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Initiating SEAPOP in the Lofoten and Barents Sea area?

Report from the OLF study in 2004

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Samarbeid og kunnskap for framtidas miljøløsninger

Summary

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In 2004, the Norwegian Oil Industry Association (OLF) was the first body to recognise the importance of the proposed SEAPOP programme (Seabird population management and petroleum operations) by granting funds towards an extension and coordination of relevant ongoing work. The funds were used in coordination with various aspects of the current monitoring programmes and gave the opportunity to start important groundwork prior to the implementation of other parts of SEAPOP planned for 2005. Highest priority was given to the most urgent tasks recognised in the Lofoten and Barents Sea area, i.e. the initiation and continuation of long-term data series on seabird demography at the four existing key-sites in this area; Bjørnøya (Barents Sea), Hornøya (East Finnmark), Hjelmsøya (West Finnmark) and Røst (Lofoten). This report summarizes the most important findings of the fieldwork carried out for OLF at these sites in 2004 and some of the trends documented over the past few decades.

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Black-legged kittiwakes *breeding on Hjelmsøya in 2004. The bird sitting on the upper nest has a green ring engraved "CA" and was one of the 132 adults that were individually colour-ringed in order to monitor adult survival on this key-site.*
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Introduction

Seabirds are abundant and conspicuous top predators in the marine ecosystem, and their ecology makes them sensitive and early indicators of the state of the environment in which they live. Any changes in the physical parameters or in the biota lower down the food chain are often quickly manifested in changes in breeding or life-history parameters of one or more species of seabird. Furthermore, compared to other marine organisms, seabirds are a very cost-effective group to study and monitor, and because they are easily accessible and highly visible, they are a significant focus as environmental indicators. As a result, seabird monitoring is now a global science for which strict international standards are developed and in which most maritime nations now participate.

With its long coastline and rich marine fauna, including a seabird population of around 6 million pairs breeding equally divided between the mainland and Svalbard, Norway has an important role as a manager of internationally important resources. Within the northeast Atlantic, only Iceland has a larger seabird population, with ca. 7 million pairs. However, only over the last 30-40 years have seabirds been studied in any detail in Norway and one result of this interest is the two current seabird monitoring programmes, one on Svalbard (coordinated by the Norwegian Polar Institute, NP) and one on the mainland (coordinated by the Norwegian Institute for Nature Research, NINA). At present, these programmes monitor regularly four key-sites and eleven species in the southern Barents Sea (Fig. 1, Tab. 1).

Figure 1
The four key-sites (red dots) currently being monitored in the Lofoten and Barents Sea area.

The current programmes have, however, serious shortcomings in that they are limited mainly to the monitoring of population size of a limited numbers of species on a small selection of sites. While large and small changes in numbers of various species have been documented over the years, little is known about the causes of these changes. With recent national and

international focus on biological diversity and the potential impacts of anthropogenic activities on Norwegian terrestrial and marine flora and fauna, management processes have uncovered an imperative need for an improved and more precise documentation of the ecological parameters that control, among many others, seabird populations. A consequence of this is the development of the SEAPOP programme whose aim is to coordinate a long-term, comprehensive, standardised and cost-effective study of the most important aspects of seabird numbers, distribution and ecology in Norwegian waters to satisfy the needs of the offshore industry, fisheries management, nature management, the scientific community and society at large in their various roles as exploiters, protectors and researchers of the marine environment.

The SEAPOP concept was first developed in cooperation with Statoil in 1999-2000 based on the need too improve knowledge of special importance to the oil industry. Realising the huge overlap in information needs, the programme proposal has recently been modified to also secure the parallel needs of management authorities, both with respect to seabirds' importance as marine organisms and their value as indicators of environmental changes. In 2004, the Norwegian Oil Industry Association (OLF) was the first body to recognise the importance of this programme by granting funds for an extension and coordination of the two seabird monitoring programmes towards the fulfilment of the goals of SEAPOP. These funds were used in coordination with various aspects of the ongoing monitoring programmes and enabled an expansion of some work already in progress plus gave the opportunity to start important groundwork necessary to implement other parts of SEAPOP in 2005. The most urgent tasks recognised in the SEAPOP programme, i.e. the initiation and continuation of long-term data series on demographic parameters, was given the highest priority (Tab. 2).

Table 1
Seabird species whose breeding population are monitored annually in the SW Barents Sea.

