011-17 (6)	85.6 (2.7, 85)	Breeding success [2]	0.71 (0.10, 21)
Brünnich's guillemot	− 10 [p]	2015-16 (1)	93.5 (4.3, 124)	Breeding success [2]	0.42 (0.06, 78)
Great skua	− 5 [p]	*No data*		Large chicks/nest [3]	0.86 (0.15, 35)
Glaucous gull	− 39 [p]	*No data*		Large chicks/nest [3]	0.85 (0.17, 27)
Great black-backed gull	0 [p 4]			Large chicks/nest [3]	2.00 (n=1)
Lesser black-backed gull	0 [p 4]				

1) *Recorded early in the chick-rearing period when most chicks were still small/medium sized. Due to late start of fieldwork, the initial number of active nests was probably underestimated; hence, reproductive performance is probably overestimated.* ***2)*** *Number of chicks ≥ 15 days old divided by number of breeding pairs (n). Due to late start of fieldwork, the initial number of breeding pairs was probably underestimated; hence, reproductive performance is probably overestimated.* ***3)*** *Number of chicks large enough for ringing divided by number of active nests (n).* ***4)*** *Very few breeding pairs.*

Table A6 *Key population parameters (SE, n) of common eider on* ***Grindøya*** *in 2017.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Common eider	+ 2 [t 1]	2015-2016 (1)	58.4 (0.15, 1463)	Clutch size	4.17 (0.09, 117)

1) *Nest counts.*

Table A7 *Key population parameters (SE, n) of seabirds on* ***Anda*** *in 2017.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	− 33 [t]			Clutch size [1]	1.86 (0.24, 22)
Herring gull	+ 9 [t]			Clutch size [2]	0.89 (0.12, 57)
				Clutch size [3]	1.42 (0.12, 36)
				Large chicks/nest	0.12 (0.04, 57)
Kittiwake	+ 1 [p]	2015-16 (1)	79.9 (3.5, 457)	Clutch size/pair [4]	1.69 (0.07, 55)
				Large chicks/nest	1.01 (0.03, 819)
Puffin	+ 2 [p]	2015-16 (1)	86.3 (3.6, 416)	Hatching success	0.90 (0.04, 60)
				Chicks ≥ 20d/ nest	0.85 (0.05, 60)
				Chicks ≥ 30d/ nest	0.78 (0.06, 55)
Black guillemot	+ 29 [t]				1.09 (0.19, 22)

1) *Including empty nests, counted on 3 July.* ***2)*** *Including empty nests, counted on 24 June.* ***3)*** *Including empty nests, counted on 24 June.* ***4)*** *Excluding empty nests, counted on 22 June.*

Table A8 *Key population parameters (SE, n) of seabirds on* ***Røst*** *in 2017.*

Species	Population change %	Annual adult survival		Reproductive performance	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	+ 137 [p]				
Great cormorant	+ 11 [t]			Clutch size [1,2]	2.71 (0.17, 58)
				Large chicks/nest [3]	1.19 (*n*=58)
Shag	+ 41 [p]	2015-16 (1)	74.1 (5.5, 530)	Clutch size [4,5]	2.37 (0.08, 331)
				Clutch size [1,5]	2.02 (0.16, 377)
				Large chicks/nest [4]	1.61 (0.30, 18)
Common eider	− 22 [p]			Clutch size	3.81 (0.18, 47)
Great skua	+ 14 [t 6]			Clutch size	1.83 (0.17, 6)
				Breeding success	0.88 (0.32, 8)
Common gull	− 2 [p]			Clutch size [4]	2.27 (0.08, 98)
				Large chicks/nest [4]	0.13 (*n*=97)
Lesser black-backed gull	− 22 [p]			Clutch size [4]	2.04 (0.11, 48)
				Large chicks/nest [4]	0.38 (*n*=40)
Herring gull	+ 15 [p]			Clutch size [4]	2.34 (0.09, 93)
				Large chicks/nest [4]	0.24 (*n*=59)
Great black-backed gull	− 30 [p]			Clutch size [4]	2.29 (0.06, 161)
				Large chicks/nest [4]	0.38 (*n*=100)
Kittiwake *Vedøy*	+ 16 [p 7]			Large chicks/nest [7]	0.00 (0.00, 66)
Gjelfruvær	+ 35 [t 8]			Large chicks/nest [9]	0.12 (0.02, 314)
Kårøy area	+ 2 [t 10]	2015-16 (1)	74.6 (5.2, 335)	Clutch size/pair [11]	1.68 (0.12, 34)
				Clutch size/pair [12]	1.39 (0.07, 161)
				Large chicks/pair [11]	0.56 (0.13, 34)
				Large chicks/nest [13]	0.53 (826)
Arctic tern				*Two small colonies fledged chicks in 2017*	
Common guillemot	+ 83 [p 14]	*No data 2017*		Breeding success	*No data 2017*
Razorbill	+ 303 [p 14]				
Puffin	+ 1 [p]	2015-16 (1)	88.6 (3.3, 551)	Hatching success	0.81 (0.04, 81)
				Breeding success	0.24 (0.05, 72)
Black guillemot	*Not analysed*	2015-16 (1)	86.0 (7.7, 127)	Clutch size	1.91 (0.07, 33)
				Large chicks/clutch	1.32 (0.20, 19)

