SEAPOP Short Report 1-2023

Key-site monitoring in Norway 2022, including Svalbard and Jan Mayen

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

NINA Norsk institutt for naturforskning

Norsk Polarinstitutt

Key-site monitoring in Norway 2022, including Svalbard and Jan Mayen

Breeding success

The 2022 breeding season was characterized by large variations in breeding success between species and localities, without an obvious general pattern. The avian influenza epidemic (HPAI), that has been widespread along the NE Atlantic coast for several years, seems to have affected the breeding success of some species in several Norwegian colonies, with the strongest effect on great skuas. Despite HPAI being a very likely explanation for the low number of nesting great skuas on Bjørnøya and Jan Mayen for instance, their breeding success at these locations was moderate (Jan Mayen) to good (Bjørnøya). HPAI also prevented fieldwork in some places, resulting in an unknown nesting success for puffins and razorbills on Hornøya, amongst others.

Breeding success was generally moderate to good for most species on Svalbard and Jan Mayen, except for black-legged kittiwakes in Isfjorden (Spitsbergen) and eiders and glaucous gulls in Kongsfjorden (Spitsbergen). The latter can be explained by high predation pressure from polar bears, which have been observed increasingly often. At some of the northernmost key localities on the mainland, breeding success was good for kittiwakes (Hornøya) and eiders (Grindøya), but probably moderate to poor for the other species (we have limited information due to HPAI preventing the completion of fieldwork on Hornøya). Breeding success on Anda and Røst was generally poor for kittiwakes, great skuas, and black guillemots; it was, at best, moderate for great black-backed gulls, common guillemots, and razorbills. Puffin breeding success on Røst was again zero for the 11th year since 2006. Overall productivity generally seemed slightly better on Runde and Sklinna, where several species had good or moderate breeding success. But there, too, the breeding success was poor for some species, such as eiders and great black-backed gulls on Sklinna, and great skuas on Runde.

A very young black-legged kittiwake chick on a nest on Røst, where few chicks survived to fledging. Photo: © Annette L. Fayet

