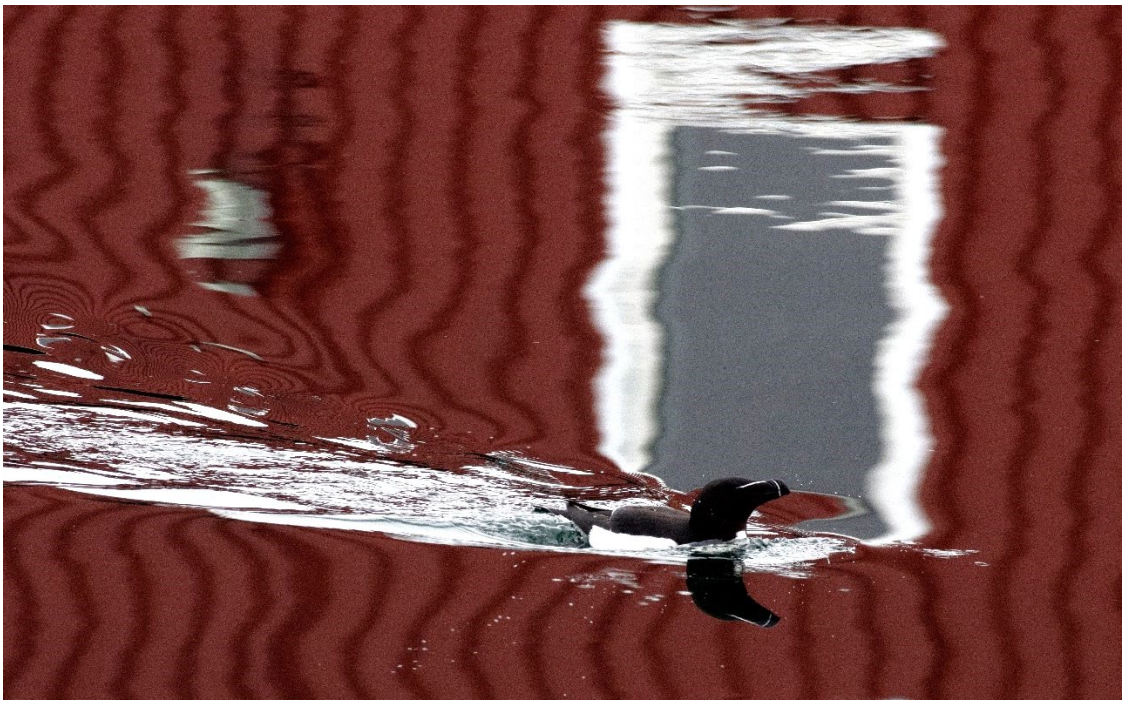
SEAPOP Short Report 1-2022



Key-site monitoring in Norway 2021, including Svalbard and Jan Mayen

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Key-site monitoring in Norway 2021, including Svalbard and Jan Mayen

Breeding success

Compared to 2020, the 2021 season was overall better for Norwegian seabirds with 33% of the monitored populations having good breeding success and 22% doing poorly. Although better than the previous year, the overall breeding success was still only moderate across all sea areas and species (Table 1a). In general, coastal surface-feeding species were the winners in 2021, with 44% of the populations having a good breeding success, especially in the Barents Sea. Only 24% of the populations monitored did poorly. This good trend was, however, not evenly distributed among all species: the great skua and glaucous gull did well across all colonies and sea areas, except for a moderate breeding success for great skuas on Jan Mayen. For the other three gull species, the breeding success was only good in three cases (great black-backed and herring gull on Røst and herring gull in Agder), while there was moderate or poor breeding success in the rest of the populations throughout mainland Norway, with no tendency for the individual sea areas.

Most of the diving species had a moderate breeding success, and only a few populations did badly. The latter applied to three populations of pelagic diving species (puffins on Røst, common guillemots on Hornøya, and Brünnich's guillemots on Hjelmsøya where none were found nesting in 2021), and three populations of diving coastal species (shags on both Hornøya and Hjelmsøya, and eiders on Grindøya). Five of the six populations of diving species with poor breeding success were in the Barents Sea, and one in the Norwegian Sea (puffins on Røst). Thirty-two percent of the populations of pelagic-diving seabird species that were monitored had a good breeding success, and these were distributed across the country, with no differences between sea areas. For diving coastal species, only four populations had a good breeding success: shags in Rogaland, great cormorants in Agder, black guillemots on Røst and eiders on Spitsbergen.

