SEAPOP Short Report 1-2019

Key-site monitoring in Norway 2018, including Svalbard and Jan Mayen

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

© SEAPOP 2019

NINA Norwegian Institute for Nature Research
NORSK POLARINSTITUTT
UNIVERSITETET I TROMSØ

Key-site monitoring in Norway 2018, including Svalbard and Jan Mayen

Breeding success

The 2018 breeding season was, overall, not good for Norwegian seabirds (Table 1a) with a third of the populations having a poor breeding success, as was the case in 2017. Fortunately, several populations did do well (38% compared to 34% in 2017). When comparing pelagic and coastal populations, the former were more successful (43% good, 22% poor) than the coastal (33% good, 33% poor).

Among the pelagic species, northern gannets and razorbills fared best with a good breeding success recorded in two out of two and three of four populations respectively. Common guillemots also did well with five of eight populations having good breeding success. The three puffin colonies monitored in the Barents Sea produced many chicks while at Røst breeding success was poor for the 12th year in a row. At the two other colonies in the Norwegian Sea, it was moderate. Little auks on Bjørnøya did well, but only moderately so on Spitsbergen. The fulmar's success on Jan Mayen was good, but poor on Røst and Sklinna. Brünnich's guillemots had a poor breeding season on Jan Mayen, a good one on Bjørnøya and a moderate one on Spitsbergen. The ivory gull had moderate breeding success on Spitsbergen. The kittiwake fared worst of all pelagic populations with no populations having a good breeding success, either in the Barents Sea or the Norwegian Sea.

Among the coastal species, eiders had the worst season, with poor breeding success at four of six sites, and moderate at the other two. In Kongsfjord, Spitsbergen, the breeding failure was due to predation by polar bears. The breeding season was almost as bad for shags, with poor or moderate breeding success at all of the monitored sites. Among the large gulls, breeding performance was relatively poor for lesser and great black-backed gulls, with poor breeding success at three of five and three of seven sites respectively. The breeding success for great black-backs was good only at Hornøya in the north, in Hordaland and in the outer Oslofjord in the south. Lesser black-backs and herring gulls also performed well in the outer Oslofjord, as did lesser black-backs in South Helgeland and herring gulls on Hornøya. Cormorants did well in Vest-Agder and on Hjelmsøya, and moderately well at Røst. Great skuas had the best breeding success among the coastal species and only on Jan Mayen was it bad. At Runde, Røst, Hjelmsøya and Bjørnøya it was good.

Of all the species monitored, the 2018 breeding season was best for gannets, razorbills and great skuas. For gannets and great skuas, this is the continuation of a long-lasting trend with good reproduction. Razorbills have also been successful over time at several sites. Common guillemots have had relatively good reproduction in the north for several years, but in 2018 those that nest on open shelves at Hornøya had total breeding failure due to disturbance and predation by white-tailed eagles. In stark contrast to Røst, the puffins at Anda, Hjelmsøya and Hornøya again did well showing that there have been significantly better breeding conditions in recent years, with more food in the

