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Key site monitoring on Anda in 2008

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Anda (64°04'N 15°10'E), Vesterålen was established as a SEAPOP key-site in 2005. The main target species are puffin and kittiwake.

Atlantic puffins were first monitored at Anda in 1981-83 but between 1984 and 2004, no regular monitoring was carried out. Fortunately, the monitoring plots counted in the early 1980s were well documented and comparisons could be made with results from the monitoring in 2005-2008. In 2005, new plots for puffin monitoring using the Star system described by Anker-Nilssen & Røstad (1993) and monitoring plots for kittiwakes were established. The first counts were done in 2006, and monitoring continued in 2007 and 2008. Total censuses of shag, herring gull and common guillemot populations were also carried out in 2008. In 2008, data on breeding success of the puffin and kittiwake were again collected. For monitoring of adult survival, 26 puffins and 26 kittiwakes were fitted with individual colour rings, as supplements to the 211 and 209 individuals, respectively, colour-ringed in 2005-2007. Fifty-one food loads containing 399 fish were collected from puffins and 67 food regurgitations were collected from kittiwakes (62 from adults and 5 from chicks).

Results from the national monitoring programme for seabirds (Lorentsen & Christensen-Dalsgaard 2009) suggest that the breeding population of puffins at Anda has declined between 1981 and 2008. The total population appears to have declined from an estimated 22,200 pairs in 1981 to 17,840 pairs in 2008, a total decrease of 19.5% (Table 1). Between 2007 and 2008, the breeding population of puffins on Anda declined by 11% from an estimated 20,040 pairs to 17,840 pairs.

Table 1 *Key population parameters (SE, n) of seabirds on Anda 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). 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			Clutch size [1]	2.38 (0.27,16)
Herring gull	No data			Clutch size [1]	2.17 (0.12, 48)
Kittiwake	– 0.1 [p]	2006-07 (1)	87.3 (2.6,209)	Clutch size [1]	1.84 (0.08, 62)
				Large chicks/nest	0.93 (*n*=613)
Puffin	– 11.0 [p]	2007-08 (1)	79.4 (5.4, 211)	Chicks ≥ 10d/nest	0.28 (*n*=43)
				Chicks ≥ 10d/nest	0.28 (*n*=43)

1) *Number of eggs or small chicks per nest (with content). Sample dates: shag; 16 July, herring gull: 24 June, kittiwake: 19 June.*

The best fit model to estimate adult survival for puffins was one where survival but not recapture rates were time-dependent, indicating that the survival of puffins varies between years. The annual survival rate for adults was estimated at 79.4% (Table 1) between 2007 and 2008, compared to 83.0% (*SE*=5.1) in 2005-2006 and 77.3% (*SE*=5.2) in 2006-2007. This is remarkably low for Atlantic puffin populations (e.g. Harris et al. 2005).

The mean hatching date for puffins in 2008 was 30 June (*SE*=1.2, range 23.1-13.1, *n*=24), one, five and seven days later than in 2007, 2006 and 2005, respectively. Chicks hatched in 53% (*n*=43) of the study nests, compared to 56% (*n*=54), 86% (*n*=50) and 67% (*n*=58) in the three preceding years. We used growth curves for the head+bill length of chicks measured at Røst in bad years (Anker-Nilssen & Aarvak 2004) to estimate chicks' ages and thus compute an index of reproductive performance at Anda (Table 1). In 2008, only 28% of the puffin chicks reached the age of at least 10 days (compared to 41% and 80% in 2007 and 2006, respectively), and 28% also reached the age of 20 days (compared to 37% in 2007 and 74% in 2006). Of the eggs that hatched, 50% survived to 10 days. It thus seems that there was a high mortality of newly hatched puffin chicks, which also corresponds with numerous observations of small, dead chicks elsewhere in the colony.

In 2008, the diet of the puffin on Anda was dominated by sandeel (*Ammodytes* sp.) throughout the breeding season (Figures 1-2). In total, sandeel comprised 90% of the diet by mass (69% and 43% in 2007 and 2006 respectively), followed by 5% gadoids (9% and 8% in 2007 and 2006, respectively) and 4% first-year herring (*Clupea harengus*) (22% and 49% in 2007 and 2006, respectively). The very low level of herring in the diet supports the findings at other key-sites along the coast to the south of Anda (from Runde to Røst).

Figure 1
An adult puffin bringing home a large sandeel to its chick on Anda in 2008. (© S. Christensen-Dalsgaard)

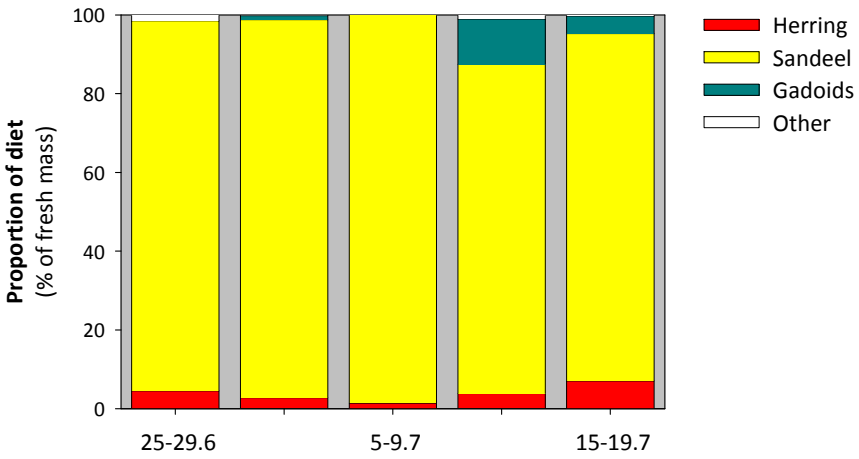

Figure 2
Seasonal variation (5-day periods) in composition of the chick diet (% by mass) of puffins on Anda in 2008.

