SEAPOP Short Report 1-2021

Key-site monitoring in Norway 2020, including Svalbard and Jan Mayen

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

NINA Norwegian Institute for Nature Research
Norsk Polarinstitutt
Universitetet i Tromsø

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Breeding success

For Norwegian seabirds, breeding success in 2020 was the worst of a long series of bad years (Table 1a). Among all the populations monitored, 41% had a poor breeding success. This is much more than in previous years. The negative results were highest among pelagic species although their breeding success varied more (28% good, 43% poor) than among coastal species (20% good, 40% poor).

There was a large spatial variation in breeding success in 2020. Populations on Runde in the southern Norwegian Sea and on Bjørnøya in the Barents Sea fared best, while those in mainland colonies in the Barents and Norwegian Seas fared worst. On Runde, 2020 was the second year on the run with a good breeding success among most of the species, probably due to good access to sandeels in the region these years. On Hornøya and Hjelmsøya, results were catastrophic with 86% and 64% respectively of the populations faring badly, and none of the remainder did well. As in 2019, breeding success on Hornøya was seriously affected by disturbance by sea eagles, resulting in poor success for kittiwakes, common guillemots and razorbills breeding on open shelves. This phenomenon has become widespread among the bird cliffs along the mainland coast over the last 20 years. Covid-19 restrictions prevented documentation of breeding success on Jan Mayen and for the pelagic species on Spitsbergen.

Among the pelagic species, the northern gannets were the most successful with good success in two of three colonies. Puffins did very badly throughout its area of distribution with one exception, Runde, where they were successful. The pattern was similar for kittiwakes with successful breeding in Ålesund (the colony on Runde has all but disappeared), and moderate or poor success in the other colonies. Fulmars also did badly in all colonies monitored. For common guillemots the picture was more diffuse, with successful breeding in half the colonies and poor breeding in most of the others. Ivory gulls did well on Spitsbergen, probably because there was extensive sea ice throughout the breeding season.

Of the coastal species, eiders and herring gulls had the poorest season, with low breeding success in four of six and three of seven populations respectively, and moderate in the remainder. Shags also did badly with poor or moderate success in all colonies monitored, except Runde where success was good. The breeding success of great black-backed gulls was good in colonies in the Norwegian Sea, but poor to the north and south. In contrast, lesser black-backed gulls fared badly in Sør-Helgeland (Horsvær) but well in the south in Vestland (Lyngøy). The great skua and great cormorant did best of the coastal species with good success in two of four and two of three colonies respectively, and moderate in the remainder.