A common guillemot chick on its way to the sea. Photo: © Tycho Anker-Nilssen

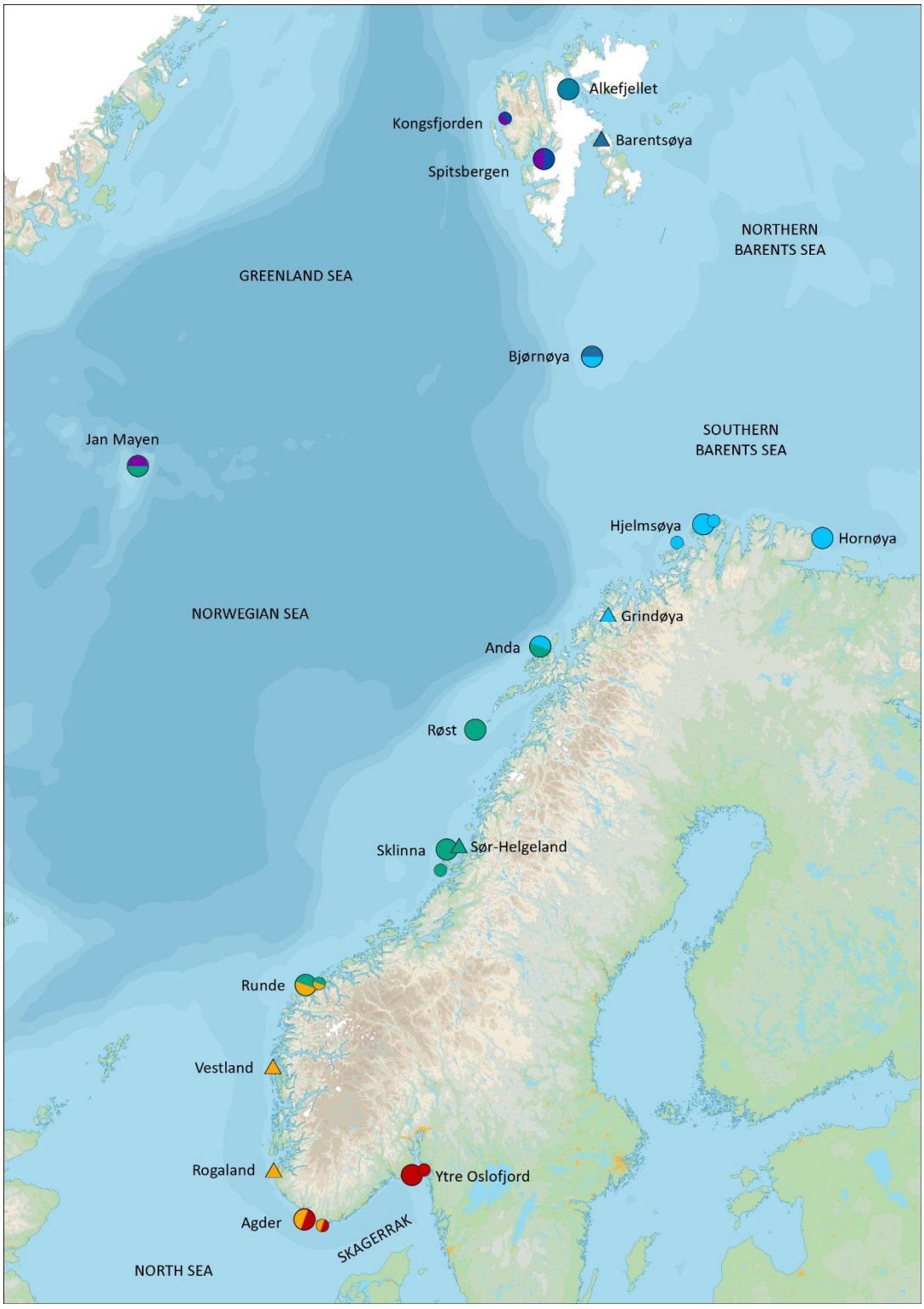
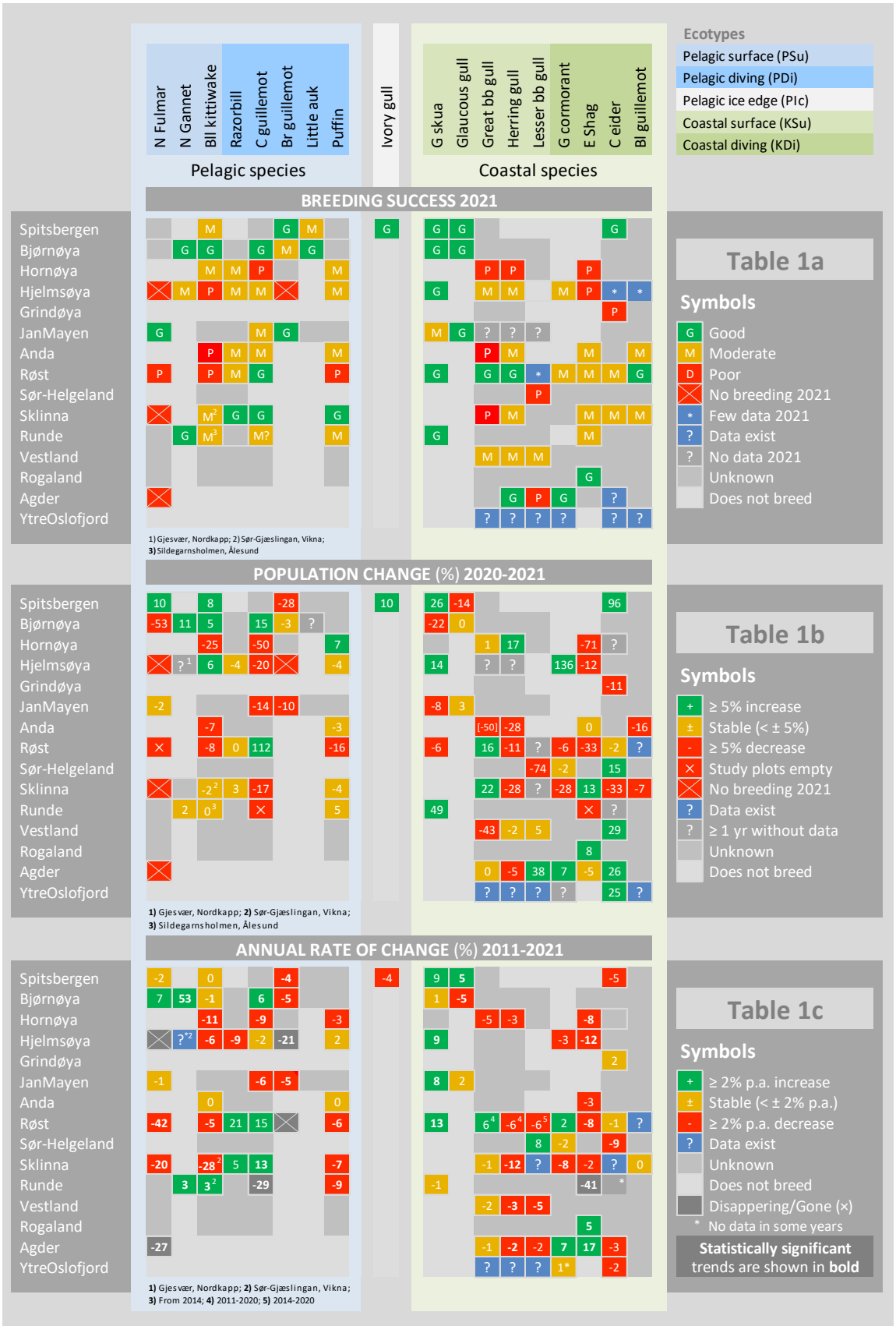


