



## Key-site monitoring in Norway 2023, including Svalbard and Jan Mayen

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## Breeding success

In 2023, breeding success varied widely between Norwegian seabird species and colonies. On average, surface-feeding species had poorer breeding success than diving species. The pelagic surface-feeding species had moderate or poor breeding success in all the monitored colonies, with the exception of black-legged kittiwakes (hereafter kittiwakes) at Sør-Gjæslingen/Sklinna and northern gannets on Runde, which had good breeding success. In fact, kittiwakes at Sør-Gjæslingen produced the highest number of chicks since monitoring began in 2011, with one chick fledging per nest on average. Among the pelagic surface-feeders, northern fulmars had the lowest breeding success. They did not even breed at previously active sites at Sklinna and Agder, and hatching success was poor at Jan Mayen.

Among coastal surface-feeders, great black-backed gulls had the lowest breeding success, which was moderate or poor in all colonies. Herring gulls did not do much better, with poor offspring production in four of the seven monitored colonies. Lesser black-backed gulls and glaucous gulls had, on average, moderate breeding success. Great skuas, one of the species heavily affected by Highly Pathogenic Avian Influenza (HPAI) in 2022, had good breeding success at Runde and Jan Mayen, but did poorly on Spitsbergen, Bjørnøya and Røst.

Breeding success among the pelagic diving species was better. Four of six monitored Atlantic puffin (hereafter puffin) colonies had good breeding success. It is worth noting that puffins on Røst had moderate breeding success (50%) for the first time after a record number of years with extremely poor breeding success or near-total nest failure. Little auks on Bjørnøya had good breeding success, as had razorbills in most monitored colonies. Common guillemots had total breeding failure on Hornøya for the fourth year in a row, but moderate or good breeding success in all other colonies.



*Black-legged kittiwakes breeding on a man-made nesting structure at Sør-Gjæslingen, where they had their highest breeding success since monitoring began in 2011. Photo: © Nina Dehnhard*



