SEAPOP Short Report 1-2020

Key-site monitoring in Norway 2019, including Svalbard and Jan Mayen

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Breeding success

Overall, the 2019 breeding season was negative for Norwegian seabirds (Table 1a). There was poor breeding success in 34% of the monitored populations, a drop since 2018, and fewer populations nested successfully (32% versus 38% in 2018). Productivity in 2019 was better for pelagic populations (43% good, 34% moderate, 23% poor) than coastal populations (23% good, 33% moderate, 44% poor).

Among the pelagic species, northern gannets, common guillemots and razorbills performed best in 2019, with good breeding success in at least half of the colonies where these species are monitored. For razorbills, the exceptions were Hjelmsøya (moderate) and Hornøya (poor). In the latter colony, white-tailed eagles contributed to a severe setback also for common guillemots and kittiwakes, with no chick production for any of these species in 2019. Gannets had good breeding success at Bjørnøya, Gjesværstappan and at Runde.

For puffins, 2019 was a variable season, and at only two (Anda and Runde) of six sites was nesting successful. Røst had another year of poor reproduction, the 13th in a row, including 9 years (2007–2015) of total breeding failures. Little auks again had a good season on Bjørnøya and a moderate one on Spitsbergen. Fulmars did well on Jan Mayen, poorly on Røst and moderately on Sklinna. Brünnich's guillemots also had a moderate breeding season on Bjørnøya and Spitsbergen, while those on Jan Mayen had good breeding success for the first time since monitoring began in 2012. Ivory gulls had moderate breeding success on Spitsbergen. Kittiwakes had another bad year, and only the colony in Ålesund (Runde) bred successfully while those on Bjørnøya, Anda and Røst had moderate productivity.

Among the coastal species, the herring gulls came out worst with low production in six of seven colonies and moderate in the seventh. For eiders, 2019 was a bad year. Four colonies had poor breeding success and one moderate. As usual, the picture varied for the other large gulls. Glaucous gulls had a successful breeding season on Bjørnøya and Jan Mayen while the breeding success for the great black-backed gull was good on Anda and Sklinna, but poor on Hjelmsøya and Hornøya. Lesser black-backs had good breeding success in southern Helgeland and Hordaland, and bad on Røst and in Vest-Agder. For the great skua, 2019 was a mixed year, with poor success in the large population on Bjørnøya, moderate on Runde and Jan Mayen and good on Hjelmsøya and Røst. For the cormorants and shags, the breeding success was generally moderate, with the exception of shags on Runde and great cormorants in the outer Oslofjord where both species had good breeding success.

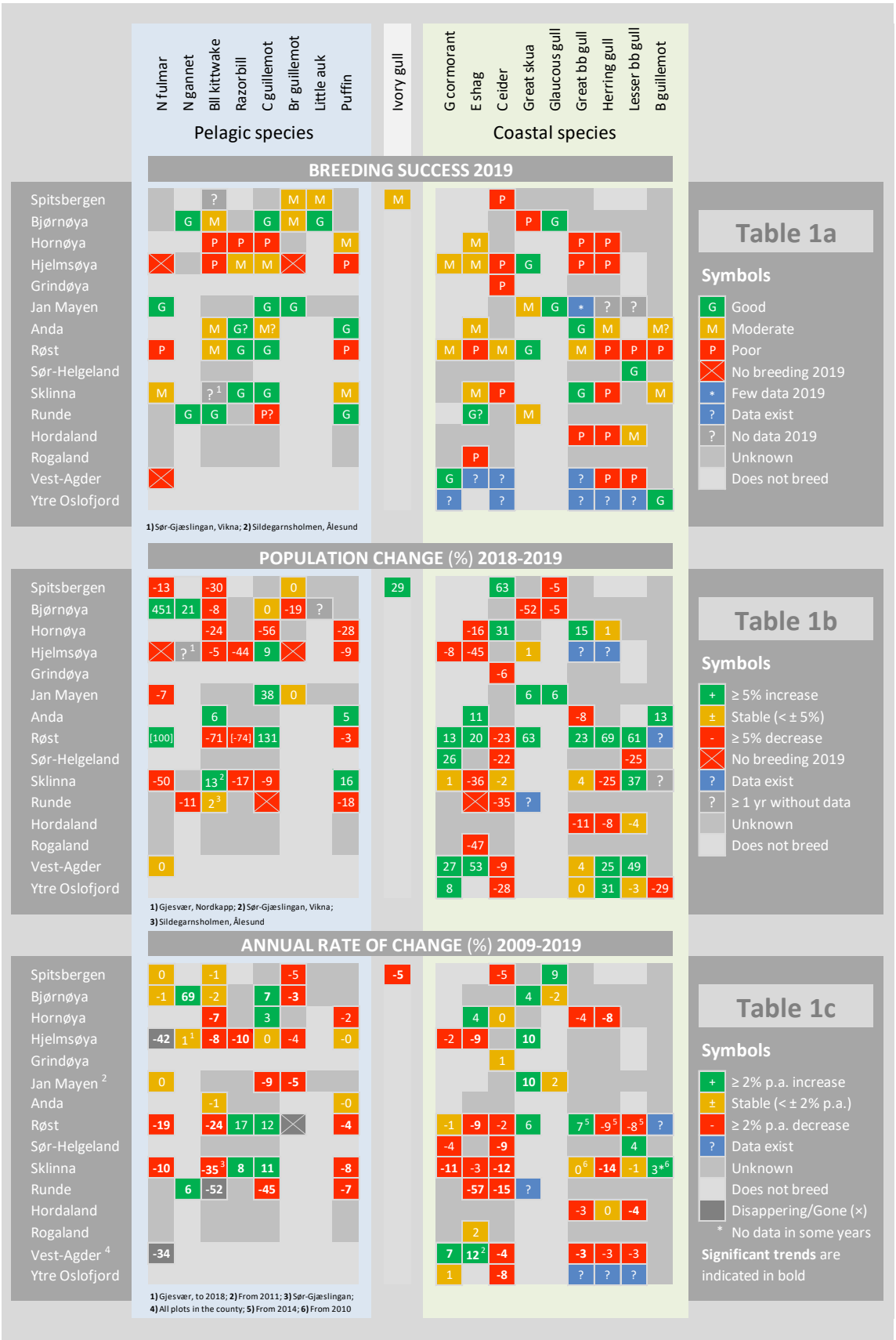
Overall, breeding success was best for gannets, glaucous gulls and razorbills. The trend for gannets has been very good over time. A good breeding success for glaucous gulls on both Jan Mayen and

