STATE OF NATURE

UK OVERVIEW

Chris O'Reilly (rspb-images.com)

2023 | state of nature PARTNERSHIP

Capercaillie, Dave Braddock (rspb-images.com)

SUMMARY

The UK, like most other countries worldwide, has experienced a significant loss of biodiversity. The trends in nature presented here cover, at most, 50 years, but these follow on from major changes to the UK's nature over previous centuries. As a result, the UK is now one of the most nature-depleted countries on Earth.

The main causes of these declines are clear, as are many ways in which we can reduce impacts and help struggling species. The evidence from the last 50 years shows that on land and in freshwater, significant and ongoing changes in the way we manage our land for agriculture, and the effects of climate change, are having the biggest impacts on our wildlife. At sea, and around our coasts, the main pressures on nature are unsustainable fishing, climate change and marine development.

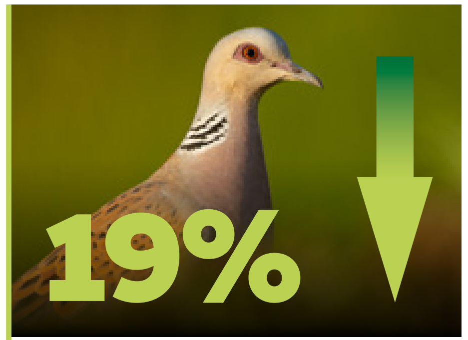
More broadly there has been growing recognition of the value of nature, including its role in tackling climate change, and the need for its conservation among the public and policymakers alike.

With each report our monitoring of change improves and we have never had a better understanding of the state of nature. Yet, despite progress in ecosystem restoration, conserving species, and moving towards nature-friendly land and sea use, the UK's nature and wider environment continues, overall, to decline and degrade. The UK has set ambitious targets to address nature loss through the Global Biodiversity Framework, and although our knowledge of how to do this is excellent, the size of the response and investment remains far from what is needed given the scale and pace of the crisis.

We have never had a better understanding of the State of Nature and what is needed to fix it.

#STATEOFNATURE

Terrestrial and freshwater



The abundance of 753 terrestrial and freshwater species has on average fallen by 19% across the UK since 1970.

Within this average figure, 290 species have declined in abundance (38%) and 205 species have increased (27%).

The UK distributions of 4,979 invertebrate species have on average decreased by 13% since 1970.

Stronger declines were seen in some insect groups which provide key ecosystem functions such as pollination (average 18% decrease in species' distributions) and pest control (34% decrease). By contrast, insect groups providing freshwater nutrient cycling initially declined before recovering to above the 1970 value (average 64% increase in species' distributions).

Since 1970, the distributions of 54% of flowering plant species and 59% of bryophytes (mosses and liverworts) have decreased across Great Britain.

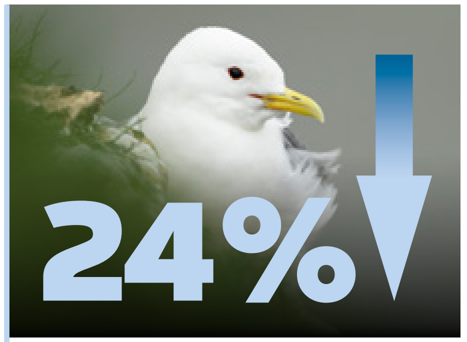
By comparison, only 15% and 26% of flowering plants and bryophytes, respectively, have increased. In Northern Ireland, since 1970, 42% of flowering plant species and 62% of bryophytes have decreased in distribution, compared to 43% and 34%, respectively, that have increased.

Turtle dove, Ben Andrew (rspb-images.com); Forester moth, Mike Read (rspb-images.com); Heath Spotted-Orchid, Andy Hay (rspb-images.com); Ladybird Spider, Ian Hughes (rspb-images.com); Kittiwake, Ben Andrew (rspb-images.com); Grey Seal, Ben Hall (rspb-images.com); Atlantic Yellow Nosed Albatross, Steffen Oppel (rspb-images.com)

10,008 species were assessed using Red List criteria.

2% (151 species) are extinct in Great Britain and a further 16% (almost 1,500 species) are now threatened with extinction here. In Northern Ireland, 281 (12%) of 2,508 species assessed are threatened with extinction from the island of Ireland.

Marine



The abundance of 13 species of seabird has fallen by an average of 24% since 1986.

The situation is worse in Scotland, where the abundance of 11 seabird species has fallen by an average of 49% since 1986. These results pre-date the potentially major impact of the ongoing outbreak of Highly Pathogenic Avian Influenza.

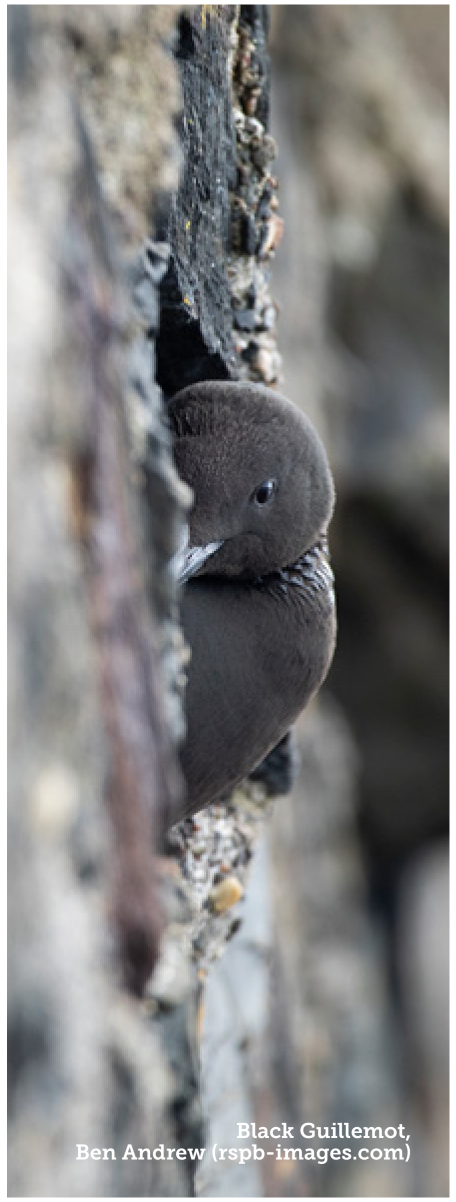
Varied picture for other marine life.

We know less about changes in species' abundance and distribution in UK seas. Well-monitored species of demersal fish (those living on or near the seafloor, 105 species) showed an average increase in abundance during the 1990s and early 2000s but have since declined. Whales and dolphins (three species) have shown little change in average abundance since the early 1990s. Grey Seal abundance has increased as they recover from historical hunting pressure. Harbour Seals are in decline in parts of north-east Scotland and south-east England, but are stable or increasing in other regions.

UKOT and CDs

UK Overseas Territories and Crown Dependencies.

94% of the species unique to the UK and its territories are found on the Overseas Territories. Across the Overseas Territories and Crown Dependencies, 11% of 6,557 species assessed are threatened with global extinction.



Black Guillemot, Ben Andrew (rspb-images.com)

What do our headlines mean?

This report focuses on three measures of biodiversity change: abundance (the number of individuals), distribution (the proportion of sites occupied) and extinction risk. These measures have been assessed for hundreds and in some cases thousands of species native to the UK, as the available data allow.