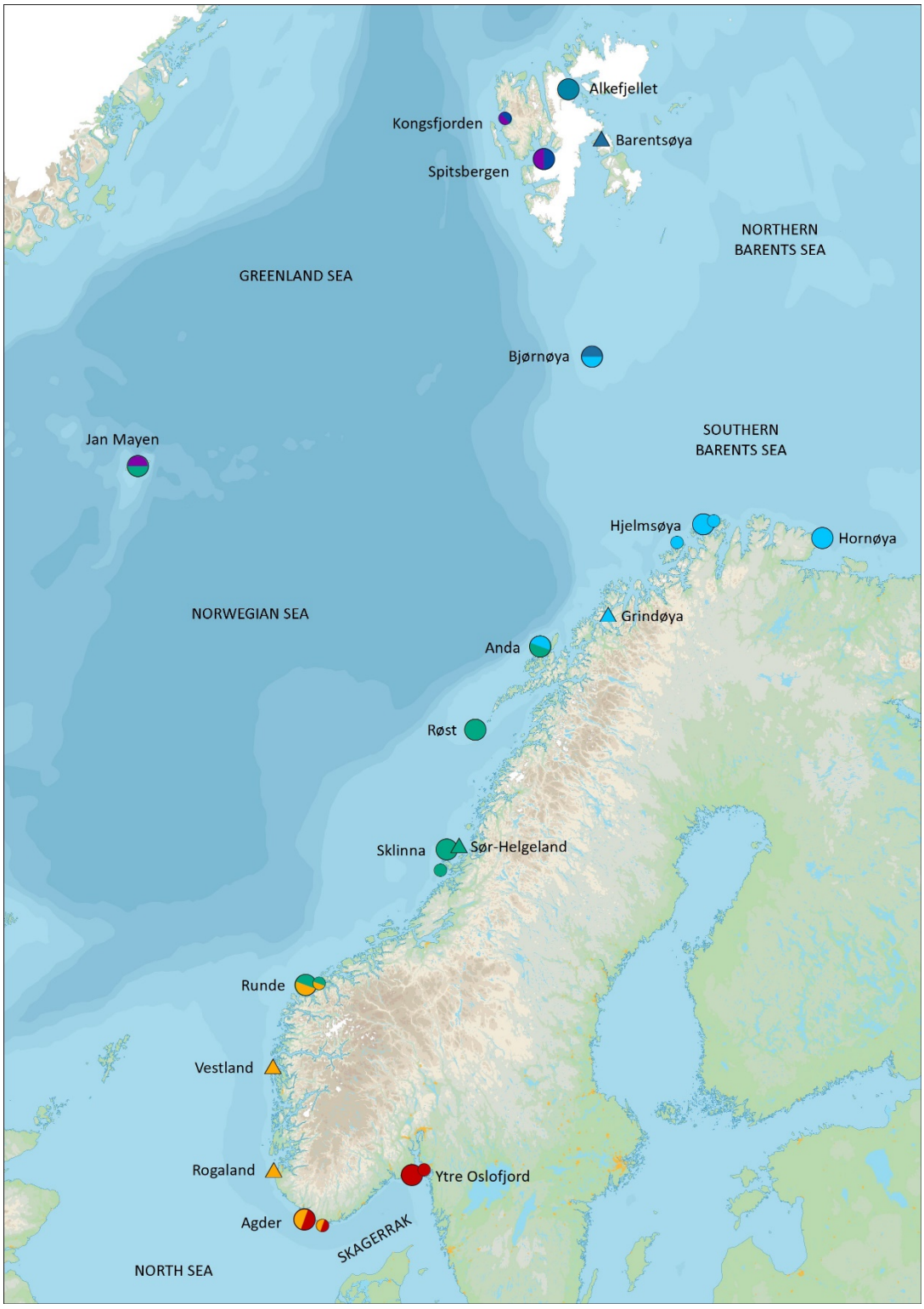
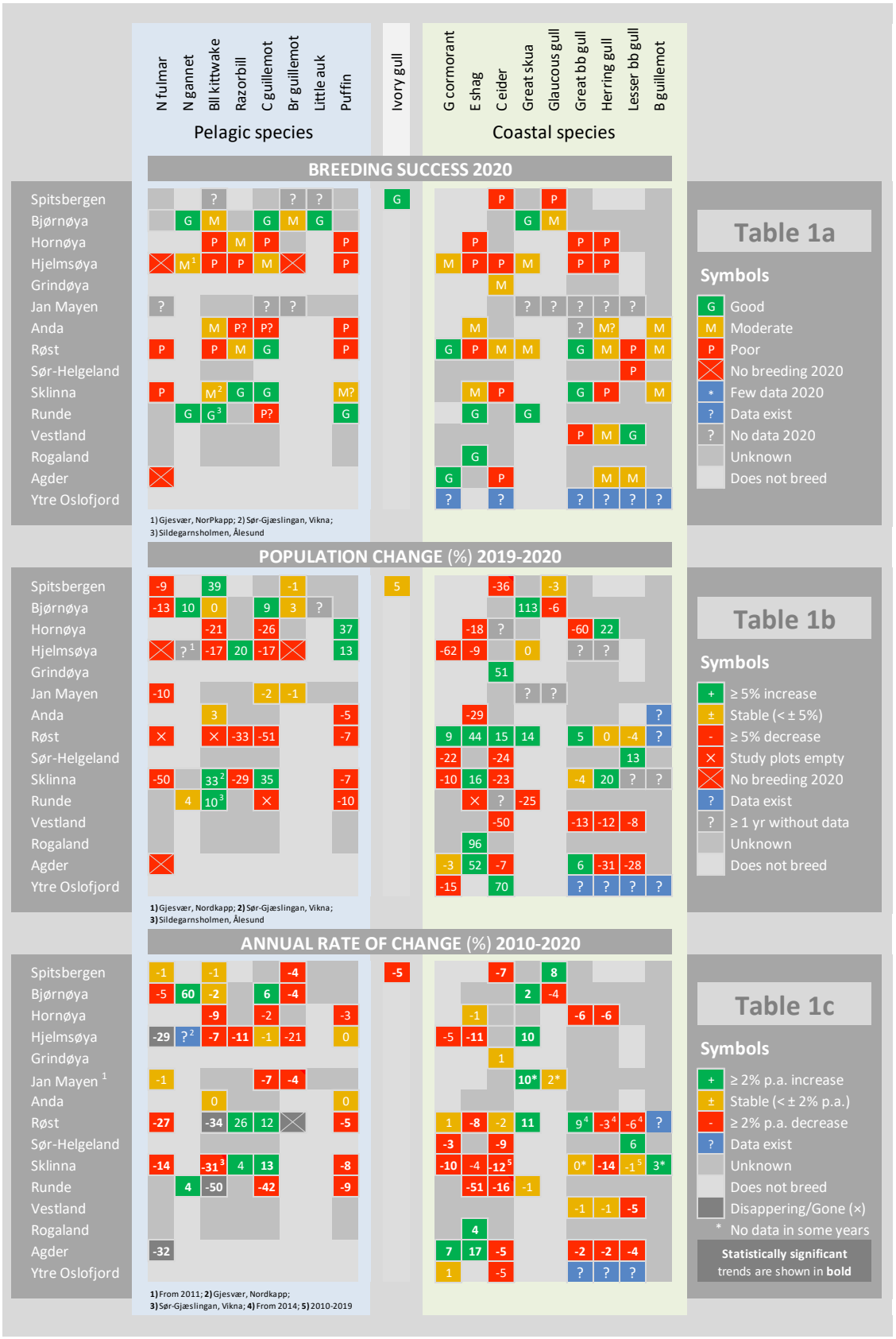


Figure 1

SEAPOP key-sites, as of 2020. 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 2020, and their mean population trend over the last ten years (1c).