1) *Including empty nests.* ***2)*** *On 29 June, when 13 (22%) clutches had hatched.* ***3)*** *Minimum estimate for all three colonies on 9 August, based on counts of large chicks from a distance.* ***4)*** *Excluding empty nests.* ***5)*** *On 1 July, estimated by linear regression of mean values for counts on six different days between 12 June and 13 July.* ***6)*** *Eight breeding pairs in 2017.* ***7)*** *Main colony with about 1750 pairs in 2017.* ***8)*** *Small cliff-breeding colony 9 km SW of Vedøy with 314 pairs in 2017.* ***9)*** *Estimated at 17 July, when there was still 30 small chicks in the nests. Maximum production was therefore 0.22 (SE=0.03).* ***10)*** *Population of 826 pairs in 2017 breeding on/near buildings in Røst harbour.* ***11)*** *On main ledges monitored at regular intervals (plot VIII only).* ***12)*** *All nests monitored at regular intervals (plot VIII only).* ***13)*** *Based on total counts of entire colony on buildings.* ***14)*** *Quasi-extinct colony on open ledges. Birds breeding in shelter on other islands in Røst were seemingly doing OK, but are not monitored.*

Table A9 *Key population parameters (SE, n) of lesser black-backed gull on* ***Horsvær*** *in 2017.*

Species	Population change %	Annual adult survival		Reproductive performance	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Lesser black-backed gull	+ 15	2006-17 (11)	89.9 (1.1, 181)	Clutch size	2.34 (0.1X, 47)
				Fledged juv./pair	0.65 (*n*=60) [1]

Table A10 *Key population parameters (SE, n) of seabirds on* ***Sklinna*** *in 2017.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	+ 40 [t]				
Great cormorant	− 18 [t]			*No data 2017*	
Shag	− 42 [t]	2015-16 (1)	84.8 (4.3, 502)	Clutch size [1]	2.10 (0.06, 247)
				Hatching success/nest	0.70 (*n*=50)
				Clutch size hatching	1.34 (0.16, 50)
				Chicks ≥ 10d/nest	1.96 (*n*=29)
				Chicks ≥ 20d/nest	1.76 (*n*=25)
				Chicks ≥ 30d/nest	2.00 (*n*=9)
Common eider	+ 56 [t]			Clutch size	3.67 (0.24, n=9)
Herring gull [2]	− 14 [p]			Clutch size [3]	1.88 (0.22, 25)
				Clutch size [4]	2.40 (0.13, 20)
Great black-backed gull	− 41 [p]			Clutch size [5]	1.55 (0.23, 20)
				Clutch size [6]	2.07 (0.15, 15)
Kittiwake *Sklinna*	0 [t 7]				
Sør-Gjæslingan	− 57 [t 8]	2015-16 (1)	68.0 (9.4, 285)	Large chicks/nest [9]	0.69 (*n*=48)
Common guillemot	+ 55 [t]	2008-17 (9)	90.7 (0.9, 315)	*No quantitative estimate* [10]	
Razorbill	+ 18 [t]				
Puffin	− 11 [p]	*No estimate yet possible* [11]		Hatching success/nest	0.73 (0.11, *n*=15)
				Chicks ≥ 10d/hatched	1.00 (0.00, *n*=7)
				Chicks ≥ 20d/hatched	1.00 (0,00, *n*=7)
Black guillemot	− 10 [p]	2008-17 (9)	88.6 (2.6, 60)		

1) *Counted on2- 3 June.* ***2)*** *Monitoring of adult survival was discontinued in 2010.* ***3)*** *Counted on 4 June, including empty nests.* ***4)*** *Counted on 4 June, excluding empty nests.* ***5)*** *Counted on 3 June, including empty nests.* ***6)*** *Counted on 5 June, excluding empty nests.* ***7)*** *No kittiwakes have bred on Sklinna since 2010.* ***8)*** *Based on numbers of breeding birds counted in May and early June.* ***9)*** *Based on nest count in May and early June and chick count on 7 July.* ***10)*** *Quantitative estimates difficult to obtain because the birds breed in shelter under big boulders.* ***11)*** *Colour ringing was initiated in 2007, but re-sighting rate in all later years has been very low because few birds have attended the colony by sitting out in the open.*