	Bjørnøya	Hornøya	Hjelmsøya	Røst
Northern fulmar	✓			✓
Great cormorant				✓
European shag		✓[1]		✓
Common eider				✓
Great Skua	✓		✓	✓
Glaucous gull	✓			
Black-legged kittiwake	✓	✓	✓	✓
Brünnich's guillemot	✓		✓	
Common guillemot	✓	✓	✓	✓
Razorbill			✓	✓
Atlantic puffin		✓	✓	✓

[1] *Total counts made every two years.*

Fieldwork 2004

In the 2004 season, supplementary work was concentrated on the four key-sites in the Lofoten and Barents Sea area at which monitoring of breeding populations was already in progress, viz. Bjørnøya, Hornøya, Hjelmsøya and Røst (Fig. 1, Tab. 1). Thanks to continued support from Norsk Hydro, Statoil and BP to the long-term Atlantic puffin project at Røst, OLF funds intended for use there could be channelled into an increased effort into upgrading Hjelmsøya as a key-site.

Table 2
Breeding parameters among seabirds sampled on the four key-sites in 2004. The red asterisks indicate where OLF funds enabled the initiation or improvement of the regular sampling.

	Adult survival	Chick growth	Chick food	Breeding success	Other parameters[1]
Bjørnøya					
Great skua				✓*	
Glaucous gull	✓			✓	
Black-legged kittiwake	✓*		✓*	✓*	
Brünnich's guillemot	✓		✓	✓	✓
Common guillemot	✓	✓	✓	✓	✓
Little auk			✓*		
Hornøya					
European shag	✓*				
Black-legged kittiwake	✓*	✓	✓	✓*	✓
Common guillemot	✓	✓	✓		
Razorbill	✓	✓*	✓	✓	✓
Atlantic puffin	✓*	✓*	✓	✓*	✓
Hjelmsøya					
Great Skua				✓*	
Black-legged kittiwake	✓*			✓*	
Common guillemot	✓*		(✓)	✓*	
Atlantic puffin	✓*		(✓)		
Røst					
Great cormorant				✓	
European shag	✓*			✓	✓
Common eider					✓
Black-legged kittiwake	✓*			✓	✓
Arctic tern				(✓)	✓
Common guillemot			(✓)		✓
Atlantic puffin	✓	✓	✓	✓	✓
Black guillemot	✓	✓	✓*	✓	✓

[1]*e.g. egg size, clutch size, timing of breeding, body condition of adults.*

Bjørnøya

At Bjørnøya, the OLF funds were primarily used to start a study of adult survival, breeding success and chick diet in the black-legged kittiwake. As the field season was thus extended, this also enabled improved estimates of common and Brünnich's guillemot breeding success, chick growth and chick diet. Two hundred adult kittiwakes were caught at the breeding site and individually colour-ringed. The birds were also blood sampled and biometric measurements were taken. Pair combinations were also registered, and chicks ringed with metal rings. Five sample plots were established for estimating kittiwake breeding success. Samples of food being brought to kittiwake chicks were also collected for the first time on Bjørnøya.

The extended field season also enabled the initiation of monitoring of the little auks (diet) and the great skuas (number of breeding pairs and breeding success) breeding on the island. The little auk colonies on Bjørnøya are the southernmost in the Barents Sea region and the great skua colony is the largest in the region.

***Bjørnøya** is one of the most important seabird colonies in the southern Barents Sea. Its steep cliffs may be ideal for many seabirds to breed on, but not so for all scientists to work on!*
© H. Strøm, NP

Results Bjørnøya

Despite an increase since 2003, the breeding population of kittiwakes still shows an overall negative trend which started in 1995. The common guillemot breeding population is still increasing after the collapse in 1986-87, whereas the Brünnich's guillemot breeding population is stable. The glaucous gull population has decreased by 60% since 1986.

Kittiwake breeding success was 0.90 chicks/nest, whereas the breeding success of common guillemot and Brünnich's guillemot was 0.58 and 0.74 chick/nest, respectively. Kittiwakes (n=45 food samples) fed their chicks mainly on capelin, but krill of the genus *Thysanoessa* and young individuals of deepwater red shrimp also occurred. Both the common and Brünnich's guillemot fed their chicks mainly capelin, but also polar cod, saithe, squid and krill.