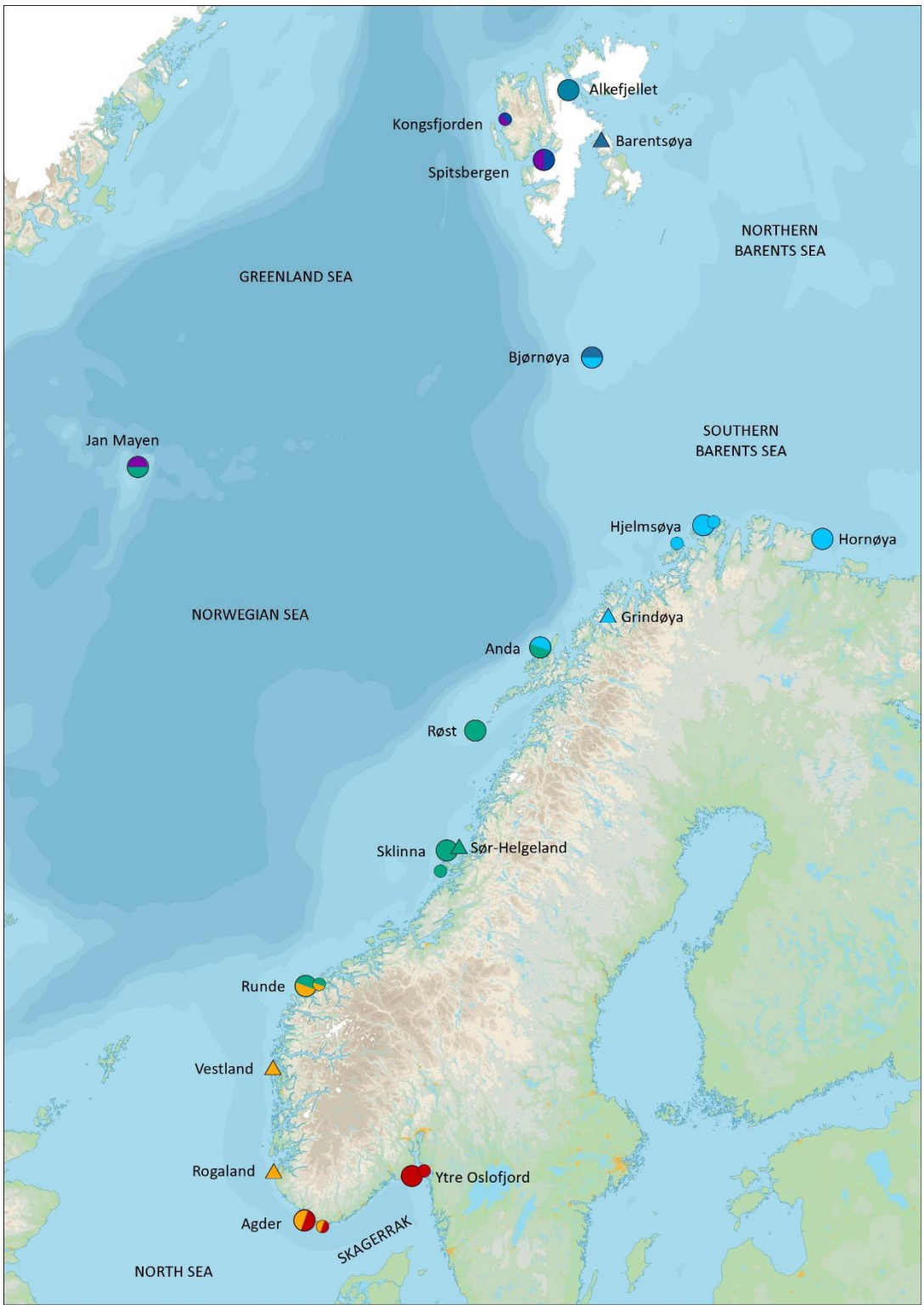
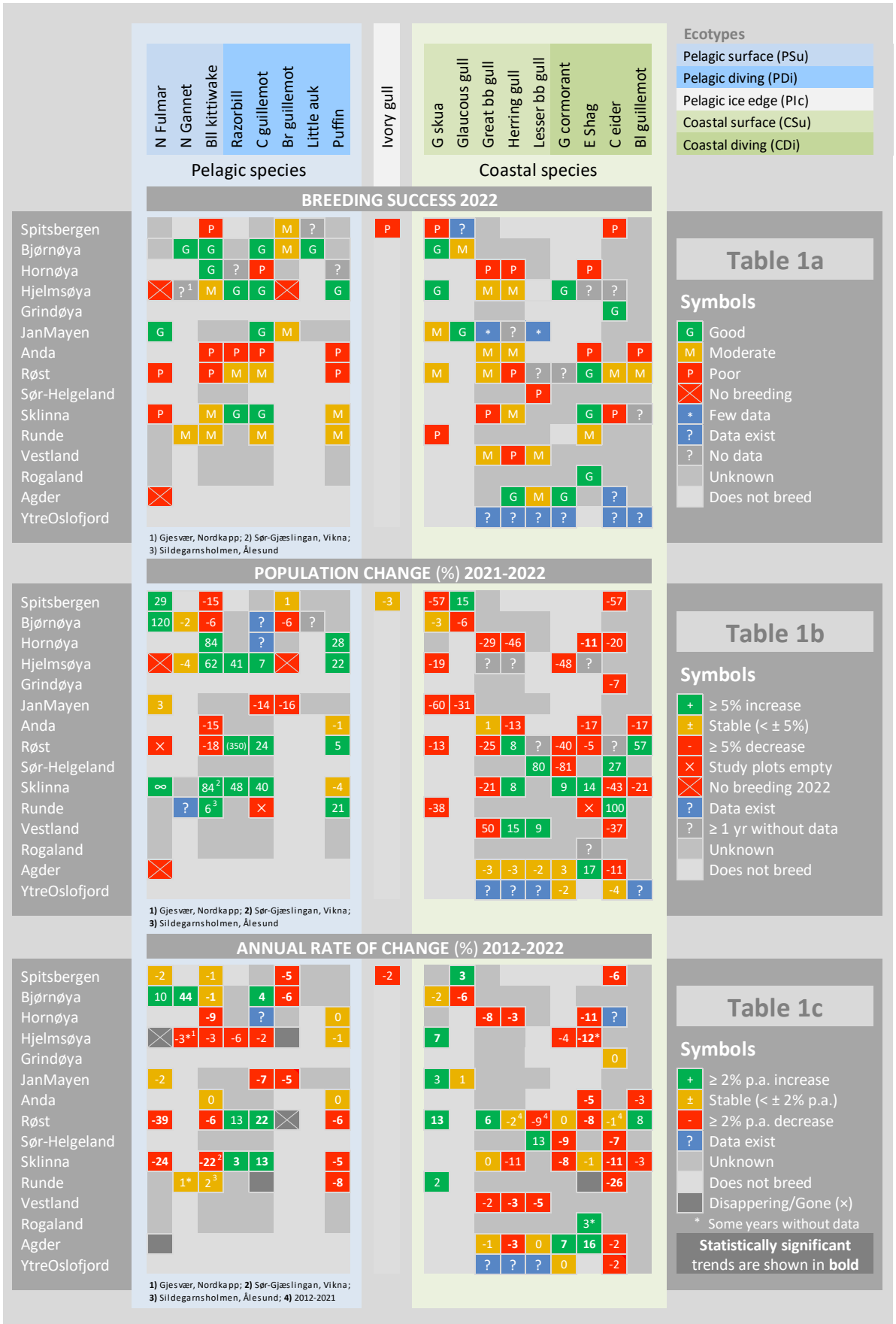


Figure 1

SEAPOP key-sites, as of 2022. 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 2022, and their mean population trend over the last ten years (1c).