The great cormorant was one of the few species that experienced moderate or good breeding success in all colonies monitored by SEAPOP in 2020. Photo: © Tycho Anker-Nilssen, Røst.

All in all, breeding success in 2020 was highest among gannets, cormorants and great skuas. For gannets and great skuas, this is a continuation of a long trend with successful reproduction and positive population changes. In contrast, northern fulmars, kittiwakes, puffins, shags, eiders and herring gulls all had a very poor season in most of the colonies in 2020. In recent years, such failures have been more-or-less restricted to the coastal species, and it is now concerning to observe that pelagic species also fared equally badly in 2020. The causes are many, but poor food conditions and high rates of predation have affected many species. The steep declines in numbers of many of the Norwegian seabird populations highlight an increasing need for successful breeding seasons and recruitment. The recent failures are thus of considerable concern.

Population changes

More than half of the populations in SEAPOP's key sites declined in numbers between 2019 and 2020 (Table 1b). Corresponding trends over the last decade are shown in Table 1c. There are no clear differences between the different groups of seabirds, either between pelagic and coastal groups or between areas. There are, however, clear differences between species and colonies.

Many of the kittiwake populations have declined seriously and the species is endangered. On Spitsbergen and Bjørnøya, however, the populations have either been stable or increased over the last 10 years (2010-2020). Along the mainland coast the situation is quite different. On Anda, numbers remained stable between 2019 and 2020, as they have done since 2010. On Hornøya and Hjelmsøya, however, they have declined seriously and on Røst, 2020 was the year they vanished completely from Vedøy (where 25 000 pars bred 40 years ago). The colonies on Sklinna and Runde have also disappeared over the last 10 years, while the urban colonies on Sør-Gjeslingan and Ålesund both increased between 2019 and 2020. For fulmars, the situation is concerning with large declines

in nearly all the monitored colonies. Gannets, on the other hand, continue their increase on Bjørnøya while numbers on Runde remained stable since 2019.

Overall, the population of common guillemot in Norway has have declined seriously since the 1960s, especially on Røst, Hjelmsøya and Runde. The trend has, however, reversed in some colonies with large increases on Hornøya and Bjørnøya since the 1986/87 collapse. Between 2019 and 2020, numbers increased on Bjørnøya, Røst and Sklinna, remained more-or-less stable on Jan Mayen, but decreased in the counting plots on Hjelmsøya and Hornøya. Among the other auks, a negative trend continues. The puffin population on Røst is in steady decline, and declines are to be seen in all the southernmost colonies of the species. On Hornøya, where numbers have been stable over many years, there have also been signs of a decline since 2010. In 2020, however, numbers rose again, as they also did on Hjelmsøya. While numbers on Hjelmsøya and Anda have remained stable since 2010, they have declined fast on Sklinna and Runde at rates of 8% and 9% p.a. respectively. Razorbills have been declining on Hjelmsøya, but there was again a respite in 2020 with an increase since 2019. The opposite was the case on Røst and Sklinna where numbers have been increasing but dropped in 2020. Brünnich's guillemot numbers remained stable in the four colonies monitored, but the overall decadal trend is negative.

Despite a decrease at Runde over the last two years, great skuas are increasing in numbers at all colonies monitored in Norwegian areas. For all other species except the northern gannet, SEAPOP has documented declining populations at many sites. Photo: © Tycho Anker-Nilssen, Røst.

There have also been worrying signals among the coastal divers. Eiders are monitored in eight areas, and in six (Spitsbergen, Sør-Helgeland, Sklinna, Runde, Agder and Outer Oslofjord) declines were registered. Only on Grindøya and Røst have the populations been relatively stable over the last decade. Great cormorants increased on Røst, were stable in Agder and declined elsewhere. European shag numbers declined in all populations from Anda and northwards, but increased at Røst and southwards. Among the large gulls, both herring and lesser black-backed gulls increased from mid-Norway and northwards while the populations to the south declined. Great black-backed gulls declined on both Hornøya and Lyngøy/Vestland but were stable elsewhere. Glaucous gulls increase in numbers on Spitsbergen but have declined on Bjørnøya over the last decade.