Figure 1

SEAPOP key-sites, as of 2019. 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).

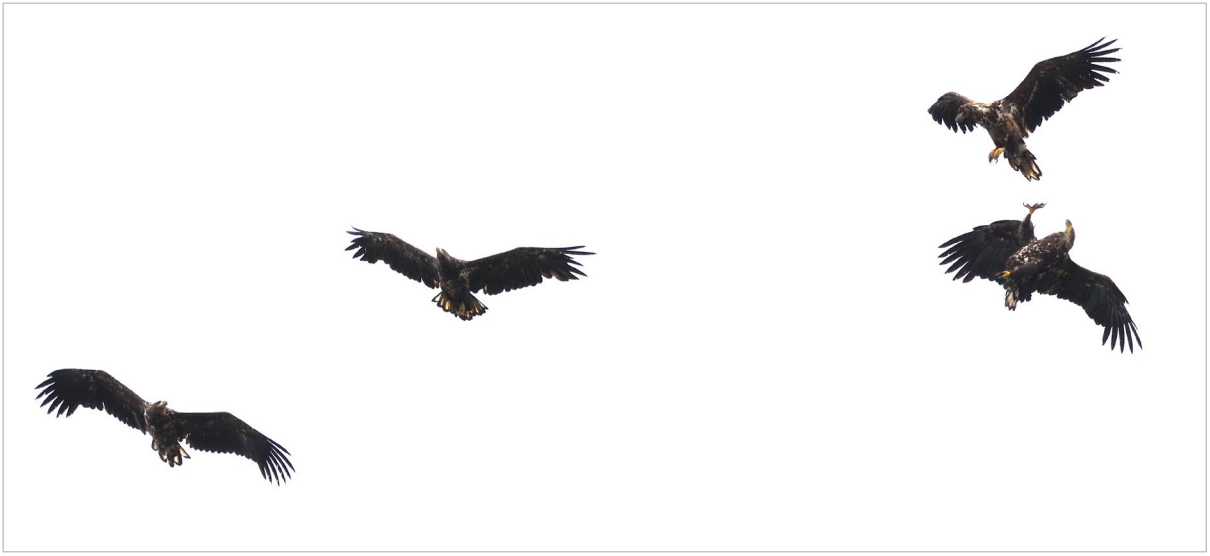
Table 1

Schematic summary of breeding success (1a) and change in breeding numbers (1b) for focal seabird species at the regular SEAPOP monitoring sites in 2019, and their mean population trend over the last ten years (1c).



Bjørnøya in 2019 is positive for this species that has suffered over time. In contrast, razorbills have been successful over time at several sites but have problems on Hjelmsøya and Hornøya. The situation on Hornøya is drastic for most species due to increased activity of white-tailed eagles and the colony is now experiencing what several of the other mainland colonies have experienced in previous decades.

Over recent years, breeding success has been lowest among the coastal species although the picture is complex and varies geographically. Eiders have produced few chicks over time, and the big gulls also have problems. This applies especially to herring gulls, while breeding success is more varied for great black-backed and lesser black-backed gulls. Despite the positive note that several pelagic species have had good breeding success in several colonies in recent years, many Norwegian seabirds are struggling with variable and poor reproduction. Poor food supplies combined with increased predation appear to be the main cause.



