CHAINSPAN

Climate Change Impacts on Avian Interests of the SPA Network

A policy-focused summary of the CHAINSPAN project

The current UK SPA network is projected to be relatively resilient to future climate change. Resilience may be further increased through better SPA management, bigger SPAs and better connected SPAs.

Introduction

- Establishment of the European network of Special Protection Areas (SPAs) has proven to be one of the region's most effective tools for the conservation of birds and their habitats.
- SPAs are designed to protect and manage the habitats of rare and threatened birds on Annex I of the EU Directive on the conservation of wild birds, such as golden eagles, stone curlews and roseate terns, as well as regular migrants, like the millions of wintering and passage swans, geese, ducks and waders that rely on our wetland and coastal habitats.

Stone curlews are an Annex I species whose populations are projected to increase as a result of climate change

Upland SPAs may support a range of Annex I upland bird species at the southern edge of their global range in the UK

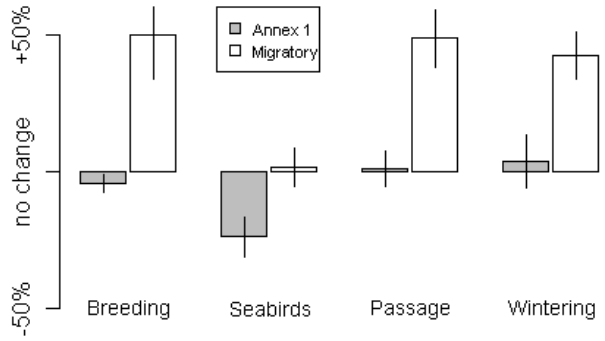
- There is considerable debate about the likely impacts of climate change on the SPA network, as on all other protected areas. By modelling future changes to the abundance of Annex I and migratory species in response to climate change, CHAINSPAN has helped develop our understanding of the potential scale, pace and location of change with respect to our internationally important bird sites. It has also helped us assess the future resilience of the UK's SPAs network as a whole.

BOX: Limitations and assumptions

- There were too few data to allow us to model the abundance of rare or poorly monitored species. Models assume that the relationships between abundance and climate do not change through time. To provide a fixed benchmark of change, SPA feature qualifying thresholds remain constant.
- Outputs should be viewed in the light of the assumptions and uncertainty underpinning the climate change projections employed in this study.
- Model validation showed that between-site variation in the density of many species was relatively weakly related to climate. This suggests that site-quality is a key determinant of abundance. We assumed that populations of species very poorly predicted by climate remain unchanged in the future.
- We use the ratio of observed to predicted densities to moderate future projections by site-quality. However, this means that many of the model results do not allow for the colonisation of new sites.
- Reassuringly, recent population trends in modelled species were significantly correlated with projected future trends, providing an important validation of our approach.
- In addition to the models, we also conduct a qualitative review of the potential for colonisation of additional species as a result of climate change.

Projected changes

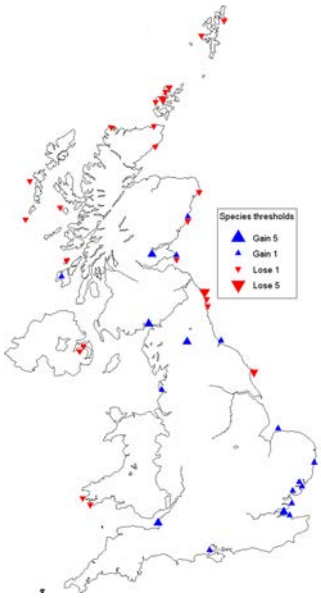
- More species were more likely to benefit from climate change in the short (2020) to medium (2050) term and under a low-emissions scenario than were not likely to benefit, but with increasing severity of climate change, a greater proportion of species were projected to decline in abundance than increase. For the species modelled, projected population trends on the existing UK SPA network were less favourable for Annex 1 species than for migratory species.



Projected changes in the mean proportion of SPA features per site for different species groups and status (Annex I or Migratory) under a 2050 medium emissions scenario.

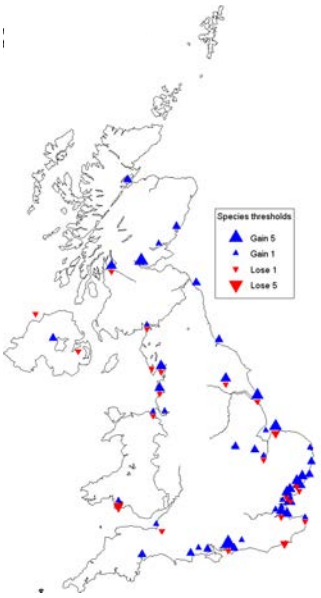
- Populations of northern breeding species on SPAs, particularly seabirds, were projected to be most vulnerable to future climate change. Milder winters were projected to benefit wintering SPA populations of many waterbirds, although potentially detrimental effects of climate change on their breeding grounds were not accounted for by the models. Southerly distributed heathland species were projected to benefit from climate change.

- Large sites were projected to continue supporting important numbers of many bird species into the future and therefore are likely to remain key sites irrespective of climate change.