Figure 1

SEAPOP key-sites, as of 2021. 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 2021, and their mean population trend over the last ten years (1c).



2021	PSu	PDi	CSu	CDi	All
Barents Sea	M	M	G	P	M
Norwegian Sea	P	M	M	M	M
North Sea		?	M	G	M
All	M	M	M	M	**M**

Table 2

Average breeding success in 2021 for different ecotypes of seabirds at the keysites in the three main sea areas covered by SEAPOP. The codes indicate whether the birds mainly forage in pelagic (P) or coastal (C) areas and seek food at the surface (Su) or by diving (Di).

Among the pelagic surface-feeding species, only gannets did well, with good breeding success in two of three monitored colonies. Kittiwakes and fulmars, on the other hand, were clear losers in 2021, following the trend from previous years. Only two of the thirteen monitored populations of these two species had good breeding success: kittiwakes on Bjørnøya and fulmars on Jan Mayen. Not a single kittiwake colony among those monitored on the mainland was deemed to have a good breeding success, and it was poor in colonies along the coasts of both the Barents Sea (Hjelmsøya) and the Norwegian Sea (Anda and Røst). For fulmars, the breeding season was, overall, even worse and historically poor. There were no signs of breeding in three of the four populations on the mainland, and breeding success was poor in the fourth (Røst). For the ivory gull on Spitsbergen, breeding success was, as in 2010, good.

Population changes

More than half of the seabird populations at SEAPOP's key sites declined between 2020 and 2021 (Table 1b), corresponding to trends seen over the last ten years (Table 1c). In the Barents Sea, the pelagic seabirds declined most since 2020, the most marked being among Brünnich's guillemots on Spitsbergen, common guillemots and kittiwakes on Hornøya and fulmars on Bjørnøya. These declines were a continuation of already negative ten-year trends for these groups of species. In the Barents Sea, changes among coastal species were more positive with increases in numbers among coastal surface-feeding species. The cormorant population at Hjelmsøya increased by 136%! Eiders had an

Table 3

Average rates of population change (%) in the last year (left) and annually over the last decade (right) for different ecotypes of seabirds at the keysites in the three main sea areas covered by SEAPOP. The codes indicate whether the birds forage mainly in pelagic (P) or coastal (C) areas and seek food at the surface (Su) or by diving (Di).

2020-2021	PSu	PDi	CSu	CDi	All
Barents Sea	-5	-11	3	28	1.6
Norwegian Sea	-3	6	-11	-9	-4.6
North Sea		?	-1	15	6.9
All	-4.3	-1.7	-4.2	5.8	**-0.6**

2011-2021	PSu	PDi	CSu	CDi	All
Barents Sea	6	-5	2	-5	-0.8
Norwegian Sea	-11	-1	1	-7	-4.1
North Sea	-27	?	-3	4	-1.3
All	-4.8	-2.7	0.3	-3.5	**-2.5**

especially good season in Kongsfjorden, Spitsbergen, where nearly twice as many birds nested than in earlier years.