Our results show:

- The number of species that have increased or decreased in abundance or distribution over time
- The average change in abundance or distribution across species over time
- The proportion of species at risk of being lost from the country.

Here we present UK findings in most cases. Where UK information is not available, we present results for Great Britain and Northern Ireland separately.

RESPONDING TO THE CRISIS

The UK and many of the UK Overseas Territories and Crown Dependencies are party to a new set of international biodiversity targets under the Convention on Biological Diversity (CBD): the Global Biodiversity Framework. To support the delivery of these, each UK country has committed to developing and implementing national biodiversity strategies. In many cases, countries have developed (or are committed to developing) legally binding targets to restore nature. In this report, we have grouped the CBD targets into the five broad areas discussed below.

IMPROVING SPECIES STATUS:

There is good evidence that conservation can be effective for individual species when it can be applied to a large proportion of the population, and targeted conservation action has set some species on the path to recovery. Halting and reversing biodiversity decline is vital, but it is only the first step towards a healthy environment with resilient species populations, thriving habitats and functioning ecosystems.

> ***"targeted conservation action has set some species on the path to recovery"***

INCREASING NATURE-FRIENDLY FARMING, FORESTRY AND FISHERIES:

In the UK a fifth of farmland is in agri-environment schemes, but only a part of this could be considered as nature-friendly farming. 44% of woodland is certified as sustainably managed and half of marine fish stocks are sustainably harvested. All three measures have improved over the past 20 years, but there is a long way to go. Sustainable management is a positive step but does not necessarily mean the same as well-managed for nature. At a local level, many species benefit from nature-friendly farming, but the impact of different schemes on species populations has been variable. The best available information suggests that nature-friendly farming needs to be implemented at a much wider scale to halt and reverse the decline in farmland nature. The increased proportion of sustainably harvested fish stocks appears to be having a positive impact, with the proportion of large fish in landings, an indication of population health, increasing since 2002.

> ***"nature-friendly farming needs to be implemented at a much wider scale to halt and reverse the decline in farmland nature"***

EXPANDING AND MANAGING PROTECTED AREAS:

11% of UK land is in protected areas (areas subject to a legal nature conservation designation). However, within this only 44% of the measured attributes of terrestrial and freshwater Areas or Sites of Special Scientific Interest are in favourable condition. In protected areas on land, there is some evidence that target species or species of conservation concern have more positive trends than outside them. Although 38% of UK waters are designated as protected areas, we lack a comprehensive condition assessment and management is not yet fully implemented at most sites. Work is ongoing to designate marine protected areas and implement fisheries management within them. This will contribute towards the 2030 target of 30% of land and sea under effectively managed protected areas or other areas well-managed for nature.

> ***"Only 11% of UK land is in protected areas, and not all of these are well-managed for nature"***

INCREASING ECOSYSTEM RESTORATION:

Restoration is taking place across a wide range of ecosystems, from peatlands to urban forests to seagrass beds, with more than 5,000 hectares (ha) of degraded peatland being restored each year. Despite this, only 14% of priority habitats, 7% of woodland and 25% of peatlands are assessed to be in good condition. Large areas of the UK seafloor do not meet Good Environmental Status because of habitat disturbance from fishing. Restoration and creation of carbon-rich habitats have clear co-benefits for climate change mitigation and adaptation, as well as biodiversity, but realising these will require a step-change in the rate and scale of restoration.

> ***"Only 25% of peatlands are in good condition"***

CO-ORDINATING OUR RESPONSE:

Action to restore nature is best co-ordinated with action to mitigate and adapt to the impacts of climate change because land-use scenarios suggest that wildlife is likely to benefit from maximising nature-based solutions (for example, native woodland creation and peatland restoration) in order to achieve net-zero in the land sector. However, this will need to be achieved whilst meeting people's needs for food, energy and access to nature. Access to nature supports human health and well-being but there is inequality, with people in poorer socio-economic settings having less access to wildlife-rich natural spaces.

> ***"Access to nature supports human health and well-being"***

The power of volunteers

It is through the collective efforts of thousands of skilled people, most of whom are volunteers, that we can report on the state of nature. Without their enthusiasm and commitment, we could not understand the pressures on nature, or whether our efforts to address these pressures through conservation action have been effective.

Green-veined white Butterfly, Paul Turner (rspb-images.com)

THE CASE FOR NATURE

Nature needs space to live and flourish, but around the globe we humans have decreased and diminished those spaces. This is especially the case in the UK. There are substantial negative consequences of living in a nature-depleted country. These include impacts on human health, and direct costs associated with adaptation to lost and damaged ecosystem services. For example, pollinating insects are worth millions of pounds to UK agriculture, and their population declines threaten food production[1]. Recent years have seen severe flooding in the UK arising from development in areas prone to flooding and climate change. There are enormous costs both of allowing continued degradation and repairing damage[2], so it is far more cost-effective to avoid causing damage in the first place. Where it has already occurred, restoring nature can cost less in the long-term than bearing the costs of continued degradation[3].

The UK's peatlands are a prime example. They are an enormous carbon store, but three-quarters are damaged or degraded, releasing the equivalent of 5% of UK greenhouse emissions each year[4]. Restoring peatlands and other systems to protect their existing carbon stores will improve our resilience to current climate change, can help mitigate future change and will boost nature.

Protecting and restoring healthy, functioning natural systems is essential, not only for nature's sake, but for people as well[3]. The good news is that there are decades of successful conservation practice to draw upon, and for many habitats and species there is detailed evidence of what actions work[72]. Research suggests that urgent action can reverse some of the biodiversity loss and damage of recent decades[5].

If we are to halt and reverse biodiversity decline we need not only to increase our efforts towards conservation and restoration, but also to tackle the drivers of biodiversity loss[6], especially in relation to our food system[5]. That means making our food production more sustainable and nature-friendly and adjusting our consumption to reduce demand for products that drive loss of nature.

All of society needs to be involved in efforts to halt biodiversity loss. Encouragingly, as the recently launched People's Plan for Nature shows[7], many people in the UK are deeply committed to protecting and restoring nature.

> ***"Pollinating insects are worth millions of pounds to UK agriculture"***

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KEY FINDINGS

Atlantic Puffin, Drew Buckley (rspb-images.com)

We present an objective assessment of the state of nature in the UK. The metrics show how species status has changed over time and the variation in trends among species. We focus on measuring change over two periods: the medium term, up to 50 years; and short-term trends, the last 10 years. The changes in the past 50 years follow extensive preceding changes to our land and seascapes (see Historical Change in the full report). The metrics we present are not directly comparable to previous *State of Nature* reports, as we report across a wider range of species and some methods have been updated.

In the UK we have a wealth of data on which to assess the state of nature. This primarily comes from volunteer-based species monitoring and recording schemes. Our species' status metrics use two data types: **Abundance data** from structured monitoring schemes in the UK, including those that monitor birds, mammals, butterflies, moths and marine fish. Our abundance metrics report the average change in abundance across species. **Distribution data** from biological recording datasets can now be used to generate trends for thousands of species across a wide variety of taxonomic groups (including vascular plants, lichens, bryophytes and a number of invertebrate groups). These trends measure the change in the proportion of occupied sites, so our metrics report the average change in distribution for these species. Unless otherwise stated, figures were produced for this report.

