Definition of Favourable Conservation Status for kittiwake

Defining Favourable Conservation Status Project

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Executive summary

This document sets out Natural England's view on favourable conservation status for kittiwake in England.

Favourable conservation status is the situation when the species can be regarded as thriving in England and expected to continue to thrive sustainably in the future. The definition is based on the available evidence on the ecology of kittiwake. Favourable conservation status is defined in terms of three parameters: natural range and distribution; population; extent and quality of habitat necessary for long-term maintenance of populations.

A summary definition of favourable conservation status in England follows. Section 1 of this document describes the species and its ecosystem context, Section 2 the units used to define favourable conservation status and Section 3 describes the evidence considered when defining favourable conservation status for each of the three parameters. Section 4 sets out the conclusions on favourable values for each of the three parameters.

This document does not include any action planning, or describe actions, to achieve or maintain favourable conservation status. These will be presented separately, for example within strategy documents.

The guidance document Defining Favourable Conservation Status in England describes the Natural England approach to defining favourable conservation status.

Summary definition of favourable conservation status

Kittiwake *Rissa tridactyla* is a surface feeding seabird that nests colonially on sea cliffs, and nearby structures, in many English coastal counties. It is found throughout the North Atlantic, feeding on small fish, zooplankton and other invertebrates close to the surface of the sea. It can be found throughout English territorial waters with numbers concentrated close to colonies during the breeding season.

In the first half of the 20th century there were probably fewer than 30,000 pairs of kittiwakes breeding in England. By the time of Operation Seafarer (1969-1970), the first comprehensive national survey, there were an estimated 50,000 pairs in England, the increase likely to be a result of a cessation of human persecution. The increase continued and by the time of the second national survey in 1985-88, there were an estimated 126,000 pars in England. Numbers have subsequently fallen, with as few as 76,000 pairs at the time of the 1998-2002 national survey. Numbers have continued to fall and many colonies in southern England have been abandoned. The causes of the current decline are likely to be related to warming sea surface temperatures, leading to a reduction in prey availability. Sandeel fishing may also be affecting breeding success by reducing the abundance of available prey.

Favourable breeding range and distribution is determined by the availability of nesting cliffs close to suitable foraging habitat (though birds often nest on man-made surrogates including offshore rigs and coastal buildings). The extent of maritime cliffs is stable over time therefore the favourable breeding range and distribution is all English coastal counties with sea cliffs suitable for breeding kittiwake.

Kittiwakes can be found at sea throughout English territorial waters throughout the year.

The favourable population is the breeding population before the current decline commenced, that is 126,000 breeding pairs as recorded in the Seabird Colony Register Census (1985-88).

Favourable supporting habitat is represented by the current extent of sea cliffs suitable for breeding kittiwake and suitable foraging habitat sufficient to support the favourable population.

Table 1: Confidence levels for favourable values

Favourable conservation status parameter	**Favourable status**	**Confidence in the parameter**
Range and distribution	The favourable breeding range is English coastal counties with suitable breeding habitat: Northumberland, Tyne & Wear, Durham, Cleveland, North Yorkshire, Humberside, Kent, East Sussex, Isle of Wight, Dorset, Cornwall, Isles of Scilly, Devon and Cumbria. Present at sea throughout English territorial waters throughout the year.	High
Population	126,000 breeding pairs.	Moderate
Habitat	Favourable breeding habitat is the current extent of stable sea cliffs with narrow ledges. Favourable foraging habitat requires suitable sea areas (with sufficient food availability) to support the favourable breeding population and to support non-breeding kittiwakes throughout English territorial waters at all times of year.	High

As of April 2022, based on a comparison of the favourable values with the current values, kittiwake is not in favourable conservation status. Note, this conclusion is based solely on the information within this document and not on a formal assessment of status nor on focussed and/or comprehensive monitoring of status.

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About the Defining Favourable Conservation Status project

Natural England's Defining Favourable Conservation Status (DFCS) project is defining the minimum threshold at which habitats and species in England can be considered to be thriving. Our Favourable Conservation Status (FCS) definitions are based on ecological evidence and the expertise of specialists.

We are doing this so we can say what good looks like and to set our aspiration for species and habitats in England, which will inform decision making and actions to achieve and sustain thriving wildlife.

We are publishing FCS definitions so that you, our partners and decision-makers can do your bit for nature, better.

As we publish more of our work, the format of our definitions may evolve, however the content will remain largely the same.