Table A11 *Key population parameters (SE, n) of seabirds on* ***Runde*** *in 2017.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Common eider	− 58 [t]				
Gannet	? [t 1]			Large chicks/nest [2]	0.87 (0.01, 735)
Shag	0 [p 3]	*No estimate yet possible* [4]		*No breeding in 2017*	
Great skua	[t 5]			Large chicks/nest [5]	
Kittiwake *Runde*	0 [p 3]			*No breeding in 2017*	
Sildegarnsholmen	+ 3 [t]	2011-17 (6)	81.5 (1.8, 199)	Large chicks/nest	0.68 (*n*=657)
Common guillemot	0 [p 3]			*No breeding on open ledges in 2017*	
Puffin	[p 5]	2007-17 (10)	87.0 (1.2, 331)	Hatching success/nest	0.75 (0.06, 48)
				Chicks ≥ 20d/hatched	0.64 (0.08, 36)
				Chicks ≥ 40d/hatched	0.61 (0.08, 36)
				Fledged/nest [5]	0.47 (0.08, 36)

1) *Study area photographed in 2017 but pictures not counted yet.* ***2)*** *Counted in 4 study plots on 4 August.* ***3)*** *As in 2015-16, no breeding was recorded in the study plots in 2017.* ***4)*** *Colour ringing was initiated in 2008, but sample size is still too low.* ***5)*** *No data collected in 2017.* ***6)*** *Maximum estimate.*

Table A12 *Key population parameters (SE, n) of seabirds on the different localities in* ***Hordaland*** *in 2017.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Lesser black-backed gull	+ 13 [t]	2009-17 (8)	81.9 (3.4, 50)	Clutch size [1] Fledged chicks/nest	2.64 (0.07, 110) 0.72 (*n*=110)
Herring gull	+ 15 [t]	2009-17 (1)	87.5 (6.8, 130)	Clutch size [1] Fledged chicks/nest	2.63 (0.04, 362) 0.58 (*n*=378)

1) *Including empty nests.*

Table A13 *Key population parameters (SE, n) of shag in* ***Rogaland*** *in 2017.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	+ 51 [p]	*No estimate yet available* [1]		Clutch size [2] Breeding success [3]	2.78 (0.07, 49) 1.42 (0.15, 48)

1) *Colour-ringing of adults was initiated in 2014, but few birds were ringed in the first year.* ***2)*** *On 30 May, when no empty nests were found.* ***3)*** *"Maximum" estimate based on number of chicks alive on 22 June (i.e. excluding 2 nests that still contained only eggs).*

Table A14 *Key population parameters (SE, n) of seabirds on the different sites in* ***Vest-Agder*** *in 2017.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant	+ 7	*No estimate yet available* [1]		Clutch size Large chicks/nest	3.31 (0.08, 284) 1.76 (*n*=284)
Common eider	− 22 [2]			Clutch size Small chicks on sea [3] Large chicks on sea [3]	4.08 (0.50, 12)
Lesser black-backed gull		2001-17 (16)	80.8 (1.3, 659) [4]		
Slettingene	+ 21			Clutch size [5] Fledged juv./pair	2.26 (0.08, 228) 0.31 (*n*=229)
Storøy	− 92			Clutch size [5] Fledged juv./pair	0.43 (0.430, 7) 0.00 (*n*=7)
Klovholmene	+ 46			Clutch size [5] Fledged juv./pair	2.23 (0.196, 35) 0.43 (*n*=35)
Rauna	− 20	1999-17 (18)	82.6 (0.7, 1184)	Clutch size [5] Fledged juv./pair	1.95 (0.251, 21) 0.32 (*n*=1700)
Herring gull		2001-17 (16)	80.6 (1.8, 401) [4]		
Slettingene	− 9			Clutch size [5] Fledged juv./pair	2.68 (0.08, 85) 0.55 (*n*=118)
Storøy	− 25			Clutch size [5] Fledged juv./pair	2.47 (0.11, 45) 0.45 (*n*=67)
Klovholmene	+ 4			Clutch size [5] Fledged juv./pair	2.71 (0.12, 21) 0.56 (*n*=27)
Rauna	+ 87	2002-17 (15)	81.7 (2.6, 161)	Clutch size [5] Fledged juv./pair	2.17 (0.23, 23) 0.45 (*n*=440)

1) *Colour-ringing of chicks for later monitoring of survival rates was initiated in 2008.* ***2)*** *Based on counts of adult males in Farsund municipality.* ***3)*** *No estimates in 2017 due to no complete count at Rauna.* ***4)*** *General estimate for birds from Slettingene, Storøy and Klovholmane.* ***5)*** *Including empty nests.*

Cover photo:
An adult European shag captured for ringing. Note the two ticks (Ixodes uria) just above the bird's eye. © Tycho Anker-Nilssen

Author contact information

T. Anker-Nilssen (tycho@nina.no)
Norwegian Institute for Nature Research, P.O. Box 5685 Sluppen, NO-7485 Trondheim

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Series editors
Tycho Anker-Nilssen, tycho@nina.no
Robert T. Barrett, rob.barrett@uit.no