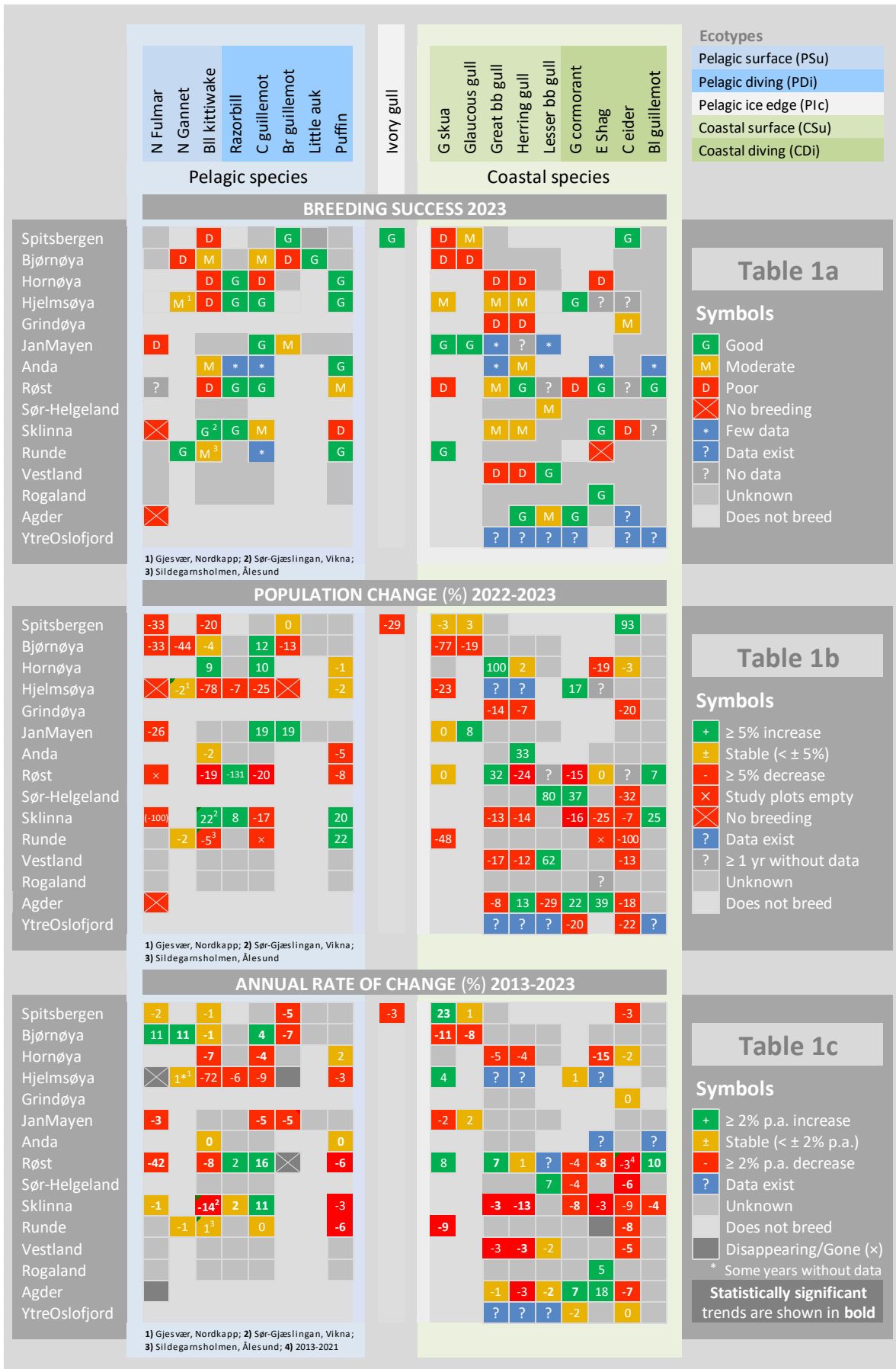
**Figure 1**

SEAPOP key-sites, as of 2023. 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 2023, and mean population trend over the last ten years (1c).



2023	PSu	PDi	CSu	CDi	All
Barents Sea	D	G	D	M	M
Norwegian Sea	M	G	M	M	M
North Sea	✗	?	M	G	M
All	M	G	M	M	M

**Table 2**

*Average breeding success in 2023 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).*

All in all, the coastal diving species had a good breeding season. Exceptions include common eiders on Sklinna, and European shags on Runde, where very few individuals attempted to breed, and on Hornøya, where breeding success was low. In contrast, the breeding success of shags on Røst, in Rogaland and on Sklinna was good; in fact, offspring production on Sklinna was the highest since monitoring began (1.8 chicks per nest on average). Great cormorants had good offspring production on Hjelmsøya and in Agder. Black guillemots had a good breeding season on Røst, the only colony where the species' reproduction is monitored. Common eiders had moderate and good breeding success on Grindøya and Spitsbergen, respectively.

## Population changes

More than half of the seabird populations monitored at SEAPOP key-sites showed downward trends between 2022 and 2023. This is a continuation of the declines in many Norwegian seabird populations documented over a number of years and the general trends in most Norwegian seabird populations of the last ten-year period (2013-2023) are very worrying.

In the Barents Sea, an increase in the common eider population on Spitsbergen and the great cormorant population on Hjelmsøya contributed to the positive population trend of coastal diving species from 2022 to 2023. The exception was shags on Hornøya, which declined by 18%. Apart from common guillemots on Bjørnøya, and kittiwakes, herring gulls, and great black-backed gulls on Hornøya, which all increased from 2022 to 2023, all the other species groups in the Barents Sea declined. This decline is a continuation of previous negative ten-year trends for these species.

In the Norwegian Sea, coastal surface-feeding species performed best from 2022 to 2023, with increasing populations of lesser black-backed gulls in Sør-Helgeland and great black-backed gulls on Røst, amongst others. For the other species groups, population trends were negative on average. Exceptions include common and Brünnich's guillemots on Jan Mayen, as well as kittiwakes, razorbills and puffins on Sklinna, which increased in numbers. Of the four ecotypes, the coastal diving species and pelagic surface-feeding species declined the most in the Norwegian Sea over the ten-year period 2013-2023.

In the North Sea, where the coastal species dominate, there was a positive trend for lesser black-backed gulls in Vestland, and for shags, great cormorants and herring gulls in Agder. Declines were recorded in great black-backed gulls in both Vestland and Agder, herring gulls in Vestland and lesser black-backed gulls 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).

<b>2022-2023</b>	PSu	PDi	CSu	CDi	All	<b>2013-2023</b>	PSu	PDi	CSu	CDi	All
Barents Sea	-26	-3	-4	14	-7.4	Barents Sea	-8	-4	0	-4	-3.8
Norwegian Sea	-5	-9	5	-13	-5.5	Norwegian Sea	-9	1	0	-4	-2.8
North Sea	✗	?	2	-2	-0.3	North Sea	✗	?	-2	2	0.2
<b>All</b>	<b>-16.9</b>	<b>-6.6</b>	<b>1.0</b>	<b>-3.3</b>	<b>-5.4</b>	<b>All</b>	<b>-8.0</b>	<b>-1.2</b>	<b>-0.7</b>	<b>-2.2</b>	<b>-2.7</b>

The global outbreak of HPAI appears to have hit the Norwegian great skua populations hard. With the exception of Jan Mayen and Røst, all the monitored populations markedly declined between 2022 and 2023. Northern gannets, another species strongly affected by HPAI, seem to have done a little better, and only the population on Bjørnøya substantially decreased while other monitored populations remained stable. All monitored populations of kittiwakes, except on Sklinna and Hornøya, declined between 2022 and 2023. Norwegian kittiwakes were heavily affected by HPAI at the end of the 2023 breeding season, especially in eastern Finnmark, and there is therefore great concern about the status of this species in the future. Northern fulmars also declined dramatically from 2022 to 2023. A silver lining is that puffin populations increased on Sklinna and on Runde, where there has been a positive population trend in recent years, probably caused by strong year classes of sandeels that have ensured good reproduction for puffins on the island for several years since 2019.