This definition has been prepared using current data and evidence. It represents Natural England's view of favourable conservation status based on the best available information at the time of production.

1. Species definition and ecosystem context

1.1 Species definition

Kittiwake *Rissa tridactyla*, also known as black-legged kittiwake, has a sub-arctic circumpolar distribution, breeding through much of the North Pacific as well as in the higher latitudes of the North Atlantic.

The birds found in the Pacific are described as a distinct subspecies *Rissa tridactyla pollicaris*, with a total population of about 1.9 million breeding pairs (Coulson 2011).

The nominate subspecies, *Rissa tridactyla tridactyla*, has a total population of about 2.8 million breeding pairs (Coulson 2011), breeding from northern Spain and Portugal (in very small numbers) to Svalbard in the east Atlantic (with largest numbers in Norway, Iceland, Russia, UK and Faroes), and in eastern Canada and Greenland in the west Atlantic. There is little genetic or morphological difference between birds from different parts of the North Atlantic, although size increases with breeding latitude, and there are some differences in the black wing-tip pattern and timing of moult and breeding with latitude (Coulson 2011).

1.2 Species status

Red list status

An assessment of the risk of extinction.

Global: Vulnerable. Population trend decreasing – this species has declined rapidly over the past three generations and the decline is likely to be continuing (BirdLife International 2019). The global population is estimated to number approximately 14,600,000 to 15,700,000 individuals (including immatures) (Wetlands International 2016). Red List history for this species is ‘Least Concern’ from 1988 to 2016, then moved to Vulnerable in 2017 and retained there since 2017.

European: Vulnerable. The European population is estimated to number 1,730,000 to 2,200,000 pairs (BirdLife International 2015).

GB: Critically Endangered (Stanbury and others 2021).

Conservation status

Birds of Conservation Concern: Green 1996-2001, Amber 2002-2007, Amber 2009-2014, Red 2017 (Eaton and others 2015; BTO BirdFacts 2019), Red 2021 (Stanbury and others 2021).

Listed on Annex III of the Bern Convention.

1.3 Life cycle

Kittiwakes spend most of their lives at sea. In England, adults return to reoccupy their nest sites between February and April. Birds from colonies in higher latitudes remain in English waters well into spring, often not returning to colonies in the Arctic until May (Furness 2015). There is, therefore, a prolonged spring migration from January to May through English waters (Furness 2015).

Kittiwakes first breed on average at four years old (Coulson 2011). The younger age classes of immature birds may remain at sea in wintering areas through the summer, whereas older immatures may visit colonies to look for potential nest sites (Coulson 2011). The immatures tend to visit colonies during the period when breeders are incubating (May and early June) but tend to disperse away from colonies during chick-rearing (late June and early July).

Chicks fledge in mid to late July, and the fledglings rapidly disperse from colonies, often moving into the North Atlantic (Coulson 2011). Immatures moult in summer during the months when adults are breeding (Coulson 2011). Adults moult the innermost primaries while incubating but undergo most of the moult after breeding (Coulson 2011). Moulting birds, especially moulting immatures, may congregate to rest on rocky coasts, beaches, or on man-made structures (such as harbour walls) during late summer and autumn (Brown & Grice 2005).

Autumn migration of kittiwakes usually occurs offshore and is not especially evident unless onshore winds drive these pelagic birds to the coast. Very large numbers of kittiwakes may pass headlands in late summer and autumn when birds are pushed close to shore by storms (Coulson 2011).

Some adults remain in English waters through the non-breeding period, but many move out across the North Atlantic (Frederiksen and others 2012). Some reach Canadian waters, perhaps mostly immature birds and failed breeders (Bogdanova and others 2011). Particularly during the non-breeding season, there may be large numbers of kittiwakes in English waters that are derived from colonies further north, including adults and immatures from the Arctic as well as from Scotland and Norway (Frederiksen and others 2012). These birds from different breeding localities are most likely all mixed up together, spending highly variable amounts of time in English waters.

1.4 Supporting habitat

The vast majority of kittiwakes nest on sea cliffs (Brown & Grice 2005; Coulson 2011). They prefer cliffs with narrow ledges, because they build substantial nests that are plastered onto these narrow ledges. The use of narrow ledges prevents access by many other seabirds that require broader ledges, such as guillemots, gannets and large gulls. The use of narrow ledges also allows kittiwakes to build rows of nests along the ledge, making it more difficult for other species of seabirds that might be able to land on a narrow

ledge (such as fulmars) from usurping such nest sites, and preventing access by predators such as jackdaws, ravens, carrion crows or large gulls.

