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Key-site monitoring on Hornøya in 2008

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The 2008 breeding season on Hornøya was characterised by a later than normal breeding season and near total breeding failures among the surface-feeding herring and great black-backed gulls and the kittiwake, while the diving auks and shags fared better (Table 1).

Some kittiwakes started to lay early in the second half of May, but the main laying period was late, in early June with most clutches being completed around 10-15 June. The mean clutch size was only 1.1 eggs/nest, with no 3-egg clutches being recorded in a sample of 718 nests. Only three times in 26 seasons has the mean been below this. It seemed that most eggs hatched normally, but chicks soon vanished from the nests and by the end of July, only 60 large chicks were recorded in more than 1700 nests giving an overall breeding success of 0.04 chicks/nest. This is the lowest ever recorded in 25 years of records, and adds to the downward trend in breeding success since 1980. Equally concerning was the continued decline in the breeding population. Numbers in the monitoring plots in 2008 dropped again, reaching ca. 35% of the numbers first recorded in the early 1980s. As in the two previous years, there was very little feeding activity among any of the gull species in the waters around Hornøya and a near complete absence of "feeding frenzies", which in previous years have been common in inshore waters.

Demographic studies on herring gulls and great black-backed gulls were initiated on Hornøya in 2006. Both adults and full grown chicks have been ringed annually to follow both adult survival and recruitment rates of young to the colony. As for the kittiwakes, the 2008 breeding season was very

Table 1 *Key population parameters (SE, n) of seabirds on Hornøya in 2008. Population change is the numeric change in size of the breeding population registered between 2007 and 2008 on the basis of plot counts (p) or total censuses (t). For each species, the listed survival estimate was derived from the model(s) that best fitted the data set (i.e. those with ΔQAICc < 2 when adjusting for median c-hat).*

Species	**Population change %**	**Annual adult survival**		**Reproductive performance**	
		Period (yrs)	Estimate %	Sampling unit	Estimate
Shag	No data	2004-08 (4)	78.1 (2.9, 118)	Clutch size	2.62 (0.07,86)
Herring gull	No data	Data not yet analysed		Clutch size	2.40 (0.07, 107)
				Large chicks/nest	0.14 (0.03, 107)
Great black-backed gull	No data	Data not yet analysed		Clutch size	2.38 (0.10, 58)
				Large chicks/nest	0.26 (0.06, 58)
Kittiwake	– 5.5 [p]	2006-07 (1)	80.8 (4.2,1129)	Clutch size	1.06 (0.03, 718)
				Large chicks/nest	0.04 (0.00, 1706)
Common guillemot	+ 11.5 [p]	1989-08 (19)	95.7 (0.5, 183)	No data	No data
Razorbill	No data	2000-08 (14)	90.9 (0.9, 171)	Fledging success [1]	0.74 (*n*=66)
Puffin	+ 0.5 [p]	1990-08 (18)	86.8 (0.5, 685)	Fledging success [1]	0.60 (*n*=50)

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

poor for both the herring gull (0.14 chicks per nest) and for the great black-backed gull (0.26 chicks/nest), most likely a result of food shortages for both species. The success of both species has been very low since 2006 (when we started the studies on breeding success). We have as yet no data on the population trends, but the general impression is that both species are declining.

At present we have adult survival estimates for five species on Hornøya. The shag, common guillemot, razorbill and the puffin all have had a stable adult survival over several years. The only species whose adult survival varies considerably from year to year is the kittiwake. Since 1991, the survival estimates have ranged from 64% to 95% and an ongoing analysis shows that this variation is closely linked to that of the Barents Sea capelin stock (Figure 1) (Erikstad and Barrett et al. in prep.). This corroborates Barrett's (2007) suggestion that variations in capelin availability may have contributed to the steep decline in the kittiwake population in the Barents Sea region.