The population trends of Norwegian seabirds over the last decade show that many species are declining. The picture is complex however, and there are a few exceptions, such as common guillemots, whose numbers increased at several localities.



A pair of northern fulmars displaying. Fulmars strongly declined at all monitored sites between 2022 and 2023. Photo: © Nina Dehnhard

## Adult survival

Survival of adult seabirds, which is calculated in 43 populations of 18 different seabird species, is an important demographic parameter monitored by SEAPOP and a key driver of population trends in long-lived species like seabirds. These populations and species cover the geographical areas and the four ecological groups that SEAPOP is responsible for.

Seabird adult survival can be affected by diverse factors, such as environmental conditions, access to food, as well as human activity such as offshore windfarms and fisheries, but also diseases and predation in the breeding area. It is therefore assumed that there is a link between the birds' area use and their ability to survive. Time series of population survival therefore provide an important basis for causal studies, and detecting significant decreases in survival provides a strong and important signal that something is wrong. For analytical reasons, survival is given either as an average value over several years or as the value from the previous year (in this report, survival between 2021 and 2022).

In coastal surface-feeding species, which are mainly made up of large gull species, there were no major changes in adult survival compared to the average over a longer period. It is worth noting, however, that lesser black-backed gulls from Mandal had a similarly low survival as in the previous year (77%), compared to their average survival of 84%.

For coastal diving species, there was a particularly dramatic drop in the survival of common eiders on Grindøya in Troms, which stood at 27%, compared to an average of 76%. Black guillemots and razorbills on Sklinna also had lower survival (83% and 62%, respectively) than average (88% and 84%, respectively). However, there were also positive changes for this group, such as shags on Røst, which had a much higher survival (86%) than the previous year (47%), above their long-term average of 78%.



*An adult Atlantic puffin with a colour ring for survival studies. The species had declining survival rates at almost all monitored colonies this year, with the strongest declines in the Barents Sea. Photo: © Tone K. Reiertsen*

Among pelagic diving species, a worrying decline was recorded in the survival of almost all puffin populations that SEAPOP monitors. This was especially the case on Hjelmsøya (56%) and Hornøya (68%). Only puffins from Runde had a good survival rate (88%), a significant improvement from the

previous year (75%). For common guillemots, only the population on Hjelmsøya had a drop in survival (72% vs an average of 84%). The survival of Arctic pelagic divers was generally close to the long-term average of their respective populations, with the exception of Brünnich's guillemots on Jan Mayen (75%), and the little auks on Spitsbergen (72%) which were both lower than average.

Kittiwakes, a pelagic surface-feeding species, has received a lot of attention because of its sharp population declines in all colonies along the coast of mainland Norway, with many smaller colonies already abandoned. The kittiwake populations still had a worryingly low survival rate on Hornøya (56%), Hjelmsøya (68%) and Røst (72%), while the other populations stayed closer to the long-term average (around 85%). Great skuas were another surface-feeder with a very low survival rate on Bjørnøya (34%) and Kongsfjorden (54%) on Svalbard. This is most likely a result of the HPAI outbreak during the 2022 breeding season.



*A great skua breeding on Røst dive bombing researchers monitoring its nest. Great skuas were strongly impacted by the HPAI outbreak in 2022, this resulted in low population numbers and survival rates in 2023. Photo: © Tycho Anker-Nilssen*



## APPENDIX – Key parameters from all key-sites in 2023

### Key to Tables A1-A13

Key population parameters (SE, n) of seabirds breeding on the key-sites indicated above each table, from North to South. 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 2022 and 2023 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 2023, 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 (2022-2023). 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 (2022-2023), so the survival is only reported for the previous time step (2021-2022, yrs = 1 in the tables below). In the tables, parameters that have not yet been calculated are marked as such, while blank cells or “no data” indicate a parameter is not monitored at this particular key-site.