Where there is little competition from other seabird species, and where predators are absent or in low numbers, kittiwakes may breed on sloping rocks or on broad ledges, but this is not common, and it leaves their nests much more vulnerable to competing seabird species and to predators.

Kittiwakes may nest in small numbers on man-made structures such as harbour walls, ‘kittiwake walls’ (specifically provided to accommodate the species) and warehouses, and several hundred nest on undisturbed offshore structures in Suffolk and Lancashire.

The most secure kittiwake colonies are probably those where birds nest within sea caves, on narrow ledges that overhang the water. The quality of such nest sites has been evident in Shetland in recent years, where kittiwake numbers have declined by over 90% and the few remaining colonies are in many cases within sea caves in sites that are largely inaccessible to avian or mammalian predators.

Kittiwakes tend to nest on the lower parts of high cliffs, apparently showing a preference for nesting relatively close to the water. Storms can sometimes result in kittiwake nests being washed away by exceptional waves and sea spray. Breeding success is higher in the central part of the colony, and those birds nesting on the edge of the colony are not only more vulnerable to predators but also tend to be lower quality individuals that are less able to compete for the best nest sites (Coulson 2011). Presence or absence of suitable cliff nesting habitat clearly constrains the breeding distribution and colony sizes of kittiwakes in many parts of the English coastline (Brown & Grice 2005; Coulson 2011).

Adults travel out to sea from the colony to forage, in the North Sea feeding predominantly on sandeels during the breeding season (Furness & Tasker 2000; Wanless and others 2018), whereas kittiwakes breeding in the Irish Sea also take sprats and other small fish (Chivers and others 2012). Based on a range of tracking studies in the UK and elsewhere, Woodward and others (2019) calculated a mean maximum foraging range for kittiwake to be 156.1 km (+/- 144.5 km). Mean foraging range was 54.7 km (+/- 50.4 km). There is high variability in the distance birds are travelling from colonies to forage, as shown by the large standard errors for the figures. Foraging distances vary between colonies and between years, and birds may commute longer distances in search of food from particularly large colonies (due to the high intra-specific competition for food created by large aggregations of birds) or where food is scarce (as seen in Shetland after the collapse of the local sandeel stock). Marine habitat requirements, or even habitat preferences, of foraging kittiwakes are not well understood, but the strong association between kittiwakes and sandeels during the breeding season (Furness & Tasker 2000) suggests that presence of aggregations of sandeels over suitable sandy banks is important for breeding kittiwakes.

Outside the breeding season, kittiwakes are more pelagic, and become widely dispersed over and far beyond English territorial waters. Mapping of kittiwakes at sea suggests that they do not tend to show strong preferences for specific marine habitats (Waggitt and others 2019) but tend to be widely distributed at relatively low densities. They tend to

occur only in very low numbers in waters south of about 50ºN, although why they prefer higher latitudes than 50ºN is unclear.

During the non-breeding season, kittiwakes take a wide range of foods, with zooplankton becoming more important than during breeding (Coulson 2011; Reiertsen and others 2014). Although kittiwakes are primarily visual feeders that snatch food at the sea surface during the day, they will also feed on bioluminescent fish such as myctophids where these can be caught at the sea surface at night (although myctophids are generally not found in North Sea waters but rather in deeper Atlantic waters). Kittiwakes will scavenge behind fishing boats, mostly outside the breeding season, taking offal and fragments of discarded fish, although they tend to be displaced by larger scavenging seabirds such as gannets, great skuas, fulmars and large gulls, and are unable to swallow the size of fish typically discarded from fishing boats. Distribution and behaviour of kittiwakes during the non-breeding period may therefore be influenced not only by availability of natural foods, but also by fisheries and by distributions and numbers of larger seabirds with which they must compete.

1.5 Ecosystem context

Kittiwakes breed on sea cliffs alongside other seabirds such as fulmars, guillemots, razorbills, cormorants and herring gulls.