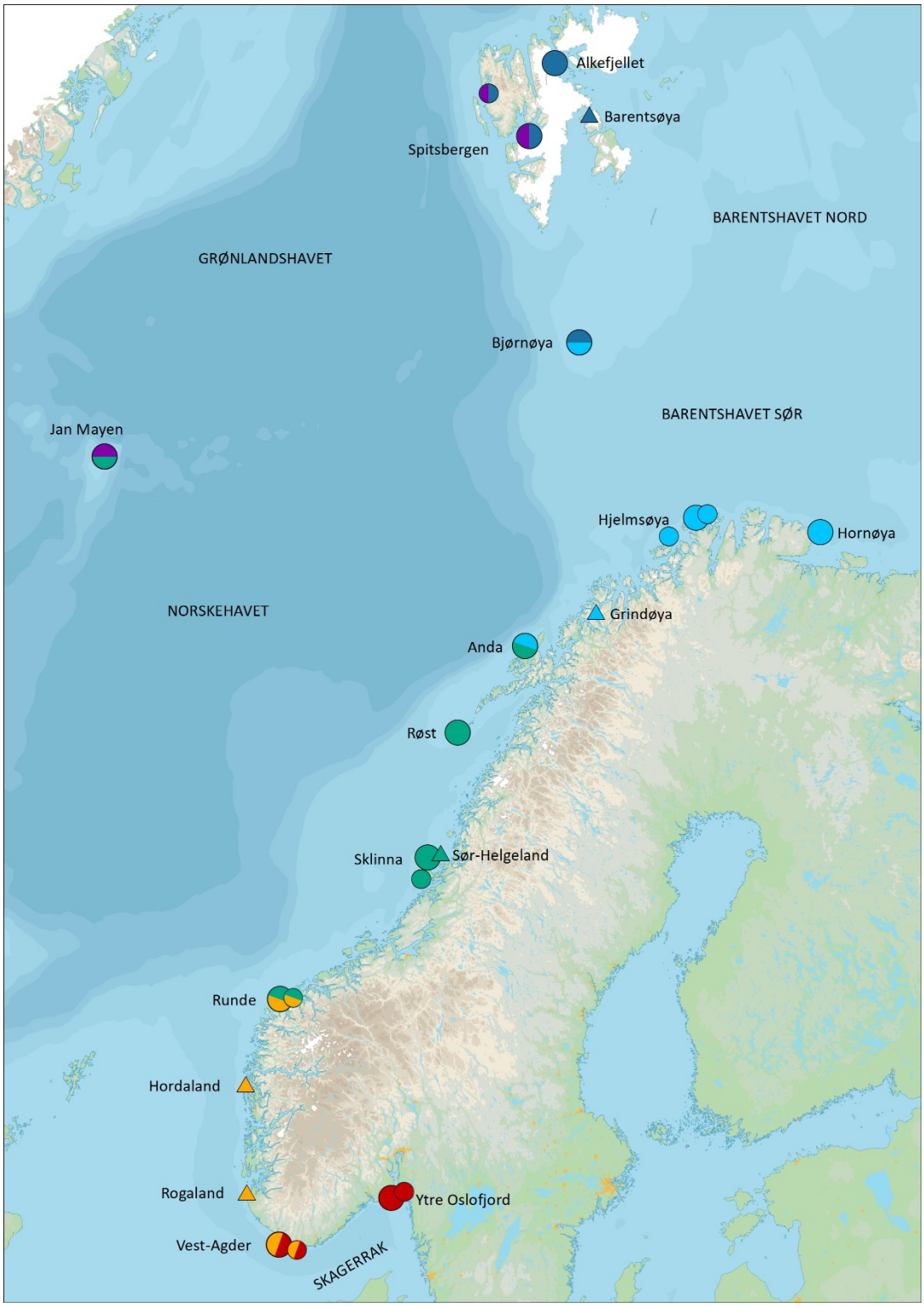
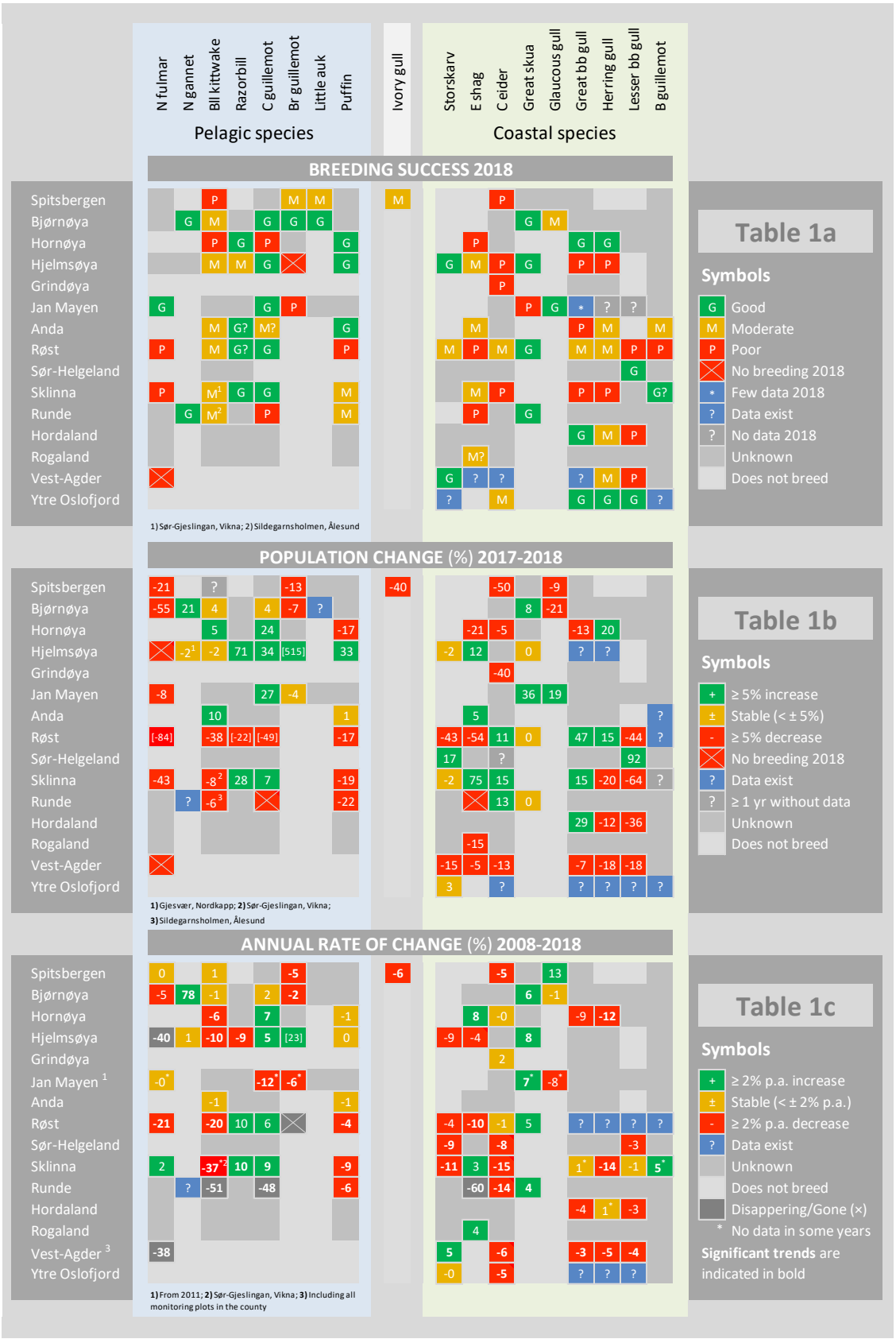