Adult survival

The adult survival rate of a long-lived species is a vital parameter, and any changes can have important consequences for population stability. In seabirds, these rates are estimated from the numbers of colour-ringed individuals that are observed in the colony from year to year. In most colonies both rates of survival and resighting vary from year to year. In such cases, the pertinent estimate of survival rate reported in the site-specific tables (Appendices A1-A14) is, due to analytical methods, from 2018 to 2019. When rates are stable over time, however, an overall estimate for the full length of the time series up to and including 2020 is reported.

The news is both good and bad regarding the survival of Norwegian seabirds. The good news is that all the large gulls and most of the auks had a high and stable survival rate over the last year measured. Most concerning was the low rate of survival of eiders on Grindøya, puffins on Hornøya and kittiwakes on Hjelmsøya and Hornøya. All three populations had the lowest rates ever recorded between 2018 and 2019. For kittiwakes, which are in a decline, there was a general improvement from Røst and southwards. Their numbers and survival rate remained stable on Anda, but on Hjelmsøya and Hornøya survival rates were at a record low, 57% and 63% respectively. Further north, survival was stable on Bjørnøya but in Grumant on Spitsbergen it was lower (ca. 79%) than expected for the species.

There was no change in the survival of the large gulls compared to the previous estimate and the results were at levels one can expect for these species. Glaucous gulls on Bjørnøya and Spitsbergen did moderately and well with 78% and 94% respectively surviving from 2018 to 2019. The survival of ivory gulls in the same year was higher than the previous year, and that of great skuas on Bjørnøya remained stable at 87%. The latter was true for shags on Hornøya (86%), while those on Sklinna and Røst fared worse (68%), a steep drop since the previous year.

Many of the puffin populations showed a decline in survival from 2018 to 2019 apart from at Runde where it remained high (96%) and Hjelmsøya where, despite an improvement to 62%, survival rates are extremely low for the species. The steepest decline was at Hornøya where only 63% survived from 2018 to 2019. The survival of common guillemots on Sklinna, Hornøya and Jan Mayen remained high, while the rate for those on Hjelmsøya was low. Brünnich's guillemots on Jan Mayen and Bjørnøya also did well, an improvement for those on Bjørnøya where survival rates were low in the mid-2000s. The rate for Brünnich's guillemots on Spitsbergen was 83% (2018-2019) and lower that the mean for the previous 10-15 years. Survival of little auks on both Bjørnøya and Spitsbergen was high; an improvement for those on Bjørnøya, whereas there has been little variation on Spitsbergen

over the last 10-15 years. Razorbill survival is monitored only on Hornøya where it has remained stable around 94%. Also, black guillemots that are monitored only on Røst had a constant and reasonably good survival rate of 84%

Of all species monitored, the survival rate of eiders that is monitored on Grindøya was estimated to be an all-time low of 42% between 2018 and 2019.

For most species, survival rates are monitored by resighting of colour-ringed individuals, as these puffins on Røst. The oldest of them, PF, was ringed as an adult male in 1992 and last seen in 2019, i.e. when at least 30 years old. Photo: © Tycho Anker-Nilssen.

APPENDIX – Key parameters from all key-sites in 2020

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 2019 and 2020 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 2020 (excl. Bjørnøya, cf. Table A2).*

Species	Colony	Population change %	Annual adult survival		Reproductive performance	
			Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	*Nøisdalen*	− 9 p				
Common eider	*Kongsfjorden*	− 36 t	2007-2020 (13)	81.8 (1.1, 420)	Hatching success [1]	0.03 (*n*=58)
Ivory gull	*32 colonies*	− 5 p				
	Barentsøya		2006-2020 (14)	80.9 (2.0, 274)	Large chicks/nest	1.31 (0.08, 64)
Glaucous gull	*Kongsfjorden*	− 3 p	2018-2019 (1)	93.8 (13.6, 135)	*No data 2020*	
Kittiwake	*Ossian Sars*	+ 59 p			*No data 2020*	
	Grumantbyen	*No data*	2010-2020 (10)	78.7 (2.5, 210)	*No data 2020*	
	Fuglehuken	+ 35 p			*No data 2020*	
Brünnich's guillemot	*Ossian Sars*	− 10 p	2018-2019 (1)	82.8 (5.0, 212)	*No data 2020*	
	Diabasodden	− 14 t	*No data 2020*		*No data 2020*	
	Fuglehuken	0 p	*No data 2020*		*No data 2020*	
Little auk	*Bjørndalen*	*No data*	2006-2020 (14)	83.1 (1.5, 616)	*No data 2020*	
	Feiringfjellet	*No data*	2007-2020 (13)	79.8 (1.5, 799)	*No data 2020*	

1) *Minimum proportion of nests with at least 1 chick hatching.*

Table A2 *Key population parameters (SE, n) of seabirds on* ***Bjørnøya*** *in 2020.*