Disturbance and predation from immature white-tailed eagles now affects the breeding success of seabirds at most key-sites along the Norwegian mainland coast. Photo: © Tycho Anker-Nilssen, Røst.

Population changes

The population changes from 2018 to 2019 were overall positive for seabirds on Anda and Jan Mayen, negative on Bjørnøya and Sklinna and varied on the other key sites.

Of all the monitored seabird populations, just under half declined between 2018 and 2019 (Table 1b). One third increased and the remainder (about 15%) remained stable. On most sites, trends were contrasting with numbers of some species decreasing while others remained stable or increased. For all species, pelagic or coastal, there were also different developments at different localities.

Seen over the last decade (2009–2019), the trends in most Norwegian seabird populations remain very worrying (Table 1c). Most kittiwake populations decreased between 2018 and 2019, a

continuation of the long-term decline. At Spitsbergen, the breeding season was very late in 2019, and many of the pairs did not start to breed until after the monitoring was completed. Over the past ten years, the population sizes of species monitored at Spitsbergen have been quite stable, as also on Bjørnøya and Anda.

The populations of northern fulmars on Spitsbergen and Jan Mayen are stable, while the species has declined sharply on both Bjørnøya and the mainland over the last ten years. This is despite a sharp increase from 2018 to 2019 on Bjørnøya. The northern gannet is the exception among the pelagic surface-feeding species. The population is still growing, especially at Bjørnøya, where the first two pairs were established in 2011 increasing to 92 pairs in 2019.

For razorbills and common guillemots, the populations on Bjørnøya, Sklinna, Røst and Hornøya have increased over the last ten years, but in 2019 numbers on Hornøya fell by 56%. Disturbance by white-tailed eagles explain much of the decline in numbers breeding on the mainland. Common guillemots that breed in shelter on Hjelmsøya have been stable in numbers over the last ten years (as they probably also have in Røst, where that part of the population is not monitored), but the species is practically absent on open ledges, as it is also on Røst and Runde. At Jan Mayen, common guillemot numbers have declined by 9% annually since monitoring began in 2011.

Brünnich's guillemots have declined slightly over the last decade in the monitoring sites on Jan Mayen, West Spitsbergen and Bjørnøya, despite signs of a reprieve at Jan Mayen and Spitsbergen between 2018 and 2019. A large part of the population breeds on the east side of Spitsbergen, where the colony at Alkefjellet has been stable since monitoring started in 2015. Atlantic puffin populations are more or less stable north of Lofoten, but are in sharp decline (4-8% annually) further south.

From 2018 to 2019, the number of nesting great cormorants increased at all localities except Hjelmsøya. Over the last ten years, however, the populations at Sklinna and in southern Helgeland have declined while the species has been relatively stable on Hjelmsøya and Røst. In Vest-Agder, the *sinensis* subspecies is still increasing. Since 2009, the European shag population has declined, sometimes steeply, in all northern locations west of the North Cape, while it has been stable in Rogaland and increased on Hornøya and in Vest-Agder.

Eiders have had a negative trend over the past year and past decade at most sites. Only Hornøya and Grindøya have stable populations. The numbers of great skuas, on the other hand, have increased over the last ten years at all monitoring sites, despite a sharp drop on Bjørnøya in 2019. This decline was linked to a very late breeding season that seems to have affected all surface-feeding species in Svalbard. The ivory gull population in Svalbard increased by 29% in 2019, but the trend over the last decade is still clearly negative.

For the other coastal species, the situation was relatively complex between 2018 and 2019. Lesser black-backed, great black-backed, herring and glaucous gulls increased in some colonies and declined in others. The general picture for the period 2009–2019 is that most populations of gull species that are being monitored are declining.

With some patience, it is never too late to start a long-term series. For large gulls and (as this) great skua, ringing chicks that later recruit into the breeding population is one way of establishing and maintaining an adequate sample size of colour-ringed adults. Photo: © Tycho Anker-Nilssen, Røst.

Adult survival

Seabirds are typically long-lived birds with high annual survival of adult individuals. Monitoring of survival is therefore particularly important for the interpretation of changes in population numbers. Estimates of adult survival are based on the resighting of colour-ringed birds in the breeding colonies, and the numbers of birds returning in successive breeding seasons. For most populations, both survival and resighting probability vary between years. In such cases, estimates presented here are valid for the period summer 2017 to summer 2018.