Figure 1

SEAPOP key-sites, as of 2018. 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 2018, and their mean population trend over the last ten years (1c).



north of the country. The species that failed most in 2018 were eiders, shags and kittiwakes with none having a good breeding success at any site. It has not always been as bad for shags, but for eiders and kittiwakes this adds to a very disturbing national trend with many years of low reproduction. The reasons are probably many, but there is evidence that food supply and predation are challenging for both species. Given the strong negative population trends seen among a large proportion of the seabird populations in Norway, it is very worrying that so many species have had a persistent poor breeding success.

At SEAPOP key-sites, chick growth and survival are recorded in order to investigate what affects the breeding success of selected species. Kittiwakes had generally a very poor breeding season in 2018, but here at Anda it was moderate. Photo: © Signe Christensen-Dalsgaard

Population changes

Half the populations monitored declined from 2017 to 2018 (Table 1b). One third increased and the rest remained stable. Only at Jan Mayen and Hjelmsøya did most species increase in numbers since the previous year. In the far north (Spitsbergen) and the farthest southwest (North Sea), the picture was the opposite with all populations declining by >5% since 2017. At Røst and Runde, all pelagic species that are monitored declined, while the guillemot and razorbill numbers increased in the remaining key sites. The coastal species did somewhat better than the pelagic ones in the Norwegian Sea, but the picture is not clear.

Viewed over the last ten years (2008-2018), the trends among most Norwegian seabird populations continue to be of concern (Table 1c). At most of the kittiwake sites, numbers are dropping, but there is some respite in Svalbard and Anda where their numbers are relatively stable. The general impression is that kittiwake colonies associated with human settlements benefit from a form of urban protection, while colonies in natural bird cliffs are under strong predation pressure. The fulmar has also been in steep decline on the mainland over the last ten years, while the populations on Spitsbergen have remained stable. The gannet is increasing rapidly on Bjørnøya where a colony was established in 2011 while the mainland populations in Finnmark are stable and at Runde increasing.

For the razorbill and common guillemot, the small populations on Sklinna and Røst have increased over the last 10 years. Both species are virtually absent from open shelves at Røst, and the guillemot has been absent as nesting species on such sites at Runde since 2014. The same applies to Hjelmsøya where the majority has nested under the cover of rocks since 2000. At Jan Mayen, the common guillemot population has declined by 12% annually since monitoring started in 2011. At Bjørnøya and Hjelmsøya, their numbers have been stable over the past 10 years, while the population at Hornøya has increased during the same period. Brünnich's guillemots have declined slightly every year over the last 10 years in the colonies where it is monitored on Jan Mayen and Svalbard. Puffin numbers are stable north of Lofoten, but are in a steep decline (4-9% annually) further south.

The nominate subspecies of the great cormorant has declined steeply throughout the country since 2008. The continental subspecies, on the other hand, continues its increase in Vest-Agder, but is now stable in the Outer Oslofjord. The number of nesting cormorants and shags at Røst declined sharply from 2017 to 2018 and less so in Vest-Agder, as did shags in Rogaland. There has, however, been a positive population trend for both species in Southwest Norway over the past 10 years. At Sklinna, shag numbers seemingly increased from 2017 to 2018, but this was due to the fact that the breeding

Puffins cowering in the wind at Anda. The puffin populations from Lofoten and southwards are in steep decline, while there is little change further north. Photo: © Signe Christensen-Dalsgaard

season was unusually late in 2017 such that many of the pairs had not started to breed when the monitoring was then carried out. Relatively many eiders were found breeding in the Norwegian Sea colonies in 2018 compared to the previous year, while numbers declined sharply further north. The trend over the last 10 years is strongly negative south of Røst, somewhat better further north on the mainland, and again negative on Svalbard where it has declined by 5% annually. The populations of the great skuas on Jan Mayen and Bjørnøya increased in 2018, as they have done since 2008 at all sites where they are monitored. The ivory gull population dropped by 40% compared to 2017 on Svalbard, and the trend is also clearly negative in the period 2008-2018.

For the other coastal species, the picture was relatively complex. Numbers of lesser black-backed gulls increased by 92% at Horsvær, probably due to reduced predation, while at all the other colonies they declined sharply from 2017 to 2018. Great black-back numbers increased in three of the colonies while the northernmost and southernmost colonies declined from 2017 to 2018. Herring gulls also declined in the south, while they did well at Røst and Hornøya. The glaucous gulls on Bjørnøya and Spitsbergen had a bad year, while numbers at Jan Mayen increased by 19%. The general picture for the period 2008-2018 is that all the gulls that are monitored are in decline.