2022	PSu	PDi	CSu	CDi	All
Barents Sea	M	G	M	M	M
Norwegian Sea	M	M	M	M	M
North Sea		?	M	G	M
All	M	M	M	M	M

Table 2

Average breeding success in 2022 for different ecotypes of seabirds at the key-sites in the three main sea areas covered by SEAPOP. The codes indicate whether the birds mainly forage in pelagic (P) or coastal (C) areas or seek food at the surface (Su) or by diving (Di).

In addition to the lack of a clear spatial pattern in breeding success in 2022, there were no clear interspecific differences, and in particular no clear difference between pelagic and coastal species. Nevertheless, breeding success continued to be poor for some species and localities. Puffins on Røst experienced complete breeding failure once again. In the north, common guillemots and glaucous gulls experienced low breeding success due to disturbance and predation from sea eagles and polar bears, respectively. Overall, breeding success in 2022 was highly variable, which underlines the importance of local environmental conditions**.**

Population changes

Just under half of the seabird populations at key SEAPOP locations showed downward trends from 2021 to 2022, which is similar to the last ten years. In the Barents Sea, the coastal seabirds declined most between 2021 and 2022, the most marked being among great skuas and eider ducks on Spitsbergen, herring gulls on Hornøya, great cormorants on Hjelmsøya, and great skuas and glaucous gulls on Jan Mayen. This decline is a continuation of the negative ten-year trend for these species, although the large negative effects on great skuas and the large gulls can to some extent be attributed to the HPAI outbreak in spring/summer 2022. In the Barents Sea, the outlook for pelagic species was more positive, with a substantial population increase for northern fulmars on Bjørnøya, kittiwakes on Hornøya and Hjelmsøya and razorbills on Hjelmsøya.

In the Norwegian Sea, the coastal surface-feeders declined most from 2021 to 2022. The breeding population of great cormorants fell sharply on Røst and Sør-Helgeland, while eider ducks struggled on Sklinna. In the North Sea, where most breeding species are coastal, there was an increase in the number of European shags in Agder.

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 key-sites in the main sea areas covered by SEAPOP. The codes indicate whether the birds forage mainly in pelagic (P) or coastal (C) areas or seek food at the surface (Su) or by diving (Di).

2021-2022	PSu	PDi	CSu	CDi	All
Barents Sea	34	16	-21	-29	2.6
Norwegian Sea	12	11	-9	-1	1.1
North Sea		?	11	-6	2.7
All	25.2	13.0	-7.6	-8.4	**6.4**

2012-2022	PSu	PDi	CSu	CDi	All
Barents Sea	4	-2	-2	-7	-0.9
Norwegian Sea	-11	2	2	-6	-3.1
North Sea		?	-2	4	0.7
All	-3.4	0.3	-0.3	-3.5	**-1.8**

For seabirds in Norway, general population trends over the last 10 years show that almost all species and species groups are declining. There are however a few exceptions, with the pelagic surface-feeders slightly increasing in the Barents Sea, due to both increased populations of northern fulmars and the establishment of a colony of northern gannets on Bjørnøya. In the Norwegian Sea, pelagic diving species, such as razorbills and common guillemots on Røst and Sklinna, have also increased slightly, as have great cormorants and European shags in Agder in the North Sea. Other exceptions include species which are expanding their breeding area northwards, such as great skuas in their northernmost breeding areas. Northern gannets established a new colony in 2011 on Bjørnøya, and it has been growing ever since. Unfortunately, the HPAI outbreak early in the 2022 breeding season seems to have hit these two species the hardest, and it is expected that this will slow down or even reverse their positive population trends.

A female eider on the nest. Eiders on Spitsbergen experienced one of the strongest declines recorded at SEAPOP locations in 2022. This particular bird was photographed on Røst. Photo: © Tycho Anker-Nilssen