**Table A1.** Key population parameters (SE, n) of seabirds on **Svalbard** in 2023 (excl. Bjørnøya, cf. Table A2).

Species	Locality	Population change		Annual adult survival		Reproductive performance			
		Estimate	%	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)
Fulmar	Nøisdalen	-33 <sup>p</sup>							
Common eider	Kongsfjorden	93 <sup>t</sup>		2007-2023 (17)	80.5	(1.0, 441)	Hatching success <sup>1</sup>	0.82	(-, 44)
Great skua	Kongsfjorden	-36 <sup>t</sup>		2021-2023 (2)	53.8	(8.4, 30)	Hatching success <sup>1</sup>	0.33	(-, 3)
							Clutch size <sup>2</sup>	1.43	(-, 7)
Ivory gull	Hermansenøy	3 <sup>t</sup>			No data		Clutch size <sup>2</sup>	1.92	(-, 61)
	32 colonies	-3 <sup>p</sup>							
Glaucous gull	Barentsøya				No data		Large chicks/nest	No data 2023	
	Kongsfjorden	1 <sup>p</sup>		2021-2022 (1)	94	(5.5, 143)	Hatching success	0.51	(0.07, 55)
Kittiwake	Ossian Sars	-15 <sup>p</sup>					Chicks >15d/nest <sup>3</sup>	0.17	(0.08, 24)
	Grumantbyer	No data			No data			No data 2023	
	Fuglehuken	-21 <sup>p</sup>						No data 2023	
Brünnich's guillemot	Ossian Sars	-28 <sup>p</sup>		2021-2022 (1)	91	(4.6, 221)	Chicks >15d/nest	0.89	(0.05, 44)
	Diabasodden	9 <sup>t</sup>			No data			No data 2023	
	Fuglehuken	3 <sup>p</sup>						No data 2023	
Little auk	Bjørndalen	No data			No data			No data 2023	
	Feiringfjellet	No data		2021-2022 (1)	71.6	(10.7, 806)		No data 2023	
Atlantic puffin	Gåsøyane	No data		2018-2023 (5)	85.6	(2.7, 151)		No data 2023	

<sup>p</sup> plot count <sup>t</sup> total census <sup>1</sup> Minimum proportion of nests with at least one chick hatching, based on nests with known fate. <sup>2</sup> Number of eggs per active nest. <sup>3</sup> % of nests with at least 1 chick surviving up to 15 days.

**Table A2.** Key population parameters (SE, n) of seabirds on *Bjørnøya* in 2023.

Species	Population change	Annual adult survival			Reproductive performance		
	Estimate %	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)
Fulmar	-33 <sup>p</sup>						
Gannet	-44 <sup>p</sup>				Large chicks/nets	0.63	(0.09, 32)
Great skua	-77 <sup>p</sup>	2021-2022 (1)	34.1	(0.6, 280)	Large chicks/nest	0.86	(0.05, 43)
Glaucous gull	-19 <sup>p</sup>	2009-2023 (13)	80.1	(1.5, 183)	Large chicks/nest	0.38	(0.13, 13)
Kittiwake	-4 <sup>p</sup>	2004-2023 (17)	87.7	(0.7, 421)	Large chicks/nest	0.69	(0.07, 49)
Common guillemot	12 <sup>p</sup>		<i>Results not yet available</i>		Fledging success <sup>1</sup>	0.62	(0.04, 133)
Brünnich's guillemot	-13 <sup>p</sup>	2021-2022 (1)	96.1	(3.9, 162)	Fledging success <sup>1</sup>	0.35	(0.10, 23)
Little auk	<i>No data</i> <sup>2</sup>	2021-2022 (1)	84.5	(2.7, 1113)	Fledging success	0.94	(0.03, 50)
					Large chicks/nest		

<sup>p</sup> plot count <sup>1</sup> Measured at the age of 20 days. <sup>2</sup> Pilot project data under analysis.

**Table A3.** Key population parameters (SE, n) of seabirds on *Hornøya* in 2023.

Species	Population change	Annual adult survival			Reproductive performance		
	Estimate %	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)
Shag	-18 <sup>p,1</sup>	2004-2023 (19)	85.5	(1.1, 392)	Clutch size	<i>No data 2023</i>	
					Breeding success	<i>No data 2023</i>	
Herring gull	9 <sup>p</sup>	2007-2023 (16)	85.5	(1.7, 155)	Clutch size	2.15	(0.14, 26)
					Breeding success <sup>2</sup>	<i>No data 2023</i> <sup>3</sup>	
Great black-backed gull	100 <sup>p</sup>	2001-2023 (22)	83.2	(1.2, 243)	Clutch size	2.71	(0.13, 14)
					Breeding success <sup>2</sup>	<i>No data 2023</i> <sup>3</sup>	
Kittiwake	9 <sup>p</sup>	2021-2022 (1)	56.1	(4.8, 1675)	Clutch size	0.7	(0.07, 210)
					Large chicks/nest <sup>2</sup>	0.18 <sup>4</sup>	(0.03, 210)
Common guillemot	10	1988-2023 (35)	97.5	(0.3, 305)	Breeding success <sup>2</sup>	0 <sup>5,6</sup>	(0.00, 30)
Razorbill	<i>No data</i>	1995-2023 (27)	94.1	(0.6, 415)	Breeding success <sup>2</sup>	0.73	(0.08, 30)
Atlantic puffin	-1 <sup>p</sup>	2021-2022 (1)	68.4	(5.0, 1012)	Breeding success <sup>2</sup>	0.37	(0.09, 30)

<sup>p</sup> plot count <sup>1</sup> Most shag plots were empty, and breeding birds have moved to more sheltered areas in the cliff. <sup>2</sup> Medium-sized chicks/egg laid. <sup>3</sup> Chicks were not followed to fledging. <sup>4</sup> Reproductive performance this year is probably an overestimate due to massive avian flu outbreak in the colony late in the season <sup>5</sup> Total breeding failure at the colony level because of extremely high nest-predation. <sup>6</sup> Zero hatching success.