Adult survival

Seabird population dynamics are very sensitive to changes in adult survival rates, often reflecting the conditions individuals experience outside the breeding season. The discussion below focuses on survival rates measured from 2016 to 2017, the most recent year that can be estimated, assessed in light of the survival in the previous years.

For the auks, there was great variation in how the adult survival rates changed. Mainland populations had a largely stable or positive development while it appears that Arctic populations in the southern part of their distribution area have had poorer survival rates than those that nest further north. For puffins, survival rates remained stable and good compared to the previous year at Runde, Anda and Hornøya, while they improved at Røst (from 89% to 94%) and Hjelmsøya (from 80% to 87%). The survival of most of the common guillemot populations was high and constant, with the exception of those at Hjelmsøya that increased from 81% to 89%. The survival of razorbills at Hornøya also remained stable, at 94%. For black guillemots, the rates were stable on Sklinna (88%), but clearly improved at Røst (from 84% to over 90% over the last two years). For the more Arctic species, the little auk and Brünnich's guillemot, the tendency was largely no change or a sharp decline in adult survival. At Spitsbergen, survival of little auks increased slightly in survival at Feiringfjellet (from 78% to 80%) and declined slightly in Bjørndalen (from 87% to 85%), while there was a steep decline at Bjørnøya (from 91% to 84%). The Brünnich's guillemots at Ossian Sars at Spitsbergen showed a slight improvement in survival (from 92% to 94%), while there was a strong decline in their survival rate on both Bjørnøya (from 97% to 90%) and Jan Mayen (from 94% to 76%).

Among the gulls, it was very positive to see an increase in the adult survival rates at several of the kittiwake colonies and at some colonies of large seagulls on the mainland. A strong improvement was recorded for kittiwakes at both Anda (from 80% to 90%) and Hjelmsøya (from 71% to 95%). There

was also an increase in survival on the Sør-Gjæslingan (from 68% to 72%), Røst (from 75% to 79%) and Hornøya (from 66% to 77%), although these rates still remain disturbingly low on all these localities. Survival rates remained stable for kittiwakes at Runde, Bjørnøya and Spitsbergen. The three lesser black-backed gull colonies that are monitored in the south had stable and healthy adult survival rates compared to the previous year. For herring gulls, the survival rate was constant for the Vest Agder populations, while there was a decrease in Hordaland (from 88% to 83%) and a strong increase in Hornøya (from 61% to 90%). There was no change for great black-backs at Hornøya compared to the previous year remaining at 83%. In the Arctic species, there was little change in glaucous gull on Bjørnøya (from 76% to 77%), but a sharp decline in glaucous gull in Kongsfjorden on Spitsbergen (from 84% to 63%). The ivory gulls on the Barents Island showed a strong improvement in survival from the previous year (from 57% to 76%).

There was large variation in the changes in the survival at the three shag colonies that are monitored compared to the previous year. At Hornøya in the north, it remained stable at 86%. At Røst it improved from 74% to 81%, while at Sklinna it decreased from 85% to 80%. Eiders on Grindøya had an increase in adult survival (from 58% to 65%), but this is still low. The great skua on Bjørnøya also showed a strong increase and had a year of very good survival (from 80% to 94%). The same applies to fulmars on Jan Mayen which increased from 75% to 98%, which is very high, even for this species.

Survival rates of adult black guillemots are monitored at Sklinna and Røst. At both sites, they were good compared to earlier years. This Sklinna individual has caught a flounder for its chicks. Photo: © Svein-Håkon Lorentsen

APPENDIX – Key parameters from all key-sites in 2018

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 2017 and 2018 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 2018 (excl. Bjørnøya, cf. Table A2).*

Species	Colony	Population change %	Annual adult survival		Reproductive performance	
			Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	*Nøisdalen*	− 21 [p]				
Ivory gull	*32 colonies*	− 9 [p]				
	Barentsøya		2010-18 (8)	75.6 (2.5, 243)	Large chicks/nest	0.28 (*n*=18)
Glaucous gull	*Kongsfjorden*	− 40 [p]	2016-17 (1)	62.7 (11.5, 126)	Hatching success [1]	0.73 (*n*=45)
Kittiwake	*Ossian Sars*	− 5 [p]				
	Grumantbyen	*No data*	2008-18 (10)	82.6 (1.6, 258)	Chicks ≥ 15d/nest [2]	0.22 (*n*=37)
	Fuglehuken [3]	*No data*				
Brünnich's guillemot	*Ossian Sars*	− 24 [p]	2016-17 (1)	93.8 (4.7, 217)	Chicks ≥ 15d/egg	0.78 (0.09, 23)
	Diabasodden [3]	− 10 [t]	*No data 2018*		*No data 2018*	
	Fuglehuken	− 12 [p]				
Little auk	*Bjørndalen*	*No data*	2005-18 (13)	84.9 (1.5, 592)	Chicks ≥ 15d/egg	0.65 (0.10, 23)
	Feiringfjellet	*No data*	2006-18 (12)	80.0 (1.5, 781)		

1) *Proportion of nests with at least one chick hatching. Irregular monitoring in 2018 so that hatching success estimate is to be taken with caution.* ***2)*** *Proportion of nests with at least one chick surviving to 15 days of age.* ***3)*** *Bad sea conditions and/or polar bear activity prevented working regularly at the Diabasodden and Fuglehuken colonies and estimating demographic parameters*