Kittiwakes are surface feeders, feeding on small fish, zooplankton and other invertebrates within 1-2 m of the surface of the sea (OSPAR 2016). Kittiwakes are often found in mixed-species flocks foraging on schools of sandeels in summer, together with guillemots, razorbills, puffins, gannets and fulmars when offshore, and with these species plus terns, shags and gulls when close to the coast. They can also be found in the company of other surface feeders including fulmars, gannets, herring gulls, lesser black-backed gulls and great black-backed gulls behind trawlers in English waters (Garthe and others 1996). However, kittiwakes are primarily in inter-specific competition with these other seabirds for a valuable but ephemeral food resource, rather than benefiting from any associations.

2. Units

2.1 Natural range and distribution

Kittiwake breeding distribution in England is almost exclusively coastal, with most birds nesting on maritime cliffs. Natural range is best expressed as absence or presence of breeding pairs in counties of England.

Kittiwake foraging distribution during the breeding and non-breeding seasons is widely distributed across English territorial waters. The metric is therefore best expressed as numbers of kittiwakes per km^2 of sea.

2.2 Population

The conventional unit for counting breeding kittiwakes is the ‘apparently occupied nest’ which is essentially the same as ‘breeding pair’ (Mitchell and others 2004). There is a rigorously defined protocol for censusing kittiwake colonies using this count unit (Mitchell and others 2004), so this is the obvious metric to use in assessing population. It should be recognised, however, that this metric only refers to the breeding population plus birds attempting to recruit so building a nest and attending that nest (though not necessarily laying eggs).

2.3 Habitat for the species

The national surveys of breeding seabirds (1969-70, 1985-88, 1998-2002) have almost certainly identified all breeding colonies of kittiwakes in England during that period. Breeding habitat can therefore be defined as those sites supporting kittiwake colonies (as listed in the Joint Nature Conservation Committee Seabird Monitoring Programme (JNCC SMP) database).

Foraging habitat includes all English marine waters (Waggitt and others 2019). It would be possible to define preferred foraging habitat by setting an arbitrary threshold density such that preferred habitat was defined as all areas above that threshold density. However, threshold density is likely to vary over time as well as spatially. Therefore, such a process would be arbitrary, and difficult to justify empirically, except as an artificial process to discriminate between higher and lower quality foraging habitat.

3. Evidence

3.1 Current situation

Natural range and distribution

The national census of seabirds in 1998-2002 (Mitchell and others 2004) located breeding colonies of kittiwakes on the coasts of Northumberland, Tyne & Wear, Cleveland, North Yorkshire, Humberside, Kent, East Sussex, Dorset, Cornwall, Isles of Scilly, Devon, and Cumbria. In addition, breeding kittiwakes were found on man-made structures along the coast in Suffolk and off the coast in both Suffolk and Lancashire. However, there are no colonies on natural habitat in these two counties because suitable habitat is absent. The BTO 2007-11 Atlas shows the distribution of colonies in England (Balmer and others 2013).

Kittiwakes can be found at sea across all English territorial waters, at all times of year (Waggitt and others 2019).

Population

The most recent national census of breeding seabirds was Seabird 2000, carried out in 1998-2002 (Mitchell and others 2004). Numbers of kittiwakes breeding in England reported in that survey are shown in Table 2.

Table 2: Numbers of pairs of kittiwakes reported in the Seabird 2000 national census (Mitchell and others 2004) in each English county

County	Pairs in 1998-2002
Northumberland	8,621
Tyne & Wear	2,628
Durham	0
Cleveland	7,101
North Yorkshire	8,616
Humberside	41,971
Norfolk	0

County	Pairs in 1998-2002
Suffolk	369
Kent	1,229
East Sussex	1,002
Isle of Wight	0
Dorset	115
Cornwall	1,853
Isles of Scilly	281
Devon	1,204
Lancashire	22
Cumbria	1,269
England (total)	76,281

The size of the breeding population now is slightly uncertain because there has not been a complete national survey since 2000 (Musgrove and others 2013) but there are known to have been declines within England and elsewhere in the UK.

Breeding numbers have been counted in some colonies in some years since Seabird 2000 (see Seabird Monitoring Programme (SMP) database (JNCC 2019)). Those data show that breeding numbers have fluctuated from year to year in some colonies, have increased in others, and have decreased in yet others, with no clear and consistent trend in numbers among colonies. That said, more than half of colonies in southern England have been lost altogether and numbers of breeding pairs at remaining colonies have declined by two-thirds (McMurdo Hamilton and others 2016). More than half of the English breeding population is located at Flamborough Head and Bempton Cliffs (where numbers may have increased slightly in recent years), and about one-third of the population breeds along the north-east coast from Northumberland to North Yorkshire.