Breeding seabirds. SPA populations of many northern seabirds are projected to decline, matching recent trends in breeding performance

Projected changes in the number of qualifying features at individual SPAs as a result of changes in SPA populations of individual species. Significant latitudinal shifts in species composition at many sites are likely, suggesting that site managers may consider the species assemblage present on more southerly sites in order to inform likely future changes in site composition.



Wintering waterbirds. SPA populations of many wintering waterbirds are projected to increase as a result of milder winters, although climate change impacts on the arctic and sub-arctic breeding grounds may prevent such increases occurring.

Implications for particular habitats within SPAs

Intertidal habitats: The UK's intertidal habitats support and are projected to continue to support internationally important waterbird populations and thus the maintenance of a coherent network of sites capable of hosting internationally important waterbird populations should remain a priority. This is likely to require compensation for projected losses of intertidal habitat through coastal squeeze. Potentially limited opportunities for intertidal habitat creation mean that where they take place they should be designed to maximise their short- and long-term benefits for SPA features.

Intertidal habitats projected to remain important and therefore should be subject to continued protection.

The creation of inland reedbeds away from risk of coastal inundation will benefit breeding waterbirds now and provide potential habitat for future colonists, such as purple heron.

Lowland freshwater wetlands: Most sites are projected to continue to support important numbers of wintering and passage waterbirds, although the species mix is projected to change. Amongst the most vulnerable habitats are freshwater reedbeds in coastal areas at risk of salt-water incursion. New reedbeds may be created inland by way of compensation for the loss of those currently used by species such as bitterns, and most may be used by potential Annex I colonists. As evaporation increases with warmer temperatures, predicted increases in the rate of drawdown of water in spring and summer are likely, and will reduce habitat quality at some sites. These negative impacts may be mitigated using a range of hydrological measures. Such reductions in water supply in spring and summer are predicted to reduce the dilution of nutrients from agricultural runoff and other inputs which together with higher temperatures, is likely to increase eutrophication and reduce habitat quality for some SPA features. We do not currently have enough large, undisturbed wetlands of suitable quality in the UK to support other than very small, or very localised, breeding populations of the following potential Annex I colonists: night-heron, great white egret, purple heron, glossy ibis and spoonbill. Increasing the size of lowland freshwater wetlands or wetland complexes will both increase the resistance of current SPA features to climate change and provide suitable conditions for potential Annex I colonists.

Saline lagoons & brackish marshes: Changes in climate are predicted to affect the abundance of invertebrate prey for waterbirds through affecting within-year variation in salinities, and the accessibility of these prey through affecting seasonal changes in water levels. The likely impacts of these effects, and the ability to adapt to negative impacts on birds, will differ between sites depending on details of their hydrology. We do not currently have large enough complexes of saline lagoons in the UK to support more than very small breeding populations of the full range of predicted Annex I colonists associated with saline lagoons.

Lowland heathland, lowland dry and coastal grassland and cropped/fallow land: The UK's climate is projected to become increasingly suitable for Annex I species breeding in these habitats. However, as most of these are sensitive to human disturbance, some management of recreational pressure may be necessary to facilitate the colonisation of relatively disturbed sites. The projected expansion in range and population of Dartford warblers, and possibly some other species, might be limited at some sites by the replacement of dwarf-shrub heath with grassy vegetation as a result of interactions between increased nitrogen availability and climate change. Although this can be mitigated against through intensive management, such measures may be impractical at a large scale. The potential colonisation of sites in southern and south-eastern England by several continental Annex I species is likely to be limited by a lack of colonists. Most of the potential source populations for these species in western Europe have been in decline during a period when climatic conditions in western Europe are predicted to have become more suitable for them.

Land management to improve habitat conditions can increase the resistance of upland species, like this golden plover, to climate change

Upland & montane habitats: Projected reductions in the abundance of upland birds on SPAs and the relatively small number of potential Annex I colonists (lowland heathland species predicted to increase their altitudinal range), mean that land management should seek to increase the resistance of existing populations to climate change by improving habitat conditions and reducing other sources of harm not linked to climate change. Priorities for management include minimising the impacts of artificial drainage, poor burning and grazing management, afforestation adjacent to open-ground SPAs, recreational disturbance and illegal persecution as well as detrimental changes in land-use on surrounding agricultural land used by the birds nesting in upland SPAs. Recent research suggests there is considerable potential for such adaptation management to be successful.

Co-ordinated management work to create more nesting sites safe from tidal inundation, human disturbance and predation will be important if projected increases of little terns are to be realised

Seabirds: Populations of many northern seabird species of which the UK currently supports internationally important numbers, are projected to decline, thus continuing recent trends in breeding performance and population trends. The suggested main aims of adaptation should therefore be to increase the resistance of our existing internationally important populations of breeding seabirds. The main suggested measures for increasing the resistance of seabirds are minimising pressures on their food supply from commercial fishing, avoiding locating marine energy installations in important foraging areas, and reducing pressure on nesting islands from introduced predatory mammals, particularly brown rats. The UK's climate is projected to become more suitable for breeding little terns, but this benefit could be undermines by loss of suitable nest sites through coastal squeeze. It should therefore be a priority to maintain and create nesting areas for little terns that are safe from tidal inundation, human disturbance and high levels of predation.