In the Norwegian Sea, many of the coastal species declined dramatically from 2020 to 2021. The large gulls and cormorants are of concern with large declines over the last 10 years. In the North Sea, the coastal species dominate the monitored populations and several increased in numbers between 2020 and 2021. But regarding the last ten years, most species in the Norwegian Sea have declined steadily. A positive note is the increase in numbers of shags and cormorants in e.g., Agder over the last ten years.

Overall, the population trends of all Norwegian seabirds over the last 10 years show that almost all species and species groups have declined in numbers (Table 1c). One exception includes species that are expanding their breeding distribution northwards. For example, the great skua continues to increase in number in its northernmost nesting areas and, in recent years, the gannet has established a colony in the far north, on Bjørnøya, where numbers continue to increase.

To avoid predation, many black-legged kittiwakes abandon the colonies on natural cliffs and settle to breed in human settlements. In Røst, the population breeding in the 200 m high iconic bird cliffs at Vedøy (background, left) went extinct in 2020. Photo: © Tycho Anker-Nilssen

Adult survival

Changes in the annual survival rates of adult breeding birds can mean a lot for population development and can give us a good indication of the conditions the seabirds experience in the time between breeding seasons. In SEAPOP, the adult survival rates of approximately 45 populations among 16 species are monitored. The good news regarding recorded changes in survival rates includes improvements in puffins at Røst, Anda and Hornøya, and shags at Røst and Sklinna, all of which had been very low the year before. The disturbing news are the significant drops in survival rates among kittiwakes in Vesterålen and southwards as well as for glaucous gulls in Kongsfjorden, and for little auks and Brünnich's guillemots at Bjørnøya, compared to the previous year. Furthermore, the negative trend of poor survival among common guillemots continued at Hjelmsøya. Eiders from Grindøya near Tromsø also had a low survival, although somewhat better than earlier years.

Gulls can be important predators of other seabirds. This 26-year-old, male great black-backed gull, which breeds close to the field station at Hernyken, is often seen hunting puffins and eider ducklings. Photo: © Tycho Anker-Nilssen, Røst 2022

Among the auks, there were significant declines in survival rates from the previous year among the puffins at Runde (from 96% to 89%) and Brünnich's guillemots (from 90% to 85%) and little auks (from 98% to 82%) at Bjørnøya. Regarding the other pelagic auks, survival rates remained relatively high and stable. For common guillemots, there was also no change in most of the populations monitored, except for a further decline at Hjelmsøya where it dropped from an estimated 76% in 2019 to 71% in 2020. For puffins, there was a significant improvement at Røst, Anda and Hornøya, all of which had very low survival in 2019. For the more coastal auks, such as black guillemots and razorbills, survival rates were stable and within values expected for the species.

For other coastal diving species, an improvement was evident, but survival rates were still low among shags in the more southern populations such as Røst and Sklinna (76% and 75%, respectively). These were, however, an improvement on very poor rates (ca 68% for both populations) the year before. Shags at Hornøya, on the other hand, had a constant and stable survival of 86% that is within the value expected for the species. Rates also improved among the eiders at Grindøya from 42% in 2019 to 68% in 2020, but they are still lower than that expected for the species.

Regarding the herring gull, lesser black-backed gull and great black-backed gull, survival rates were stable and within the expected values along mainland Norway. The glaucous gull from Kongsfjorden on Spitsbergen, on the other hand, had a significant drop in survival from 94% to 52%. Among kittiwakes, there was also a significant decrease in the survival rates in the populations from Vesterålen and southwards, where rates from Anda, Røst, Sør-Gjeslingan and Ålesund fell by 5%, 10%, 10% and 9%, respectively. Of concern were those at Røst and Sør-Gjæslingan where survival rates (76% and 75%, respectively) were lower than that expected for the species. Kittiwakes at Hjelmsøya and Hornøya, on the other hand, had an increase in survival from very low values the year before of 57% and 63%, respectively, to more normal values of 87% and 82%.

Since the turn of the century, an increasing number of non-breeding, immature white-tailed eagles visit the bird cliffs in summer and target a variety of seabirds. Photo: © Tycho Anker-Nilssen

APPENDIX – Key parameters from all key-sites in 2021

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 on the SEAPOP web (https://seapop.no/en/distribution-status/time-series-data/). Population change (expressed as percentage) is the numeric change in size of the breeding population registered between 2020 and 2021 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.

