SEAPOP Short Report 1-2012

Key-site monitoring in Norway 2011

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Cover photo: Part of a fulmar colony on Jan Mayen, 2011. This volcanic island, which is situated a third of the way between Iceland and Svalbard, is now included as a SEAPOP key-site. (© Ola Nordsteien)

Key-site monitoring in Norway 2011

After signs of optimism after a very poor season in 2008 through an improvement in breeding results along the coast in 2009 and 2010, 2011 was again a disappointment with many species decreasing in numbers and producing few to no chicks on many of the key sites (Table 1, Appendix 1). This was especially evident in the southern Barents Sea and the northern part of the Norwegian Sea where also the traditionally successful auks breeding on Hornøya and Bjørnøya had a poor season. Conditions were evidently also very poor on Hjelmsøya where seven of nine species monitored decreased in numbers (by 10-38%), and many of the more coastal species produced fewer chicks than in the two preceding years. Breeding success was also poor for most species on Runde and the sites along the North Sea coast.

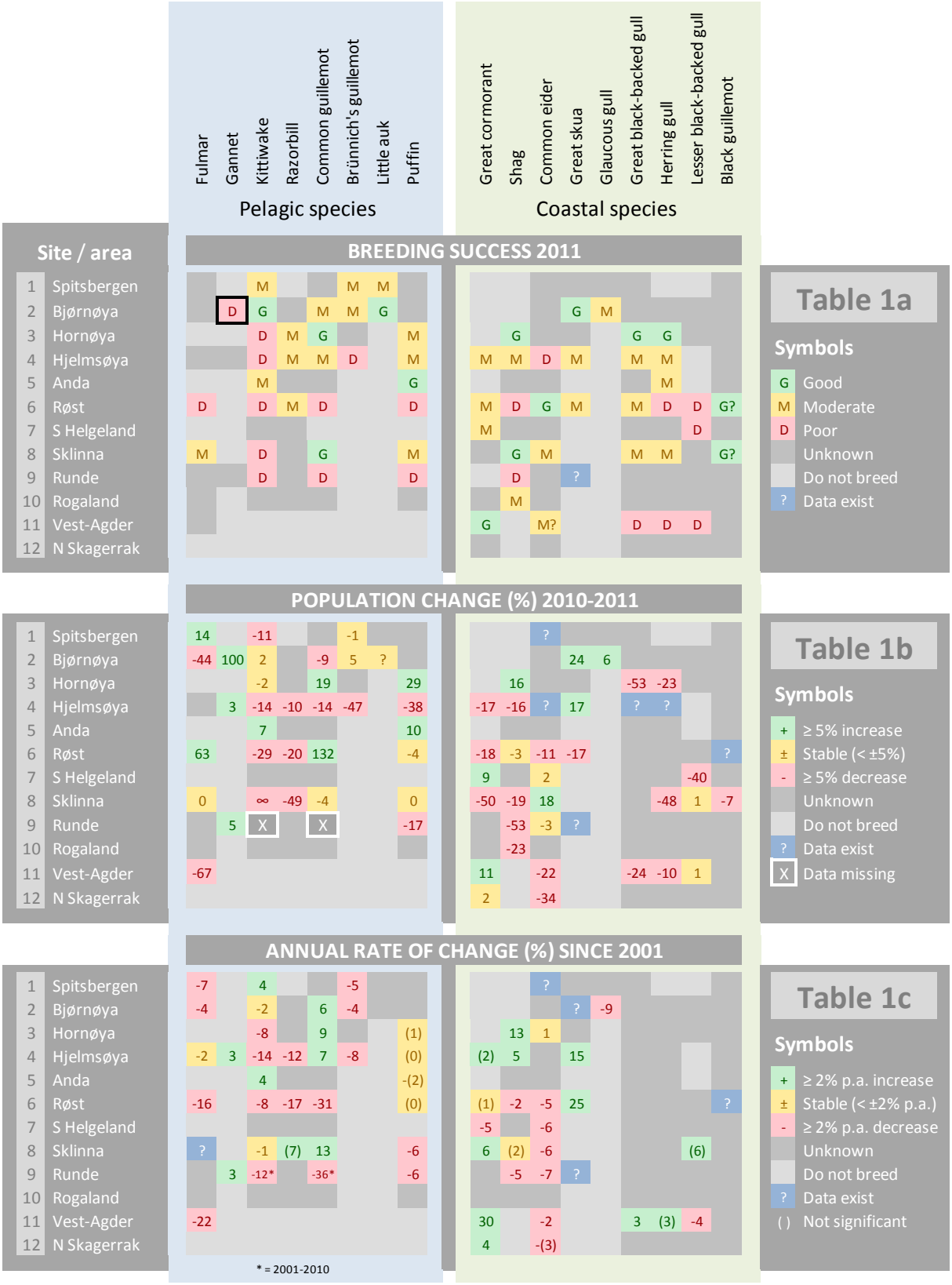
Jan Mayen becomes a new key-site

In summer 2010 the Norwegian Polar Institute surveyed the breeding populations of seabirds on Jan Mayen on assignment from the Norwegian Ministry of Environment and the Directorate for Nature Management. The suitability of various colonies for long-term monitoring of population trends and demography was assessed and monitoring plots for the most numerous species were established. In 2011 the work on Jan Mayen was continued as an integral part of the SEAPOP and MOSJ (Environmental Monitoring in Svalbard and Jan Mayen) programmes, with the intention to develop it into a regular SEAPOP key-site activity in line with those on Svalbard and the mainland. The work is in its infancy and the emphasis has so far been on establishing monitoring of population trends and demography of fulmar and common and Brünnich's guillemots. To study migration routes and wintering areas of the guillemots, 40 geolocation tags (GLS loggers) were deployed on breeding adults of both species in 2011. This study is part of an environmental programme associated to an assessment process for opening the sea areas around Jan Mayen for petroleum exploration, which was initiated by the Norwegian government in 2010.