The sandeels consisted of two distinct age-groups with no overlap in size; 0-group fish with a mean length of 53.2 mm (*SD*=9.8, range 28-79 mm, *n*=182) and older fish with a mean length of 138.8 mm (*SD*=18.2, range 108-176, *n*=27). All of the herring in the food samples were larvae, with a mean length of 36.7 mm (SD=6.4, range 12-61 mm, *n*=91), and mean mass of 0.1 g (*SD*=0.07).

About 1000 pairs of kittiwakes bred on Anda in 2005-2008. Compared to a census made in the early 1980s (Røv 1984), the population seems to have remained fairly stable over the last two decades, and there was no change in numbers between 2007 and 2008 (Table 1). The best fit model for estimating adult survival for kittiwakes was one where both survival and recapture rates were time-dependent; it is therefore not yet possible to estimate the survival between 2007 and 2008. Annual survival rates for adults equalled 87.3% between 2006 and 2007 (Table 1), which is within the "normal range" for kittiwakes (Frederiksen et al. 2005).

Figure 3
In contrast to most other colonies, the breeding success of kittiwakes was high on Anda in 2008. (© S. Christensen-Dalsgaard)

In 2008, the hatching of the kittiwakes was very early. When the field team arrived on Anda on 19 June, 70.2% of the eggs had already hatched (whereas the mean hatching date in 2007 was 25 June). The breeding success of kittiwakes in 2008 on Anda was good with 0.93 chicks fledging per nest (Table 1, Figure 3). This is remarkable when compared to Røst (located just 200 km southwest of Anda), where there was complete breeding failure in 2008, and Hjelmsøya and Hornøya, Finnmark where the kittiwakes only raised 0.06 and 0.04 chicks per nest, respectively.

Compared to the puffins, the kittiwakes on Anda had a more varied diet in 2008. Sandeel dominated by mass (38.9%), but also glacier lanternfish (*Benthosema glaciale*) (20.8%), herring (14.8%) and gadoids (7.8%) were common prey (Figure 4). Glacier lanternfish has not previously been found in diet samples from Anda, but dominated kittiwake food samples from Bleiksøy (40 km northeast of Anda) in the mid 1980s (Barrett 1996). The apparent high breeding success of kittiwakes on Anda compared to other key-sites in 2008 is most likely due to a better access to food during the breeding season. From the monitoring of puffins on Anda it is known that there is a local population of sandeel which the birds benefit from. The food samples from kittiwakes in 2008 show that in addition to sandeel they also have access to glacier lanternfish.

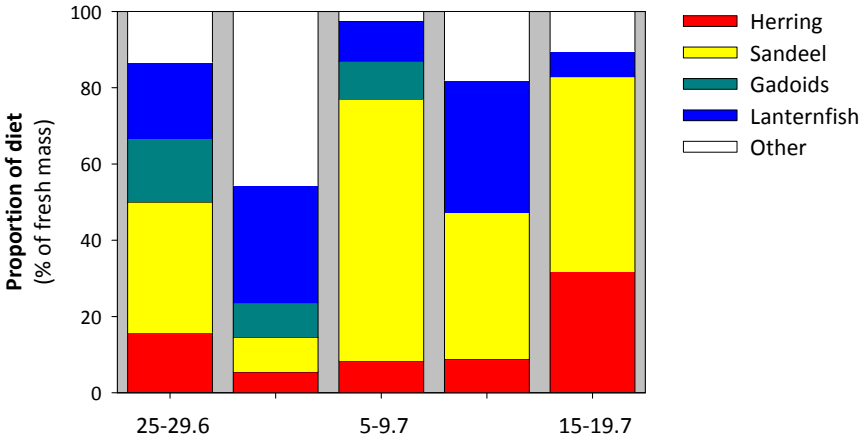

Figure 4
Seasonal variation (5-day periods) in composition of the diet (% by mass) of kittiwake adults and chicks on Anda in 2008.

In the summer of 2008, a visitor joined the monitoring plot for kittiwakes. A kittiwake with the ring Stavanger Museum 6123165, which was ringed as a chick by R. Barrett on Bleiksøya in 1985 and thus 23 years old in 2008, was observed occupying a nest with one egg. The egg did not hatch, however, and it is still unclear whether the bird was just squatting the nest. Being the oldest known kittiwake in Norway, it will be interesting to see if it joins us in the coming years. This is the second finding of a kittiwake ringed as a chick on Bleiksøy and supposedly breeding on Anda. The first was ringed in 1983 and observed (and equipped with colour ring CT) at Anda in 2005, but has not been seen in the later years. The kittiwake colony at Bleiksøy is now more or less deserted due to heavy disturbance by white-tailed eagles (R.T. Barrett pers. comm.), so it is interesting to see that birds from that colony move to Anda.

Thanks

During these last four field seasons the lighthouse building at Anda has proved to be an excellent field station. So, many thanks to the Norwegian Coastal Administration for letting us use the lighthouse! Also thanks to the great field assistants Jannik Schultner, Pål Adolfsen and Duncan Halley and to the "locals" Vidar Carlsen and Mads Henriksen who were of great help with the logistics.

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Cover photo: An adult kittiwake defending its nest on Anda against an intruding common guillemot (bridled morph). (© S. Christensen-Dalsgaard)

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