Policy implications

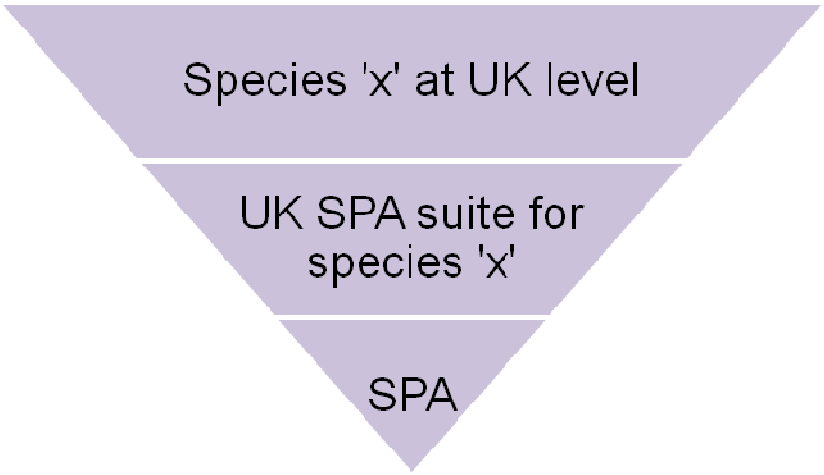
- Our results provide significant support for the application of existing climate change adaptation principles to the UK SPA network.

- Paraphrasing *Making Space for Nature* (Lawton et al, 2010), the main implications may be summarised as better managed, bigger and better connected SPAs.

Better managed SPAs will be essential to optimise their value for birds both now and in the future and to maximise their resilience to future change. There should be greater clarity in setting SPA conservation objectives and favourable condition targets, not least to allow them to accommodate the changes anticipated as a result of climate change. Long-term monitoring will be essential in underpinning the SPA programme.

Bigger SPAs are likely to support the highest numbers of birds now and into the future. Larger sites will be more resilient to change and better able to accommodate colonisation by new species, although we probably do not have large enough freshwater and brackish wetlands in the UK to support anything other than very small populations of several potential colonists, such as spoonbills, great white egrets and purple herons. Following *Making Space for Nature*, measures for habitat restoration and creation should focus on adding to existing SPAs where appropriate, whilst management to increase heterogeneity will also increase resilience. With appropriate planning, more sites may need to be established to enable the UK's SPA network to support the full range of Annex I and migratory bird species predicted to occur in the UK as the climate changes.

Better connected SPAs may be required to accommodate the projected latitudinal shifts in the abundance of species. Whilst it is unclear how important increasing connectivity within the UK SPA network will be for facilitating range shifts for most species, the projected dynamism means that continued reviews of the performance of the network will be essential.



Work to increase UK SPA network resilience would benefit from co-ordinated adaptive management at different spatial scales.

The Natura 2000 and Ramsar Steering Committee, supported by the UK SPA and Ramsar Scientific Working Group, could play a crucial role in such work.

Conclusion

Although some species are likely to suffer as a result of climate change and others are likely to benefit, we estimate that the current UK SPA network is likely to be relatively resilient to future climate change. By protecting and managing many large areas of semi-natural habitats and concentrations of birds, SPAs will continue to support important populations of birds in a changing climate. Whilst declines in vulnerable northern species seem likely, management to improve site-quality and reduce the severity of other pressures may reduce the magnitude of such reductions. Management to increase site-size and quality may also increase the ability of sites to accommodate change.

Monitoring and review

Ongoing common standards monitoring of the condition of the UK's SPAs and their features, their response to climate change and the success of any management interventions will be key to any strategy devised to help ensure the UK's SPA network is able to adapt to climate change.

The projections suggest that the spatial distribution, abundance and composition of bird species within the SPA network could be significantly different to the present day. Continuing with the roughly decadal reviews of the UK SPA network would seem appropriate to take account of new monitoring data and scientific evidence on the impacts of climate change.

In general, the implementation of existing legal and policy mechanisms may be adapted to enable such changes to occur on the ground and therefore maximise the opportunities for appropriate steps to help Annex I and migratory birds in the UK to adapt to climate change. In order to be effective, such adaptation action should be underpinned by sound-science, based on effective monitoring of change and research to identify and test the most effective solutions.

BOX: Key terms

Resilience. The ability of a species or population to absorb disturbances, in this case from climate change, while retaining the same basic structure and function. The focus of much **adaptive management** is to increase the resilience of species and populations to climate change, and may involve management for accommodation or management for resistance

Resistance. The capacity of a species or population to remain unchanged in the face of climate change. Management may be used to increase the resistance of a species or populations to climate change.

Accommodation. The ability of new species to colonise a site, or populations to increase at a site, in response to climate change. Management for accommodation will therefore increase the potential suitability of a currently unoccupied site for a future colonising species.

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