Jan Mayen was protected as a nature reserve in November 2010 to preserve a virtually untouched arctic island and surrounding waters, with its mountains, active volcanoes, many historical sites and important seabird populations. The protection covers most of the island and the waters out to the territorial limit of 12 nautical miles. Its isolated position in large, productive waters makes Jan Mayen a very important area for seabirds. In particular, fulmars, little auks and Brünnich's guillemots are abundant with breeding populations of 100,000–400,000 individuals.

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 2011, and their mean population trend over the last ten years (1c).



Population changes

One positive highlight of the season was the first breeding of **gannets** *Morus bassanus* on Bjørnøya. At least two pairs built a nest and appeared to incubate eggs, but no chicks were produced (Figure 1). This is by far the northernmost breeding record of the species ever. The previous was 400 km farther south on Storstappen, Gjesvær where ca. 1400 nests were counted in 2011, an estimated increase of 3% since 2010. After a steady decline between 1990 and 2004, numbers of gannets in Lofoten and Vesterålen are increasing again and have nearly trebled in number to ca. 900 pairs in 2011.

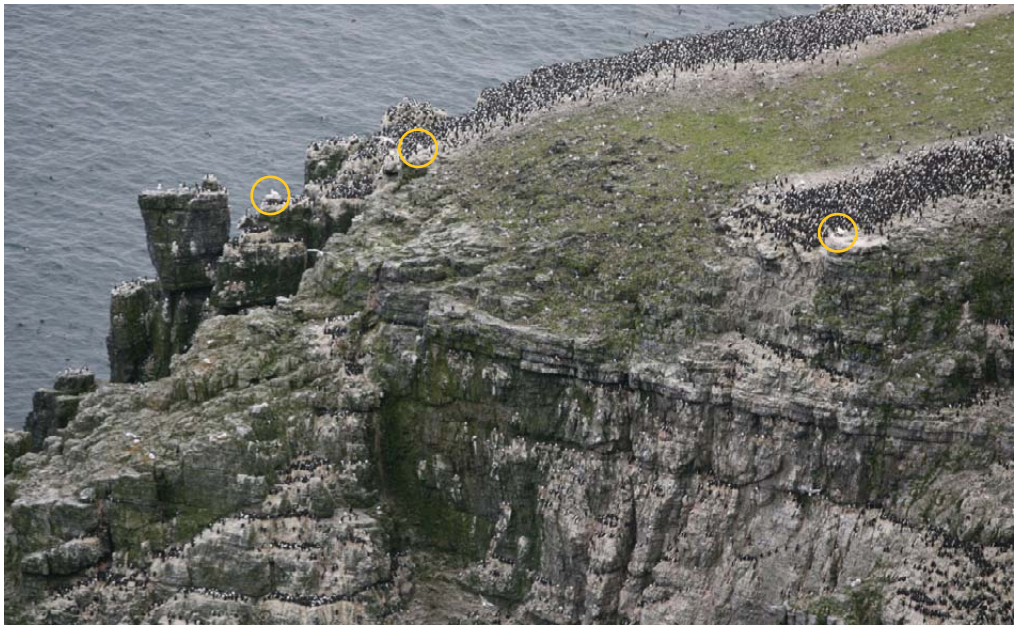


Figure 1 *Breeding sites of gannets (circled) on Alkeholmen, Bjørnøya, 2011. (©Hallvard Strøm)*

There were, however, few signs of reprieve for the 22 seabird species on the Norwegian Red List. Numbers of the common guillemots *Uria lomvia* dropped considerably on Bjørnøya and Hjelmsøya, and numbers of **kittiwakes** *Rissa tridactyla* dropped or remained more-or-less stable in the largest colonies (Figure 2). Kittiwake numbers fell by >10% at several sites from Spitsbergen in the north and south to Sklinna where, for the first time, no birds bred in 2011. On Bjørnøya and Hornøya numbers were about the same as in 2011 and on Anda they increased slightly (7% since 2010). Overall the Norwegian kittiwake population continues its long-term decline with alarming rates of 8-14% p.a. (2001-2011) at three of the key sites (Table 1).

Whereas numbers of **common guillemots** declined on Bjørnøya and Hjelmsøya, there was a large increase compared to 2010 at Røst. However, at Røst, this applies to the remnant of the population that used to breed on open ledges that is now very small, unstable and has declined by 31% p.a. since 2001. The population breeding in crevices seems however to be stable or increasing, although this is not yet documented. At Hjelmsøya, the birds breeding at open ledges, have failed breeding every year due to disturbance of avian predators, and this part of the population decreased 22.2% from 2010-2011, and at a rate of 5.5% p.a. since 2001. However, the population breeding in crevices has increased at a rate of 6.9% p.a. over the same time period, even though there was a 13.5%