Species	Population change %	Annual adult survival		Reproductive performance	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	− 13 p			*No data 2020*	
Gannet	+ 10 p			Large chicks/nest	0.67 (0.05, 101)
Great skua	+ 113 p	2018-2019 (1)	87.1 (5.0, 243)	Large chicks/nest	0.97 (0.10, 175)
Glaucous gull	− 6 p	2009-2020 (11)	77.8 (2.0, 190)	Large chicks/nest	0.94 (0.01, 18)
Kittiwake	0 p	2005-2020 (15)	87.0 (1.0, 378)	Large chicks/nest	0.82 (0.03, 223)
Common guillemot	+ 9 p	*Results not yet available*		Fledging success [1]	0.75 (0.04, 145)
Brünnich's guillemot	+ 3 p	2018-2019 (1)	90.3 (7.0, 359)	Fledging success [1]	0.78 (0.06, 50)
Little auk	p [2]	2018-2019 (1)	98.0 (8.8, 1044)	Fledging success	0.84 (0.05, 50)

1) *Measured at the age of 20 days.* ***2)*** *Pilot project data under analysis.*

Table A3 *Key population parameters (SE, n) of seabirds on* ***Hornøya*** *in 2020.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	− 18 [p]	2004-2020 (16)	85.8 (1.2, 355)	Clutch size	*No data 2020*
				Breeding success	*No data 2020*
Herring gull	+ 22 [p]	2007-2020 (13)	83.6 (2.0, 148)	Clutch size	2.64 (0.09, 25)
				Breeding success [1]	0.28 (0.15, 25)
Great black-backed gull	− 60 [p]	2001-2020 (19)	82.8 (1.2, 238)	Clutch size	2.54 (0.10, 28)
				Breeding success [1]	0.25 (0.10, 28)
Kittiwake	− 21 [p]	2018-2019 (1)	63.3 (4.3, 1557)	Clutch size	1.76 (0.06, 60)
				Large chicks/nest [1]	0.00 (0.00, 60) [2]
Common guillemot	− 26 [p]	1988-2020 (33)	97.4 (0.3, 285)	Breeding success [1]	0.00 (0.00, 35) [2]
Razorbill	*No data 2020*	1995-2020 (25)	94.2 (0.6, 395)	Breeding success [1]	0.17 (0.04, 36)
Puffin	+ 37 [p]	2018-2019 (1)	62.2 (4.4, 963)	Breeding success [1]	0.06 (0.04, 36)

1) *Medium-sized chicks/egg laid.* ***2)*** *Because of extremely high nest predation, the species experienced a total breeding failure at Hornøya in 2020 with no chicks hatched or fledged.*

Table A4 *Key population parameters (SE, n) of seabirds on* ***Hjelmsøya*** *in 2020.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant				*No data 2020*	
W Finnmark	− 69 [t]			*No data 2020*	
Shag *Lille Kamøy*	− 9 [p]			*No data 2020*	
Gannet *Gjesværstappan*	− 9 [p]				
Common eider	[t 3]				
Great skua	0 [t]			Clutch size	1.63 (0.19, 11)
Arctic skua	− 45 [t]			Clutch size	1.00 (0.00, 1)
Common gull	− 11 [t]			Clutch size [1]	2.40 (0.16, 35)
Herring gull	[p 3]	*No data 2020*		Clutch size [4]	1.69 (0.25, 13)
				Breeding success [5]	0.00 (0.00, 13)
Great black-backed gull	[p 3]	*No data 2020*		Clutch size [1]	1.32 (0.20, 28)
				Breeding success [5]	0.00 (0.00, 28)
Kittiwake	− 17 [p]	2018-2019 (1)	57.0 (8.5, 398)	Clutch size [1]	1.46 (0.10, 71)
				Clutch size [2]	1.76 (0.07, 59)
				Breeding success [5]	0.34 (0.04, 173)
Common guillemot					
Open ledges (inds.)	+ 125 [P]	*No data 2020*		*No breeding confirmed 2020*	
Crevices not predated (eggs)	− 17 [p]	2018-2019 (1)	75.9 (8.3, 347)	Breeding success [5]	0.43 (0.11, 20)
Crevices predated (eggs)				Breeding success [5]	0.00 (0.00, 28)
Brünnich's guillemot	*Extinct* [6]	*No data 2020*		*No breeding confirmed 2020*	
Razorbill *Open ledges (inds.)*	+ 20 [p]	*Too small sample*		*No data 2020*	
Crevices (eggs)	+ 52 [p]			Breeding success [5]	0.00 (0.00, 24)
Puffin *Gjesværstappan*	+ 18 [p 7]				
Hjelmsøya	+ 22 [p 8]	2018-2019 (1)	62.1 (5.4, 334)	Hatching success	0.15 (0.03, 110)
				Breeding success [5]	0.12 (0.03, 101)