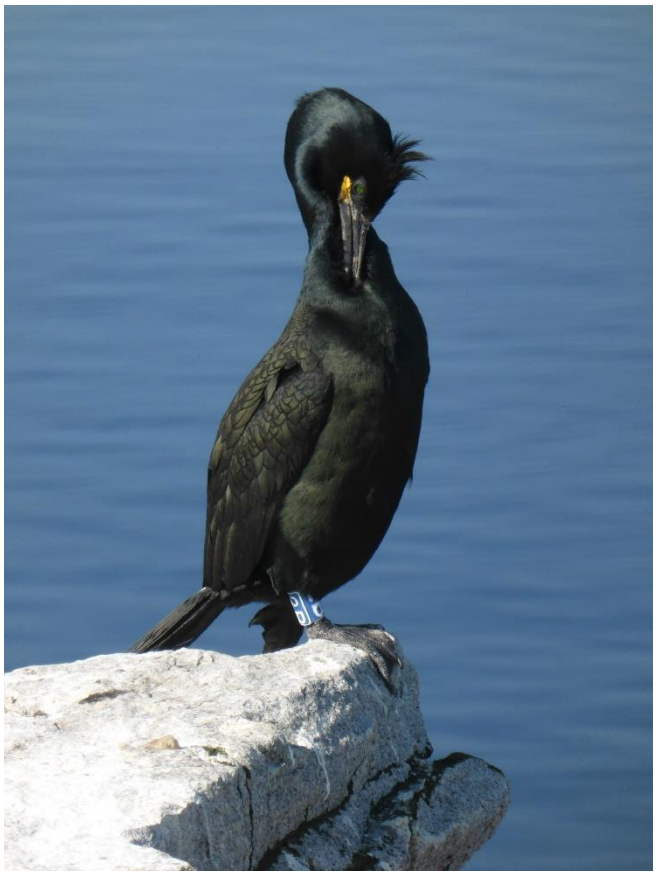
Adult survival

SEAPOP monitors the annual variations in seabirds' adult survival to help understand what drives population trends. In general, seabird population growth is more affected by changes in adult survival than by changes in offspring production. This is due to seabirds' long lifespan, which is an adaptation to the variable marine environment they live in. A long lifespan enables them to increase their chances of successfully reproducing during their lifetime. As such, populations can tolerate years of poor breeding success from time to time but are less tolerant of declines in adult survival. Measuring adult survival is therefore a good way to check the health of the populations.

Although all seabirds have the same strategy of living long and having high, relatively constant adult survival, there are some differences between seabird groups. For example, auks that lay only one egg generally have a higher adult survival and longer lifespan than gulls, which lay three eggs and have a somewhat shorter lifespan.

For analytical reasons detailed in the Appendix, the monitoring of adult survival in 2022 reflects either survival between the breeding seasons 2020 to 2021, or constant survival over the whole monitoring period until 2021 or 2022 (this varies between location and species, see Appendix tables). The monitoring of adult survival in SEAPOP in 2022 yielded few surprises. Most of the species and populations had good survival rates and were within expectations. For the pelagic auks, survival was good for both common and Brünnich's guillemots, and for razorbills. In addition to Hornøya, razorbill survival is now also monitored on Sklinna. Ringing was started there in 2020, and the first survival estimate could be calculated in 2022. With an annual survival probability of 83%, survival of razorbills at Sklinna was 10% lower than at Hornøya, and thus rather moderate. There were a few more worrying findings, which are worth following up on. For example, the survival rates of little auks in both colonies on Spitsbergen in 2020-2021 were low. This was also the case for puffins on Runde and Anda, where the survival in 2020-2021 was respectively 75% and 72%, while it was good for the other puffin populations.

For most of the gulls, survival was good and in line with expectations. For lesser black-backed gulls however, long-term survival in Mandal (77%) was still poor and last year survival at Rauna (75%) was well below the long-term average (82%). For black-legged kittiwakes, survival in 2020-2021 was within expected values for most populations, but it dropped noticeably at Anda (70% over 2020-2021, 10% lower than the previous year) and at Hornøya (82% over 2020-2021, 8% less than the previous year).



An adult European shag with a colour ring for survival studies. The species had poor survival rates in the Norwegian Sea, with a record low figure on Røst. Photo: © Nina Dehnhard

The survival of coastal species such as black guillemots, European shags and eider ducks, varied between locations. Black guillemots, monitored at Sklinna and Røst, had a good and stable survival. While European shags had good survival on Hornøya in the north, they had low survival on Sklinna (78%) and especially on Røst (48%). The latter is particularly worrying, as this is a continuation of a negative trend in survival and the lowest survival rate from one year to the next recorded for the Røst population since monitoring began in 2002. Eider ducks from Grindøya also had low survival (72%)

compared to expectations, but this was still an improvement from the record low survival rate of 42% in 2018-2019.

A decrease in adult survival may indicate poor conditions outside the breeding season and is often linked to food availability and marine conditions. Declines may also be due to increased human activity in the areas the birds use in autumn and winter. Extreme weather can also lead to high mortality, and increased frequencies of extreme weather are expected as one of the consequences of climate change. Having a good knowledge of adult survival in seabird populations is therefore important and provides insight into population health.

SEAPOP researchers wearing personal protective equipment while handling a gull chick during the HPAI outbreak. Photo: © Nina Dehnhard

APPENDIX – Key parameters from all key-sites in 2022

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 2021 and 2022 based on plot counts (p) or total censuses (t). For survival, in all cases the listed estimate is derived from the basic CJS model(s) that fits the dataset best (i.e., the one with the lowest AICc or QAICc value). When the model retained is one with constant survival and recapture rate, the survival can be estimated over the whole monitoring period (up until 2022, yrs >1 in the tables below). If the model retained is one with constant recapture rate but varying survival, it is possible to produce a valid estimate for the last time step (2021-2022). However, when the model retained is one with varying survival and recapture rates, it is not possible to distinguish the two variables in the last time step (2021-2022), so the survival is only reported for the previous time step (2020-2021, yrs = 1 in the tables below). Note also that the table for Vestland and some estimates for Hjelmsøya are not yet available and will be added later.