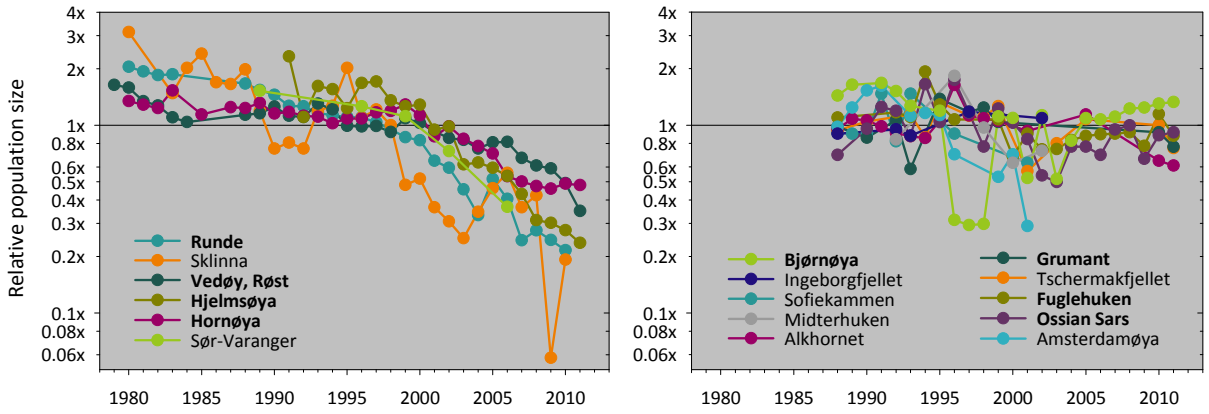


Figure 2
Long-term changes in kittiwake breeding populations at regular SEAPOP monitoring sites on the Norwegian mainland (left panel) and Svalbard (right panel). Names of kittiwake key-sites are in bold.

decrease in the number of eggs counted between 2010 and 2011. Thus, this "hidden" part of the population makes up the main body of the population for the time being. At Hornøya was the population still thriving, and there numbers increased by 19% since 2010. Although common guillemot numbers are critically low in Norway, there are positive signs with 10-year increases of 6-13% at four of the key sites.

The long-term decline in the Norwegian population of **puffins** *Fratercula arctica* also seems to be continuing in the Norwegian Sea colonies, but on the four sites in the north that have been monitored since 2001 (Hornøya, Hjelmsøya, Anda and Røst) numbers have stabilized somewhat. After an increase between 1980 and 2005, numbers of puffins on Hornøya declined over the next five years, but an apparent 29% increase since 2010 is cause for optimism. In the Hjelmsøya region, the numbers increased slowly from 1997 to 2002, but suddenly halved in 2003. Since then, numbers of occupied nests have fluctuated greatly. They reached a maximum in 2010, only to decrease again by 38% from 2010-2011. Numbers were still fairly high in 2011 and overall the population seems to have been stable in the period 2001-2011. On Røst, a 24% increase between 2002 and 2007 was followed by a 17% decrease in the years 2007-2011, which were all breeding failures. A further drop of ≥25% can therefore be expected over the next five years. Further south, although numbers of puffins on Sklinna remained unchanged since 2010, numbers there and on Runde have declined by 6% p.a. since 2001. During the last few years the puffins on Røst and Sklinna have been almost absent from the colony in large numbers during the incubation period when the only activity that is observed is when parents change their duty on incubating their egg. Monitoring of daily and seasonal puffin activity using time-laps cameras show that the highest numbers of puffins enter the colony shortly before darkness, and leave very early in the morning. This has been observed on Røst in all twelve years with time-lapse monitoring since 1992, and might be caused by relatively high rates of predation from great black-backed gulls *Larus marinus*, perhaps also ravens *Corvus corax* and peregrine falcons *Falco peregrinus*.

Razorbill *Alca torda* numbers are monitored at three sites only, but at all three there were declines since 2010 and at two these are continuations of a long-term decline at least since 2001. The 49% decline at Sklinna between 2010 and 2011 may be an overestimate as more birds seem to have moved into more concealed sites than in earlier years, thus making counts very difficult. At Hjelmsøya, several of the monitoring burrows have been abandoned recently, possibly due to mink predation.

Among the coastal species, **shags** *Phalacrocorax aristotelis* and **great cormorants** *P. carbo* both declined significantly on all but a few colonies. The only exception for shags was a continuation of their increase on Hornøya from 50 pairs in 1990 to nearly 800 pairs in 2011. Numbers of great cormorants subspecies *carbo* declined in three of the key sites, and increased slightly at one. The long-term trend is still positive at all but one of the sites although the overall rate of increase seems to be dropping. The exception is in Sør-Helgeland where numbers have been steadily declining since 2001. On the south coast, numbers of subspecies *sinensis* increased in Vest Agder but remained more-or-less stable since 2010 further east along the coast, but again, the long-term trend is positive (strongly so in Vest Agder) in both regions.

Common eiders *Somateria mollissima* are also struggling and, despite a brief reprieve at Sklinna where numbers increased between 2010 and 2011, long-term declines are evident in all of the key sites. The geographical coverage for the **large** *Larus* **gulls** on the mainland is still relatively poor, but for all three species (herring *L. argentatus*, great black-backed and lesser black-backed *L. fuscus* gulls) the general trend was negative since 2010 with some numbers dropping by 30-50% at several sites. At Lyngøy, Hordland, herring gulls and lesser black-backed gulls were counted for the third season in a row and whereas numbers of the former remained stable, those of the latter dropped by 28% since 2010. On Bjørnøya there was a small (6%) increase in numbers of glaucous gulls *L. hyperboreus*, but the long-term trend is negative (-9%).