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 2020.*

Species	Population change %	Annual adult survival		Reproductive performance	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	− 10 [p]	*No data 2020* [1]		*No data 2020* [1]	
Common guillemot	− 2 [p]	2011-2020 (9)	91.1 (1.5, 91)	*No data 2020* [1]	
Brünnich's guillemot	− 1 [p]	2011-2020 (9)	90.9 (1.5, 142)	*No data 2020* [1]	
Great skua	*No data* [1]			*No data 2020* [1]	
Glaucous gull	*No data* [1]			*No data 2020* [1]	
Great black-backed gull	*No data* [1]			*No data 2020* [1]	
Lesser black-backed gull	*No data* [1]			*No data 2020* [1]	

1) *Due to Covid-19, access to the island was restricted and this data series could not be continued in 2020.*

Table A6 *Key population parameters (SE, n) of common eider on* ***Grindøya*** *in 2020.*

Species	Population change %	Annual adult survival		Reproductive performance	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Common eider	+ 6 [t 1]	2018-2019 (1)	42.2 (24.5, 1500)	Clutch size	4.16 (0.18, 50)

1) *Nest counts.*

Table A7 *Key population parameters (SE, n) of seabirds on* ***Anda*** *in 2020.*

Species	Population change %	Annual adult survival		Reproductive performance	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Shag	− 29 [t]			Clutch size [1]	1.24 (0.26, 21)
Herring gull	− 14 [t]			Clutch size [2]	1.56 (0.14, 55)
				Clutch size [3]	2.00 (0.12, 43)
				Large chicks/nest	0.40 (*n*=55)
Kittiwake	+ 3 [p]	2018-2019 (1)	86.0 (2.9, 560)	Clutch size/pair [4]	1.74 (0.10, 19)
				Large chicks/nest	0.53 (0.02, 915)
Puffin	− 5 [p]	2018-2019 (1)	77.7 (7.7, 501)	Hatching success	0.63 (0.07, 54)
				Chicks ≥ 20d/nest	0.24 (0.06, 54)
Black guillemot	+ 10 [t 5]			Large chicks/nest	0.79 (0.20, 19)

1) *On 15 July, including empty nests.* ***2)*** *On 24 June, including empty nests.* ***3)*** *On 24 June, excluding empty nests.* ***4)*** *On 26 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 2020.*

Species		Population change %	Annual adult survival		Reproductive performance	
			Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	*Hernyken*	− ∞ p				
Great cormorant		+ 9 t			Clutch size [1,2]	3.09 (0.13, 44)
					Large chicks/nest [3]	0.75 (*n*=48)
Shag	*Ellefsnyken*	+ 44 p	2018-2019 (1)	67.5 (8.6, 541)	Clutch size [4,5]	2.37 (0.05, 227)
					Clutch size [1,5]	1.79 (0.07, 299)
					Large chicks/nest [4]	0.19 (0.28, 16)
Common eider		+ 15 p			Clutch size	3.98 (0.09, 132)
Great skua		+ 14 t [6]			Clutch size	1.79 (0.11, 14)
					Breeding success	1.00 (0.14, 15)
Common gull		+ 29 p			Clutch size [4]	2.43 (0.07, 134)
					Large chicks/nest [4]	0.80 (*n*=132)
Lesser black-backed gull		− 4 p			Clutch size [4]	2.34 (0.11, 44)
					Large chicks/nest [4]	0.58 (*n*=43)
Herring gull		0 p			Clutch size [4]	2.32 (0.05, 197)
					Large chicks/nest [4]	1.21 (*n*=188)
Great black-backed gull		+ 5 p			Clutch size [4]	2.43 (0.04, 312)
					Large chicks/nest [4]	1.50 (*n*=283)
Kittiwake	*Vedøy*	− ∞ p [7]			*No breeding in 2020*	
	Gjelfruvær	+ 9 t [8]			Large chicks/nest	0.00 (0.00, 445)
	Kårøy area	− 5 t [9]	2018-2019 (1)	83.5 (3.4, 491)	Clutch size/pair [10]	1.42 (0.15, 33)
					Clutch size/pair [11]	1.35 (0.05, 240)
					Large chicks/pair [10]	0.30 (0.16, 33)
					Large chicks/pair [11]	0.38 (0.04, 239)
					Large chicks/pair [12]	0.32 (0.02, 715)
Arctic tern					*No data 2020*	
Common guillemot		− 51 p [13]			Breeding success	0.83 (0.05, 52)
Razorbill		− 67 p [13]				
Puffin		− 7 p	2018-2019 (1)	86.0 (3.5, 577)	Hatching success	0.26 (0.05, 76)
					Breeding success	0.00 (0.00, 79)
Black guillemot		*Not analysed*	1997-2020 (23)	84.3 (1.4, 139)	Clutch size	1.69 (0.08, 36)
					Large chicks/clutch	1.18 (0.21, 16)