At sea survey data can be used to model the densities and broad-scale distribution of birds at sea (for example, Waggitt and others 2019). During the breeding season highest densities at sea are found close to the largest breeding colonies, whereas birds are more dispersed across a wider area in the non-breeding season. However, these data do not

provide information on the total number of birds at sea. In the non-breeding season Furness (2015) estimated that UK North Sea waters hold about 830,000 kittiwakes in autumn (August to December inclusive) and 630,000 in spring (January to April inclusive), that UK western waters hold about 910,000 kittiwakes in autumn and 690,000 in spring, based on data on colony population sizes, likely origin of birds using UK waters and population structure. However, these numbers were not broken down into separate totals for English, Welsh and Scottish waters. Trends in numbers at sea are not well known but may be assumed to be directly linked to trends at likely source colonies, which include colonies outside England and outside the UK.

Habitat for the species

Kittiwakes breed in about 40 colonies around the coast of England (Mitchell and others 2004). Colonies are mapped and defined within the SMP database. Kittiwakes breed (or have bred) in most coastal counties in England where there is suitable natural nesting habitat.

Mapping suggests that kittiwake distribution at sea during the breeding season is strongly influenced by the locations of large colonies. However, distribution at sea is much wider than can be explained only on the basis of the distribution of breeding colonies. It is clear that there are large numbers of kittiwakes in English territorial waters even during the breeding season that are likely to be immature birds, or birds from higher latitude populations that have not yet returned to their breeding areas (Wernham and others 2002; Furness 2015), or have taken a year off from breeding in order to improve their body condition.

Kittiwake non-breeding season distribution is widespread across English territorial waters, with a tendency for the at sea density of kittiwakes to decrease from north to south through English waters, becoming particularly low south of 50^{o}N (Waggitt and others 2019).

Maps of kittiwake density at sea suggest that the natural range of kittiwakes in English territorial waters is throughout all English territorial waters (Waggitt and others 2019).

Confidence: Moderate overall, though better for breeding distribution and numbers than for at-sea distribution and numbers.

3.2 Historical variation in the above parameters

Breeding numbers of kittiwakes were greatly reduced during the 19th century by human harvesting for feathers and food and killing for sport (Holloway 1996). Kittiwakes were killed in very large numbers all around the coast of England for their feathers, used in the millinery trade, for food (eggs, chicks and adults), and as target practice or sport shooting from boats, often from below colonies (Holloway 1996; Coulson 2011). Numbers at many colonies were greatly reduced; colonies on the Isle of Wight were eradicated, only three kittiwake nests remained in the Isles of Scilly in 1900, and the species was close to extinction as a breeding bird in Cornwall (Coulson 1963).

As a direct consequence of the slaughter of kittiwakes, the 1869 Sea Birds Preservation Act was brought in, and although persecution continued, the level was progressively reduced. As persecution declined in intensity, there was a steady increase in numbers of kittiwakes breeding in England (Holloway 1996). Between 1920 and 1969, breeding numbers in England increased at about 3-4% per annum (Coulson 1963), after which the rate of increase slowed (Lloyd and others 1991) and numbers have subsequently declined markedly.

Natural range and distribution

Despite very large changes in breeding numbers, the species' overall range and distribution changed relatively little between 1800 and the Seabird 2000 survey (Holloway 1996; Mitchell and others 2004; Brown & Grice 2005; Balmer and others 2013). Numbers of colonies increased over the 20th century (Coulson 2011; Mitchell and others 2004; Brown & Grice 2005), with some extension of breeding range in Suffolk and Lancashire due to colonisation of man-made structures by kittiwakes where no suitable cliff-nesting habitat is available (Brown & Grice 2005).

However, the distribution appears to be contracting in southern England with the loss of 58% of colonies in Kent, Sussex, Dorset, Devon, Cornwall and the Isles of Scilly since the time of the 1998-2002 national seabird census (McMurdo Hamilton and others 2016).

Population

Coulson (1963) estimated that there were 37,000 breeding pairs in England and Wales in 1959.

National seabird censuses in 1969-70, 1985-88 and 1998-2002 provide comprehensive estimates of breeding numbers in England (Table 3), although the 1969-70 estimate of 49,676 pairs may be an underestimate as coverage during that survey was incomplete.

Table 3: Breeding numbers of kittiwakes on the coasts of English counties reported in the three national surveys of breeding seabirds (Mitchell and others 2004).