**Table A4.** Key population parameters (SE, n) of seabirds on *Hjelmsøya* in 2023. Missing values (indicated with <sup>1</sup>) are currently unavailable and will be updated at a later date.

Species	Locality	Population change		Annual adult survival		Reproductive performance	
		Estimate %	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate (SE, n)
Great cormorant	<i>W Finnmark</i>	<sup>t,1</sup>					
Shag	<i>Lille Kamøy</i>						
Gannet	<i>Gjesværstapp</i>	<sup>p,1</sup>					
Common eider		<sup>t,1</sup>					
Great skua		<sup>t,1</sup>				Clutch size <sup>1</sup>	
Arctic skua		<sup>t,1</sup>					
Common gull		<sup>t,1</sup>					
Herring gull		<sup>p,1</sup>				Clutch size <sup>2,1</sup>	
						Breeding success <sup>1,3</sup>	
Great black-backed gull		<sup>p,1</sup>				Clutch size <sup>2,1</sup>	
						Breeding success <sup>1,3</sup>	
Kittiwake		<sup>p,1</sup>	2021-2022 (1)	68.1	(7.7, 681)	Clutch size <sup>2,1</sup>	
						Clutch size <sup>4,1</sup>	
						Breeding success <sup>1</sup>	
Common guillemot							
	<i>Open ledges (inds.)</i>	<sup>p,1</sup>					
	<i>Crevice (total)</i>	<sup>p,1</sup>	2021-2022 (1)	71.7	(17.7, 441)		
	<i>Crevice not predated (eggs)</i>					Breeding success <sup>1</sup>	
	<i>Crevice predated (eggs)</i>					Breeding success <sup>1</sup>	
Brünnich's guillemot		Extinct <sup>5</sup>					
Razorbill	<i>Open ledges (inds.)</i>	<sup>p,1</sup>					
	<i>Crevice (eggs)</i>	<sup>p,1</sup>				Breeding success <sup>1</sup>	
Atlantic puffin	<i>Gjesværstapp</i>	<sup>1</sup>					
	<i>Hjelmsøya</i>	<sup>p,1,6</sup>	2021-2022 (1)	55.9	(8.0, 1163)	Hatching success <sup>1</sup>	
						Breeding success <sup>1,3</sup>	

<sup>t</sup> total census <sup>1</sup> Results not yet available. <sup>p</sup> plot count <sup>2</sup> Including empty nests. <sup>3</sup> Large chicks/egg laid. <sup>4</sup> Excluding empty nests. <sup>5</sup> Very few birds still attended the colony irregularly. <sup>6</sup> 25 plots

**Table A5.** Key population parameters (SE, n) of seabirds on *Jan Mayen* in 2023.

Species	Population change	Annual adult survival			Reproductive performance		
	Estimate %	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)
Fulmar	-26 <sup>p</sup>	2014-2023 (9)	94.0	(2.7, 92)	Chicks/nest <sup>1,2</sup>	0.38	(0.05, 102)
Common guillemot	19 <sup>p</sup>	2011-2023 (12)	90.1	(1.6, 113)	Breeding success <sup>3,2</sup>	0.74	(0.10, 19)
Brünnich's guillemot	19 <sup>p</sup>	2021-2022 (1)	74.6	(7.0, 150)	Breeding success <sup>3,2</sup>	0.38	(0.07, 47)
Great skua	0 <sup>p</sup>				Large chicks/nest <sup>4</sup>	0.8	(0.17, 15)
Glaucous gull	8 <sup>p</sup>				Large chicks/nest <sup>4</sup>	1.38	(0.18, 26)
Great black-backed gull	No data				Large chicks/nest <sup>4</sup>	No data 2023	
Lesser black-backed gull	No data				Large chicks/nest <sup>4</sup>	No data 2023	

<sup>p</sup> plot count <sup>1</sup> Recorded early in the chick-rearing period when most chicks were still small or medium sized. <sup>2</sup> Due to late start of fieldwork, the number of initially active nests is probably underestimated, hence reproductive performance is probably overestimated. <sup>3</sup> Number of chicks  $\geq 15$  days of age divided by number of breeding pairs (n). <sup>4</sup> 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 2023.