Breeding success

Of the pelagic species, the **kittiwake** had a miserable season along the coast of mainland Norway. On Anda their production was 0.3 chicks/nest, on Hornøya 0.2 and on Røst they failed completely for the fifth year in a row. As mentioned above, kittiwakes abandoned breeding on Sklinna. This failure was either due to very poor feeding conditions or, as on Anda, an extended period of egg-predation by crows and ravens. On Hornøya, the kittiwake breeding season started early and positively with a mean clutch size of 1.75 eggs/nest, probably due to an abundance of capelin *Mallotus villosus* around the colony at the time. However, after the main hatching period, there was a 2-3 week period of high chick mortality due to an apparent shortage of food and subsequent chick starvation. Conditions improved, however, at the end of the season and most chicks that hadn't starved to death fledged successfully. Further north, on Spitsbergen and Bjørnøya, kittiwake production was moderate to good (0.32 and 0.62 chicks/nest, respectively).

Figure 3
While breeding success of puffins at Hornøya was less than good for the first time on record, both herring gulls and common guillemots on the island did well in 2011, although not all their chicks fledged successfully...
(© Rob Barrett)

Among the **auks**, the razorbill was the only one to fare reasonably well on the three sites where breeding success is monitored (from Røst northwards). The common guillemots did moderately well in the Barents Sea but failed on Røst and Runde. Again, the small population on Sklinna seemed to do well, but due to birds nesting well-hidden in a large boulder scree, no details are available. The puffin fared a little better in 2011 than in the two preceding years along most of the coast, except at Røst and Runde where there again were complete failures. 2011 was the fifth year in a row that puffins failed to produce chicks at Røst, a phenomenon only surpassed by the six years of failure in 1977-1982. At Hornøya, 2011 was a special year for auks. For the first time for many years, both razorbills and puffins had a poorer season than normal, whereas the common guillemots seemed to produce many chicks, although their mean fledging mass was one of the lowest ever recorded on the colony (Figure 3).

As is normal for **cormorants**, the breeding success of shags and great cormorants varied greatly from colony to colony. Whereas the great cormorant subspecies *carbo* did moderately well in NW Norway, subspecies *sinensis* had yet another good season on the south coast. The shags on the other hand, either produced many chicks (Hornøya, Sklinna), a few (Hjelmsøya, Rogaland) or close to none (Røst and Runde). Similarly, among the **other coastal species**, there was a spread in breeding success with those breeding in the Barents Sea doing better than those in the Norwegian and North Seas. In the south, 2011 was a poor year for herring and lesser-black-backed gulls. On Lyngøy, Hordland, the breeding success was 0.30 and 0.45 chicks/nest respectively and in Vest-Agder the same species produced about 0.5 chicks/nest. The spread in breeding success among coastal species was also evident at Røst where two inshore bottom-feeding species (common eider and black-guillemot *Cepphus grylle*) did fairly well, the cormorant, great skua *Stercorarius skua* and great black-backed gull did moderately well and the shag, herring gull and lesser black-backed gull failed almost completely.

Chick diet

Samples of food brought to chicks are collected at all key sites from species that are readily accessible or, in the case of those carrying whole fish in their bills, easily seen (and photographed). In time, these data provide a good basis for comparisons between key-sites and/or from year to year and are an important input in analyses of e.g. spatial and temporal variations in chick production and their roles in population dynamics. Chick diet varies considerably from species to species, from key-site to key-site and year to year and the data collected in a single year are too extensive to present in detail here. Hornøya and Anda can serve as a good example of this variation.

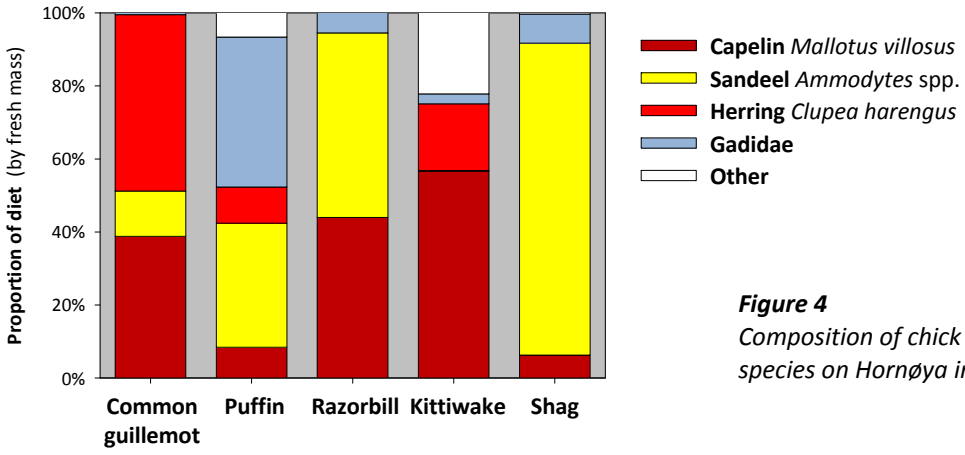


Figure 4
Composition of chick diet of four seabird species on Hornøya in 2011.