Table A1 *Key population parameters (SE, n) of seabirds on* ***Svalbard*** *in 2021 (excl. Bjørnøya, cf. Table A2).*

Species	Colony	Population change %	Annual adult survival		Reproductive performance	
			Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	*Nøisdalen*	+ 10 p				
Common eider	*Kongsfjorden*	+ 96 t	2007-2021 (14)	81.3 (1.1, 424)	Hatching success [1]	0.81 (0.05, 53)
Great skua	*Kongsfjorden*	+ 257 t	2007-2021 (14)	87.7 (3.3, 37)	Hatching success [1]	0.89 (0.11, 9)
					Clutch size [2]	1.76 (0.09, 25)
	Hermansenøya	+ 38 t			Clutch size [2]	1.81 (0.03, 129)
Ivory gull	*32 colonies*	+ 10 p				
	Barentsøya		2011-2021 (10)	81.7 (2.1, 284)	Large chicks/nest	1.04 (0.06, 52)
Glaucous gull	*Kongsfjorden*	− 14 p	2019-2020 (1)	52.5 (8.9, 130)	Hatching success	0.67 (*n*=29)
Kittiwake	*Ossian Sars*	+ 7 p			*No data 2021*	
	Grumantbyen	*No data*	2011-2021 (10)	78.2 (2.0, 191)	Chicks >15d/nest	0.38 (*n*=29)
	Fuglehuken	+ 9 p			*No data 2021*	
Brünnich's guillemot	*Ossian Sars*	+ 1 p	2019-2020 (1)	86.3 (4.7, 222)	Chicks >15d/nest	0.71 (0.10, 21)
	Diabasodden	+ 11 t	*No data 2021*		*No data 2021*	
	Fuglehuken	− 31 p	*No data 2021*		*No data 2021*	
Little auk	*Bjørndalen*	*No data*	2006-2021 (15)	82.6 (1.4, 617)	Chicks >15d/nest	0.53 (0.12, 17)
	Feiringfjellet	*No data*	2007-2021 (14)	79.3 (1.4, 781)	*No data 2021*	

1) *Minimum proportion of nests with at least 1 chick hatching, based on nests with known fate.* ***2)*** *Number of eggs per active nest.*

Table A2 *Key population parameters (SE, n) of seabirds on* ***Bjørnøya*** *in 2021.*

Species	Population change %	Annual adult survival		Reproductive performance	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	− 53 p				
Gannet	+ 11 p			Large chicks/nest	0.72 (0.04, 127)
Great skua	− 22 p	2020-2021 (1)	83.9 (4.8, 243)	Large chicks/nest	0.96 (0.02, 136)
Glaucous gull	0 p	2009-2021 (12)	80.3 (1.6, 178)	Large chicks/nest	0.82 (0.09, 17)
Kittiwake	+ 5 p	2005-2021 (16)	87.3 (0.8, 381)	Large chicks/nest	0.80 (0.02, 290)
Common guillemot	+ 15 p	*Results not yet available*		Fledging success [1]	0.66 (0.04, 150)
Brünnich's guillemot	− 3 p	2019-2020 (1)	85.4 (6.3, 359)	Fledging success [1]	0.58 (0.07, 48)
Little auk	? p [2]	2019-2020 (1)	82.1 (2.4, 1063)	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 2021.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	− 71 p 1	2004-2021 (17)	83.1 (1.1, 367)	Clutch size	*No data 2021*
				Breeding success	*No data 2021* 2
Herring gull	+ 17 p	2007-2021 (14)	83.5 (1.9, 152)	Clutch size	2.74 (0.04, 23)
				Breeding success 3	*No data 2021* 2
Great black-backed gull	+ 1 p	2001-2021 (20)	83.4 (1.2, 241)	Clutch size	2.28 (0.14, 28)
				Breeding success 3	*No data 2021* 2
Kittiwake	− 25 p	2019-2020 (1)	81.9 (5.3, 1573)	Clutch size	0.67 (0.04, 153)
				Large chicks/nest 3	0.00 (0.00, 153) 4
Common guillemot	− 50 p	1988-2021 (33)	97.5 (0.3, 295)	Breeding success 3	0.00 (0.00, 35) 4,5
Razorbill	*No data*	1995-2021 (25)	94.2 (0.6, 409)	Breeding success 3	0.41 (0.07, 44)
Puffin	+ 7 p	2019-2020 (1)	86.3 (7.3, 981)	Breeding success 3	0.10 (0.05, 31)

1) *Most shag plots were empty, and breeding birds have moved to more sheltered areas in the cliff.* ***2)*** *Chicks were not followed to fledging.* ***3)*** *Medium-sized chicks/egg laid.* ***4)*** *Total breeding failure at the colony level because of extremely high nest-predation.* ***5)*** *Zero hatching success.*