Species	Population change	Annual adult survival			Reproductive performance		
	Estimate %	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)
Common eider	-35.6 <sup>t,1</sup>	2021-2022 (1)	26.8	(39.7, 1539)	Clutch size	4	(0.333, 9)

<sup>t</sup> total census <sup>1</sup> Nest counts

**Table A7.** Key population parameters (SE, n) of seabirds on *Anda* in 2023.

Species	Population change	Annual adult survival			Reproductive performance		
	Estimate %	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)
Shag	1				Clutch size <sup>2</sup>		
Herring gull	33 <sup>t</sup>				Clutch size <sup>2</sup>		
Kittiwake	-2 <sup>p</sup>	2021-22 (1)	84.5	(3.4, 588)	Large chicks/nest	0.52	(0.03, 727)
Puffin	-5 <sup>p</sup>	2021-22 (1)	77.1	(17.0, 572)	Hatching success	0.78	(0.06, 45)
					Chicks $\geq 20d$ / nest	0.61	(0.07, 46)
Black guillemot	1				Large chicks/nest <sup>2</sup>		

<sup>1</sup> Not counted in 2023. <sup>2</sup> Not estimated in 2023. <sup>t</sup> total census <sup>p</sup> plot count



**Table A8.** Key population parameters (SE, n) of seabirds on Røst in 2023.

Species	Locality	Population change		Annual adult survival		Reproductive performance				
		Estimate %		Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)	
Fulmar	Hernyken	Extinct <sup>2p</sup>								
Great cormorant		-15 <sup>1</sup>					Clutch size <sup>1,2</sup>	2.57	(0.3, 23)	
							Large chicks/nest <sup>3</sup>	0.59	(0.24, 22)	
Shag	Ellefsnyken	0 <sup>p</sup>	2021-2022 (1)	85.8	(12.8, 574)		Clutch size <sup>3,5</sup>	2.67	(0.06, 99)	
							Clutch size <sup>1,5</sup>	2.62	(0.07, 101)	
							Large chicks/nest <sup>3</sup>	1.92	(0.24, 13)	
Common eider		No data 2023 <sup>p</sup>					Clutch size	4.07	(0.12, 67)	
Great skua		0 <sup>t,6</sup>					Clutch size <sup>3</sup>	2	(0, 5)	
							Breeding success	0.46	(0.12, 11)	
Common gull		-16 <sup>p</sup>					Clutch size <sup>3</sup>	2.51	(0.11, 55)	
							Large chicks/nest <sup>3</sup>	1.14	(-, 57)	
Lesser black-backed gull		No data 2023 <sup>p,7</sup>						No data 2023		
Herring gull		-24 <sup>p</sup>					Clutch size <sup>3</sup>	2.44	(0.18, 9)	
							Large chicks/nest <sup>3</sup>	1.62	(-, 53)	
Great black-backed gull		32 <sup>p</sup>					Clutch size <sup>3</sup>	2.36	(0.08, 72)	
							Large chicks/nest <sup>3</sup>	1.22	(-, 99)	
Kittiwake	Vedøy	Extinct <sup>p,8</sup>						No breeding in 2023		
	Gjelfruvær	-15 <sup>t,9</sup>					Large chicks/nest	0.19	(0.03, 213)	
	Kårøy area	-19 <sup>t,10</sup>	2021-2022 (1)	71.7	(4.5, 544)			Clutch size/pair <sup>11</sup>	1.17	(0.32, 29)
								Clutch size/pair <sup>12</sup>	1.26	(0.07, 171)
								Large chicks/pair <sup>11</sup>	0	(0, 29)
Large chicks/pair <sup>12</sup>	0.17	(0.04, 174)								
Large chicks/pair <sup>13</sup>	0.2	(0.02, 494)								
Common tern							Clutch size <sup>3</sup>	2	(0.09, 17)	
Common guillemot		-20 <sup>p,14</sup>					Breeding success	0.71	(0.06, 58)	
Razorbill		131 <sup>p,14</sup>								
Atlantic puffin		-8 <sup>p</sup>	2021-2022 (1)	86.4	(4.0, 577)		Hatching success	0.84	(0.04, 74)	
							Breeding success	0.5	(0.06, 80)	
Black guillemot		7 <sup>p,15</sup>	1997-2023 (27)	85.3	(1.2, 154)		Clutch size	1.96	(0.08, 23)	
							Large chicks/nest	1.38	(0.22, 16)	

<sup>p</sup> plot count <sup>t</sup> total census <sup>1</sup> Including empty nests. <sup>2</sup> One colony on 18 June, when 4 nests (17%) were still empty, and 4 nests contained small chicks. <sup>3</sup> Excluding nests not known to have contained eggs/chicks. <sup>4</sup> On 1 July, estimated by linear regression of mean values for counts on five different days between 8 June and 4 July. <sup>5</sup> A total of 11 territories were occupied in Røst in 2023. <sup>6</sup> Most breed in one colony, which was not counted in 2022-2023. <sup>7</sup> Last breeding in 2019. No kittiwakes seen on the island in 2020-2023. <sup>8</sup> Small cliff-breeding colony 9 km SW of Vedøy with 213 pairs in 2023. <sup>9</sup> Population of 494 pairs in 2023 breeding on/near buildings in Røst harbour. <sup>10</sup> On traditional study ledges in plot VIII. <sup>11</sup> All nests monitored at regular intervals in plot VIII (Kårøya rorbucamping). <sup>12</sup> Total count of entire colony on/near buildings in Røst harbour. <sup>13</sup> 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. <sup>14</sup> 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 2023.