Table A1 *Key population parameters (SE, n) of seabirds on* ***Svalbard*** *in 2022 (excl. Bjørnøya, cf. Table A2).*

Species	**Colony**	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	*Nøisdalen*	+ 29 [p]				
Common eider	*Kongsfjorden*	− 67	2007-2022 (16)	81.0 (1.02, 439)	Hatching success [1]	0.16 (n=18)
Great skua	*Kongsfjorden*	− 56	2007-2022 (16)	90.5 (2.58, 37)	Hatching success [1]	0.33 (*n*=6)
					Clutch size [2]	1.9 (*n*= 11)
	Hermansenøya	− 57	*No data*		Clutch size [2]	1.81 (*n*=59)
Ivory gull	*32 colonies*	+ 10 [p]				
	Barentsøya		2010-2021 (11)	81.8 (2.0, 206)	Large chicks/nest	0.26 (0.06, 20)
Glaucous gull	*Kongsfjorden*	+ 16 [p]	2020-2021 (1)	90.5 (8.3, 135)	Hatching success	0.51 (0.08, 37)
Kittiwake	*Ossian Sars*	− 31 [p]			*No data 2022*	
	Grumantbyen	*No data*	2011-2022 (10)	78.2 (2.0, 198)	Chicks >15d/nest	0.16 (0.07, 27)
	Fuglehuken	− 11 [p]			*No data 2022*	
Brünnich's guillemot	*Ossian Sars*	− 12 [p]	2020-2021 (1)	86.4 (5.1, 222)	Chicks >15d/nest	0.74 (0.07, 43)
	Diabasodden	− 10 [t]	*No data 2022*		*No data 2022*	
	Fuglehuken	+3 [p]				
Little auk	*Bjørndalen*	*No data*	2020-2021 (1)	75.7 (14.2, 621)	*No data 2022*	
	Feiringfjellet	*No data*	2020-2021 (14)	57.9 (11.5, 791)	*No data 2022*	

1) *Minimum proportion of nests with at least one 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 2022.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	+ 120 [p]				
Gannet	− 2 [p]			Large chicks/nets	0.52 (0.06, 31)
Great skua	− 3 [p]	2020-2021 (1)	83.7 (11.3, 243)	Large chicks/nest	0.98 (0.15, 41)
Glaucous gull	− 6 [p]	2009-2022 (13)	80.3 (1.6, 183)	Large chicks/nest	1.64 (0.03, 14)
Kittiwake	− 6 [p]	2005-2022 (17)	87.2 (0.8, 378)	Large chicks/nest	0.80 (0.03, 229)
Common guillemot	− 10 [p]	*Results not yet available*		Fledging success [1]	0.45 (0.04, 147)
Brünnich's guillemot	− 6 [p]	2020-2021 (1)	86.0 (6.6, 361)	Fledging success [1]	0.46 (0.07, 50)
Little auk	[2]	2020-2021 (1)	92.0 (1.9, 1093)	Fledging success Large chicks/nest	0.92 (0.04, 50) 0.26 (0.06, 20)

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 2022.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	+ 81 [p 1]	2004-2022 (18)	85.7 (1.1, 390)	Clutch size Breeding success	*No data 2022* *No data 2022*
Herring gull	− 23 [p]	2007-2022 (15)	84.5 (1.8, 154)	Clutch size Breeding success [3]	2.50 (0.13, 30) *No data 2022* [2]
Great black-backed gull	− 27 [p]	2001-2022 (21)	83.2 (1.2, 242)	Clutch size Breeding success [3]	2.05 (0.16, 21) *No data 2022* [2]
Kittiwake	+ 83 [p]	2020-2021 (1)	81.8 (6.9, 1620)	Clutch size Large chicks/nest [3]	1.57 (0.04,262) 1.30 (0.06, 262)
Common guillemot	*No data 2022*	1988-2022 (34)	97.5 (0.3, 295)	Breeding success [3]	0.00 (0.00, 35) [4,5]
Razorbill	*No data*	1995-2022 (26)	93.8 (0.6, 415)	Breeding success [3]	*No data 2022*[6]
Puffin	+ 28 [p]	2020-2021 (1)	85.8 (13.0, 1013)	Breeding success [3]	*No data 2022*[6]

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.* ***6)*** *Assessing reproductive performance was not possible this year due to avian flu outbreak in the colony.*