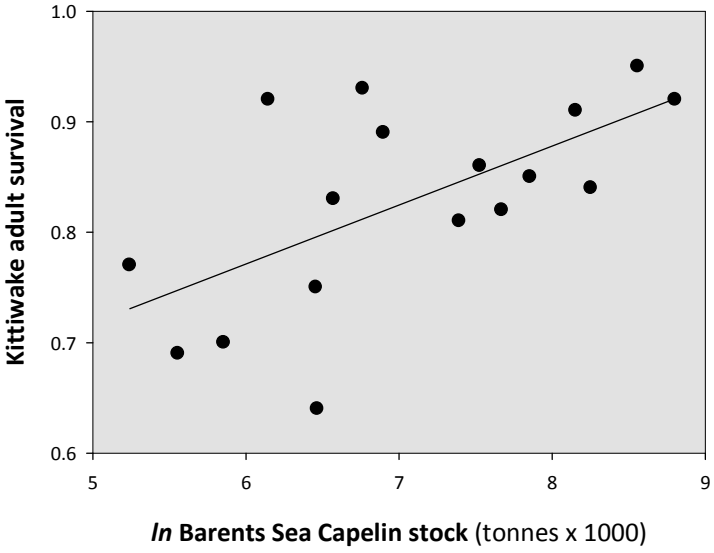

Figure 1
The relationship between yearly variations in adult survival of kittiwakes on Hornøya in 1991-2007 and the Barents Sea capelin stock. A linear regression line is fitted to the data set (r^2=0.38, n=19, p=0.008).

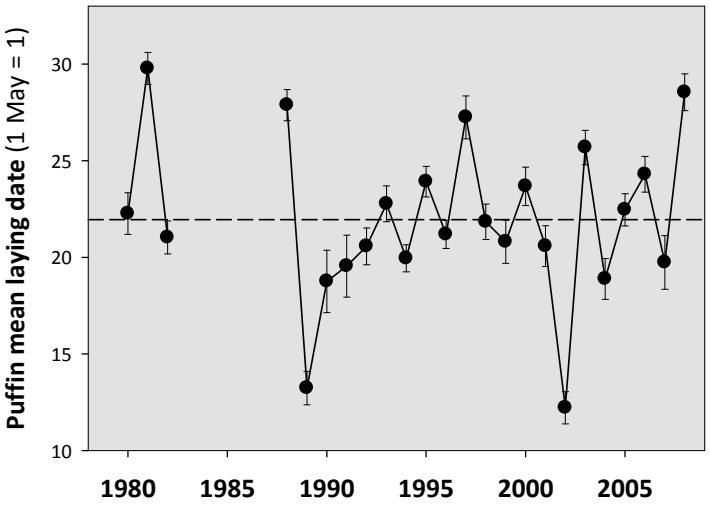

Figure 2
Mean laying dates (±1 SE, n=24-56 eggs each year) of puffins on Hornøya in 1980-2008. The dotted line indicates the overall mean.

Figure 3
The numbers of common guillemots breeding on Hornøya in 2008 were the second highest on record and their breeding success was seemingly good. However, the body mass of chicks at nest departure was the lowest ever, suggesting food conditions were not optimal. (© R. Barrett)

After an apparent decline in numbers of occupied puffin burrows between 2005 and 2006, monitoring counts in 2007 and 2008 showed that the population seems to be again increasing slowly, but is still ca. 10% below the peak reached in 2005. Based on a constant incubation period (here set at 39 days) and observations of hatching dates (Figure 2), hatching started about a week later than average and, although not fully quantified, it seemed that fewer than normal eggs were laid. Furthermore, measurements of eggs made since 1980 show a steady and statistically significant decline in volume from 67 ml to 64 ml, something that needs to be addressed later.

The delayed breeding among puffins may have been a result of a late spring (Barrett 2001) with six of 74 burrows inspected on 16 June still full of ice. Razorbills also laid a little later than normal whereas there was no sign of a delay among the common guillemots. Growth rates of puffin and razorbill chicks were normal (ca. 11 g/d during the period of maximum growth), and the fledging success of razorbills (0.75 chicks/egg laid) was also normal while that of the puffin (0.6 chicks fledged/egg laid) was lower than ever recorded. The overall result for puffins was thus below average. The common guillemot breeding population recovered from last year's slight decline with the counts in the monitoring plots 8% higher in 2008 than in 2006 and their breeding success seemed 'normal' (this needs to be quantified better in future) (Figure 3). However, the mean 'fledging' mass of common guillemot chicks as they left the colony (ca. 230 g) was the lowest ever recorded and 40-50 g (ca. 15%) lower than normal (270-280 g). This suggests that adults found it difficult to find sufficient food for normal chick growth.