1) *Including empty nests.* ***2)*** *Main colony on 14 June, when 6 clutches (14%) contained chicks.* ***3)*** *Minimum estimate on 5 July when there were still 46 small chicks and 5 eggs in the two colonies (i.e. maximum estimate was 1.71-1.81).* ***4)*** *Excluding nests not known to have contained eggs/chicks.* ***5)*** *On 1 July, estimated by linear regression of mean values for counts on five different days between 17 June and 15 July.* ***6)*** *A total of 16 pairs bred in Røst in 2020.* ***7)*** *No kittiwakes observed on the island in 2020.* ***8)*** *Small cliff-breeding colony 9 km SW of Vedøy with 445 pairs in 2020.* ***9)*** *Population of 715 pairs in 2020 breeding on/near buildings in Røst harbour.* ***10)*** *On traditional study ledges in plot VIII.* ***11)*** *All nests monitored at regular intervals in plot VIII (Kårøya rorbucamping).* ***12)*** *Total count of entire colony on/near buildings in Røst harbour.* ***13)*** *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 2020.*

Species	Population change %	Annual adult survival		Reproductive performance	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Lesser black-backed gull	+ 17	2005-2020 (15)	89.0 (1.0, 180)	Clutch size	2.75 (0.05, 148)
				Large chicks/pair	0.08 (*n*=194)

Table A10 *Key population parameters (SE, n) of seabirds on* ***Sklinna*** *in 2020.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	− 50 [t]				
Great cormorant	− 10 [t]			*No data 2020*	
Shag	+ 16 [t]	2018-2019 (1)	67.7 (7.2, 542)	Clutch size [1]	1.76 (0.08, 224)
				Hatching success/nest	0.60 (*n*=50)
				Clutch size at hatching	1.22 (0.16, 50)
				Chicks/nest 10d later [2]	1.08 (0.16, 50)
				Chicks/nest 20d later [2]	1.12 (0.15, 50)
Common eider	− 23 [t]			Clutch size	3.40 (0.25, 10)
Herring gull [3]	+ 20 [p]			Clutch size [3]	1.94 (0.25, 18)
				Clutch size [4]	2.33 (0.18, 15)
Great black-backed gull	− 4 [p]			Clutch size [3]	2.26 (0.21, 23)
				Clutch size [4]	2.48 (0.17, 21)
Kittiwake *Sklinna*	[t 5]			*No breeding in 2020*	
Sør-Gjæslingan	+ 33 [t 6]	2018-2019 (1)	84.1 (12.0, 304)	Large chicks/nest [7]	0.33 (*n*=125)
Rørvik	+ 13 [t 8]			Large chicks/nest [9]	1.09 (*n*=470)
Common guillemot	+ 35 [t]	2008-2020 (12)	91.5 (0.7, 355)	*No quantitative estimate* [10]	
Razorbill	− 29 [t]				
Puffin	− 7 [p]			Hatching success/nest	0.85 (0.09, 20)
				Chicks ≥ 10d/hatched	0.88 (0.08, 17)
				Chicks ≥ 20d/hatched	0.82 (0.09, 17)
Black guillemot	− 30 [p]	2008-2017 (9) [11]	88.1 (2.2, 67)		

1) *On 3–6 June, including empty nests.* ***2)*** *After mean hatching date in the colony (1 July).* ***3)*** *On 7 June, including empty nests.* ***4)*** *On 7 June, excluding empty nests.* ***5)*** *No breeding in 2019 or 2020.* ***6)*** *Based on nest count on 12 June.* ***7)*** *Based on nest count on 12 June and chick count on 3 July.* ***8)*** *Based on nest count on 2 June.* ***9)*** *Based on nest count on 2 June and chick count on 29 June.* ***10)*** *Difficult to obtain quantitative estimates because the birds breed in shelter under big boulders.* ***11)*** *No estimate possible for 2018 and 2019.*

Table A11 *Key population parameters (SE, n) of seabirds on* ***Runde*** *in 2020.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Common eider	− 16 [t]				
Gannet	+ 4 [t 1]			Large chicks/nest [1]	0.71 (0.02, 389)
Shag	0 [p 2]			Large chicks/nest [2]	1.00 (0.19, 24)
Great skua	− 1 [t]			Large chicks/nest	1.07 (0.11, 44)
Kittiwake *Runde*	[p 3]			*No breeding in 2020*	
Sildegarnsholmen	+ 3 [t]	2018-2019 (1)	90.0 (3.8, 313)	Large chicks/nest	0.80 (0.03, 697)
Common guillemot	[p 3]			*No breeding on open ledges in 2020*	
Puffin	− 9 [p]	2018-2019 (1)	95.7 (3.1, 414)	Hatching success/nest	0.77 (0.06, 44)
				Chicks ≥ 20d/hatched	0.70 (0.08, 44)
				Chicks ≥ 30d/hatched	0.70 (0.08, 48)
				Fledged chicks/nest	0.65 (0.07, 48)

1) *Large chicks counted in 4 study plots on 28 July.* ***2)*** *Breeding success monitored in new study plots at Lisjestakken and Huldene.* ***3)*** *As in the preceding years, no breeding was recorded in the study plots in 2020.*