Table A4 *Key population parameters (SE, n) of seabirds on* ***Hjelmsøya*** *in 2022. Missing values (indicated with [3]) are currently unavailable and will be updated at a later date.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant				*No data 2022*	
W Finnmark	− 48 [t]			*No data 2022*	
Shag *Lille Kamøy*	*No data 2022*			*No data 2022*	
Gannet *Gjesværstappan*	− 4 [p]			*No data 2022*	
Common eider	[t 3]			*No data 2022*	
Great skua	− 19 [t]			Clutch size	1.15 (0.19, 13)
Arctic skua	− 35 [t]			*No data 2022*	
Common gull	+ 6 [t]			*No data 2022*	
Herring gull	[p 3]	*No data 2022*		Clutch size [1,3] Breeding success [3,4]	
Great black-backed gull	[p 3]	*No data 2022*		Clutch size [1,3] Breeding success [3,4]	
Kittiwake	+ 62 [p]	2020-2021 (1)[3]	[3]	Clutch size [1,3] Clutch size [2,3] Breeding success [3]	
Common guillemot					
Open ledges (inds.)	+ 4 [p]	*No data 2022*		*No breeding confirmed 2022*	
Crevices not predated (eggs)	+ 10 [p]	2020-2021 (1)[3]	[3]	Breeding success [3]	
Crevices predated (eggs)				Breeding success [3]	
Brünnich's guillemot	*Extinct* [5]	*No data 2022*		*No breeding confirmed 2022*	
Razorbill *Open ledges (inds.)*	+ 106 [p]			*No data 2022*	
Crevices (eggs)	+ 37 [p]	*Too small sample*		Breeding success [3]	
Puffin *Gjesværstappan*	[3]				
Hjelmsøya	+ 22 [p 6]	2020-2021 (1)[3]	[3]	Hatching success	0.55 (0.05, 120)
				Breeding success [4]	0.45 (0.05, 110)

1) *Including empty nests.* ***2)*** *Excluding empty nests.* ***3)*** *Results not yet available.* ***4)*** *Large chicks/egg laid.* ***5)*** *Very few birds still attended the colony irregularly.* ***6)*** *25 plots.*

Table A5 *Key population parameters (SE, n) of seabirds on* ***Jan Mayen*** *in 2022.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	+ 3 [p]	2014-2022 (8)	95.6 (2.5, 89)	Chicks/nest [1,2]	0.66 (0.05, 88)
Common guillemot	− 14 [p]	2011-2022 (11)	90.2 (1.6, 114)	Breeding success [3,2]	0.65 (0.11, 20)
Brünnich's guillemot	− 16 [p]	2011-2022 (11)	90.4 (1.2, 150)	Breeding success [3,2]	0.56 (0.07, 50)
Great skua	− 60 [p]			Large chicks/nest [4]	0.44 (0.21, 18)
Glaucous gull	− 31 [p]			Large chicks/nest [4]	1.08 (0.22, 25)
Great black-backed gull	*No data*			Large chicks/nest [4]	*No data 2022*
Lesser black-backed gull	*No data*			Large chicks/nest [4]	*No data 2022*

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)*** *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 2022.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Common eider	− 13 [t 1]	2020-2021 (1)	0.724 (0.280, 1529)	Clutch size	4.12 (0.15, 25)

1) *Nest counts.*

Table A7 *Key population parameters (SE, n) of seabirds on* ***Anda*** *in 2022.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	− 17 [t]			Clutch size [1]	0.27 (0.19, 11)
Herring gull	− 13 [t]			Clutch size [2]	1.00 (0.15, 50)
				Clutch size [3]	1.85 (0.15, 27)
				Large chicks/nest	0.60 (55)
Kittiwake	− 15 [p]	2020-21 (1)	78.8 (3.10, 594)	Large chicks/nest	0.02 (0.00, 745)
Puffin	− 1 [p]	2020-21 (1)	72.3 (6.00, 573)	Hatching success	0.84 (0.05, 51)
				Chicks ≥ 20d/ nest	0.56 (0.07, 48)
Black guillemot	− 17 [t, 4]			Large chicks/nest	0.00 (0.00, 8)

1) *Including empty nests, counted on 19 July;* ***2)*** *Including empty nests, counted on 25 June;* ***3)*** *Excluding empty nests, counted on 25 June;* ***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 2022.*