County	Pairs in 1969-70	Pairs in 1985-88	Pairs in 1998-2002
Northumberland	2,935	6,638	8,621
Tyne & Wear	3,559	4,074	2,628
Durham	10	0	0
Cleveland	1,809	12,715	7,101
North Yorkshire	4,276	7,451	8,616

County	Pairs in 1969-70	Pairs in 1985-88	Pairs in 1998-2002
Humberside	30,797	83,694	41,971
Norfolk	3	0	0
Suffolk	32	93	369
Kent	50	2,450	1,229
East Sussex	0	972	1,002
Isle of Wight	8	0	0
Dorset	262	375	115
Cornwall	839	3,429	1,853
Isles of Scilly	1,400	1,210	281
Devon	2,228	1,713	1,204
Lancashire	0	0	22
Cumbria	1,468	995	1,269
England (total)	49,676	125,819	76,281

The validity of the counts undertaken at Flamborough Head and Bempton Cliffs between 1979 and 1987 has been questioned by Coulson (2011, 2017), on the basis that they suggest a doubling and then halving of the colony numbers of kittiwake between 1969 and 2000. These numbers are significant because that colony holds more than half of the breeding kittiwakes in England. The count data, and other evidence and information available for the 1979, 1986 and 1987 counts, have been reviewed by Natural England (Natural England 2020) with the conclusion that the 1987 count of 85,395 AON kittiwake at Bempton Cliffs and Flamborough Head (that is, the count on the JNCC SMP database), is accurate and valid. Note: this figure is a little higher than the figure in Table 3 as the Flamborough Head and Bempton Cliffs site does not fall completely within Humberside and some count sectors are missing from some of the published figures for the whole colony in both Lloyd and others (1991) and Mitchell and others (2004).

McMurdo Hamilton and others (2016) have found that since the time of the 1998-2002 national seabird census the number of colonies in southern England has more than halved and breeding numbers at remaining colonies have declined by 66%.

Balmer and others (2013) suggest that the abundance of kittiwakes along the coasts of England in winter may have decreased between 1981-84 and 2007-08 winter atlases. Since most kittiwakes in winter remain offshore, this trend may not reflect change in abundance across all of English territorial waters. But it would be consistent with the general decline in kittiwake numbers in the biogeographic population over the last few decades.

Habitat for the species

There has been almost no change in the availability of nesting habitat for kittiwakes in England over the last two hundred years. A few man-made structures (such as harbour walls, warehouses, castles, piers, outfall pipes, oil and gas platforms) have become available for kittiwakes to nest on as a result of human activity. Some of these have then been lost to kittiwakes through demolition or modification/redevelopment. However, the availability of sea cliffs has remained almost unchanged.

Kittiwakes in the North Sea predominantly feed on sandeels during the breeding season, so preferred foraging habitat of breeding kittiwakes is over sandbanks supporting high abundances of sandeels near to kittiwake colonies (since sandeels show little movement over the sea but tend to remain close to areas of suitable sand in which they can burrow (Wright and others 2018)). The abundance of sandeels, and therefore the foraging habitat available to kittiwake, has been affected by fishing activity in recent decades. Productivity data for Flamborough Head and Bempton Cliffs SPA shows a statistically significant decrease since the 1980s, with that reduction largely being attributable to high fishing mortality of sandeels resulting in a reduction in sandeel abundance (Carroll and others 2017). The relationship found by Carroll and others (2017) in relation to sandeel stock in ICES sandeel management Area 1 (‘Dogger Bank’ and neighbouring areas) is similar to that previously identified elsewhere. Kittiwake breeding success and adult survival at Shetland were closely related to changes in sandeel stock biomass in that area (Furness & Tasker 2000; Oro & Furness 2002; Furness 2007), and kittiwake breeding success at the Isle of May was strongly influenced by effects of sea surface temperature and sandeel fishing on the sandeel stock off the Firth of Forth, east Scotland (Frederiksen and others 2004).

Lindegren and others (2018) carried out a hindcast analysis of the Dogger Bank sandeel stock to assess the consequence of the high fishing mortality. They estimated that sandeel spawning stock biomass would have been about twice as large now as it is, if the fishery had maintained fishing mortality at F=0.4 rather than at the levels of F=0.8 to 1.2 as seen during 1999-2009 in the history of this fishery. The stock would be larger still had there been no sandeel fishery, although Lindegren and others (2018) did not report on that scenario. However, their results further support the conclusion that the high fishing mortality imposed on the sandeel stock has been a major influence on the abundance of the sandeel.