Table A2 *Key population parameters (SE, n) of seabirds on **Bjørnøya** in 2018.*

Species	Population change %	Annual adult survival		Reproductive performance	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	− 55 [p]			*No data 2018*	
Gannet	+ 21 [p 1]			Large chicks/nest	0.68 (0.05, 75)
Great skua	+ 8 [p]	2016-2017 (1)	94.4 (3.2, 231)	Large chicks/nest	1.12 (0.08, 169)
Glaucous gull	− 21 [p]	2009-2018 (9)	77.1 (2.2, 171)	Large chicks/nest	1.05 (0.11, 19)
Kittiwake	+ 4 [p]	2004-2018 (14)	87.7 (0.7, 408)	Large chicks/nest	0.74 (0.02, 458)
Common guillemot	+ 4 [p]	*Results not yet available*		Fledging success [2]	0.66 (0.06, 68)
Brünnich's guillemot	− 7 [p]	2016-2017 (1)	89.8 (5.7, 351)	Fledging success [2]	0.82 (0.09, 17)
Little auk	[p 3]	2016-2017 (1)	84.0 (2.1, 972)	Fledging success	0.86 (0.06, 44)

1) *75 nests.* ***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 2018.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	− 21 [p]	2016-2017 (1)	86.3 (1.3, 328)	Clutch size	*No data*
				Breeding success [1]	*No data*
Herring gull	+ 20 [p]	2016-2017 (1)	89.7 (9.2, 148)	Clutch size	2.55 (0.12,31)
				Breeding success [1]	1.26 (0.19,31)
Great black-backed gull	− 13 [p]	2001-2018 (17)	82.8 (1.3, 231)	Clutch size	2.55 (0.12,31)
				Breeding success [1]	1.10 (0.18,31)
Kittiwake	+ 5 [p]	2016-2017 (1)	76.6 (4.6, 1467)	Clutch size [1,2]	1.63 (0.06, 160)
				Large chicks/nest [1,2]	1.04 (0.07, 160)
Common guillemot	+ 24 [p]	1988-2018 (30)	96.7 (0.4, 265)	Breeding success [1]	0.86 (0.06, 35)
Razorbill	*No data*	1995-2018 (23)	94.1 (0.7, 359)	Breeding success [1]	0.58 (0.08, 38)
Puffin	− 17 [p]	2016-2017 (1)	92.0 (3.9, 925)	Breeding success [1]	0.82 (0.06, 39)

1) *Medium-sized chicks/egg laid.* ***2)*** *Combination of a new study plot and old plots. The old plots were nearly empty, whereas the new is more sheltered from avian predators and probably better reflects food conditions. However, the new plot does not reflect the overall breeding success in the colony, which was extremely low due to high predation rate from ravens and white-tailed eagles.*

Table A4 *Key population parameters (SE, n) of seabirds on* ***Hjelmsøya*** *in 2018.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant	− 2 [t]			*No data 2018*	
W Finnmark	+ 28 [t]			*No data 2018*	
Shag *Lille Kamøy*	+ 12 [p]			*No data 2018*	
Gannet *Gjesværstappan*	*No data*				
Common eider	[t 3]				
Great skua	0 [t]			Clutch size	1.67 (0.19, 6)
Arctic skua	− 36 [t]				
Common gull	− 3 [t]			Clutch size [1]	2.71 (0.09, 41)
Herring gull	[p 3]	*No data*		Clutch size [1]	1.07 (0.17, 45)
				Large chicks/nest [1]	0.00 (0.00, 45)
Great black-backed gull	[p 3]	*No data*		Clutch size [1]	0.83 (0.19, 24)
				Large chicks/nest [1]	0.00 (0.00, 35)
Kittiwake	− 2 [p]	2016-2017 (1)	95.0 (2.3, 342)	Clutch size [1]	1.03 (0.06, 199)
				Clutch size [2]	1.65 (0.05, 124)
Common guillemot				Large chicks/nest	0.27 (0.04, 234)
Open ledges (inds.)	− 16 [P]	*No data*		Breeding success [4]	0.00
Crevices not predated (eggs)	+ 34 [p]	2005-2018 (13)	88.6 (1.7, 311)	Breeding success [5]	1.00 (0.00, 29)
Crevices predated (eggs)				Breeding success [5]	*No data 2018*
Brünnich's guillemot	+ 515 [P 6]	*No data*		Breeding success [5]	0.00
Razorbill *Open ledges (inds.)*	− 60 [P]	*Too small sample*		*No data 2018*	
Crevices not predated (eggs)	+ 71 [P]			Breeding success [5]	0.66 (0.19, 6)
Crevices predated (eggs)				Breeding success [5]	*No data 2018*
Puffin *Gjesværstappan*	+ 19 [P 7]				
Hjelmsøya	+ 33 [P 8]	2008-2018 (10)	86.6 (2.5, 292)	Hatching success	0.53 (0.05, 101)
				Breeding success [9]	0.52 (0.05, 98)