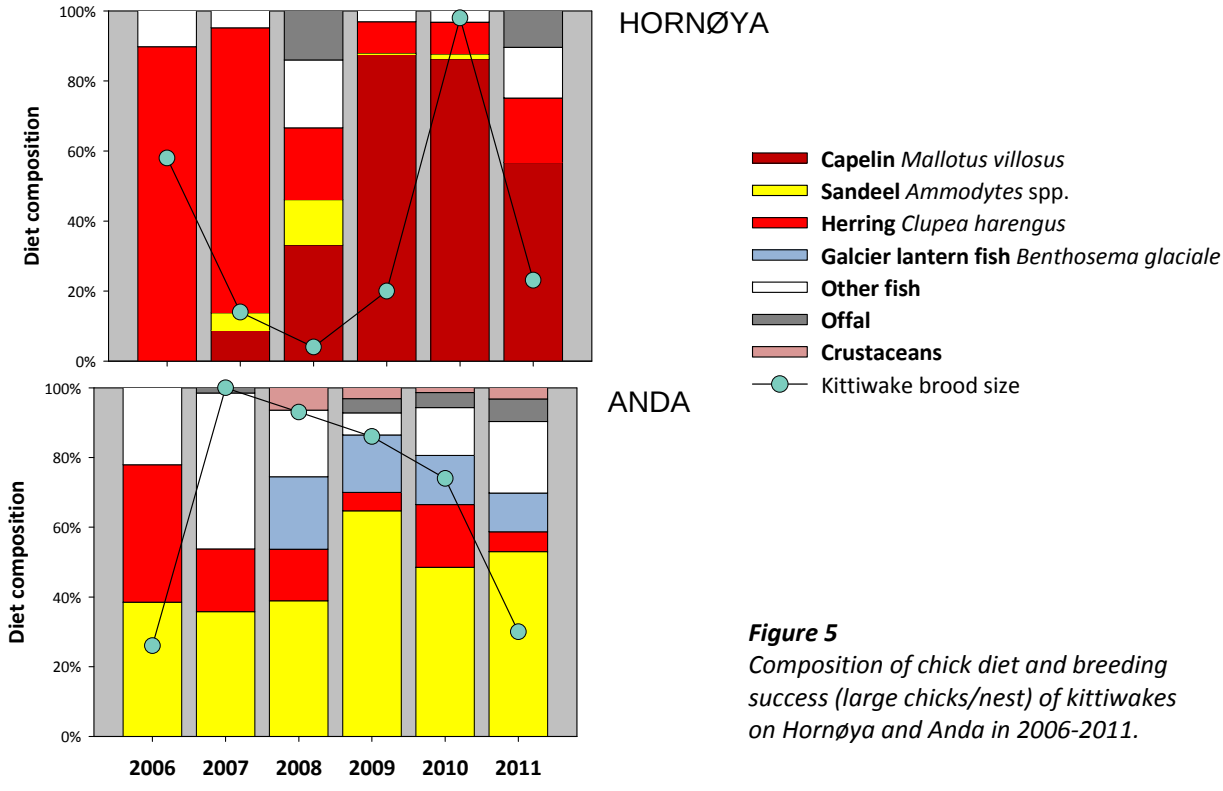


Figure 5
Composition of chick diet and breeding success (large chicks/nest) of kittiwakes on Hornøya and Anda in 2006-2011.

On Hornøya, shag diet in 2011 was dominated by sandeel *Ammodytes* sp. whereas that of puffins was mainly sandeel and gadids (Figure 4 and 6). Capelin was an important constituent of common guillemot, razorbill and kittiwake diets, but of minor importance for puffins and shags. Herring *Clupea haren*gus (I-group) was also important for common guillemots and partly also kittiwakes, but was absent in the diet of razorbills and shags.

An example of spatial differences and temporal changes in chick diet is given in Figure 5 that shows both contrasting diets of kittiwake chicks between two key-sites in any single year and considerable inter-annual variations at both sites. At Hornøya capelin and herring (most often I-group fish) are important constituents of chick diet whereas the diet on Anda is much more varied with herring (0-group), sandeels, glacier lantern fish *Benthosema glaciale* and "other fish" (here mainly gadids) appearing in different amounts each year. Between years there is a marked change at Hornøya, shifting from a domination of herring in 2006 and 2007 to one of capelin over the last three years.

The figure also shows that there is no immediately clear relationship between chick diet and breeding success. For example, on both colonies kittiwake breeding success varied considerably in 2009-2011 despite chicks seemingly being fed similar diets each year. This was partly due to differences in predation of eggs and chicks by crows, ravens and gulls on both sites from year to year but also to amounts and quality (size and energetic value) of fish being brought in to the chicks, which are not shown in the figure.

Figure 6
Analyses of indigestible food remains in pellets regurgitated by adult shags in the colony, indicate that sandeel is the main constituent of the species' diet at Hornøya (©Tycho Anker-Nilssen)

Appendix 1 – Key parameters from all key-sites in 2011

Key to Tables A1-A13

Key population parameters (SE, n) of seabirds breeding on the key-sites indicated above each table. The start year of most data series are listed in Table 3.1.1 of Anker-Nilssen et al. (2008). Population change (expressed as percentage) is the numeric change in size of the breeding population registered between 2010 and 2011 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 survival varied between years the given estimate applies for the last estimable time step only (yrs=1), whereas it applies for the whole monitoring period indicated (yrs>1) if the analysis indicated a constant survival.

Ref.: Anker-Nilssen, T. (ed.), Barrett, R.T., Bustnes, J.O., Christensen-Dalsgaard, S., Erikstad, K.E., Fauchald, P., Lorentsen, S.-H., Steen, H., Strøm, H., Systad, G.H. & Tveraa, T. 2008. SEAPOP studies in the Barents and Norwegian Seas in 2007. – **NINA Report 363**, 92 pp.