For many species, distribution is the most appropriate way to measure status: for instance, it would be impractical to count the number of individual moss plants but looking at changes in where they can be found tells us a lot about both the mosses themselves and the pressures on their habitats. Change in distribution does not tell us whether a species' range is shifting. For example a species may be found in a similar proportion of sites but those sites are found farther north in the country than previously. Our metrics focus on species native to the UK as well as those introduced at least 500 years ago.

Many of the same monitoring and recording datasets used in this report also underpin official UK and UK country biodiversity indicators, which are published annually for groups including birds, butterflies and mammals, as well as other measures of biodiversity status. We feature some of these indicators in *State of Nature 2023*.

Change in abundance and change in distribution are different measures of the state of nature. Changes in these two measures are often related, although changes in abundance are likely to be detected sooner and be of greater magnitude than changes in distribution. Additionally, in some cases, abundance and distribution trends move in opposite directions.

The term 'wildlife' is used throughout this report to include all living organisms in their many forms, from mammals to lichens, plants to birds, fungi to invertebrates. For a fuller description of the methods used please see the Methods section in the full report.

Terrestrial and freshwater species

Change in species' abundance

Trends in species abundance largely derive from key volunteer-based monitoring schemes such as the Breeding Bird Survey, UK Butterfly Monitoring Scheme, Wetland Bird Survey, National Bat Monitoring Programme, Rothamsted Insect Survey and bespoke species surveys.

The UK abundance indicator for 753 terrestrial and freshwater species shows a decline in average abundance of 19% (Figure 1, Uncertainty Interval (UI): -30% to -9%) between 1970 and 2021. Over the short-term period (2010 to 2020), the decline was 3% (UI: -8% to +2%). We have no evidence that the rate of change in the last decade of the indicator is atypical of the changes seen in previous decades.

Within multispecies indicators like these, there is substantial variation among individual species trends.

To examine this, we have allocated species into abundance trend categories based on the magnitude of population change. Rates of change equivalent to at least a doubling or halving of the population size over 25 years were considered 'Strong' increases or decreases. Rates of change equivalent to at least an increase of a third or a decrease of a quarter over 25 years were considered 'Moderate' changes.

- Over the long term, 290 species (38%) had strong or moderate decreases and 205 (27%) had strong or moderate increases; 261 (35%) showed little change (Figure 1).
- Over the short term, 282 species (38%) had strong or moderate decreases while 273 species (37%) had strong or moderate increases.

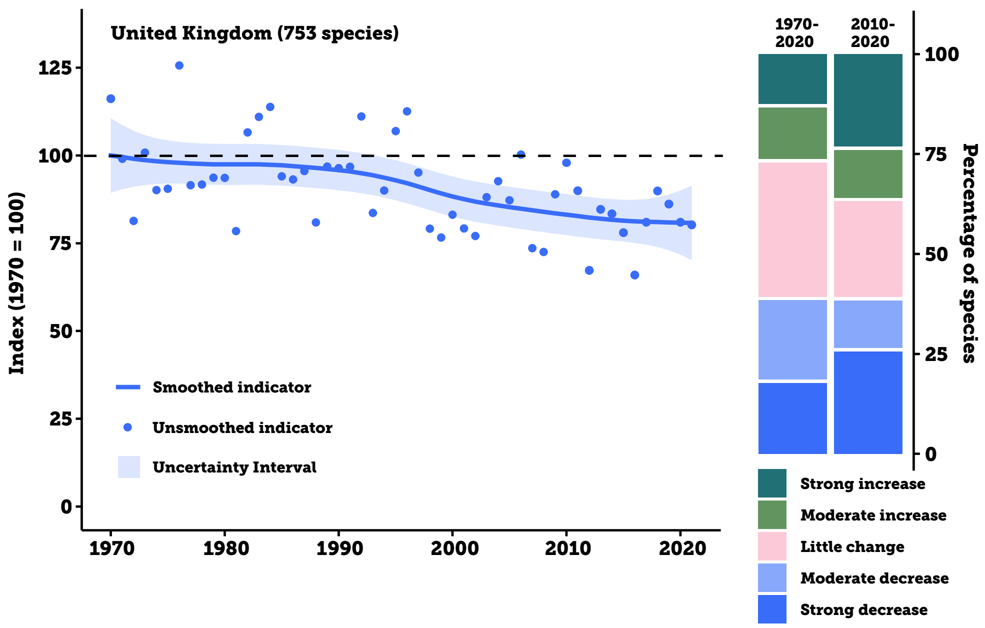


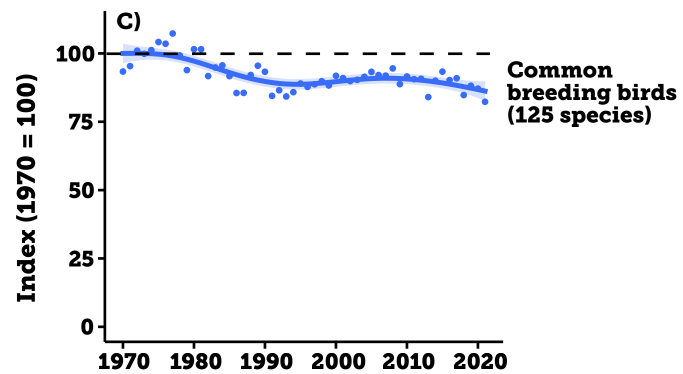
Figure 1: Change in average species' abundance across terrestrial and freshwater species (mammals, butterflies, moths, landbirds and wetland birds). The bar chart shows the percentage of species within the indicator that have increased, decreased (moderately or strongly) or shown little change in abundance (1970- 2020: 753 species, 2010-2020: 743 species).

See page 34 to find out how to interpret this report

Change in species' abundance by group

Composite multispecies indicators can hide other important underlying trends. Here we present trends in some major species groups, which all contribute to the headline abundance indicator.

- The long-term decrease in average abundance of moths (-31%; UI: -44% to -18%) has not slowed; short-term declines are 7% (UI: -13% to -2%) (Figure 2A).
- The specialist butterflies[8] indicator ended 18% below its starting value (Figure 2B, -18%; UI: -39% to +4%), with the majority of this change in the 1970s. Generalist butterflies have greater inter-annual variation but overall have remained stable (Figure 2B, 10%; UI: -14% to +33%).
- The abundance indicator for common breeding birds declined by 14% (Figure 2C, UI: -17% to -10%). The UK Wild Bird Indicator shows that within this group, farmland birds have suffered particularly strong declines of on average 58%[9].
- Rare or colonising bird species (those with fewer than 1000 pairs) showed on average a strong increase in abundance over the long term to 2020 (Figure 2D, 145%; UI: 127% to 164%). This increase was driven by the rapid recovery of some species from very low numbers and the arrival of colonising species. Note that species in the rare and colonising group make up just 0.01% of the total number of individual birds in the UK[10].