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 2018.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	− 8 [p]	2011-18 (7)	97.5 (3.4, 79)	Chicks/nest [1]	0.75 (0.05, 85)
Common guillemot	+ 27 [p]	2011-18 (7)	86.4 (2.3, 92)	Breeding success [2]	0.62 (0.09, 29)
Brünnich's guillemot	− 4 [p]	2016-17 (1)	75.8 (5.8, 132)	Breeding success [2]	0.29 (0.06, 68)
Great skua	+ 36 [p]	*No data*		Large chicks/nest [3]	0.27 (0.07, 49)
Glaucous gull	+ 19 [p]	*No data*		Large chicks/nest [3]	1.14 (0.16, 29)
Great black-backed gull	[p 4]			Large chicks/nest [3]	0.00 (0.00, 2)
Lesser black-backed gull	[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)*** *Sample size is too low for estimation.*

Table A6 *Key population parameters (SE, n) of common eider on* ***Grindøya*** *in 2018.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Common eider	− 40 [t 1]	2016-2017 (1)	64.8 (2.6, 1462)	Clutch size	4.16 (0.16, 63)

1) *Nest counts.*

Table A7 *Key population parameters (SE, n) of seabirds on* ***Anda*** *in 2018.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	+ 57 [t]			Clutch size [1]	1.14 (0.26, 22)
				Chicks/nest [2]	0.68 (0.26, 22)
Herring gull	0 [t]			Clutch size [3]	1.16 (0.13, 57)
				Clutch size [4]	1.71 (0.11, 38)
				Large chicks/nest	0.19 (0.05, 57)
Kittiwake	+ 10 [p]	2016-17 (1)	90.7 (2.6, 493)	Clutch size/pair [5]	1.70 (0.07, 63)
				Large chicks/nest	0.55 (0.03, 865)
Puffin	+ 1 [p]	2016-17 (1)	87.8 (3.7, 443)	Hatching success	0.98 (0.02, 52)
				Chicks ≥ 20d/nest	0.88 (0.04, 52)
Black guillemot	− 1 [t 6]			Large chicks/nest	0.89 (0.23, 19)

1) *On 26 June, including empty nests.* ***2)*** *On 20 July, including empty nests.* ***3)*** *On 25 June, including empty nests.* ***4)*** *On 25 June, excluding empty nests.* ***5)*** *On 19 June, excluding empty nests.* ***6)*** *Population change calculated as three-year running mean.*

Table A8 *Key population parameters (SE, n) of seabirds on* ***Røst*** *in 2018.*

Species		Population change %	Annual adult survival Period (yrs)	Annual adult survival Estimate %	Reproductive performance Sampling unit	Reproductive performance Estimate
Fulmar		− 84 [p]				
Great cormorant		− 43 [t]			Clutch size [1,2]	1.37 (0.23, 19)
					Large chicks/nest [3]	0.68 (0.20, 19)
Shag	*Ellefsnyken*	− 54 [p]	2016-17 (1)	81.1 (5.7, 531)	Clutch size [4,5]	1.65 (0.10, 95)
					Clutch size [1,5]	0.66 (0.09, 221)
					Large chicks/nest [4]	0.00 (0.00, 10)
Common eider		+ 11 [p]			Clutch size	4.09 (0.22, 33)
Great skua		± 0 [t 6]			Clutch size	2.00 (0.00, 6)
					Breeding success	1.50 (0.27, 8)
Common gull		− 10 [p]			Clutch size [4]	2.55 (0.08, 78)
					Large chicks/nest [4]	0.45 (*n*=86)
Lesser black-backed gull		− 44 [p]			Clutch size [4]	2.22 (0.14, 27)
					Large chicks/nest [4]	0.54 (*n*=28)
Herring gull		+ 15 [p]			Clutch size [4]	2.43 (0.09, 115)
					Large chicks/nest [4]	1.11 (*n*=111)
Great black-backed gull		+ 47 [p]			Clutch size [4]	2.44 (0.04, 236)
					Large chicks/nest [4]	1.06 (*n*=218)
Kittiwake	*Vedøy*	− 38 [p 7]			Large chicks/nest [7]	0.05 (0.03, 41)
	Gjelfruvær	+ 21 [t 8]			Large chicks/nest [9]	0.41 (0.03, 381)
	Kårøy area	− 16 [t 10]	2016-17 (1)	78.6 (4.3, 403)	Clutch size/pair [11]	1.70 (0.15, 33)
					Clutch size/pair [12]	1.27 (0.06, 219)
					Large chicks/pair [11]	0.94 (0.16, 33)
					Large chicks/pair [12]	0.70 (0.05, 241)
					Large chicks/nest [13]	0.45 (698)
Arctic tern					*No breeding in 2018*	
Common guillemot		− 49 [p 14]			Breeding success	*No data 2018*
Razorbill		− 22 [p 14]				
Puffin		− 17 [p]	2016-17 (1)	93.8 (2.3, 561)	Hatching success	0.90 (0.04, 62)
					Breeding success	0.20 (0.05, 60)
Black guillemot		*Not analysed*	1997-18 (21)	83.9 (1.5, 133)	Clutch size	1.80 (0.08, 25)
					Large chicks/clutch	0.71 (0.18, 21)