Table A1 *Key population parameters (SE, n) of seabirds on* ***Spitsbergen*** *in 2011.*

Species	Colony	Population change %	Annual adult survival		Reproductive performance	
			Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	*Nøisdalen*	+ 14 [p]				
Kittiwake	*Ossian Sars*	+ 5 [p]				
	Grumantbyen		2008-11 (3)	85.8 (8.1, 150)	Chicks >20d/nest	0.36 (47) [1]
	Fuglehuken	− 21 [p]				
Brünnich's guillemot	*Ossian Sars*	+ 1 [p]	2007-11 (4)	79.8 (6.1, 45)	Chicks >15d/egg	0.79 (0.14, 14)
	Diabasodden	+ 13 [t]	2005-11 (6)	90.4 (1.1, 146)	Chicks >15d/egg	0.75 (0.06, 59)
	Fuglehuken	− 3 [p]				
Little auk	*Bjørndalen*		*Results not yet available*		Chicks >20d/egg	0.78 (0.10, 27)
	Feiringfjellet		*Results not yet available*			

1) *Proportion of nests with at least one chick surviving to 20 days of age.*

Table A2 *Key population parameters (SE, n) of seabirds on* ***Bjørnøya*** *in 2011.*

Species	Population change %	Annual adult survival		Reproductive performance	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Fulmar	− 44 [p]				
Gannet	[1] [t]			Large chicks/nets	0.00 (0.00, 2)
Great skua	+ 24 [p]	2010-2011 (1)	96.1 (2.9,725)	Large chicks/nest	0.98 (0.05, 55)
Glaucous gull	+ 6 [p]	*Results not yet available*		Large chicks/nest	0.83 (0.05, 26)
Kittiwake	+ 2 [p]	*Results not yet available*		Large chicks/nest	0.62 (0.03, 634)
Common guillemot	− 9 [p]	*Results not yet available*		Fledging success [2]	0.47 (0.07, 58)
Brünnich's guillemot	+ 5 [p]	*Results not yet available*		Fledging success [2]	0.56 (0.08, 39)
Little auk	[3]	2004-2011 (7)	90.1 (1.7,725)	Fledging success	0.85 (0.05, 52)

1) *First breeding on the island: three apparently occupied nest sites with two nests built;* ***2)*** *Measured at the age of 20 days;* ***3)*** *Pilot project data under analysis.*

Table A3 *Key population parameters (SE, n) of seabirds on* ***Hornøya*** *in 2011.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Shag	+ 16 [p]	2004-2011 (7)	85.9 (2.2, 169)	Clutch size	2.43 (0.07, 192)
Herring gull	− 23 [p]	*Results not yet available*		Fledging success [1]	0.46 (0.05, 113)
Great black-b. gull	− 53 [p]	2001-2011 (10)	85.5 (2.3, 192)	Fledging success [1]	0.43 (0.06, 72)
Kittiwake	− 2 [p]	2009-2010 (1)	85.8 (13.3, 1290)	Clutch size	1.75 (0.04, 527)
				Large chicks/nest	0.23 (0.01, 1422)
Common guillemot	+ 19 [p]	1988-2011 (23)	96.1 (0.5, 209)	Fledging success [1]	0.79 (0.07, 34)
Razorbill		1995-2011 (16)	91.5 (0.9, 205)	Fledging success [1]	0.07 (*n*=74)
Puffin	+ 29 [p]	2009-2010 (1)	84.1 (4.2, 734)	Fledging success [1]	0.28 (*n*=54)

1) *Medium-sized chicks/egg laid.*

Table A4 *Key population parameters (SE, n) of seabirds on* ***Hjelmsøya*** *in 2011.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great Cormorant	− 17 [p]				
Shag	− 16 [p]			Clutch size	2.29 (*n*=171)
Arctic skua	− 14 [t]				
Great skua	+ 40 [t]			Clutch size	1.86 (*n*=7)
Herring gull	[1] [p]			*Results not yet available*	
Great black-b. gull	[1] [p]			*Results not yet available*	
Common gull	+ 34 [t]			Clutch size	2.90 (*n*=21)
Kittiwake	− 14 [p]	2004-2011 (7)	0.87 (0.05,264)	Clutch size	1.33 (*n=74*)
				Large chicks/nest	0.05 (*n=74*)
Common guillemot					
Open ledges (inds.)	− 22 [p]			Fledging success [2]	0.00 (no eggs laid)
Crevices (eggs)	− 9 [p]	2004-2011 (7)	0.83 (0.03,167)	Fledging success [2]	0.81 (0.07, 27)
Brünnich's guillemot	− 47 [p]			Fledging success [2]	0.00 (no eggs laid)
Razorbill	− 10 [p]			Fledging success [2]	0.47 (0.08, 36)
Puffin	− 44 [p]	2004-2011 (7)	0.82 (0.11,288)	Fledging success [2]	0.13 (0.04, 68)

1) *Results not yet available;* ***2)*** *Medium-sized chicks/egg laid.*

Table A5 *Key population parameters (SE, n) of common eider on* ***Grindøya*** *in 2011.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Common eider	+ 31 [t]	2009-10 (1)	89.9 (22.4, 1335)	Clutch size	4.56 (0.09, 118)