Table A4 *Key population parameters (SE, n) of seabirds on* ***Hjelmsøya*** *in 2021.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant				*No data 2021*	
W Finnmark	+ 136 t			*No data 2021*	
Shag *Lille Kamøy*	− 12 p			*No data 2021*	
Gannet *Gjesværstappan*	0 p				
Common eider	t 3				
Great skua	0 t			Clutch size	1.83 (0.11, 12)
Arctic skua	+ 109 t			*No data 2021*	
Common gull	+ 6 t			*No data 2021*	
Herring gull	p 3	*No data 2021*		Clutch size 1	1.23 (0.55, 39)
				Breeding success 5	0.18 (0.09, 39)
Great black-backed gull	p 3	*No data 2021*		Clutch size 1	1.29 (0.19, 21)
				Breeding success 5	0.52 (0.19, 21)
Kittiwake	+ 6 p	2019-2020 (1)	87.3 (9.5, 390)	Clutch size 1	1.60 (0.08, 77)
				Clutch size 2	1.86 (0.04, 66)
				Breeding success 5	0.19 (0.04, 186)
Common guillemot					
Open ledges (inds.)	+ 4 p	*No data 2021*		*No breeding confirmed 2021*	
Crevices not predated (eggs)	− 20 p	2019-2020 (1)	71.0 (10.1, 368)	Breeding success 5	0.58 (0.10, 26)
Crevices predated (eggs)				Breeding success 5	0.00 (0.00, 23)
Brünnich's guillemot	*Extinct* 6	*No data 2021*		*No breeding confirmed 2021*	
Razorbill *Open ledges (inds.)*	− 59 p			*No data 2021*	
Crevices (eggs)	− 4 p	*Too small sample*		Breeding success 5	0.14 (0.08, 21)
Puffin *Gjesværstappan*	p 3				
Hjelmsøya	− 4 p 8	2019-2020 (1)	74.2 (16.3, 376)	Hatching success	0.40 (0.04, 160)
				Breeding success 5	0.37 (0.04, 148)

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 2021.*

Species	**Population change** %	**Annual adult survival**		**Reproductive performance**	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	− 2 [p]	2011-2021 (10)	93.5 (2.2, 94)	Chicks/nest [1,2]	0.65 (0.05, 89)
Common guillemot	− 14 [p]	2011-2021 (10)	90.4 (1.6, 104)	Breeding success [3,2]	0.41 (0.10, 22)
Brünnich's guillemot	− 10 [p]	2011-2021 (10)	90.3 (1.3, 142)	Breeding success [3,2]	0.72 (0.06, 53)
Great skua	− 13 [p 4]			Large chicks/nest [5]	0.59 (0.12, 39)
Glaucous gull	+ 6 [p 4]			Large chicks/nest [5]	1.00 (0.22, 33)
Great black-backed gull	*No data*			Large chicks/nest [5]	*No data 2021*
Lesser black-backed gull	*No data*			Large chicks/nest [5]	*No data 2021*

1) *Recorded early in the chick-rearing period when most chicks were still small or medium sized.* ***2)*** *Due to late start of fieldwork, the number of initially active nests is probably underestimated, hence reproductive performance is probably overestimated.* ***3)*** *Number of chicks ≥15 days of age divided by number of breeding pairs (n).* ***4)*** *Change between 2019 and 2021 (no data 2020).* ***5)*** *Number of chicks large enough for ringing divided by number of active nests (n).*

Table A6 *Key population parameters (SE, n) of common eider on* ***Grindøya*** *in 2021.*

Species	**Population change** %	**Annual adult survival**		**Reproductive performance**	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Common eider	− 4 [t 1]	2019-2020 (1)	68.4 (35.7, 1521)	Clutch size	3.78 (0.17, 45)

1) *Nest counts.*

Table A7 *Key population parameters (SE, n) of seabirds on* ***Anda*** *in 2021.*

Species	**Population change** %	**Annual adult survival**		**Reproductive performance**	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Shag	0 [t]			Clutch size [1]	1.00 (0.29, 21)
Herring gull	− 28 [t]			Clutch size [2]	0.93 (0.14, 61)
				Clutch size [3]	1.84 (0.13, 31)
				Large chicks/nest	0.41 (*n*=61)
Kittiwake	− 7 [p]	2019-2020 (1)	80.7 (3.0, 580)	Large chicks/nest	0.37 (0.02, 875)
Puffin	− 3 [p]	2019-2020 (1)	80.1 (5.5, 524)	Hatching success	0.85 (0.05, 52)
				Chicks ≥ 20d/nest	0.74 (0.07, 42)
Black guillemot	− 16 [t 4]			Large chicks/nest	0.77 (0.23, 13)

1) *On 17 July, including empty nests.* ***2)*** *On 23 June, including empty nests.* ***3)*** *On 23 June, excluding empty nests.* ***4)*** *Based on counts of adult birds on the water early in the season.*

Table A8 *Key population parameters (SE, n) of seabirds on* ***Røst*** *in 2021.*

