Seabirds

What is the issue?

Climate change has the potential to impact upon seabirds through changes in prey availability and through severe weather affecting nesting sites.

What has happened and how confident?

Whilst quantitative evidence is lacking, the ICES 2008 advice book makes some general inferences about how seabirds react to climate change:

- In some circumstances, a warming trend advances the timing of breeding and in others breeding is retarded. Seabirds show some flexibility in dealing with climate change in this regard, but are ultimately constrained because of the finite (and often lengthy) time required to complete the breeding cycle.
- Because they are long-lived, seabirds are often able to 'buffer' short-term (<10 years) environmental variability, especially at the population level.
- Seabirds are vulnerable to both spatial and temporal mismatches in prey availability, especially when breeding at fixed colony sites with the foraging constraints that these entail.

Many factors affect range shifts and it is not clear how changes in ocean climate (e.g. circulation and sea temperature) are involved, but they are presumed to be a contributing factor (Mitchell *et al.*, 2004; Wernham *et al.*, 2002).

Variations in food quality are likely to be an important link between climate and seabirds. In the North Sea, changes in plankton caused by climate variability have affected sandeel populations. This has had consequences for the breeding success of many seabirds, in particular black-legged kittiwakes. (Frederiksen *et al.*, 2006). However, it is rarely possible to identify exact causal mechanisms (Mitchell and Frederiksen, 2008).

Evidence for changes in seabird demography and population dynamics is building and are summarised below (Table 3.2.1.).

What might happen?

Because seabirds are very long-lived, it is only possible to document and understand the causes of changes in population size and distribution by continuous monitoring over many years.

Future climate change is likely to affect seabirds in two major ways, either directly through an increased frequency of severe weather causing e.g. nest flooding, or indirectly through changes in their food supply. The consensus is that the latter is likely to be more important for most species (Mitchell and Frederiksen, 2008).

There is a link between wildlife diseases and climate that suggests the possibility of a future threat to seabirds through climate change. This hypothesis remains difficult to test due to lack of baseline data, background understanding and coincident pressures (Harvell *et al*., 2002, Newman *et al*., 2007).

Modelling studies predicting how seabirds will respond to climate change in the long term are still at an early stage.

Are there any OSPAR regional differences?

Monitoring of seabird populations is highly variable across the OSPAR maritime area. OSPAR Region II (Greater North Sea) is much better studied than other OSPAR regions.

Table 3.2.1. *Links between climate change and aspects of seabird condition and behaviour (ICES, 2008a)*

Seabird parameter	Species	Region	Climate variable	Sign of correlation with warming	Sources
Breeding range	Lesser black-backed gull	U.K.	Sea temperature	Positive	Mitchell *et al*. (2004)
	Northern gannet	U.K.	Sea temperature	Positive	Mitchell *et al*. (2004)
Non-breeding range	Lesser black-backed gull	U.K.		Positive	Wernham *et al*. (2002), Mitchell *et al*. (2004)
	Common guillemot	Shetland	Sea temperature, sandeels		Heubeck *et al*. (1991)
Reproductive success	Northern fulmar	Orkney (North Sea)	NAO index	Negative (hatching); positive (fledging)	Thompson and Ollason (2001)
	Atlantic puffin	Røst Norwegian Sea	Sea temperature	Positive	Durant *et al*. (2003)
	Atlantic puffin	Røst Norwegian Sea	Salinity	Negative	Durant *et al*. (2006)
	Greater black-backed gull	Newfoundland	Sea temperature	Positive	Regehr and Rodway (1999)
	Herring gull	Newfoundland	Sea temperature	Positive	Regehr and Rodway (1999)
	Black-legged kittiwake	Newfoundland	Sea temperature	Positive	Regehr and Rodway (1999)
	Leach's storm-petrel	Newfoundland	Sea temperature	Positive	Regehr and Rodway (1999)
	Black-legged kittiwake	Isle of May (North Sea)	Sea temperature	Negative	Frederiksen *et al*. (2004a)
	Black-legged kittiwake	Six coastal sections of OSPAR Regions II and III	Sea temperature	Negative within 2 sections. Negative in across-section comparison	Frederiksen *et al*. (2007)
Annual survival	Northern fulmar	Orkney (North Sea)	NAO index	Negative	Grosbois and Thompson (2005)
	Black-legged kittiwake	Isle of May (North Sea)	Sea temperature	Negative	Frederiksen *et al*. (2004a, 2006)
	Atlantic puffin	North Sea, Irish Sea	Sea temperature	Negative	Harris *et al*. (2005)
	Atlantic puffin	Røst Norwegian Sea	Sea temperature	Positive	Harris *et al*. (2005)
	Atlantic puffin	Norway (Barents Sea)	Sea temperature	Negative	Sandvik *et al*.(2005)
	Common guillemot	Norway (Barents Sea)	Sea temperature	Negative	Sandvik *et al*. (2005)
	Black-legged kittiwake	Norway (Barents Sea)	Sea temperature	Positive	Sandvik *et al*. (2005)
Population change	Common guillemot	Circumpolar	Sea temperature	Increase with moderate cooling of SST	Irons *et al*. (in press)
	Brünnich's guillemot	Circumpolar	Sea temperature	Increase with moderate warming of SST	Irons *et al*. (in press)
	Black-legged kittiwake	Isle of May (North Sea)	Sea temperature	Negative	Frederiksen *et al*. (2004a)
Nesting (laying or hatching) date Nesting	Black-legged kittiwake	Isle of May	NAO index	Positive	Frederiksen *et al*. (2004b)
	Common guillemot	Isle of May	NAO index	Positive	Frederiksen *et al*. (2004b)
	Atlantic puffin	St. Kilda	Sea temperature	Positive	Harris *et al*. (1998)

Seabird parameter	Species	Region	Climate variable	Sign of correlation with warming	Sources
(laying or hatching) date	Atlantic puffin	Røst (Norwegian Sea)	NAO winter Index	Negative	Durant *et al*. (2004)
	Common guillemot	Isle of May (North Sea)	Sea temperature	Negative	Harris and Wanless (1988)
	Razorbill	Isle of May (North Sea)	Sea temperature	Negative	Harris and Wanless (1989)
	European shag	Isle of May (North Sea)	Wind	Negative	Aebischer and Wanless (1992)
Fledging date	Common guillemot	Baltic Sea	Air temperature	Negative	Hedgren (1979)
Foraging cost	Common guillemot	Isle of May (North Sea)	Stormy weather	Positive	Finney *et al*. (1999)
	Northern fulmar	Shetland (North Sea)	Wind speed	Negative	Furness and Bryant (1996)

➥ *Go to the full QSR assessment report on impacts of climate change (publication number 463/2009)*

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