Confidence: Moderate

3.3 Future maintenance of biological diversity and variation of the species

Kittiwakes are strongly affected by climate change; warming has reduced breeding success and survival (Frederiksen and others 2004, 2007; Sandvik and others 2005; Frederiksen and others 2013; Sandvik and others 2014). Other surface feeders have also experienced frequent, widespread breeding failure, but water-column feeding species, which also feed on fish but can dive to catch prey below the surface, have not experienced the same breeding failures. This suggests that it is the availability of prey to surface feeders that is affecting breeding success (OSPAR 2016). The poor breeding success of kittiwakes has been related to increases in sea surface temperature (Frederiksen, 2004; 2007; Cook and others 2014) and stratification within the water column (Carroll and others 2017), suggesting these environmental factors are important in determining the abundance or availability of sandeels to kittiwakes and other surface-feeders (Mitchell and others 2018). Lindegren and others (2018) also identified influences of sea temperature and copepod abundance on the abundance of sandeels and suggested that long term trends in those drivers may inhibit recovery of sandeels if fishing pressure was reduced.

Kittiwakes are also strongly affected by fisheries. In the North Sea, breeding success of kittiwakes is influenced by sandeel abundance in the stock closest to the colony (Oro & Furness 2002; Frederiksen and others 2005) and by the scale of fishing on the sandeel stock, which reduces sandeel abundance (Frederiksen and others 2004; Carroll and others 2017; Lindegren and others 2018). Breeding success of kittiwakes was lower at the Isle of May by about 0.5 chicks per pair during years when there was a sandeel fishery there, compared to years without a fishery (Frederiksen and others 2004). Breeding success of kittiwakes at Flamborough and Filey Coast SPA was lower in years following high fishing mortality imposed on the Dogger Bank sandeel stock (Carroll and others 2017). Therefore, a reduced sandeel abundance could result in a decline in kittiwake population and that population contracting its spatial distribution. Sandeel abundance may also be sensitive to changes in abundance of predatory fish stocks. There is considerable uncertainty as to whether increases in abundance of major predators of sandeels, such as adult herring, mackerel, cod, hake, haddock and whiting, because of reduced fishing effort for these species, may increase the predation pressure on sandeels and lead to reduced abundance of sandeels.

Bycatch of kittiwakes in fisheries is thought to be small, and not significant in terms of impact on the population (BirdLife International 2009).

Although persistent organic pollutants and mercury are found in kittiwake tissues, kittiwakes occasionally die from oil pollution, and some become entangled in lost fragments of fishing net, there is no evidence to suggest that pollutants are a cause of population decline.

Kittiwake breeding success can be affected by predators at colonies, but most colonies are on cliffs that make access to nests extremely difficult for any mammalian predators. Although some avian predators take kittiwake eggs and chicks, and large avian predators such as peregrine or white-tailed eagle may take some kittiwake adults, the impact of predators on kittiwake breeding success or survival tends to be local and mostly evident at small colonies or declining colonies (see for example Oro & Furness 2002).

Kittiwakes are considered to be one of the seabird species at relatively high risk of collision with turbine blades at offshore wind farms (Garthe & Hüppop 2004; Furness and others 2013a). Although there is still very little empirical evidence of the numbers of kittiwake collisions occurring at operational offshore wind farms (Skov and others 2018), modelling collision risk suggests that the impact on populations in the North Sea, especially in the southern North Sea, may be significant and is likely to increase the rate of decline of kittiwake populations if these are already in decline due to climate change and fishery impacts (Black and others 2019; Black & Ruffino 2019). However, the evidence suggests that impacts of climate change and fisheries may be stronger drivers of population change than impacts of offshore wind farm collision mortality on kittiwake populations.

Natural range and distribution

The impacts of climate change and high fishing mortality on sandeels in the southern North Sea (Lindegren and others 2018), together with increasing collision risk at offshore wind farms, suggest that kittiwakes may experience some contraction of breeding range in England, and this may explain the observed contraction in distribution seen in southern England. Since the kittiwake breeding population is a meta-population (that is, young produced at one colony may recruit to breed in one of several other colonies rather than necessarily returning to their natal colony to breed; Coulson & Coulson 2008), the low breeding success and population declines of kittiwakes in northern Scotland and in Norway may reduce the scope for immigration of immature birds from those populations into English colonies. If colonies have too few recruits to sustain losses caused by adult mortality, declines may disproportionately affect colonies that have low productivity (Danchin and others 1998; Cadiou 1999; Boulinier and others 2008; Coulson & Coulson 2008), in which case some colonies may be lost altogether while others may remain. Loss of colonies in the southern part of the species range is now well-documented (McMurdo and others 2016).