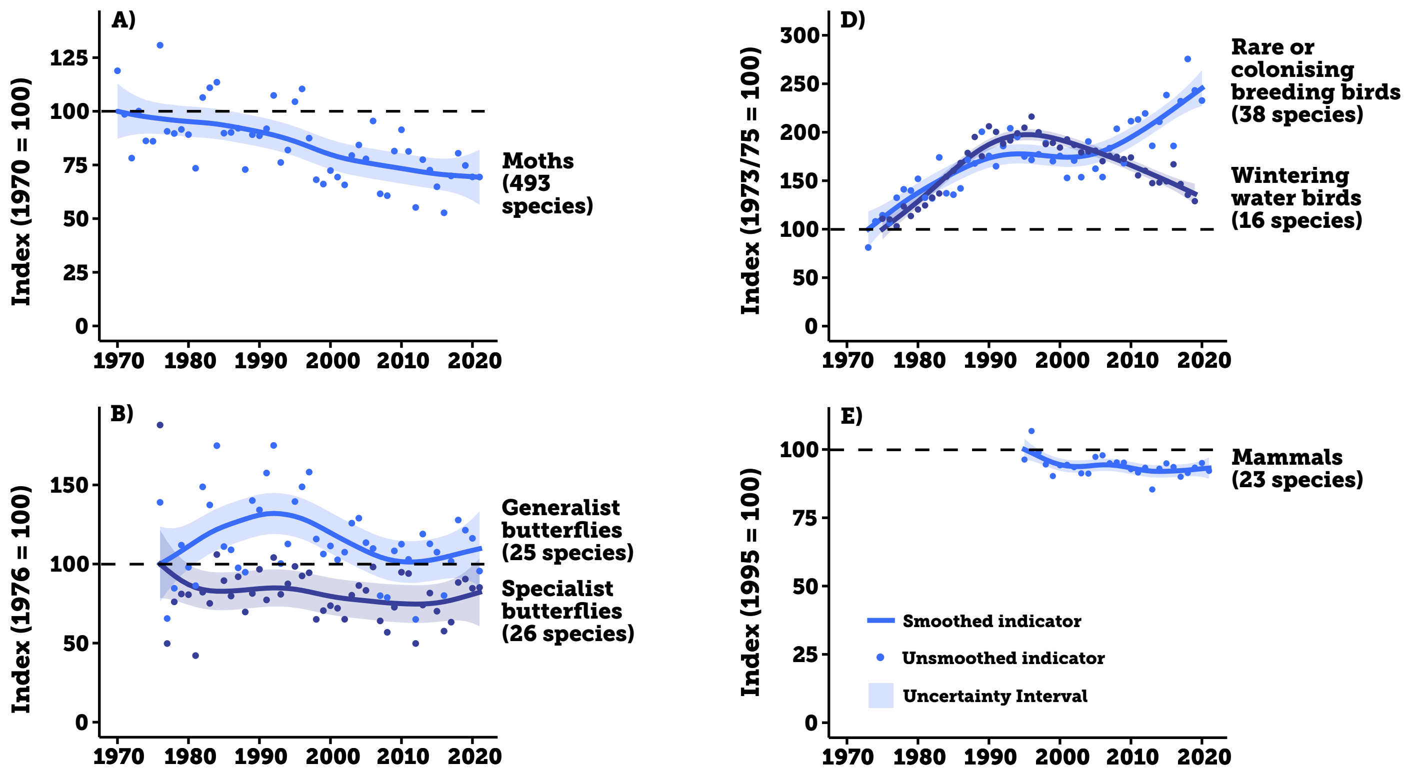


Figure 2: Change in average species' abundance across terrestrial and freshwater species in the UK by rarity, level of specialism or taxonomic group.

- Wintering waterbirds showed on average an increase of 36% (Figure 2D, UI: 26% to 47%) between 1975 and 2019. The indicator rose rapidly in the 20th century but has since steadily declined. Some species have shifted their wintering ranges in response to climate change, resulting in a smaller proportion of each population wintering in the UK, while others are declining due to poisoning from lead ammunition[11].
- Mammals show a small long-term decline in average abundance, of 7% between 1995 and 2021 (Figure 2E, UI: -11% to -3%). Within this average change some species like Water Vole and Hazel Dormouse have declined dramatically, whereas several bat species are recovering from severe historical declines.

Status of UK priority species

One measure of the success of conservation action is whether populations of priority species have stabilised or recovered. Each UK country has a list of species that have been prioritised for reasons such as rapid population decline. Taking these lists together there are 2,890 species from all major taxonomic groups that are a conservation priority for one or more of the UK countries.

The UK Priority Species Indicator[12] (Figure 3), part of the official UK Biodiversity Indicators, shows the average change in species' abundance for 228 priority species between 1970 and 2021. These species are a sample of the 2,890 species in the combined priority species list for the UK, for which robust abundance trends are available, and include birds (103), butterflies (24), mammals (13) and moths (88). Seabirds are the only marine species included in this indicator. By 2021, the index had declined to 37% of its base-line value in 1970. Over this long-term period, 19% of species showed a strong or weak increase and 58% showed a strong or weak decline. In the short-term, between 2016 and 2021, the indicator did not change.