As in earlier years, there was large variation in adult survival rates among the auks, both among key sites and years, although many were low. Adult survival of puffins in the northernmost mainland colonies was lower than in the previous year. At Hornøya, survival dropped from 96% to 85%, at Hjelmsøya from 95% to an extremely low 48% and at Anda from 90% to 84%. At Røst, survival also tends to vary between years, but remained high and similar to the previous year (94%). Survival of puffins at Runde was stable at 87%. Common guillemots showed constant annual survival at Jan Mayen (86%), Hornøya (97%) and Sklinna (91%). At Hjelmsøya, there was a larger variation between years, and survival dropped from 92% in the previous year to only 80%. Survival rates among Brünnich's guillemots increased at Jan Mayen (from 76% to 89%) and were stable on Bjørnøya (90% to 91%). On Spitsbergen, however, it decreased greatly from 94 to 63%. Little auk showed stable adult survival of 84% in Bjørndalen and 80% at Feiringfjellet on Spitsbergen. Razorbills are only monitored at Hornøya where survival rate was 94%. For black guillemots, survival rates are only monitored at Røst, and the estimate remained stable at 84%.

Survival rates for black-legged kittiwakes dropped again at all but one mainland monitoring site north of Ålesund after a year with better survival between 2016 and 2017. At Hjelmsøya, there was a decline from 95% to only 72%, at Anda from 91% to 81%, at Røst from 81% to 77% and at Sør-Gjæslingan from poor 72% to extremely low 63%. At Hornøya, kittiwake survival was in the same range as in the year before (from 77% to 78%) and at Ålesund and on Runde it was stable and relatively low (both 80%), while stable and relatively good on Bjørnøya (88%) and Spitsbergen (85%).

Lesser black-backed gulls showed constant survival along the whole Norwegian coastline, and it was higher (90%) at Horsvær in Sør-Helgeland where the nominate race *L. f. fuscus* is monitored, than at the colonies in Hordaland (81%) and in Vest-Agder (80% at Mandal and 84% at Rauna, respectively) where the subspecies *L. f. intermedius* breeds. For all three monitored populations of herring gulls, survival was constant and similar: 80% at Hornøya, 81% in Hordaland and 82% in Vest-Agder. Great black-backed gulls at Hornøya also had constant survival over time (83%). Glaucous gulls at Bjørnøya showed a constant survival at 78%, while the estimate for those in Kongsfjorden increased to 81% from only 63% in 2018. Great skuas survived well at Bjørnøya as in the previous year (95%). For Ivory gull at Barentsøya, however, we registered a worrying decline from 76% to 72%.

Among the monitored shag populations, survival rates were stable at Hornøya (85%). At Røst and Sklinna, they dropped markedly compared to the previous year, from 84% to 70% at Røst and from 84% to an extremely low 58% at Sklinna. These are the second-lowest and lowest adult survival estimates since start of the monitoring for these colonies.

Survival of common eiders at Grindøya increased substantially from 56% to 99%, which is the highest recorded in 16 years. In contrast, survival for the same species was stable at 81% in Kongsfjorden on Spitsbergen. Survival of northern fulmars is only monitored at Jan Mayen, where it remained constant at a high 94%.

Digital cameras with tracking focus are excellent tools for determining the identity of colour-ringed birds and what they bring to their chicks. Here common guillemot AZ arrives with a snakeblenny (Lumpenus lampretaeformis)*. Photo: © Håvard Eggen, Røst.*

APPENDIX – Key parameters from all key-sites in 2019

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 2018 and 2019 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 that 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 2019 (excl. Bjørnøya, cf. Table A2).*

Species	Colony	Population change %	Annual adult survival		Reproductive performance	
			Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	*Nøisdalen*	− 13 p				
Common eider	*Kongsfjorden*	+ 62 t	2007-19 (12)	81.9 (1.1, 408)	Hatching success [1]	0.12 (*n*=17)
Ivory gull	*32 colonies*	− 29 p				
	Barentsøya		2017-18 (1)	72.7 (8.0, 257)	Large chicks/nest	0.57 (0.06, 18)
Glaucous gull	*Kongsfjorden*	− 5 p	2017-18 (1)	81.4 (8.6, 131)	Hatching success [2]	0.65 (*n*=37)
Kittiwake	*Ossian Sars*	− 48 p				
	Grumantbyen	*No data*	2008-19 (11)	84.9 (2.5, 247)	Chicks ≥ 15d/nest [3]	0.43 (*n*=21)
	Fuglehuken [3]	*No data*				
Brünnich's guillemot	*Ossian Sars*	− 10 p	2017-18 (1)	63.4 (4.8, 234)	Chicks ≥ 15d/egg	0.73 (0.09, 26)
	Diabasodden [3]	+ 10 t	*No data 2019*		*No data 2019*	
	Fuglehuken	+ 21 p	*No data 2019*		*No data 2019*	
Little auk	*Bjørndalen*	*No data*	2005-19 (14)	84.1 (1.5, 606)	Chicks ≥ 15d/egg	0.57 (0.14, 14)
	Feiringfjellet	*No data*	2006-19 (13)	80.0 (1.6, 821)	*No data 2019*	