Species	Population change	Annual adult survival			Reproductive performance		
	Estimate %	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)
Lesser black-backed gull	80	2005-2023 (18)	88.4	(0.9, 190)	Clutch size	2.78	(0.05, 128)
					Large chicks/pair	0.55	(-, 158)

**Table A10.** Key population parameters (SE, n) of seabirds on *Sklinna* in 2023.

Species	Locality	Population change	Annual adult survival			Reproductive performance		
		Estimate %	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)
Fulmar		-100 <sup>t</sup>					No breeding in 2023	
Great cormorant		-16 <sup>t</sup>						
Shag		-25 <sup>t</sup>	2021-22 (1)	82.5	(5.4, 698)	Clutch size <sup>1</sup>	2.299999	(0.06, 249)
						Hatching success/nest	0.78	(-, 46)
						Clutch size at hatching	1.87	(0.18, 46)
						Chicks/nest 10d later	1.7	(0.18, 46)
						Chicks/nest 20d later	1.76	(0.19, 46)
Common eider		-8 <sup>t</sup>				Clutch size	3.14	(0.32, 7)
Herring gull		-14 <sup>p</sup>				Clutch size <sup>2</sup>	1.28	(0.26, 18)
						Clutch size <sup>3</sup>	1.92	(0.22, 12)
Great black-backed gull		-23 <sup>p</sup>				Clutch size <sup>2</sup>	2.14	(0.25, 21)
						Clutch size <sup>3</sup>	2.65	(0.14, 17)
Kittiwake	<i>Sklinna</i>	0 <sup>t4</sup>					No breeding in 2023	
	<i>Sør-Gjæstingan</i>	42 <sup>t5</sup>	2011-23 (12)	78.9	(1.5, 325)	Large chicks/nest <sup>5</sup>	1.04	(-, 320)
	<i>Rørvik</i>	3 <sup>t6</sup>				Large chicks/nest <sup>6</sup>	0.63	(-, 603)
Common guillemot		-17 <sup>t</sup>	2008-23 (15)	93.0	(0.6, 387)	Large chicks/nest <sup>7</sup>	0.64	(-, 55)
Razorbill		18 <sup>t</sup>	2022-23 (1)	62.3 <sup>8</sup>	(15.2, 21)			
Atlantic puffin		18 <sup>p</sup>				Hatching success/nest	0.63	(0.11, 19)
						Chicks ≥ 10d/hatched	0.47	(0.12, 17)
						Chicks ≥ 20d/hatched	0.4	(0.13, 15)
Black guillemot		24 <sup>p</sup>	2008-22 (14)	85.5	(2.3, 82)			

<sup>t</sup> total census <sup>1</sup> Counted on 5-10 June, including empty nests. <sup>p</sup> plot count <sup>2</sup> Counted on 5 June, including empty nests. <sup>3</sup> Counted on 5 June excluding empty nests. <sup>4</sup> No breeding 2019-2023. <sup>5</sup> Based on nest counts on 14 June and chick count on 28 June. <sup>6</sup> Based on nest counts on 2 June and chick count on 18 of June and 13 July, respectively. <sup>7</sup> Based on egg counts on 10 June and chick counts on 12 July in a confined part of the colony. <sup>8</sup> Based on time-dependent survival model, with constant resighting rate - estimate for 2023 can be given

**Table A11.** Key population parameters (SE, n) of seabirds on *Runde* in 2023.

Species	Locality	Population change		Annual adult survival		Reproductive performance		
		Estimate %	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)
Gannet						Large chick/nest <sup>1</sup>	0.74	(0.02, 390)
Shag		p,2					No breeding in 2023	
Great skua		-48 <sup>t</sup>				Large chick/nest	0.91	(0.18, 21)
Kittiwake	<i>Runde</i>	p,3					No breeding in 2023 <sup>4,3</sup>	
	<i>Sildegarnshol</i>	-5 <sup>t</sup>	2011-23 (12)	82.3	(1.0, 365)	Large chicks/nest	0.65	(0.03, 698)
Common guillemot		p,3					No breeding in 2023 <sup>3</sup>	
Atlantic puffin		22 <sup>p</sup>	2020-21 (1)	88.3	(42.5, 511)	Hatching success/nest	0.78	(0.07, 43)
						Chicks ≥ 20d/nest	0.67	(0.07, 43)
						Chicks ≥ 30d/hatched	0.62	(0.07, 43)
						Fledged chicks/nest	0.62	(0.07, 43)

<sup>1</sup> Large chicks counted in 4 study plots on 29 July. <sup>p</sup> plot count <sup>2</sup> No breeding was recorded in the study plots in 2023. <sup>t</sup> total census <sup>3</sup> As in the preceding year, no breeding was recorded in the study plots in 2023. <sup>4</sup> Breeding success is monitored in study plots at Lisjestakken and Huldene.