Table A6 *Key population parameters (SE, n) of seabirds on* ***Anda*** *in 2011.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Kittiwake	+ 7 [p]	2009-2010 (1)	82.7 (3.7, 269)	Large chicks/nest	0.30 (*n*=668) [1]
Puffin	+ 10 [p]	2009-2010 (1)	87.4 (5.9, 273)	Chicks ≥ 10d/nest	0.79 (0.06, 53)
				Chicks ≥ 20d/nest	0.75 (0.06, 53)
Black guillemot	+ 9 [t]				

1) *Value summarised for all study plots.*

Table A7 *Key population parameters (SE, n) of seabirds in* ***Røst*** *in 2011. The main kittiwake colony is on Vedøy (ca. 5,300 pairs in 2011), whereas that monitored in the Kårøy area is the total population of kittiwakes nesting on or besides buildings in Røst (633 pairs in 2011).*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	+ 64 [p]				
Cormorant	− 18 [t]			Clutch size [1,2]	2.64 (0.17, 45)
				Large chicks/nest [2]	1.49 (45)
Shag	− 3 [p]	2009-10 (1)	65.5 (12.9, 412) [3]	Clutch size [4,5]	2.21 (0.03, 369)
				Clutch size [2,5]	2.07 (0.04, 478)
				Large chicks/nest [2]	0.35 (0.13, 20)
Eider	− 11 [p]			Clutch size	3.78 (0.22, 23)
Great skua	− 17 [t 6]			Breeding success	0.80 (0.37, 5)
Common gull				Clutch size [4]	2.12 (0.17, 25)
				Large chicks/nest [2]	0.00 (0.00, 29)
Herring gull				Clutch size [4]	1.91 (0.15, 23)
Great black-b. gull				Clutch size [4]	2.16 (0.12, 44)
				Large chicks/nest [7]	0.15 (0.15,13)
Kittiwake *Vedøy*	− 29 [p 7]			Large chicks/nest [8]	0.00 (*n*=198)
Kårøy area	− 11 [t]	2003-11 (8)	87.1 (1.3, 239)	Clutch size/pair [9]	1.38 (0.09, 79)
				Large chicks/pair [9]	0.00 (0.00, 79)
				Large chicks/nest [9]	0.07 (*n*=633)
Arctic tern				*No breeding in the study area*	
Common guillemot	+ 132 [p]	*No data 2011*		*No data 2011*	
Razorbill	− 20 [p]				
Puffin	− 4 [p]	2009-10 (1)	93.6 (3.2, 452)	Hatching success	0.19 (0.06, 42)
				Breeding success	0.00 (0.00, 42)
				Fledging success	0.00 (0.00, 8)
Black guillemot	*No data 2011*	1997-11 (14)	84.8 (1.7, 95)	Clutch size	1.92 (0.10, 25)
				Large chicks/clutch	1.22 (0.20, 10)

1) *Minimum estimate on 15 June, when some clutches possibly were still incomplete while 19 (42%) had small chicks;* ***2)*** *Including empty nests;* ***4)*** *Excluding empty nests;* ***5)*** *On 1 July; estimated by linear regression of mean values for six different counts between 1 and 26 July;* ***6)*** *From six to five breeding pairs;* ***7)*** *Small colony at Skomvær;* ***8)*** *Based on total counts in study plots;* ***9)*** *On main buildings only (plot VIII);* ***10)*** *Based on total counts of entire colony on buildings.*

Table A8 *Key population parameters (SE, n) of lesser black-backed gull on* ***Sør-Helgeland*** *in 2011.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Lesser black-backed gull	− 38 [t]	2010-11 (1)	67.1 (5.0, 291)	Clutch size	2.47 (0.71, 190)
				Large chicks/nest	0.03 (*n*=202)

Table A9 *Key population parameters (SE, n) of seabirds on* ***Sklinna*** *in 2011.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Fulmar	+ 0 [t]				
Great Cormorant	− 50 [t]			*No data 2011*	
Shag	− 19 [t]	2004-11 (6)	75.9 (6.6, 310)	Clutch size [1]	2.10 (0.05, 472)
				Hatching success [2]	0.74 (*n*=50)
				Clutch size hatching	1.44 (0.15, 50)
				Chicks ≥ 10d/nest	1.66 (*n*=35)
				Chicks ≥ 20d/nest	1.41 (*n*=32)
				Chicks ≥ 30d/nest	1.27 (*n*=26)
Common eider	+ 18 [t 3]			Clutch size	3.50 (*n*=2)
Herring gull	− 48 [t]	*Monitoring discontinued in 2010*		Clutch size [4]	1.81 (0.19, 54)
				Clutch size [5]	2.45 (0.15, 40)
Great black-b. gull				Clutch size [6]	2.60 (0.24, 5)
Kittiwake	*No breeding*			*No breeding*	
Common guillemot	− 4 [t]	2008-11 (3)	92.7 (2.7, 189)		
Razorbill	− 49 [t]				
Puffin	+ 0 [p]	*No estimate yet possible* [7]		Hatching success	0.40 (0.08, 42)
				Chicks ≥ 10d/nest	0.26 (0.07, 42)
				Chicks ≥ 20d/nest	0.26 (0.07, 42)
Black guillemot	− 7 [p]	2008-11 (3)	84.8 (4.1, 58)		