1) *Minimum proportion of nests with at least 1 chick hatching.* ***2)*** *Proportion of nests with at least 1 chick hatching. Irregular monitoring in 2019 so that hatching success estimate is to be taken with caution.* ***3)*** *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 2019.*

Species	Population change %	Annual adult survival		Reproductive performance	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	+ 451 p			*No data 2019*	
Gannet	+ 21 p [1]			Large chicks/nest	0.57 (0.05, 91)
Great skua	− 52 p	2017-2018 (1)	95.3 (3.0, 234)	Large chicks/nest	0.07 (0.26, 82)
Glaucous gull	− 5 p	2009-2019 (10)	78.2 (1.9, 189)	Large chicks/nest	1.26 (0.13, 19)
Kittiwake	− 8 p	2004-2019 (15)	87.6 (0.7, 411)	Large chicks/nest	0.74 (0.02, 407)
Common guillemot	+ 0 p	*Results not yet available*		Fledging success [2]	0.72 (0.05, 78)
Brünnich's guillemot	− 19 p	2017-2018 (1)	90.5 (5.6, 351)	Fledging success [2]	0.75 (0.06, 53)
Little auk	p [3]	2017-2018 (1)	90.4 (17.5, 1002)	Fledging success	0.80 (0.06, 50)

1) *91 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 2019.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	− 13 [p]	2004-2019 (15)	85.7 (1.2, 345)	Clutch size	*No data*
				Breeding success	*No data*
Herring gull	+ 1 [p]	2007-2019 (12)	80.5 (2.0, 148)	Clutch size	2.71 (0.09, 28)
				Breeding success [1]	0.46 (0.17, 28)
Great black-backed gull	+ 15 [p]	2001-2019 (18)	82.8 (1.3, 235)	Clutch size	2.59 (0.13, 22)
				Breeding success [1]	0.50 (0.17, 22)
Kittiwake	− 24 [p]	2017-2018 (1)	78.7 (4.5, 1539)	Clutch size [1]	1.39 (0.12, 18) [2]
				Large chicks/nest [1]	0.00 (0.00, 18) [2]
Common guillemot	− 56 [p]	1988-2019 (32)	97.4 (0.3, 275)	Breeding success [1]	0.00 (0.00, 35) [2]
Razorbill	*No data*	1995-2019 (24)	94.4 (0.6, 378)	Breeding success [1]	0.48 (0.09, 31)
Puffin	− 28 [p]	2017-2018 (1)	84.5 (4.1, 952)	Breeding success [1]	0.57 (0.09, 30)

1) *Medium-sized chicks/egg laid.* ***2)*** *Because of extremely high nest-predation the sample size was low, and no kittiwake or common guillemot chicks fledged at Hornøya in 2019.*

Table A4 *Key population parameters (SE, n) of seabirds on* ***Hjelmsøya*** *in 2019.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant				*No data 2019*	
W Finnmark	− 8 [t]			*No data 2019*	
Shag *Lille Kamøy*	− 45 [p]			*No data 2019*	
Gannet *Gjesværstappan*	*No data*				
Common eider	[t 3]				
Great skua	+1 [t]			Clutch size	1.40 (0.22, 5)
Arctic skua	0 [t]			Clutch size	2.00 (0.00, 2)
Common gull	+ 10 [t]			Clutch size [1]	1.80 (0.23, 10)
Herring gull	[p 3]	*No data*		Clutch size [4]	0.00 (0.00, 25)
				Breeding success [5]	0.00 (0.00, 25)
Great black-backed gull	[p 3]	*No data*		Clutch size [1]	1.62 (0.23, 13)
				Breeding success [5]	0.00 (0.00, 28)
Kittiwake	− 5 [p]	2017-2018 (1)	72.7 (8.3, 462)	Clutch size [1]	1.03 (0.10, 73)
				Clutch size [2]	1.60 (0.08, 47)
				Breeding success [5]	0.00 (0.00, 73)
Common guillemot					
Open ledges (inds.)	− 83 [p]	*No data*		*No breeding confirmed 2019*	
Crevices not predated (eggs)	+ 14 [p]	2017-2018 (1)	79.7 (23.5, 310)	Breeding success [5]	0.43 (0.11, 21)
Crevices predated (eggs)	+ 9 [p]				
Brünnich's guillemot	~Extinct [6]	*No data*		*No breeding confirmed 2019*	
Razorbill *Open ledges (inds.)*	− 44 [p]	*Too small sample*		*No data 2019*	
Crevices (eggs)	− 34 [p]			Breeding success [5]	0.25 (0.15, 8)
Puffin *Gjesværstappan*	+ 3 [p 7]				
Hjelmsøya	− 9 [p 8]	2017-2018 (1)	48.9 (11.9, 312)	Hatching success	0.25 (0.04, 100)
				Breeding success [5]	0.19 (0.04, 93)