Species		**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	*Hernyken*	Extinct? p [7]			*No breeding on Hernyken in 2021*	
Great cormorant		− 6 t			Clutch size [1,2]	2.24 (0.22, 37)
					Large chicks/nest [3]	1.00 (0.20, 37)
Shag	*Ellefsnyken*	− 33 p	2019-2020 (1)	75.9 (14.0, 548)	Clutch size [4,5]	2.44 (0.06, 121)
					Clutch size [1,5]	2.24 (0.08, 140)
					Large chicks/nest [4]	0.77 (0.25, 11)
Common eider		− 2 p			Clutch size	3.98 (0.14, 52)
Great skua		− 6 t [6]			Clutch size	2.00 (0.00, 11)
					Breeding success	1.13 (0.24, 15)
Common gull		− 6 p			Clutch size [4]	2.58 (0.08, 77)
					Large chicks/nest [4]	0.55 (*n*=77)
Lesser black-backed gull		? p [7]			Clutch size [4]	3.00 (0.00, 1)
					Large chicks/nest [4]	0.50 (0.00, 2)
Herring gull		− 11 p			Clutch size [4]	2.40 (0.08, 62)
					Large chicks/nest [4]	1.58 (*n*=57)
Great black-backed gull		+ 16 p			Clutch size [4]	2.33 (0.06, 143)
					Large chicks/nest [4]	1.34 (*n*=76)
Kittiwake	*Vedøy*	Extinct p [8]			*No breeding on Vedøy in 2021*	
	Gjelfruvær	− 20 t [9]			Large chicks/nest	0.27 (0.03, 354)
	Kårøy area	− 3 t [10]	2019-2020 (1)	75.5 (3.6, 510)	Clutch size/pair [11]	1.79 (0.15, 33)
					Clutch size/pair [12]	1.39 (0.05, 237)
					Large chicks/pair [11]	0.24 (0.16, 33)
					Large chicks/pair [12]	0.33 (0.03, 258)
					Large chicks/pair [13]	0.36 (0.02, 695)
Arctic tern					*No data 2021*	
Common guillemot		+ 112 p [14]			Breeding success	0.63 (0.07, 54)
Razorbill		− 67 p [14]				
Puffin		− 16 p	2019-2020 (1)	90.2 (3.1, 577)	Hatching success	0.32 (0.06, 56)
					Breeding success	0.11 (0.04, 63)
Black guillemot		*Not analysed*	1997-2021 (24)	84.4 (1.3, 144)	Clutch size	1.79 (0.09, 29)
					Large chicks/nest	1.38 (0.15, 16)

1) *Including empty nests.* ***2)*** *Two main colonies on 8 June, when 5 nests (14%) were still empty and no clutches contained chicks.* ***3)*** *Minimum estimate on 5 July for 2 of the 3 colonies, when there were still 13 small chicks and 16 eggs (i.e. maximum estimate was 1.35-1.78).* ***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 14 July.* ***6)*** *A total of 15 pairs bred in Røst in 2020.* ***7)*** *Most breed in one colony, which was not counted in 2021.* ***8)*** *Last breeding in 2019. No kittiwakes seen on the island in 2021.* ***9)*** *Small cliff-breeding colony 9 km SW of Vedøy with 354 pairs in 2021.* ***10)*** *Population of 695 pairs in 2021 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)*** *Quasi-extinct colony on open ledges on Vedøy. Birds breeding in shelter on other islands in Røst were seemingly doing OK but their numbers are not monitored accurately.*

Table A9 *Key population parameters (SE, n) of lesser black-backed gull on* ***Horsvær*** *in 2021.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Lesser black-backed gull	− 74	2005-2021 (16)	88.9 (1.0, 190)	Clutch size	2.24 (0.82, 46)
				Large chicks/pair	0.00 (*n*=49)

Table A10 *Key population parameters (SE, n) of seabirds on* ***Sklinna*** *in 2021.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	− 100 [t]				
Great cormorant	− 28 [t]			*No data 2021*	
Shag	+ 13 [t]	2019-2020 (1)	74.5 (4.0, 617)	Clutch size [1]	1.93 (0.07, 231)
				Hatching success/nest	0.70 (*n*=50)
				Clutch size at hatching	1.42 (0.16, 50)
				Chicks/nest 10d later	1.06 (0.15, 50)
				Chicks/nest 20d later	0.94 (0.12, 50)
Common eider	− 26 [t]			Clutch size	3.83 (0.25, 8)
Herring gull [3]	− 28 [p]			Clutch size [2]	1.07 (0.34, 13)
				Clutch size [3]	2.14 (0.31, 7)
Great black-backed gull	+ 21 [p]			Clutch size [2]	1.57 (0.23, 28)
				Clutch size [3]	2.32 (0.14, 19)
Kittiwake *Sklinna*	[t 4]			*No breeding in 2021*	
Sør-Gjæslingan	− 2 [t 5]	2011-2021 (10)	74.4 (1.8, 305)	Large chicks/nest [5]	0.57 (*n*=122)
Rørvik	− 11 [t 6]			Large chicks/nest [6]	0.71 (*n*=429)
Common guillemot	− 17 [t]	2008-2021 (13)	92.3 (0.6, 361)	*No quantitative estimate* [7]	
Razorbill	+ 3 [t]				
Puffin	− 6 [p]			Hatching success/nest	0.74 (0.10, 19)
				Chicks ≥ 10d/hatched	0.87 (0.09, 13)
				Chicks ≥ 20d/hatched	0.80 (0.11, 13)
Black guillemot	− 7 [p 8]	2008-2021 (13)	87.0 (2.1, 75)		