1) *Counted on 2 June;* ***2)*** *Proportion of nests where egg(s) hatched;* ***3)*** *Population counts from Hortavær, Leka municipality;* ***4)*** *Counted on 4 June, including empty nests;* ***5)*** *Counted on 4 June, excluding empty nests;* ***6)*** *Counted on 9 June;* ***7)*** *Colour ringing of adults was initiated in 2007, but due to low colony attendance during incubation and poor breeding success none were resighted in 2008 and very few were resighted in 2009-2011.*

Table A10 *Key population parameters (SE, n) of seabirds on* ***Runde*** *in 2011.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Gannet	+ 5 [t]				
Shag	− 53 [p]	*No estimate yet possible* [1]		Clutch size [2]	No data
				Large chicks/nest [2]	No data
Common eider	+ 46 [t]				
Great skua	No data [t 3]			Large chicks/nest	0.85 (*n*=55)
Kittiwake	No data [p 4]			Large chicks/nest [4]	0.00
Common guillemot	No data [p 4]			Breeding success [5]	0.00
Puffin	− 17 [p]	2007-11 (4)	82.5 (2.1, 220)	Hatching success	0.40 (*n*=86)
				Chicks ≥ 10d/nest [6]	0.44 (*n*=34)
				Chicks ≥ 20d/nest [6]	0.00 (*n*=34)

1) *Colour-ringing of adults was initiated in 2008;* ***2)*** *Not assessed, but massive collapse in breeding attempts during egg-laying;* ***3)*** *Only counted in 5 years between 1998 and 2005;* ***4)*** *Not assessed, but total collapse in breeding attempts before egg-laying;* ***5)*** *No eggs or chicks were seen on open ledges.* ***6)*** *Calculated from culmen lengths by using growth rates of puffin chicks in Røst in failed seasons.*

Table A11 *Key population parameters (SE, n) of seabirds on the key-site localities in* ***Hordaland*** *county in 2011.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Lesser black-backed gull	− 28 [t]	*No estimate yet possible* [1]		Clutch size [2]	1.23 (0.14, 80)
				Fledged chicks/nest	0.30 (*n*=80)
Herring gull	+ 3 [t]	*No estimate yet possible* [1]		Clutch size [2]	2.12 (0.07, 231)
				Fledged chicks/nest	0.45 (*n*=337)

1) *Colour-ringing of chicks and adults was initiated in 2009, but too few birds have been ringed;* ***2)*** ***I****ncluding empty nests.*

Table A12 *Key population parameters (SE, n) of seabirds on the key-site localities in* ***Vest-Agder*** *county in 2011*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Cormorant	+ 11 [t]	*No estimate yet possible* [1]		Clutch size	3.19 (0.09, 236)
				Large chicks/nest	1.66 (*n*=236)
Common eider	− 31 [t 2]			Clutch size	4.12 (0.23, 33)
				Small chicks on sea	0.92 (*n*=33)
				Large chicks on sea	0.55 (*n*=33)
Lesser black-backed gull		2008-11 (3)	73.2 (4.1, 805) [3]		
Slettingene	− 27 [t]			Clutch size [4]	2.56 (0.08, 96)
				Fledged juv./pair	0.42 (*n*=96)
Storøy	− 30 [t]			Clutch size [4]	2.24 (0.06, 243)
				Fledged juv./pair	0.00 (*n*=264)
Klovholmene	− 14 [t]			Clutch size [4]	2.40 (0.08, 164)
				Fledged juv./pair	0.30 (*n*=166)
Rauna	+ 4 [t]			Clutch size [4]	2.42 (0.20, 24)
				Fledged juv./pair	0.56 (*n*=2700)
Herring gull		2008-11 (3)	76.6 (7.1, 233) [3]		
Slettingene	− 47 [t]			Clutch size [4]	2.03 (0.15, 38)
				Fledged juv./pair	0.47 (*n*=53)
Storøy	− 29 [t]			Clutch size [4]	2.54 (0.08, 87)
				Fledged juv./pair	0.42 (*n*=95)
Klovholmene	− 16 [t]			Clutch size [4]	1.81 (0.24, 26)
				Fledged juv./pair	0.47 (*n*=53)
Rauna	+ 16 [t]			Clutch size [4]	1.61 (0.29, 18)
				Fledged juv./pair	0.56 (*n*=360)

1) *Colour-ringing of chicks for later monitoring of survival rates was initiated in 2008;* ***2)*** *Not comparable with earlier estimates as this figure is based on counts of adult males, not nests* ***3)*** *Applies for all four colonies as one;* ***4)*** *Excluding empty nests.*

Table A13 *Key population parameters (SE, n) of great cormorant at* ***Ørra*** *in 2011.*

Species	**Population change** %	**Annual adult survival** Period (yrs)	Estimate %	**Reproductive performance** Sampling unit	Estimate
Great cormorant	+2 [t]	*No data 2011*		*No data 2011*	

Cover photo: Part of a fulmar colony on Jan Mayen, 2011. This volcanic island, which is situated a third of the way between Iceland and Svalbard, is now included as a SEAPOP key-site. (© Ola Nordsteien)

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Publication series information

SEAPOP Short Report (SSR) is published by the Norwegian Institute for Nature Research (NINA), the Norwegian Polar Institute (NP) and Tromsø University Museum (TMU) as a web-based newsletter presenting individual progress reports and analyses of projects within the *SEAPOP* programme. The individual SSRs have no ISNN/ISBN coding, but the reports for each year will be collated and published in the registered report series *NINA Report* as a SEAPOP annual report.

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 Industry 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 www.seapop.no, including an up-to-date list of associated publications from which all reports can be freely downloaded as pdf documents.

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