Species		**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	*Hernyken*	Extinct? [p]			*No breeding on Hernyken in 2022*	
Great cormorant		− 40 [t]			Clutch size [1,2]	1.33 (0.24, 27)
					No data 2022	
Shag	*Ellefsnyken*	− 5 [p]	2020-2021 (1)	48.3 (11.8, 574)	Clutch size [3,4]	2.46 (0.07, 97)
					Clutch size [1,4]	1.98 (0.11, 120)
					Large chicks/nest [3]	1.43 (0.27, 14)
Common eider		No data 2022 [p]			Clutch size	4.13 (0.14, 32)
Great skua		− 13 [t 5]			Clutch size [3]	2.00 (0.00, 4)
					Breeding success	0.54 (0.21, 13)
Common gull		+ 14 [p]			Clutch size [3]	1.89 (0.18, 18)
					Large chicks/nest [3]	0.58 (*n*=67)
Lesser black-backed gull		? [p 6]			*No data 2022*	
Herring gull		+ 8 [p]			Clutch size [3]	2.25 (0.31, 8)
					Large chicks/nest [3]	0.88 (*n*=8)
Great black-backed gull		− 25 [p]			Clutch size [3]	2.33 (0.34, 18)
					Large chicks/nest [3]	1.30 (*n*=27)
Kittiwake	*Vedøy*	Extinct [p 7]			*No breeding on Vedøy in 2022*	
	Gjelfruvær	− 29 [t 8]			Large chicks/nest	0.31 (0.04, 252)
	Kårøy area	− 12 [t 9]	2020-2021 (1)	82.1 (3.7, 527)	Clutch size/pair [10]	1.09 (0.03, 33)
					Clutch size/pair [11]	1.12 (0.07, 213)
					Large chicks/pair [10]	0.00 (0.00, 33)
					Large chicks/pair [11]	0.28 (0.04, 213)
					Large chicks/pair [12]	0.28 (0.02, 611)
Arctic tern					*No data 2022*	
Common guillemot		+ 24 [p 13]			Breeding success	0.63 (0.07, 54)
Razorbill		(+ 350) [p 13]				
Puffin		− 5 [p]	2020-2021 (1)	93.9 (2.7, 577)	Hatching success	0.76 (0.05, 80)
					Breeding success	0.00 (0.00, 89)
Black guillemot		+ 57 [p 14]	1997-2022 (25)	84.8 (1.3, 149)	Clutch size	1.81 (0.08, 26)
					Large chicks/nest	0.86 (0.16, 21)

1) *Including empty nests.* ***2)*** *Two colonies on 15 June, when 9 nests (33%) were still empty, and no clutches contained chicks.* ***3)*** *Excluding nests not known to have contained eggs/chicks.* ***4)*** *On 1 July, estimated by linear regression of mean values for counts on five different days between 17 June and 14 July.* ***5)*** *A total of 13 territories were occupied in Røst in 2022.* ***6)*** *Most breed in one colony, which was not counted in 2021-2022.* ***7)*** *Last breeding in 2019. No kittiwakes seen on the island in 2020-2022.* ***8)*** *Small cliff-breeding colony 9 km SW of Vedøy with 252 pairs in 2022.* ***9)*** *Population of 611 pairs in 2022 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 with very few birds left, especially razorbills. Birds breeding in shelter on other islands in Røst were seemingly doing OK, but their numbers are not monitored accurately.* ***14)*** *Based on counts of adult birds in the colony area in early May (before egg laying).*

Table A9 *Key population parameters (SE, n) of lesser black-backed gull on* ***Horsvær*** *in 2022.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Lesser black-backed gull	+79.6	2005-2022 (17)	88.5 (0.86, 190)	Clutch size	2.41 (0.71, 71)
				Large chicks/pair	0.15 (*n*=13)

Table A10 *Key population parameters (SE, n) of seabirds on* ***Sklinna*** *in 2022.*

Species	Population change%	Annual adult survival Period (yrs)	Annual adult survival Estimate%	Reproductive performance Sampling unit	Reproductive performance Estimate
Fulmar	+ 100 [t]				
Great cormorant	+ 9 [t]				
Shag	+ 14 [t]	2020-21 (1)	78.0 (3.77, 661)	Clutch size [1]	2.04 (0.07, 232)
				Hatching success/nest	0.80 (*n*=50)
				Clutch size at hatching	1.46 (0.14, 50)
				Chicks/nest 10d later	1.08 (0.13, 50)
				Chicks/nest 20d later	1.20 (0.12,50)
Common eider	− 29 [t]			Clutch size	4.20 (0.28, n=10)
Herring gull	+ 8 [p]			Clutch size [2]	1.10 (0.25, 20)
				Clutch size [3]	2.00 (0.22, 11)
Great black-backed gull	− 21 [p]			Clutch size [2]	0.38 (0.75, 24)
				Clutch size [3]	1.80 (0.18, 5)
Kittiwake *Sklinna*	0 [t 4]			*No breeding in 2022*	
Sør-Gjæslingan	+ 84 [t 5]	2011-22 (11)	77.4 (1.72, 314)	Large chicks/nest [5]	0.64 (n = 144)
Rørvik	+ 35 [t 6]			Large chicks/nest [6]	0.60 (n = 343)
Common guillemot	+ 40 [t]	2008-22 (14)	92.7 (0.59, 377)	*No quantitative estimate* [7]	
Razorbill	+ 49 [t]	2020-22 (2)	83.6 (6.71, 20)		
Puffin	0 [p]			Hatching success/nest	0.56 (0.12, *n*=18)
				Chicks ≥ 10d/hatched	0.39 (0.12, *n*=7)
				Chicks ≥ 20d/hatched	0.39 (0.12. *n*=7)
Black guillemot	− 21 [p]	2008-22 (14)	87.9 (2.28, 78)		