Hornøya

At Hornøya, an already comprehensive study of several species on the island was expanded to include that of the survival rates of European shags through the capture and colour-ringing of 50 breeding adults. This is an important supplement to the colour-ringing programme on the colony as it added a coastal fish-eating species to the list of otherwise offshore surface-feeding (kittiwake) or diving (puffin, common guillemot, razorbill) species whose adult survival

***Hornøya** is situated at the easternmost tip of Norway. The cliffs here are not as steep and high as those on Bjørnøya and Hjelmsøya.*
© R.T. Barrett, TMU

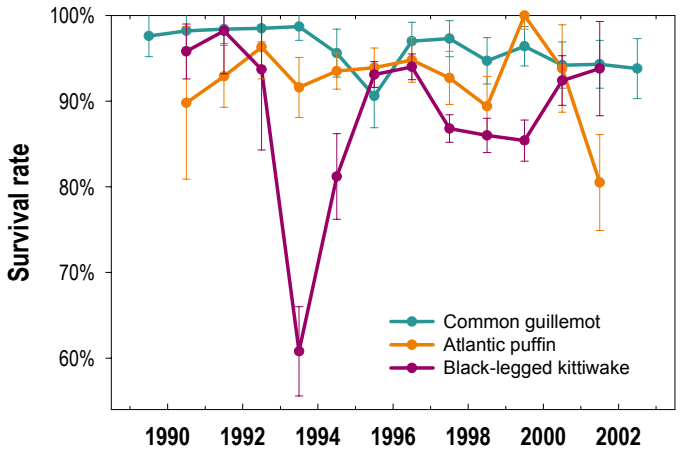


Figure 2
Changes in adult survival rates of three species monitored regularly on Hornøya.

was already being monitored (Fig. 2). New colour rings were also fitted to 100 kittiwakes and 38 puffins, thus greatly improving the study of the adult survival of these species. The field season was also extended enabling improved estimates of kittiwake breeding success, and puffin and razorbill chick growth.

Results Hornøya

The breeding population of kittiwakes continued its steady (1.6% yr^{-1}) decline registered since 1980, while that of common guillemot continued to increase (at ca. 12% yr^{-1}) since the collapse in 1987. The puffin population is also increasing (2.7% yr^{-1}).

The survival estimates for these three species show no apparent trends over years (Fig.2). However, recent analyses have shown that environmental factors (variation in sea surface temperatures and abundance of main prey) can account for some of the annual variation in adult survival of common guillemots and puffins. In the kittiwake, temporal variation in survival was much more pronounced than in the alcid species and not readily accounted for by environmental factors. There was also little co-variation in survival among the three species.

There were no sudden changes in the timing of breeding compared to previous years among any of the species studied, and clutch- and egg-sizes were normal. Puffin and razorbill chick growth and survival were also normal, but kittiwake breeding success was only 0.6 chicks/nest. Data collected since 1980 show a steady decline in the latter from ca. 1.2 chicks/nest to the present 0.6. As in previous years, capelin, sandeel and herring made up most of the diet brought to chicks on Hornøya, but the food choice differed between different species (Fig. 3).