This was not, however, evident from the observations of fish brought in to the colony as the common guillemots fed their chicks almost wholly (ca. 80% by number and mass) on capelin, a fish of normally good quality. On the other hand, more than 80% (by number) of the fish fed to puffin chicks consisted of lower quality gadoid (saithe and cod) fry (Figure 4). When converted to mass, the gadoids made up ca. 50% of the diet while larger capelin, sandeels and herring constituted the remaining 50%. In contrast to the previous 3-4 years, few puffins brought in beak loads of minute,

transparent fish larvae. The razorbills and shags, on the other hand, maintained their general pattern since 2003 of feeding their chicks mainly sandeels. In contrast to the three previous seasons when herring dominated the kittiwake diet, their food choice in 2008 was characterised by a wide diversity of prey. In 2008, the contents of the stomachs of adult common guillemots caught when bringing in fish to their chicks were sampled to see if there was a difference between adult and chick food. Such knowledge is crucial in our understanding of the possible effects of changes in fish availability on the population dynamics of breeding seabirds. These samples are being analysed as part of a Masters project.

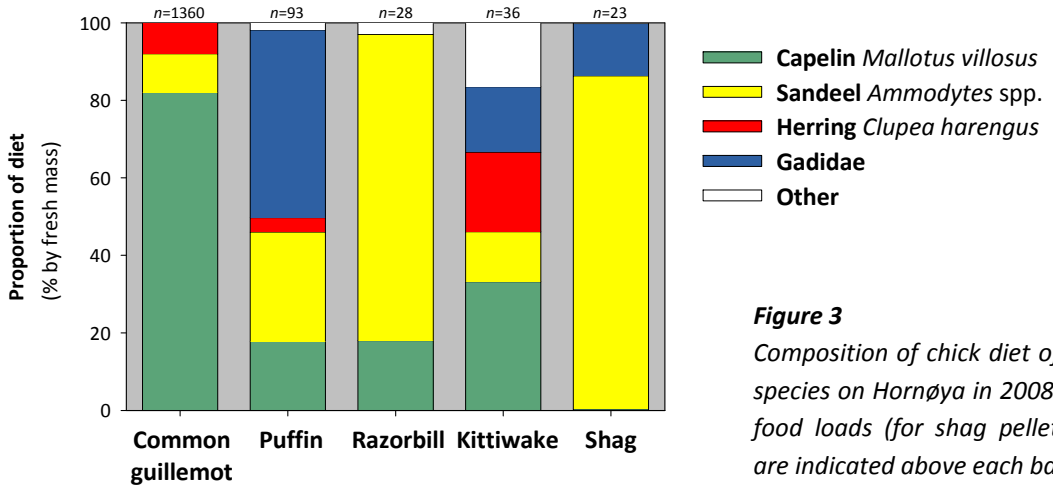

Figure 3
Composition of chick diet of five seabird species on Hornøya in 2008. Numbers of food loads (for shag pellets) examined are indicated above each bar.

As part of the closing phase of the collaborative study of the shags' winter foraging strategies and their impact on survival and breeding at high latitudes with NERC Centre of Ecology and Hydrology, Scotland, nine of the remaining shags carrying Global Location Sensing loggers were caught and the loggers removed. Data from these loggers and those from shags caught at Røst (Lofoten), Flatey (Iceland) and Isle of May (Scotland) are in the final stages of analysis.

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Cover photo: Adult puffins on Hornøya. Note colour-ringed bird in the centre (white ring engraved 'CU') and bird in front carrying a load of small gadoids. (© R. Barrett)

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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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