1) *Including empty nests.* ***2)*** *Minimum estimate on 9 July, when 12 clutches (63%) contained chicks.* ***3)*** *Also counted on 9 July, excluding a colony of ca. 20 pairs washed away by a storm on 15 June.* ***4)*** *Excluding nests not known to have contained eggs/chicks.* ***5)*** *On 1 July, estimated by linear regression of mean values for counts on seven different days between 6 June and 16 July.* ***6)*** *Eight breeding pairs in 2018.* ***7)*** *Main colony with only 329 pairs in 2018.* ***8)*** *Small cliff-breeding colony 9 km SW of Vedøy with 381 pairs in 2018.* ***9)*** *Counted on 16 July when there were still 16 small chicks in the nests. Maximum production was therefore 0.45 (SE=0.03). 1* ***10)*** *Population of 698 pairs in 2018 breeding on/near buildings in Røst harbour.* ***11)*** *On traditional study ledges in plot VIII.* ***12)*** *All nests monitored at regular intervals in plot VIII (Kårøya rorbucamping).* ***13)*** *Total count of entire colony in Røst harbour on/near buildings (excl. 22 small chicks).* ***14)*** *Quasi-extinct colony on open ledges. Birds breeding in shelter on other islands in Røst were seemingly doing OK but not monitored.*

Table A9 *Key population parameters (SE, n) of lesser black-backed gull on* ***Horsvær*** *in 2018.*

Species	Population change %	Annual adult survival Period (yrs)	Annual adult survival Estimate %	Reproductive performance Sampling unit	Reproductive performance Estimate
Lesser black-backed gull	+ 97	2005-18 (13)	87.1 (4.4, 181)	Clutch size	2.45 (0.1X, 2018)
				Large chicks/pair	0.70 (*n*=60)

Table A10 *Key population parameters (SE, n) of seabirds on* ***Sklinna*** *in 2018.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	− 43 [t]				
Great cormorant	− 2 [t]			*No data 2018*	
Shag	+ 75 [t]	2016-17 (1)	79.6 (4.3, 530)	Clutch size [1]	2.04 (0.05, 407)
				Hatching success/nest	0.60 (*n*=53)
				Clutch size hatching	1.17 (0.15, 53)
				Chicks ≥ 10d/nest	1.81 (*n*=31)
				Chicks ≥ 20d/nest	1.80 (*n*=20)
				Chicks ≥ 30d/nest	1.40 (*n*=5)
Common eider	+ 15 [t]			Clutch size	4.00 (0.00, 2)
Herring gull [3]	− 20 [p]			Clutch size [2]	1.90 (0.24, 20)
				Clutch size [3]	2.24 (0.18, 17)
Great black-backed gull	+ 15 [p]			Clutch size [2]	1.17 (0.23, 23)
				Clutch size [3]	1.93 (0.20, 14)
Kittiwake *Sklinna*	+ [t 4]				
Sør-Gjæslingan	− 57 [t 5]	2016-17 (1)	71.8 (12.9, 287)	*No data 2018*	
Common guillemot	+ 7 [t]	2008-18 (10)	91.2 (0.8, 319)	*No quantitative estimate* [6]	
Razorbill	+ 28 [t]				
Puffin	− 19 [p]	*No estimate yet possible* [7]		Hatching success/nest	0.75 (0.11, 16)
				Chicks ≥ 10d/hatched	0.75 (0.13, 12)
				Chicks ≥ 20d/hatched	0.50 (0.15. 12)
Black guillemot	[p 8]	2008-18 (10)	88.1 (2.1, 67)		

1) *Counted on 2-3 June, including empty nests.* ***2)*** *Counted on 2 June, including empty nests.* ***3)*** *Counted on 2 June, excluding empty nests.* ***4)*** *Increase from 0 to 2 nests.* ***5)*** *Based on numbers of breeding birds counted in May and early June.* ***6)*** *Quantitative estimates difficult to obtain because the birds breed in shelter under big boulders.* ***7)*** *Colour ringing 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.* ***8)*** *No population count in 2018.*

Table A11 *Key population parameters (SE, n) of seabirds on* ***Runde*** *in 2018.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Common eider	+ 13 [t]				
Gannet	− 1 [t 1]			Large chicks/nest [2]	0.76 (0.02, 410)
Shag	0 [p 2,3]	*No estimate yet possible* [4]		*No breeding in 2018*	
Great skua	0 [t]			Large chicks/nest [5]	0.95 (*n*=80)
Kittiwake *Runde*	0 [p 3]			*No breeding in 2017*	
Sildegarnsholmen	− 6 [t]	2011-18 (7)	81.7 (1.6, 287)	Large chicks/nest	0.73 (*n*=615)
Common guillemot	0 [p 3]			*No breeding on open ledges in 2018*	
Puffin	− 22 [p]	2007-18 (11)	86.7 (1.2, 251)	Hatching success/nest	0.72 (0.06, 54)
				Chicks ≥ 20d/hatched	0.18 (0.06, 39)
				Chicks ≥ 40d/hatched	0.08 (0.04, 39)
				Fledged chicks/nest [5]	0.05 (0.04, 39)