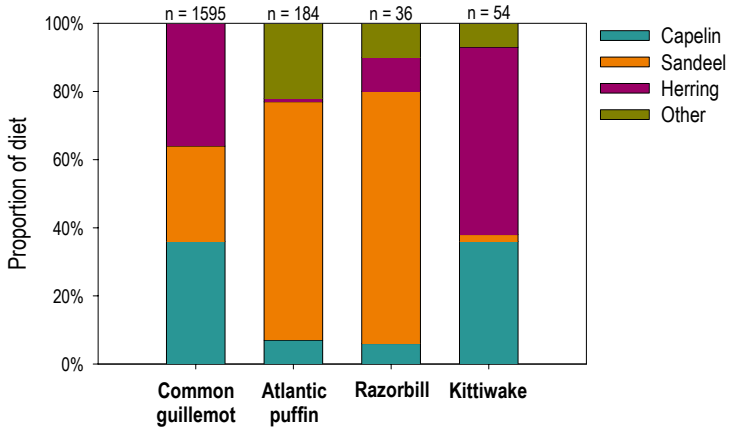


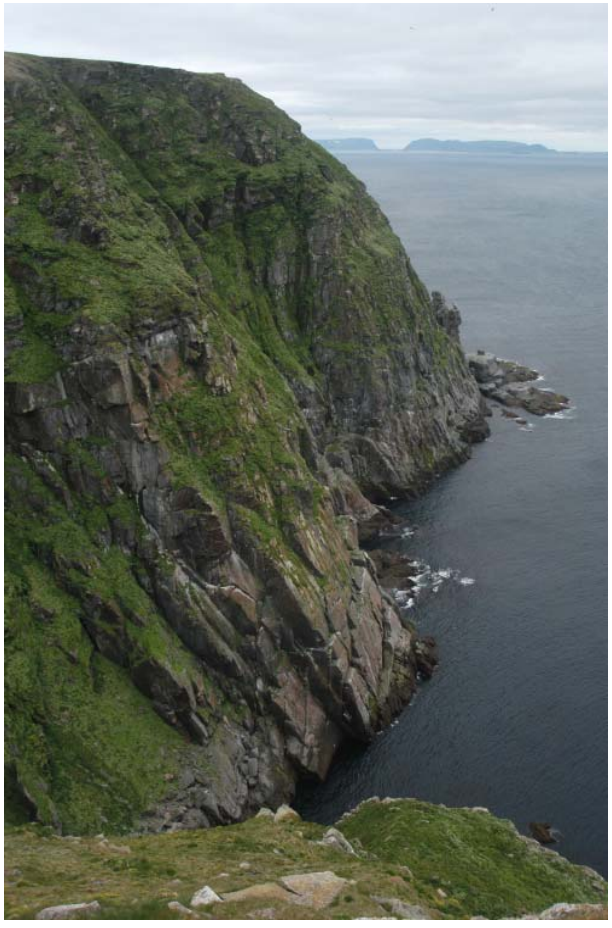
Figure 3
Composition of chick diet of common guillemot, puffin, razorbill and kittiwake on Hornøya, 2004. Figures above columns = no. of food samples collected.

Hjelmsøya

At Hjelmsøya, considerable and important supplements were made to the otherwise limited monitoring previously being carried out there. As a result, Hjelmsøya became established as the fourth important key-site southwest in the Barents Sea region (Fig. 1). Until 2004, monitoring was limited to breeding numbers of kittiwakes, common guillemots and puffins (the latter at the nearby colony Gjesvær). This has now been supplemented by the establishment of monitoring of demographic parameters of all three species. In 2004, the breeding success of kittiwakes and common guillemots was registered, and future monitoring of adult survival of kittiwakes, common guillemots and puffins was established through individual colour-ringing of 132, 40 and 150 breeding adults, respectively. A limited number of food samples was collected. Breeding success for common guillemots in 2004 was 0.46 chicks/egg laid in the boulder scree study plots. In the study plots situated in the bird cliff, breeding success could not be registered for logistic reasons. Kittiwakes failed to raise any chicks in any of the study plots due to heavy disturbance from up to 17 white-tailed eagles hunting along the cliffs.

Results Hjelmsøya

The results from the national monitoring programme for breeding seabirds (NINA Oppdragsmelding 852, in press) show that the populations of all species being monitored in West Finnmark are declining. On Hjelmsøya, the breeding population of kittiwakes continued its steady (-6.8% yr^{-1}) decline registered since 1991. The common guillemots also continued their decline (at ca. -14% yr^{-1}) recorded since 1984, when the breeding population already was estimated to only c. 25% of its size in the 1960s. Brünnich guillemots has declined by (-10% yr^{-1}) since 1984, whereas puffins at Gjesvær have declined by -5.4% yr^{-1} since 1997.



Hjelmsøya. *View towards the west from Gustavika on the NW tip of the island. The cliffs are ca. 200 m high. The plots for monitoring of common guillemot and puffin survival are on the slope at the lower right of the picture.*
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Røst

At Røst, the long-term project on puffins was continued, together with the less intensive studies of a variety of other species. For most species the monitoring included breeding numbers and different parameters of their breeding performance. The demographic studies were expanded by increased effort in the monitoring of survival rates of breeding shags and kittiwakes. Including the 46 shags and 37 kittiwakes ringed this year, a total of 238 shags (at Ellefsnyken) and 101 kittiwakes (at Kårøy) have been colour-ringed with individual codes since 2002 and 2003, respectively. The species whose adult survival is now being monitored within the Røst archipelago thereby include two coastal fish-eating species (shag and black guillemot), a pelagic surface-feeding species (kittiwake) and a pelagic diving species (puffin). Monitoring of reproductive success of these four species was continued and the great cormorant was also added to this selection.