It seems likely that the at-sea range and distribution of kittiwakes in English waters will continue to be the same as at present, with birds distributed across the entire area but with lower densities in the southern part of this range than in the north.

Population

The impacts of climate change and high fishing mortality on sandeels in the southern North Sea, together with increasing collision risk at offshore wind farms, especially in the southern North Sea, suggest that kittiwakes would be likely to decline in breeding numbers at English North Sea colonies in future decades if these pressures remain or increase.

There is considerable uncertainty as to whether collision mortality of kittiwakes at offshore wind farms will represent a significant impact on the population or whether climate change and fishing impacts will be the dominant drivers of kittiwake numbers.

Habitat for the species

The key habitats for kittiwakes are cliffs with stable narrow ledges for breeding, marine foraging areas with food availability to support breeding colonies, and offshore marine areas where non-breeding kittiwakes can feed on a variety of zooplankton as well as small fish. The last habitat includes international waters west of the British Isles across to Canada. It is unlikely that the amount or location of any of these key habitats will change in the short term, although long-term climate change may influence the distribution of sand banks suitable for sandeels and may influence sandeel abundance.

Confidence: High, Moderate for habitat

3.4 Constraints to expansion or restoration

Suitable cliffs for kittiwakes to nest on are a limiting resource in much of the coastline of England (Brown & Grice 2005; Coulson 2011). There are no possibilities to increase cliff habitat availability. Provision of artificial nest sites may be a possibility for restoration of breeding numbers if birds are lost from some existing sites, but that could probably only provide small numbers of nest sites relative to the size of the population.

Foraging habitat may be lost if sandeel stocks decline due to climate change, high fishing mortality of sandeels or recovery of stocks of predatory fish. Restoration of sandeel stocks may be possible through reduction in fishing mortality of sandeels (reduced fishing effort, or closed areas near to kittiwake colonies, or closure of sandeel fishing in English waters) (Lindegren and others 2018; Wright and others 2018). However, such measures might be of limited benefit because a decline in the carrying capacity in future decades is likely due to continuing climate change effects on the marine ecosystem which are anticipated to make conditions less favourable for kittiwakes. There is also the possibility that increases in populations of predatory fish, through reduced fishing mortality, may impact on sandeel populations.

Confidence: Moderate

4. Conclusions

4.1 Favourable range and distribution

Breeding where suitable cliff habitat provides narrow ledges on stable sea cliffs, in Northumberland, Tyne & Wear, Durham, Cleveland, North Yorkshire, Humberside, Kent, East Sussex, Isle of Wight, Dorset, Cornwall, Isles of Scilly, Devon and Cumbria.

Present at sea throughout English territorial waters throughout the year.

These ranges and distributions are not only those seen at present but are much the same as has been seen for many decades, so these are clearly relatively stable over time, as might be expected given the nest site requirements that constrain breeding range and the widespread distribution of the species at sea.

Breeding range is monitored by visits during the breeding season (May-July inclusive) to suitable cliff habitat. At sea range and distribution could be monitored by digital aerial surveys or ship-based surveys.

4.2 Favourable population

Favourable population: 126,000 pairs.

Through much of the 20th century numbers of breeding pairs of kittiwakes increased, following the cessation of human persecution. Part of the increase may have been due to increases in sandeel stocks because of the overfishing of their key predators, such as cod, haddock, whiting, and herring. More recently, kittiwake populations have declined probably due to overfishing of sandeel stocks and the impacts of climate change. Therefore, the population size for favourable conservation status has been defined as the population size before more recent pressures have reduced the population, though it is a possible that the population has benefitted from unusually abundant prey itself 'released' from natural predation pressure brought about by overfishing of those predators.

4.3 Favourable supporting habitat

Breeding habitat requires maintaining the current resource of cliffs with narrow ledges.

Favourable foraging habitat requires suitable sea areas (with sufficient food availability) to support the favourable breeding population and to support non-breeding kittiwakes throughout English territorial waters at all times of year.

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