1) *Counted on 5-8 June, including empty nests.* ***2)*** *Counted on 5 June, including empty nests.* ***3)*** *Counted on 5 June excluding empty nests.* ***4)*** *No breeding 2019-2022.* ***5)*** *Based on nest counts on 6 June and chick count on 1 July. 6) Based on nest counts on 2 June and chick count on 1 July.* ***7)*** *Quantitative estimates difficult to obtain because the birds breed in shelter under big boulders.*

Table A11 *Key population parameters (SE, n) of seabirds on* ***Runde*** *in 2022.*

Species	Population change %	Annual adult survival Period (yrs)	Annual adult survival Estimate%	Reproductive performance Sampling unit	Reproductive performance Estimate
Gannet	0 [t]			Large chick/nest[1]	0.66 (0.01, *n*=2834)
Shag	0 [p]				
Great skua	− 38 [t]			Large chick/nest	0.40 (0.11, *n*=40)
Kittiwake *Runde*	0 [p2]			*No breeding in 2022*	
Sildegarnsholmen	+ 6 [t]	2011-22 (11)	81.8 (1.04, 365)	Large chicks/nest	0.64 (0.03, *n*=732)
Common guillemot	0 [p3]			*No breeding in 2022*	
Puffin	21 [p]	2020-21 (1)	89.2 (3.50, 511)	Hatching success/nest	0.62 (0.07, *n*=43)
				Chicks ≥ 20d/nest	0.49 (0.08, *n*=43)
				Chicks ≥ 30d/hatched	0.47 (0.08, *n*=43)
				Fledged chicks/nest	0.44 (0.06, *n*=43)

1) *Large chicks counted in 4 study plots on 29 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 2022*

Table A12 *Key population parameters (SE, n) of shag in* ***Rogaland*** *in 2022.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	*No data*	2016-22 (6) [1]	81.6 (1.8, 247)	Clutch size [2]	2.58 (0.11, 50)
				Breeding success [3]	1.72 (0.19, 50)

1) *At Jarstein, omitting 7 birds colour-ringed in 2014.* ***2)*** *Maximum nest content at Kjør on 3 visits between 20 May and 28 June.* ***3)*** *Chicks/nest at Kjør on 28 June, when some chicks were still small but only two nests contained eggs.*

Table A13 *Key population parameters (SE, n) of seabirds on the different sites in* ***Agder*** *in 2022. Slettingene, Storøy and Klovholmene are located in Mandal, Lindesnes municipality. Rauna is in Farsund municipality.*

Species		**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant	*Rauna*	+ 3	*No estimate yet available* [1]		Clutch size [2]	2.85 (0.09, 305)
					Large chicks/nest	1.97 (*n*=305)
Common eider	*Rauna*	– 11 [3]			Clutch size	3.30 (0.20, 56)
					Chicks on sea [4]	*No data 2022*
Lesser black-backed gull			2007-2022 (15)	77.3 (1.0, 773) [5]		
	Slettingene	+ 6			Clutch size [2]	2.70 (0.06, 124)
					Fledged juv./pair	0.97 (*n*=124)
	Storøy	[6]			Clutch size [2]	*No breeding 2022*
					Fledged juv./pair	*No breeding 2022*
	Klovholmene	+ 25			Clutch size [2]	1.60 (0.68, 5)
					Fledged juv./pair	0.20 (*n*=5)
	Rauna	+ 4	2020-2021 (1)	75.4 (3.9, 1354)	Clutch size [2]	*No data 2022*
					Fledged juv./pair	0.62 (*n*=2230)
Herring gull			2007-2022 (15)	81.0 (1.0, 690) [5]		
	Slettingene	+ 10			Clutch size [2]	2.23 (0.13, 65)
					Fledged juv./pair	0.80 (*n*=100)
	Storøy	- 43			Clutch size [2]	1.81 (0.26, 27)
					Fledged juv./pair	0.71 (*n*=20)
	Klovholmene	+ 6			Clutch size [2]	2.63 (0.17, 19)
					Fledged juv./pair	1.21 (*n*=19)
	Rauna	+ 2	2007-2022 (15)	80.8 (1.7, 225)	Clutch size [2]	*No data 2022*
					Fledged juv./pair	1.74 (*n*=230)

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 2022 due to no complete count at Rauna.* ***5)*** *General estimate for birds from Slettingene, Storøy and Klovholmene.* ***6)*** *No breeding in 2020, 2021 and 2022*

Cover photo: *Little auks on Bjørnøya. Photo: © Hallvard Strøm*

List of contact people

Key-site(s)	Contact person	e-mail address
Svalbard (ivory gull)	Hallvard Strøm	hallvard.strom@npolar.no
Svalbard (common eider & great skua)	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
Røst	Annette L. Fayet	annette.fayet@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

Publication series information

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

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

Series editors
Annette L. Fayet, annette.fayet@nina.no, Tycho Anker-Nilssen, tycho@nina.no
NINA, PO Box 5685 Torgarden, NO-7485 Trondheim, Norway