1) *Mean annual change since the previous count in 2015.* ***2)*** *Large chicks counted in 4 study plots on 28 July.* ***3)*** *As in the preceding year, no breeding was recorded in the study plots in 2018.* ***4)*** *Colour ringing for monitoring of survival rates was initiated in 2008, but sample size is still too low.* ***5)*** *Maximum estimate.*

Table A12 *Key population parameters (SE, n) of seabirds on the different localities in* ***Hordaland*** *in 2018.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Lesser black-backed gull	− 36 [t]	2009-18 (9)	79.2 (4.2, 53)	Clutch size [1]	2.37 (0.11, 68)
				Fledged chicks/nest	0.14 (*n*=70)
Herring gull	− 12 [t]	2009-18 (9)	82.9 (7.1, 93)	Clutch size [1]	2.53 (0.05, 332)
				Fledged chicks/nest	0.39 (*n*=333)

1) *Including empty nests.*

Table A13 *Key population parameters (SE, n) of shag in* ***Rogaland*** *in 2018.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	+ 4 [p]	2016-18 (2) [1]	86.3 (19.1, 120)	Clutch size [2]	2.63 (0.11, 49)
				Breeding success [3]	No data 2018

1) *At Jarstein, when omitting data from 2014 when very few birds were colour-ringed.* ***2)*** *At Kjør, based on maximum nest content on 25 May and 5 June, when 1 and 18 empty nests, respectively, were found.* ***3)*** *No visits were made to Kjør after 5 June, when remaining clutch size had already dropped to 1.71 (0.19, 49), probably due to predation from gulls/crows, indicating final success was moderate or poor.*

Table A14 *Key population parameters (SE, n) of seabirds on the different sites in* ***Vest-Agder*** *in 2018.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant	− 15	*No estimate yet available* [1]		Clutch size	*No data 2018*
				Large chicks/nest	1.73 (*n*=231)
Common eider	− 13 [2]			Clutch size	*No data 2018*
				Small chicks on sea [3]	*No data 2018*
				Large chicks on sea [3]	*No data 2018*
Lesser black-backed gull		2001-18 (17)	81.3 (1.1, 683) [4]		
Slettingene	− 17			Clutch size [5]	2.09 (0.08, 190)
				Fledged juv./pair	0.32 (*n*=190)
Storøy	− 71			Clutch size [5]	2.50 (0.50, 2)
				Fledged juv./pair	0.00 (*n*=2)
Klovholmene	− 26			Clutch size [5]	1.85 (0.240, 26)
				Fledged juv./pair	0.0 (*n*=26)
Rauna	− 17	1999-18 (19)	82.6 (0.6, 1240)	Clutch size [5]	*No data 2018*
				Fledged juv./pair	0.12 (*n*=1415)
Herring gull		2001-18 (17)	80.9 (1.7, 482) [4]		
Slettingene	+ 5			Clutch size [5]	2.37 (0.09, 81)
				Fledged juv./pair	0.69 (*n*=124)
Storøy	− 13			Clutch size [5]	2.06 (0.21, 35)
				Fledged juv./pair	0.43 (*n*=58)
Klovholmene	+ 4			Clutch size [5]	2.43 (0.16, 21)
				Fledged juv./pair	0.71 (*n*=28)
Rauna	− 26	2002-18 (16)	82.4 (2.4, 176)	Clutch size [5]	*No data 2018*
				Fledged juv./pair	0.62 (*n*=325)

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 2018 due to no complete count at Rauna.* ***4)*** *General estimate for birds from Slettingene, Storøy and Klovholmene.* ***5)*** *Including empty nests.*

Cover photo:
Kittiwakes at Kårøya in the Røst harbour. Nowadays, colonies on buildings and other structures near human settlements are generally doing better than those on natural cliffs. © Tycho Anker-Nilssen

Author contact information

T. Anker-Nilssen (tycho@nina.no)
Norwegian Institute for Nature Research, PO Box 5685 Torgarden, NO-7485 Trondheim, Norway

Publication series information

SEAPOP Short Report (SSR) is published by the Norwegian Institute for Nature Research (NINA), the Norwegian Polar Institute (NPI) and Tromsø University Museum (TMU) as a web-based newsletter presenting individual progress reports and analyses of projects within the *SEAPOP* programme. The individual SSRs have no ISNN/ISBN coding, but all results are entered into the SEAPOP database and communicated through our open data portal on www.seapop.no. They are also published in a broad range of scientific reports and peer-reviewed papers that we present on the web site as they appear.

SEAPOP (SEAbird POPulations) is a long-term monitoring and mapping programme for Norwegian seabirds that was established in 2005 and implemented on the full national scale in Norway, Svalbard and adjacent sea areas in 2008. The programme is financed by the Ministry of the Environment, the Ministry of Petroleum and Energy and the Norwegian Oil and Gas Association, and aims to provide and maintain the most important base-line knowledge of seabird distribution, demography and ecology needed for an improved management of these marine environments. More info about SEAPOP is found on the programme's web site www.seapop.no, including an up-to-date list of associated publications from which all reports can be freely downloaded as pdf documents.

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