**Table A12.** Key population parameters (SE, n) of shag in *Vestland* in 2023. Missing values (indicated with 1) are currently unavailable and will be updated at a later date.

Species	Locality	Population change		Annual adult survival		Reproductive performance		
		Estimate %	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)
Common eider		t,1						
Lesser black-backed gull		t,d,1	2009-2023 (13)	82.9	(2.26, 102)	Clutch size <sup>2</sup>	1	
						Breeding success <sup>3</sup>	1	
Herring gull		t,d,1	2009-2023 (13)	82.3	(2.01, 234)	Clutch size <sup>2</sup>	1	
						Breeding success <sup>3</sup>	1	
Great black-backed gull		t,d,1				Clutch size <sup>2</sup>	1	
						Breeding success <sup>3</sup>	1	

<sup>t</sup> total census <sup>1</sup> Results not yet available. <sup>d</sup> drone count <sup>2</sup> Including empty nests. <sup>3</sup> Large chicks/fledglings per nest.

**Table A13.** Key population parameters (SE, n) of shag in Rogaland in 2023.

Species	Locality	Population change		Annual adult survival		Reproductive performance		
		Estimate %	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)
Shag	Kjør					Clutch size <sup>1</sup>	2.68	(0.08, 50)
						Breeding success <sup>2</sup>	1.50	(0.17, 40)
	Jarstein		2021-2022 (1)	79.48	(6.07, 274)			

<sup>1</sup> Maximum nest content on 3 visits between 24 May and 28 June. <sup>2</sup> Chicks/nest on 28 June, when some chicks were still small but only two nests contained eggs.

**Table A14.** Key population parameters (SE, n) of seabirds on the different sites in Agder in 2023. Slettingene, Storøy and Klovholmene are located in Mandal, Lindesnes municipality. Rauna is in Farsund municipality.

Species	Locality	Population change		Annual adult survival		Reproductive performance		
		Estimate %	Period (yrs)	Estimate %	(SE, n)	Sampling unit	Estimate	(SE, n)
Great cormorant	Rauna	9.2 <sup>†</sup>		Results not yet available <sup>1</sup>		Clutch size <sup>2</sup>	3.56	(0.06, 333)
						Large chicks/nest	1.73	(-, 333)
Common eider	Rauna	-17.6 <sup>3</sup>				Clutch size	4.09	(0.21, 33)
						Chicks on sea <sup>4</sup>	No data 2023	
Lesser black-backed gull			2007-2023 (16)	77 <sup>5</sup>	(0.98, 792)			
	Slettingene	-16.9 <sup>†</sup>				Clutch size <sup>2</sup>	2.37	(0.09, 103)
						Fledged juv./pair	0.73	(-, 103)
	Storøy	6				Clutch size <sup>2</sup>	No breeding 2023	
						Fledged juv./pair	No breeding 2023	
	Klovholmene	-80.0 <sup>†</sup>				Clutch size <sup>2</sup>	0	(-, 1)
						Fledged juv./pair	0	(-, 1)
	Rauna	-28.3 <sup>†</sup>	2021-2022 (1)	83.4	(3.89, 1389)	Clutch size <sup>2</sup>	No data 2023	
						Fledged juv./pair	0.66	(-, 1600)
Herring gull			2007-2023 (16)	80.8 <sup>5</sup>	(1.12, 706)			
	Slettingene	-3.0 <sup>†</sup>				Clutch size <sup>2</sup>	2.1	(0.12, 84)
						Fledged juv./pair	0.52	(-, 97)
	Storøy	17.9 <sup>†</sup>				Clutch size <sup>2</sup>	2.12	(0.19, 33)
						Fledged juv./pair	0.3	(-, 33)
	Klovholmene	10.5 <sup>†</sup>				Clutch size <sup>2</sup>	2.200000	(0.21, 20)
						Fledged juv./pair	0.95	(-, 21)
	Rauna	30.4 <sup>†</sup>	2007-2023 (16)	80.90000000	(1.59, 246)	Clutch size <sup>2</sup>	No data 2023	
						Fledged juv./pair	0.87	(-, 300)

<sup>†</sup> total census <sup>1</sup> Colour-ringing of chicks initiated in 2008. <sup>2</sup> Including empty nests. <sup>3</sup> Based on counts of adult males in Farsund municipality. <sup>4</sup> No estimates in 2023 due to no complete count at Rauna. <sup>5</sup> General estimate for birds from Slettingene, Storøy and Klovholmene. <sup>6</sup> No breeding in 2020, 2021, 2022 and 2023.



**Cover photo:** Kittiwake colony in the Barents Sea. Photo: © Geir Helge Systad

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