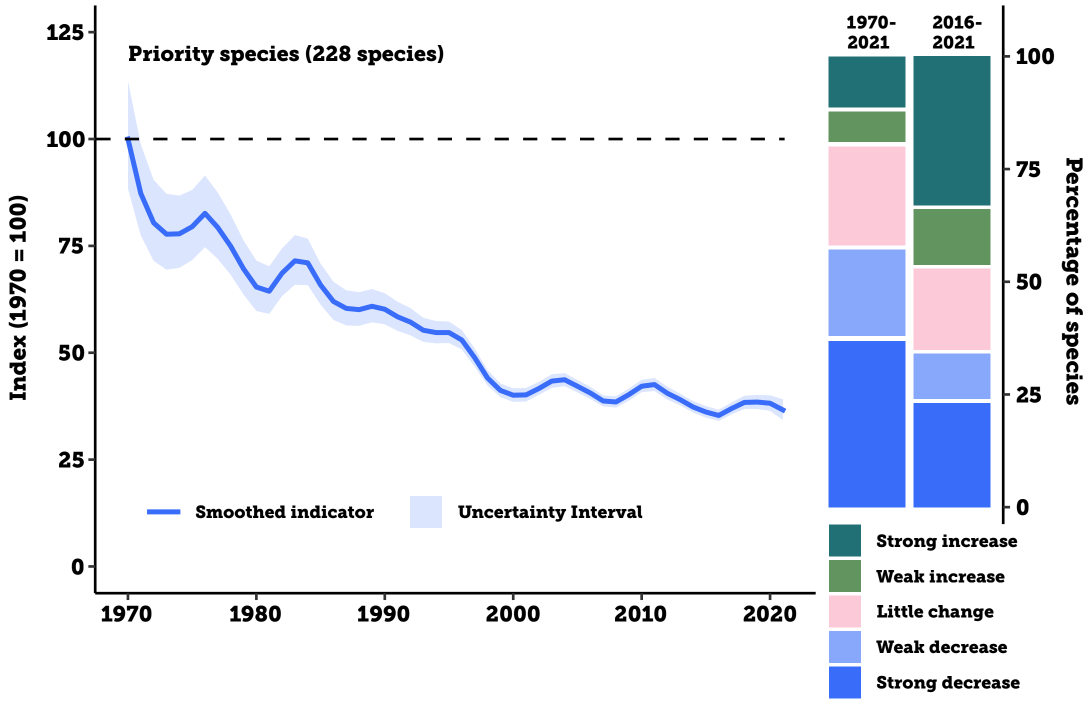


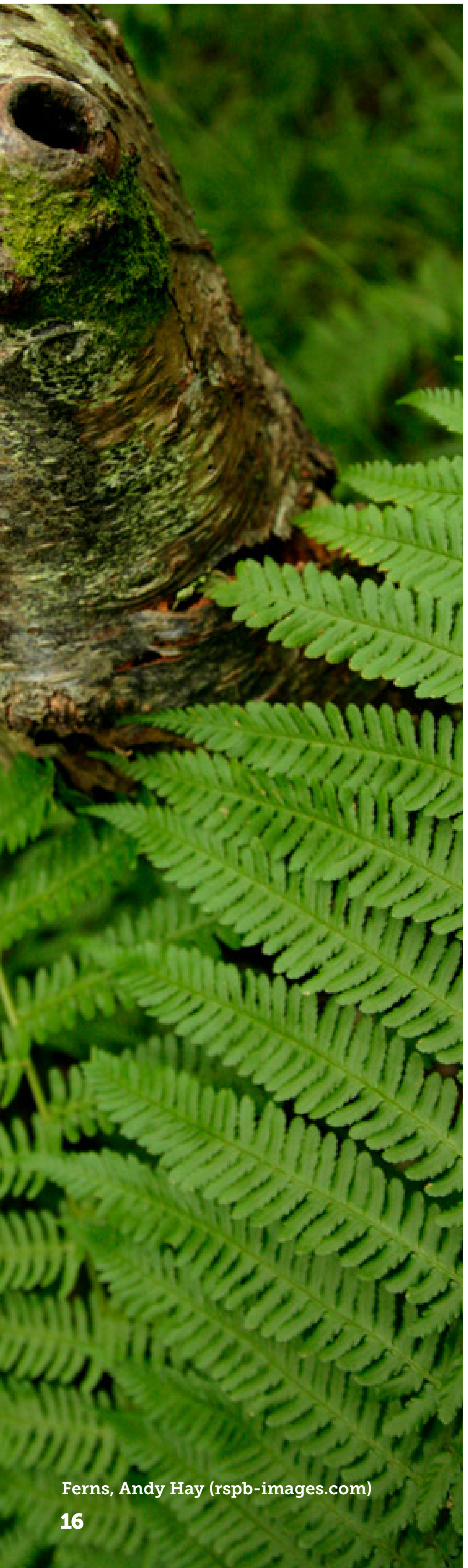
Figure 3: UK Biodiversity Indicator C4a. Change in the abundance of priority species in the UK, 1970 to 2021[12]. Source: jncc.gov.uk/ukbi-C4a. The line graph shows trends in the index of relative abundance for 228 priority species. The blue line with shading shows the smoothed trend with its 95% credible interval. The bar chart shows the percentage of species within the indicator that have increased, decreased (weakly or strongly) or shown little change in abundance (1970 – 2021: 228 species, 2016 – 2021: 215 species).

Change in species' distribution

Distribution change in plants and lichens

- On average, vascular plant species' distributions have decreased by 16% (Figure 4A, UI: -18% to -14%) between 1970 and 2019. Within this average, 54% of vascular plant species decreased in distribution, 15% increased and 31% showed little change. Species adapted to low nutrient conditions and wild plants of arable land have shown strong declines (see Historical Change section in the full report).
- On average, bryophyte species' distributions have decreased by 19% (Figure 4B, UI: -22% to -16%) between 1970 and 2019. Within this average, 59% of bryophytes decreased in distribution, 26% increased and 15% showed little change. Some bryophytes have benefited from reduced sulphur dioxide air pollution, but this has not been sufficient to stabilise species' distributions on average[34].
- Lichens initially declined slightly in distribution but on average have increased this century, with the indicator being 15% (Figure 4C, UI: 2% to 27%) higher in 2021 compared to 1980. Within this average, 43% of lichens decreased in distribution, 48% increased and 9% showed little change. In many parts of the UK, lichens were very badly impacted by historic industrial pollution[13]. Reductions in sulphur dioxide pollution are allowing some species to begin to recover. However, ongoing high levels of nitrogenous air pollution mean that recovery is skewed towards pollution-tolerant species.

Tree lungwort and green satin lichen, Andy Robinson (rspb-images.com)



Ferns, Andy Hay (rspb-images.com)

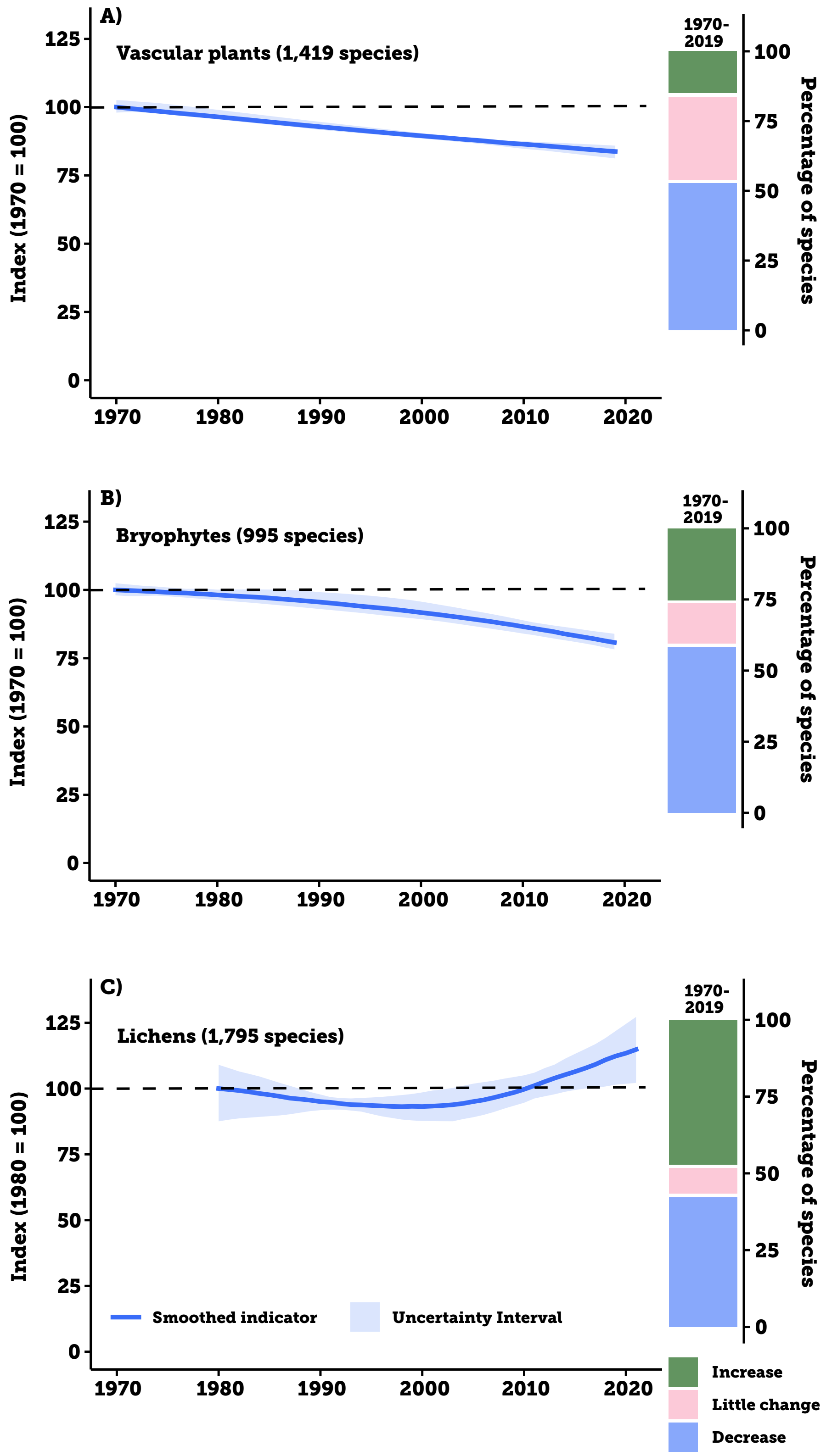


Figure 4: Change in average species' distribution of A) vascular plants, B) bryophytes and C) lichens in Great Britain. The bar charts show the percentage of species within each indicator that have increased, decreased or shown little change in distribution. The vascular plant data and analysis are taken from the Plant Atlas 2020[53].