1) *Including empty nests.* ***2)*** *Excluding empty nests.* ***3)*** *Results not yet available.* ***4)*** *No eggs produced, or eggs predated immediately after laying.* ***5)*** *Large chicks/egg laid.* ***6)*** *Very few birds still attended the colony irregularly.* ***7)*** *250 plots.* ***8)*** *25 plots.*

Table A5 *Key population parameters (SE, n) of seabirds on* ***Jan Mayen*** *in 2019.*

Species	**Population change** %	**Annual adult survival**		**Reproductive performance**	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	− 6 [p]	2011-19 (8)	94.2 (2.5, 86)	Chicks/nest [1]	0.59 (0.05, 96)
Common guillemot	+ 33 [p]	2011-19 (8)	86.1 (2.0, 100)	Breeding success [2]	0.65 (0.10, 23)
Brünnich's guillemot	0 [p]	2017-18 (1)	88.9 (5.2, 139)	Breeding success [2]	0.65 (0.06, 61)
Great skua	+ 6 [p]			Large chicks/nest [3]	0.54 (0.12, 52)
Glaucous gull	+ 6 [p]			Large chicks/nest [3]	1.18 (0.18, 34)
Great black-backed gull	(0) [p 4]			Large chicks/nest [3]	0.00 (0.00, 2)
Lesser black-backed gull	(0) [p 4]			No data 2019	

1) *Recorded early in the chick-rearing period when most chicks were still small or 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 2019.*

Species	**Population change** %	**Annual adult survival**		**Reproductive performance**	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Common eider	− 6 [t 1]	2017-2018 (1)	99.7 (0.1, 1490)	Clutch size	4.00 (0.13, 49)

1) *Nest counts.*

Table A7 *Key population parameters (SE, n) of seabirds on* ***Anda*** *in 2019.*

Species	**Population change** %	**Annual adult survival**		**Reproductive performance**	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Shag	+ 11 [t]			Large chicks/nest [1]	1.05 (0.23, 21)
Herring gull	− 8 [t]			Clutch size [2]	1.47 (0.11, 86)
				Clutch size [3]	1.91 (0.09, 66)
				Large chicks/nest	0.63 (*n*=57)
Kittiwake	+ 6 [p]	2017-18 (1)	83.0 (3.3, 527)	Clutch size/pair [5]	1.44 (0.09, 34)
				Large chicks/nest	0.48 (0.02, 849)
Puffin	+ 5 [p]	2017-18 (1)	84.3 (11.3, 471)	Hatching success	1.00 (0.00, 54)
				Chicks ≥ 20d/nest	0.93 (0.04, 54)
Black guillemot	+ 13 [t 5]			Large chicks/nest	0.96 (0.19, 24)

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

Table A8 *Key population parameters (SE, n) of seabirds on* ***Røst*** *in 2019.*

Species		Population change %	Annual adult survival Period (yrs)	Annual adult survival Estimate %	Reproductive performance Sampling unit	Reproductive performance Estimate
Fulmar		+ 100 [p]				
Great cormorant		+ 13 [t]			Clutch size [1,2]	2.84 (0.15, 44)
					Large chicks/nest [3]	0.91 (0.16, 44)
Shag	*Ellefsnyken*	+ 20 [p]	2002-19 (17)	82.5 (0.8, 534)	Clutch size [4,5]	2.11 (0.05, 174)
					Clutch size [1,5]	1.79 (0.07, 208)
					Large chicks/nest [4]	0.67 (0.28, 12)
Common eider		− 23 [p]			Clutch size	4.05 (0.14, 56)
Great skua		+ 63 [t 6]			Clutch size	1.89 (0.11, 9)
					Breeding success	1.08 (0.18, 13)
Common gull		+ 13 [p]			Clutch size [4]	2.44 (0.08, 102)
					Large chicks/nest [4]	0.42 (*n*=106)
Lesser black-backed gull		+ 61 [p]			Clutch size [4]	2.15 (0.13, 46)
					Large chicks/nest [4]	0.84 (*n*=45)
Herring gull		+ 69 [p]			Clutch size [4]	2.35 (0.05, 191)
					Large chicks/nest [4]	1.10 (*n*=192)
Great black-backed gull		+ 23 [p]			Clutch size [4]	2.32 (0.04, 315)
					Large chicks/nest [4]	1.28 (*n*=285)
Kittiwake	*Vedøy*	− 71 [p 7]			Large chicks/nest [7]	0.00 (0.00, 93)
	Gjelfruvær	+ 7 [t 8]			Large chicks/nest [9]	0.32 (0.03, 408)
	Kårøy area	± 0 [t 10]	2017-18 (1)	77.4 (4.0, 462)	Clutch size/pair [11]	1.68 (0.15, 34)
					Clutch size/pair [12]	1.49 (0.06, 247)
					Large chicks/pair [11]	0.68 (0.16, 34)
					Large chicks/pair [12]	0.68 (0.04, 284)
					Large chicks/nest [13]	0.58 (0.03, 753)
Arctic tern					Clutch size/pair [14]	1.61 (0.08, 38)
Common guillemot		+ 131 [p 15]			Breeding success	*No data 2019*
Razorbill		− 74 [p 15]				
Puffin		− 3 [p]	2017-18 (1)	94.4 (2.4, 572)	Hatching success	0.91 (0.03, 90)
					Breeding success	0.14 (0.04, 83)
Black guillemot		*Not analysed*	1997-19 (22)	84.0 (1.4, 133)	Clutch size	1.63 (0.09, 30)
					Large chicks/clutch	1.24 (0.18, 17)