Table A12 *Key population parameters (SE, n) of seabirds on Lyngøya in* ***Vestland*** *in 2020.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Common eider	− 50 [t]			*No data 2020*	
Lesser black-backed gull	− 8 [t]	2008-20 (12)	80.7 (3.4, 81)	Clutch size [1]	2.08 (0.11, 62)
				Breeding success [2]	1.19 (*n*=62)
Herring gull	− 12 [t]	2008-20 (12)	84.4 (3.2, 198)	Clutch size [1]	2.26 (0.04, 270)
				Breeding success [2]	0.74 (*n*=270)
Great black-backed gull	− 75 [t]			Clutch size [1]	2.50 (0.50, 2)
				Breeding success	*No data*

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

Table A13 *Key population parameters (SE, n) of shag in* ***Rogaland*** *in 2020.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	+ 96 [p]	2016-20 (4) [1]	81.5 (2.2, 197)	Clutch size [2]	2.72 (0.07, 50)
				Breeding success [3]	1.53 (0.17, 49)

1) *At Jarstein, omitting 7 birds colour-ringed in 2014.* ***2)*** *At Kjør, based on maximum nest content on 29 May, when no empty nests were found.* ***3)*** *Chicks/nest on 15 June, when all chicks were still small and these nests also contained on average 0.29 (SE=0.10) eggs.*

Table A14 *Key population parameters (SE, n) of seabirds on the different sites in* ***Agder*** *in 2020.*

Species		**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant	*Rauna*	0	*No estimate yet available* [1]		Clutch size [2]	3.34 (0.10, 273)
					Large chicks/nest	1.58 (*n*=273)
Common eider	*Rauna*	− 7 [3]			Clutch size	3.62 (0.31, 13)
					Chicks on sea [4]	*No data 2020*
Lesser black-backed gull			2001-2020 (19)	79.5 (1.1, 736) [5]		
	Slettingene	+ 79			Clutch size [2]	1.87 (0.08, 154)
					Fledged juv./pair	0.91 (*n*=154)
	Storøy	− 100			Clutch size [2]	*No breeding 2020*
					Fledged juv./pair	*No breeding 2020*
	Klovholmene	− 33			Clutch size [2]	1.42 (0.40, 12)
					Fledged juv./pair	0.00 (*n*=12)
	Rauna	− 37	1999-2020 (21)	83.8 (0.5, 1328)	Clutch size [2]	*No data 2020*
					Fledged juv./pair	0.72 (*n*=1520)
Herring gull			2001-2020 (19)	82.9 (1.2, 537) [5]		
	Slettingene	− 37			Clutch size [2]	1.77 (0.17, 43)
					Fledged juv./pair	0.42 (*n*=59)
	Storøy	− 39			Clutch size [2]	0.51 (0.16, 35)
					Fledged juv./pair	0.00 (*n*=36)
	Klovholmene	− 36			Clutch size [2]	2.50 (0.15, 12)
					Fledged juv./pair	0.39 (*n*=18)
	Rauna	− 37	2002-20 (18)	80.3 (1.9, 182)	Clutch size [2]	*No data 2020*
					Fledged juv./pair	0.79 (*n*=315)

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 2020 due to no complete count at Rauna.* ***5)*** *General estimate for birds from Slettingene, Storøy and Klovholmene.*

Cover photo:
Black guillemot on the nest. Photo: © Tycho Anker-Nilssen.

List of contact people

Key-site(s)	Contact person	e-mail address
Svalbard (ivory gull)	Hallvard Strøm	hallvard.strom@npolar.no
Svalbard (common eider)	Børge Moe	borge.moe@nina.no
Svalbard (other spp., excl. Bjørnøya)	Sébastien Descamps	sebastien.descamps@npolar.no
Bjørnøya and Jan Mayen	Hallvard Strøm	hallvard.strom@npolar.no
Hornøya	Tone Kristin Reiertsen	tone.reiertsen@nina.no
Hjelmsøya/Gjesvær and Hordaland	Geir Helge Rødli Systad	geir.systad@nina.no
Grindøya	Sveinn Are Hanssen	sveinn.a.hanssen@nina.no
Anda and Runde	Signe Christensen-Dalsgaard	signe.dalsgaard@nina.no
Røst	Tycho Anker-Nilssen	tycho@nina.no
Sør-Helgeland	Jan Ove Bustnes	jan.bustnes@nina.no
Sklinna/Sør-Gjæslingan	Nina Dehnhard	nina.dehnhard@nina.no
Rogaland	Arne Follestad	arne.follestad@nina.no
Vest-Agder and Ytre Oslofjord	Børge Moe	borge.moe@nina.no

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Series editor
Tycho Anker-Nilssen, tycho@nina.no
NINA, PO Box 5685 Torgarden, NO-7485 Trondheim, Norway