Distribution change in some animal groups

Across 4,979 invertebrate species, there was an average decrease in species' distributions of 13% between 1970 and 2020 (Figure 5A, UI: -17% to -10%). This average change hides substantial variation among individual species: 33% of invertebrate species showed strong or moderate decreases and 25% showed strong or moderate increases; 42% showed little change.

To help understand these patterns, insect species groups were categorised by the ecological functions they provide[14]. Some groups provide more than one function and so are included in more than one indicator.

- Pollinating insects (bees, hoverflies and moths), which play a critical role in food production, show an average decrease in distribution of 18% (Figure 5B, UI: -21% to -14%) since 1970.
- Predators of crop pests (ants, carabid, rove and ladybird beetles, hoverflies, dragonflies and wasps) showed an average decrease in distribution of 34% (UI: -39% to -29%).
- The average distribution of species providing freshwater nutrient cycling (mayflies, caddisflies, dragonflies and stoneflies) saw an initial decline followed by a strong recovery ending 64% (UI: 42% to 87%) higher in 2021 compared to 1970. This pattern may in part be related to changes in river water quality[15], but although many measures of water pollution have improved over the past few decades, significant water pollution issues remain, in particular in catchments linked to intensive agriculture[349].

Between 1970 and 2016 the distribution of small mammals (mice, voles and shrews) decreased on average by -29% (Figure 5C, UI: -49% to -3%) and those of mid-sized mammals (eg mustelids and hares) showed a similar but not significant change of -15% (UI: -30% to +2%)[16].

Caddisfly, RSPB (rspb-images.com)

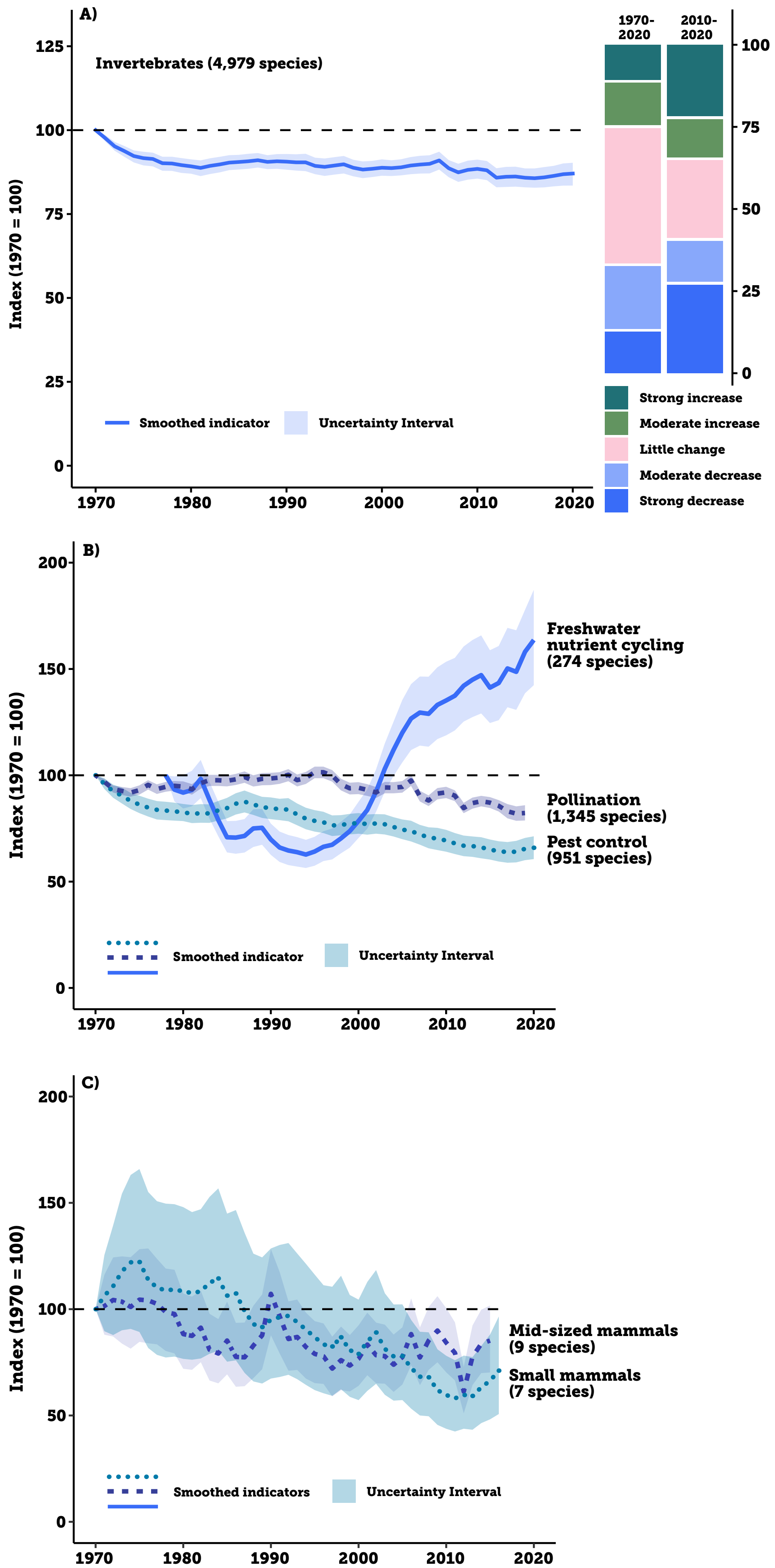


Figure 5: Change in average species' distribution for A) terrestrial and freshwater invertebrates in the UK. The bar charts show the percentage of species within the indicator that have increased, decreased (moderately or strongly) or shown little change in distribution; B) Insect species grouped by ecological function (pollination, pest control and freshwater nutrient cycling); C) mammals.

Extinction risk

Here we show species organised by International Union for the Conservation of Nature (IUCN) Red List category of extinction risk at a national scale. At the time of writing, no assessments for marine species had been published other than for seabirds, although one is underway for marine mammals. Species assessed as Critically Endangered, Endangered or Vulnerable are classified as threatened by IUCN and therefore deemed at risk of extinction in Great Britain.

Since the 2019 *State of Nature* report, the number of taxa assessed using the IUCN Regional Red List process[334] in Great Britain has increased from 8,431 to 10,008. At present we cannot assess whether extinction risk is changing over time because the vast majority of our species have only a single Red List assessment.