1) *On 4–6 June, including empty nests.* ***2)*** *On 4 June, including empty nests.* ***3)*** *On 4 June, excluding empty nests.* ***4)*** *No breeding in 2019, 2020 or 2021.* ***5)*** *Based on nest count on 12 June and chick count on 29 June.* ***6)*** *Based on nest count on 1 June and chick count on 29 June.* ***7)*** *Quantitative estimates difficult to obtain because the birds breed in shelter under big boulders.* ***8)*** *Based on counts of adult birds on the water in May. As no May count was done in 2020, the trend is the average p.a. change from 2019 to 2021.*

Table A11 *Key population parameters (SE, n) of seabirds on* ***Runde*** *in 2021.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Gannet	+ 2 [t 1]			Large chicks/nest [1]	0.76 (0.02, 432)
Shag	[p]			Large chicks/nest [2]	0.74 (0.17, 27)
Great skua	+ 49 [t]			Large chicks/nest	0.92 (0.09, 78)
Kittiwake *Runde*	na [p 3]			*No breeding in study plots in 2021*	
Sildegarnsholmen	0 [t]	2019-2020 (1)	81.1 (1.2, 343)	Large chicks/nest	0.75 (0.03, 700)
Common guillemot	na [p 3]			*No breeding in study plots in 2021*	
Puffin	+ 5 [p]	2019-2020 (1)	88.7 (0.8, 454)	Hatching success/nest	0.71 (0.07, 45)
				Chicks ≥ 20d/hatched	0.42 (0.07, 45)
				Chicks ≥ 30d/hatched	0.40 (0.07, 45)
				Fledged chicks/nest	0.40 (0.07, 45)

1) *Large chicks counted in 4 study plots on 27 July.* ***2)*** *Breeding success is monitored in study plots at Lisjestakken and Huldene.* ***3)*** *As in the preceding year, no breeding was recorded in the study plots in 2021.*

Table A12 *Key population parameters (SE, n) of seabirds on Lyngøya in* ***Vestland*** *in 2021.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Common eider	− 67 [t]			*No data 2021*	
Lesser black-backed gull	+ 5 [t]	2008-2021 (13)	79.1 (3.4, 83)	Clutch size [1]	2.75 (0.08, 65)
				Breeding success [2]	0.77 (*n*=65)
Herring gull	− 2 [t]	2019-2020 (1)	97.3 (1.8, 172)	Clutch size [1]	2.89 (0.03, 265)
				Breeding success [2]	0.92 (*n*=265)
Great black-backed gull	+ 100 [t]			Clutch size [1]	3.00 (0.00, 3)
				Breeding success	0.90 (*n*=4)

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

Table A13 *Key population parameters (SE, n) of shag in* ***Rogaland*** *in 2021.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	+ 8 [p]	2016-21 (5) [1]	82.3 (1.8, 217)	Clutch size [2]	2.62 (0.09, 50)
				Breeding success [3]	1.33 (0.16, 49)

1) *At Jarstein, omitting 7 birds colour-ringed in 2014.* ***2)*** *Maximum nest content at Kjør on 3 visits between 27 May and 26 June.* ***3)*** *Chicks/nest at Kjør on 26 June, when many chicks were still small and these nests also contained on average 0.41 (SE=0.12) eggs.*

Table A14 *Key population parameters (SE, n) of seabirds on the different sites in* ***Agder*** *in 2021.*

Species		**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant	*Rauna*	+ 8	*No estimate yet available* [1]		Clutch size [2]	2.92 (0.09, 295)
					Large chicks/nest	1.34 (*n*=295)
Common eider	*Rauna*	+ 26 [3]			Clutch size	3.45 (0.22, 22)
					Chicks on sea [4]	*No data 2021*
Lesser black-backed gull			2001-2021 (20)	78.8 (1.0, 805) [5]		
	Slettingene	− 24			Clutch size [2]	2.33 (0.09, 117)
					Fledged juv./pair	0.85 (*n*=117)
	Storøy	[6]			Clutch size [2]	*No breeding 2021*
					Fledged juv./pair	*No breeding 2021*
	Klovholmene	− 67			Clutch size [2]	2.33 (0.33, 12)
					Fledged juv./pair	0.00 (*n*=4)
	Rauna	+ 53	1999-2021 (22)	83.3 (0.6, 1395)	Clutch size [2]	*No data 2021*
					Fledged juv./pair	0.33 (*n*=2330)
Herring gull			2001-2021 (20)	81.9 (1.2, 666) [5]		
	Slettingene	+ 53			Clutch size [2]	2.56 (0.08, 90)
					Fledged juv./pair	0.66 (*n*=91)
	Storøy	+ 54			Clutch size [2]	1.85 (0.17, 48)
					Fledged juv./pair	0.04 (*n*=49)
	Klovholmene	0			Clutch size [2]	0.00 (0.00, 4)
					Fledged juv./pair	1.17 (*n*=18)
	Rauna	− 29	2002-2021 (19)	80.3 (1.8, 224)	Clutch size [2]	*No data 2021*
					Fledged juv./pair	0.89 (*n*=225)

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.* ***6)*** *No breeding in 2020 and 2021.*

Cover photo:
Razorbill in inshore waters. The species is occasionally seen foraging inside Røst harbour, especially in seasons where pelagic fish are less available. Photo: © Tycho Anker-Nilssen

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