1) *Including empty nests.* ***2)*** *Minimum estimate on 20 June, when 21 clutches (48%) contained chicks.* ***3)*** *Minimum estimate on 7 July when there were still 24 small chicks and 8 eggs in the colony (i.e. maximum estimate was 1.45-1.64).* ***4)*** *Excluding nests not known to have contained eggs/chicks.* ***5)*** *On 1 July, estimated by linear regression of mean values for counts on six different days between 19 June and 14 July.* ***6)*** *A total of 13 pairs bred in Røst in 2019.* ***7)*** *Main colony with only 93 pairs in 2019.* ***8)*** *Small cliff-breeding colony 9 km SW of Vedøy with 408 pairs in 2019.* ***9)*** *Counted on 16 July.* ***10)*** *Population of 753 pairs in 2019 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 on/near buildings in Røst harbour.* ***14)*** *Colony in Ystøran, visited 23 June. A few young seen on the wing in medio August (A. Wilhelmsen, pers. comm.).* ***15)*** *Quasi-extinct colony on open ledges on Vedøy. 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 2019.*

Species	Population change %	Annual adult survival Period (yrs)	Annual adult survival Estimate %	Reproductive performance Sampling unit	Reproductive performance Estimate
Lesser black-backed gull	− 26	2005-19 (14)	89.5 (1.0, 181)	Clutch size	2.25 (0.06, 161)
				Large chicks/pair	0.86 (*n*=142)

Table A10 *Key population parameters (SE, n) of seabirds on* ***Sklinna*** *in 2019.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	− 50 [t]				
Great cormorant	+ 1 [t]			*No data 2019*	
Shag	− 36 [t]	2017-18 (1)	58.1 (5.0, 515)	Clutch size [1]	1.57 (0.05, 409)
				Hatching success/nest	0.48 (*n*=50)
				Clutch size hatching	1.34 (0.16, 50)
				Chicks ≥ 10d/nest	1.93 (*n*=29)
				Chicks ≥ 20d/nest	1.75 (*n*=12)
				Chicks ≥ 30d/nest	1.50 (*n*=2)
Common eider	− 2 [t]			Clutch size	3.60 (0.37, 10)
Herring gull [3]	− 25 [p]			Clutch size [2]	1.60 (0.36, 15)
				Clutch size [3]	2.67 (0.17, 9)
Great black-backed gull	+ 4 [p]			Clutch size [2]	1.46 (0.19, 24)
				Clutch size [3]	1.84 (0.14, 19)
Kittiwake *Sklinna*	− 100 [t 4]				
Sør-Gjæslingan	+ 13 [t 5]	2017-18 (1)	63.2 (9.2, 287)	*No data 2019*	
Common guillemot	− 9 [t]	2008-19 (11)	91.0 (0.8, 345)	*No quantitative estimate* [6]	
Razorbill	− 27 [t]				
Puffin	+ 16 [p]	*No estimate yet possible* [7]		Hatching success/nest	0.80 (0.11, 15)
				Chicks ≥ 10d/hatched	0.75 (0.13, 12)
				Chicks ≥ 20d/hatched	0.75 (0.13, 12)
Black guillemot	− 11 [p 8]	2008-17 (9) [9]	88.1 (2.2, 67)		

1) *Counted on 31 May – 5 June, including empty nests.* ***2)*** *Counted on 3 June, including empty nests.* ***3)*** *Counted on 3 June, excluding empty nests.* ***4)*** *Decrease from 2 to 0 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; change in comparison to 2017 (i.e. over two years).* ***9)*** *No estimate possible for 2018.*