Of the extant taxa for which sufficient data are available, 1,497 (16.1%) are classified as threatened and therefore at risk of extinction from Great Britain (Figure 6). In addition, 146 species are known and 52 considered likely to have become extinct from Great Britain since 1500, and a further five are only found in captivity. Summarising these results by the main higher taxonomic groups, 674 plants (21.5%), 202 fungi and lichens (11.4%), 145 vertebrates (39.2%) and 476 invertebrates (11.9%) are classified as being at risk of extinction from Great Britain (Figure 6).

A separate summary of Irish Red List assessments (for the whole island of Ireland) found that 12% of assessed species that were found in Northern Ireland were at risk of extinction, including 144 (9.8%) plants, eleven (20.4%) vertebrates and 126 (13.9%) invertebrates (see NI key metrics in the full report).

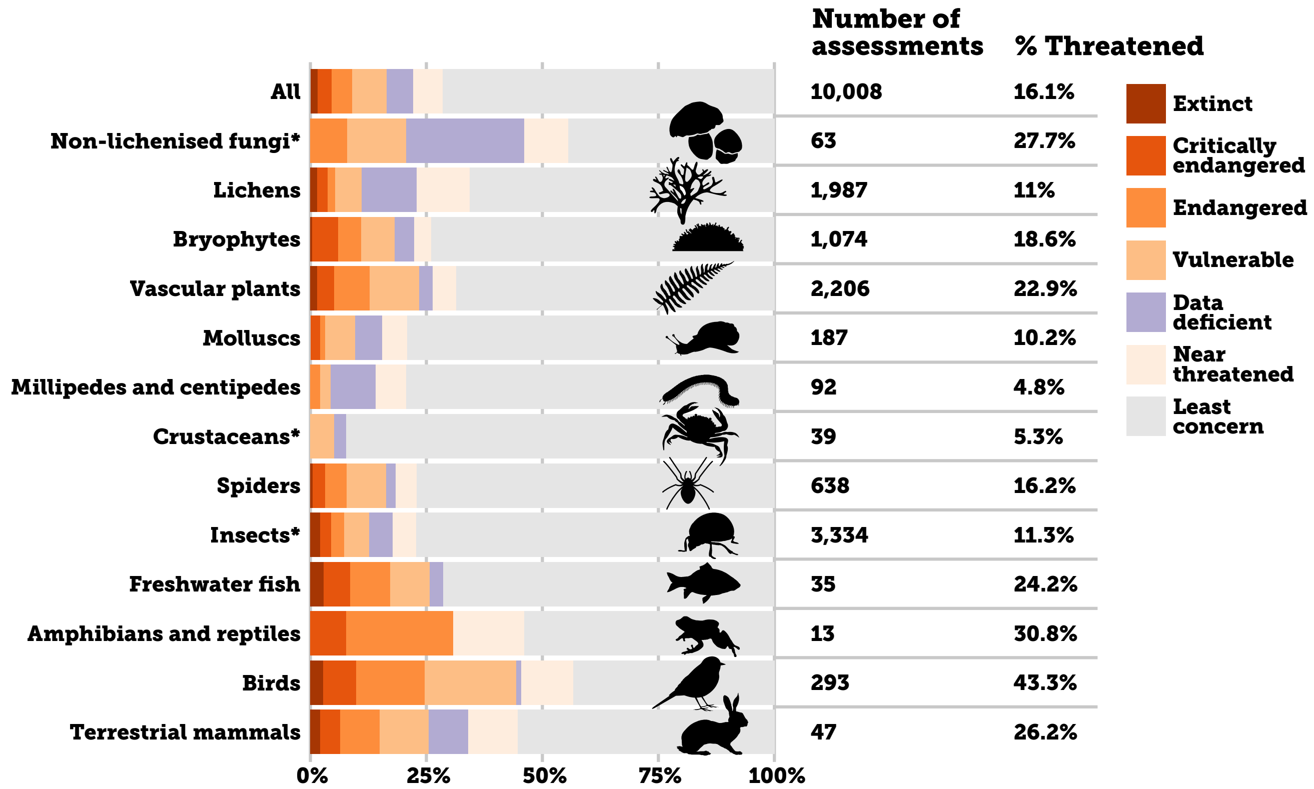


Figure 6: Summary of Red List assessment for Great Britain, showing the proportion of assessed taxa in each Red List category. *Note that only 17% of insect species have been assessed, 10% of crustaceans and less than 1% of fungi.

Marine

In 2010, the UK Marine Strategy Regulations were established to mandate measures that achieve or sustain Good Environmental Status (GES) in the marine environment via the development of a comprehensive UK Marine Strategy. This provides a framework for assessing, monitoring and implementing measures to achieve the UK's vision of 'clean, healthy, safe, productive and biologically diverse' ocean and seas.

The last assessment of GES in 2018[106] revealed a mixed picture in the environmental status of marine mammal, bird and fish populations, and in food webs[17]. GES was not achieved for seabirds, demersal fish communities and offshore seabed habitats. While achievement was uncertain for marine mammals, pelagic habitats and intertidal habitats. An updated GES assessment is due in 2024.

Given that GES has not yet been achieved, existing conservation measures have clearly had limited success. Further efforts will be required to ensure that the marine environment is in good condition, in line with the UK's aspirations and commitments.

Processing Hake at sea, RSPB (rspb-images.com)

Marine fish

The abundance of marine fish and the composition of wider food webs have been influenced by commercial fishing and climate change in addition to natural environmental changes, water quality changes, infrastructure and other human activities (eg, dredging, marine noise). Since 1993, warming sea temperatures have enabled a large proportion of smaller-bodied pelagic fish species (eg, Sardine and Sprat) to increase in abundance[18]. Fishing pressure led to declines in a number of larger-bodied species, such as North Sea Cod[19].

The abundance indicators (Figure 7) use data from a range of trawl surveys for around 100 demersal fish species that live on or near the seafloor (eg, Cod, Haddock, Saithe). The abundance of demersal fish species in both the Celtic Seas and Greater North Sea increased on average in the early years of the 21st century but by 2021 had declined back towards levels found in the early 1990s (Figure 7; Celtic Seas: 14%, UI: 6% to 22%; Greater North Sea: -8%, -14% to -1%). Little is known about the majority of non-commercial fish populations in UK waters, and trends in commercial stocks should be considered against a backdrop of overfishing dating back to at least the 1880s[21].