***Røst** is a small archipelago at the southernmost tip of the Lofoten Islands. It is most famous for one of the largest puffin colonies in the world. © T. Anker-Nilssen, NINA*

Results Røst

Results from the puffin project are presented annually in separate reports, the latest (NINA Oppdragsmelding 809) covering results up to and including 2003. Preliminary results from 2004 were recently described in a brief progress report (NINA Minirapport 79). The time series for adult survival rate of puffins from 1990 indicates an overall negative trend which suggests mortality rates have almost tripled during the period (Fig. 4). A recent analysis shows that

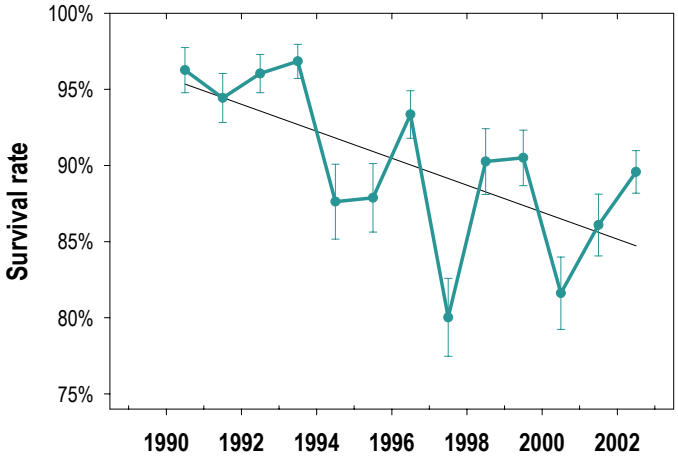

Figure 4
Changes in adult survival rates of breeding puffins on Hernyken, Røst. A linear regression line has been fitted to the data set.

while the survival rate of puffins at Røst was positively affected by sea surface temperature, survival rates of puffins on Hornøya (Fig. 2) and three British colonies (Fair Isle, Isle of May and Skomer) decreased when temperatures increased. This phenomenon most likely reflected contrasting responses by their main prey (herring vs. sandeel and capelin) to climate changes.

With three years of data (i.e. two time steps) the first Norwegian estimate for adult survival of shags was calculated at 82.4% (SE=3.0) between 2002 and 2003. Fifty of the 64 kittiwakes colour-ringed in 2003 were observed in the colony in 2004. Thus survival rate was obviously at least 68%, but the actual rate can first be estimated when the fieldwork has been continued for one more year.

From 2003 to 2004 breeding numbers at Røst increased for razorbill (+39%) and puffin (+5%), were almost stable for shag (+1%) and common guillemot (-1%) and decreased for kittiwake (-10%), northern fulmar (-30%) and great cormorant (-43%). Large inter-annual variation in numbers of razorbills and fulmars are typical and partly explained by relatively few birds in the study plots, whereas the cormorant population (51 pairs) decreased for the first time since its establishment in 1997. The puffin population was estimated at 427,000 pairs, corresponding to 30% of the numbers when monitoring started in 1979. As breeding has been successful in four of the six last years (mean fledging success = 62%), the positive population trend may continue for the next 5-6 years. The situation for the red-listed common guillemot at the main cliff (Vedøy) is, however, still critical with breeding numbers down to only 1% of their level 43 years ago. Fortunately, smaller aggregations breeding scattered and more sheltered on some of the other islands (e.g. Hernyken and Ellefsnyken) seem to be doing much better, but these birds are not covered by the present monitoring scheme. The kittiwake population has decreased relatively steady since 1980, and its new all time low in 2004 (ca. 11,500 pairs) was only 46% of the initial size. Numbers of common eiders have remained stable during 2000-04 at ca. 55% of their level in 1988.

Solving key questions *by targeting key birds of key species at key sites. An adult kittiwake being individually colour-ringed. Subsequent observations of such colour-ringed birds are used to estimate adult survival from one year to the next. © T. Anker-Nilssen, NINA*

The present facilities *for seabird studies on the four existing key-sites in the Lofoten and Barents Sea area offer very variable standards of living! © H. Strøm, NP (top left), S.-H. Lorentsen, NINA (top right), R.T. Barrett, TMU (bottom left) and T. Anker-Nilssen, NINA (bottom right).*