Table A11 *Key population parameters (SE, n) of seabirds on* ***Runde*** *in 2019.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Common eider	− 15 [t]				
Gannet	− 11 [t 1]			Large chicks/nest [1]	0.71 (0.02, 412)
Shag	0 [p 2]			*No breeding in 2019*	
Great skua	− 0 [t]			Large chicks/nest	0.75 (0.09, 67)
Kittiwake *Runde*	[p 2]			*No breeding in 2019*	
Sildegarnsholmen	+ 3 [t]	2011-19 (8)	80.0 (1.3, 280)	Large chicks/nest	0.71 (0.03, 663)
Common guillemot	0 [p 2]			*No breeding on open ledges in 2019*	
Puffin	− 18 [p]	2007-19 (12)	86.8 (1.0, 394)	Hatching success/nest	0.82 (0.06, 44)
				Chicks ≥ 20d/hatched	0.43 (0.08, 44)
				Chicks ≥ 40d/hatched	0.29 (0.07, 42)
				Fledged chicks/nest	0.29 (0.07, 42)

1) *Large chicks counted in 4 study plots on 30 July.* ***2)*** *As in the preceding years, no breeding was recorded in the study plots in 2019.*

Table A12 *Key population parameters (SE, n) of seabirds on Lyngøya in* ***Hordaland*** *in 2019.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Common eider	− 71 [t]			*No data 2019*	
Lesser black-backed gull	− 4 [t]	2009-19 (10)	81.2 (3.5, 62)	Clutch size [1]	1.95 (0.13, 67)
				Breeding success [2]	0.90 (*n*=67)
Herring gull	− 8 [t]	2009-19 (10)	81.2 (4.2, 130)	Clutch size [1]	2.26 (0.06, 305)
				Breeding success [2]	0.52 (*n*=305)
Great black-backed gull	− 11 [t]			Clutch size [1]	2.00 (0.40, 8)

1) *Including empty nests.* ***2)*** *Large chicks/fledgling per nest.*

Table A13 *Key population parameters (SE, n) of shag in* ***Rogaland*** *in 2019.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	– 47 [p]	2016-19 (3) [1]	83.0 (2.6, 176)	Clutch size [2]	2.28 (0.01, 50)
				Breeding success [3]	0.90 (0.03, 39)

1) *At Jarstein, omitting 7 birds colour-ringed in 2014.* ***2)*** *At Kjør, based on maximum nest content on 24 May and 1 June, when 1 and 16 empty nests, respectively, were found.* ***3)*** *Chicks/nest on 10 July, including only nests known to have contained eggs or chicks.*

Table A14 *Key population parameters (SE, n) of seabirds on the different sites in* ***Vest-Agder*** *in 2019.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant	+ 18	*No estimate yet available* [1]		Clutch size [2]	3.64 (0.01, 83)
				Large chicks/nest	1.68 (*n*=273)
Common eider	− 9 [3]			Clutch size	3.25 (0.07, 20)
				Small chicks on sea [4]	*No data 2019*
				Large chicks on sea [4]	*No data 2019*
Lesser black-backed gull		2001-19 (18)	80.3 (1.1, 736) [5]		
Slettingene	− 55			Clutch size [2]	2.08 (0.12, 86)
				Fledged juv./pair	1.63 (*n*=86)
Storøy	0			Clutch size [2]	3.00 (0.00, 2)
				Fledged juv./pair	0.00 (*n*=2)
Klovholmene	− 31			Clutch size [2]	1.72 (0.29, 18)
				Fledged juv./pair	0.00 (*n*=18)
Rauna	+ 70	1999-19 (20)	83.4 (0.6, 1328)	Clutch size [2]	*No data 2019*
				Fledged juv./pair	0.44 (*n*=2400)
Herring gull		2001-19 (18)	81.6 (1.5, 538) [5]		
Slettingene	− 24			Clutch size [2]	2.02 (0.17, 42)
				Fledged juv./pair	0.80 (*n*=94)
Storøy	+ 2			Clutch size [2]	1.37 (0.17, 41)
				Fledged juv./pair	0.34 (*n*=59)
Klovholmene	0			Clutch size [2]	1.84 (0.24, 25)
				Fledged juv./pair	0.00 (*n*=28)
Rauna	+ 54	2002-19 (17)	81.6 (2.1, 182)	Clutch size [2]	*No data 2019*
				Fledged juv./pair	0.63 (*n*=500)

1) *Colour-ringing of chicks initiated in 2008.* ***2)*** *Including empty nests.* ***3)*** *Based on counts of adult males in Farsund municipality.* ***4)*** *No estimates in 2019 due to no complete count at Rauna.* ***5)*** *General estimate for birds from Slettingene, Storøy and Klovholmene.*

Cover photo:
A longed-for occurrence of sandeels near Runde in June 2019 hit the news and benefited the puffins there. Also, the puffins in Røst 600 km farther north brought some nice loads of sandeels to their chicks early on. Unfortunately, the supply didn't last long up there and other prey was again either too small or insufficient to secure an adequate breeding success for this impoverished puffin colony. Photo: © Tycho Anker-Nilssen, Røst.

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