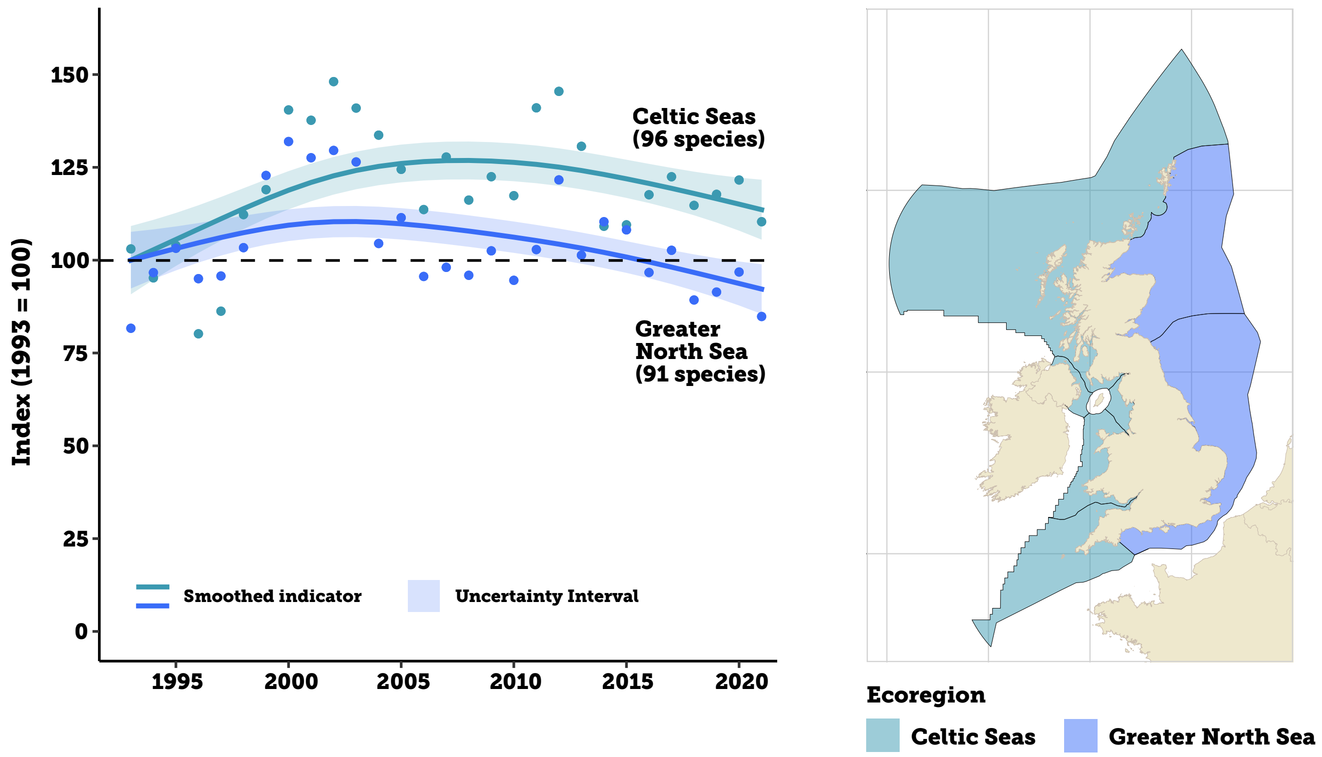


Figure 7: Change in average species' abundance for demersal and bathypelagic fish species in the UK Exclusive Economic Zone (EEZ) areas of the Oslo Paris convention (OSPAR): Celtic Seas and Greater North Sea.

Breeding seabirds

The last published seabird census covered 1998-2002 and reported over eight million seabirds breeding in Great Britain and Ireland annually[22]. The latest seabird census was completed at the end of the 2022 breeding season. The results of this full survey of nearly 12,000 known breeding colonies will be published later in 2023.

The UK breeding seabird indicator, based on annual monitoring at a subset of sites for 13 species between 1986 and 2019, shows an average decline in abundance of 24% (Figure 8[23]). In the short term the indicator has shown little change between 2013 and 2019. Between 1986 and 2018, two species have declined strongly (Arctic Skua and Kittiwake) while a further five species have shown a weak decline. The focus is on updating the seabird indicator given growing pressures on our seabirds, especially from the latest outbreak of Highly Pathogenic Avian Influenza (HPAI). Further monitoring of the effects of HPAI will be essential to understand the effects on UK seabirds and other wildlife.

Marine mammals

Since 1994, the Small Cetaceans in European Atlantic Waters and the North Sea Survey (SCANS) has estimated cetacean abundance[24]. Data from the fourth survey in 2022 are not yet available; however, the 2016 survey collected data for nine of the 28 cetacean species which regularly occur in UK waters. Sufficient data for three of these species (Harbour Porpoise, White-beaked Dolphin and Minke Whale) are available to calculate abundance trends in the Greater North Sea. Populations appeared stable between the mid-1990s and 2016, but due to the few time points available for comparison, declines in Harbour Porpoise and White-beaked Dolphin could not be ruled out.

Regular seal surveys are possible when they haul out onto land to moult or pup (Harbour Seal) or breed (Grey Seal) and regular monitoring has been carried out for both species around UK coasts since at least the 1990s and 1980s respectively. Between 2016 and 2019 UK Grey Seal pup production increased by approximately 1.5% per year; however, these changes were not experienced uniformly around Britain[27]. There have been notable declines in parts of Scotland. Harbour Seals are counted annually at colonies in England and east Scotland and every five years in colonies of north and west Scotland. It is estimated that the UK population has increased since the late 2000s, and is now close to levels seen prior to a population crash in 2002 caused by the phocine distemper virus. There are some concerns about local population declines however, with the 2019 count in the Southeast England area showing a 25% population decline compared to the mean of the previous five years. In addition to this, populations along the east and north coasts of Scotland and the Northern Isles are ~40% below the pre-2002 levels.

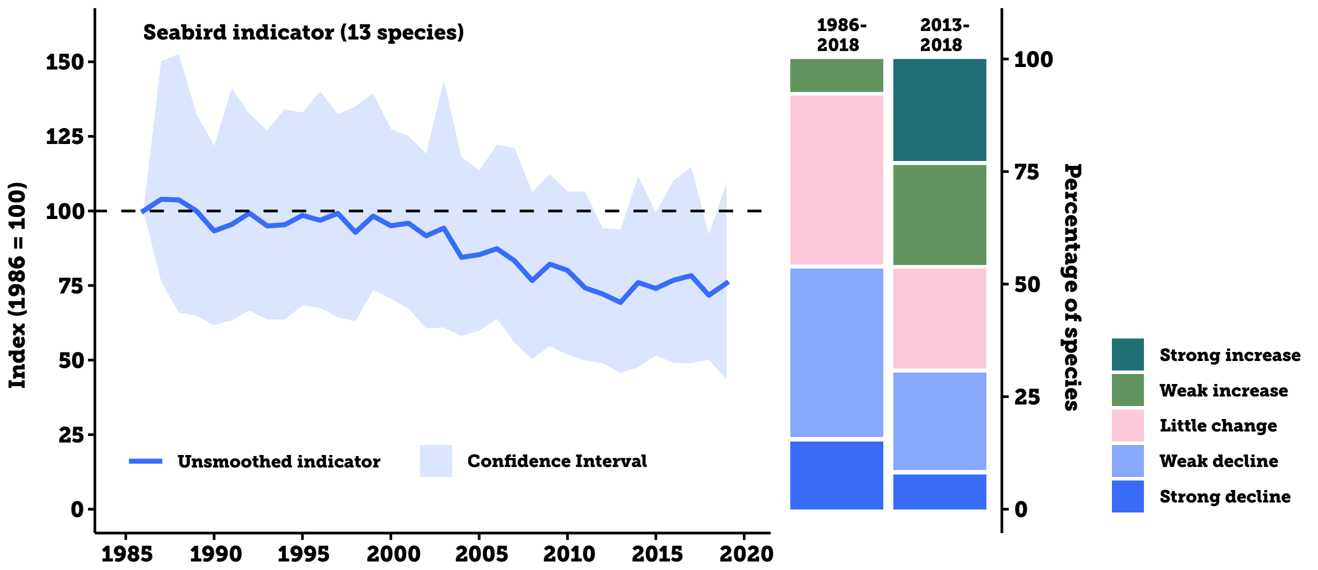
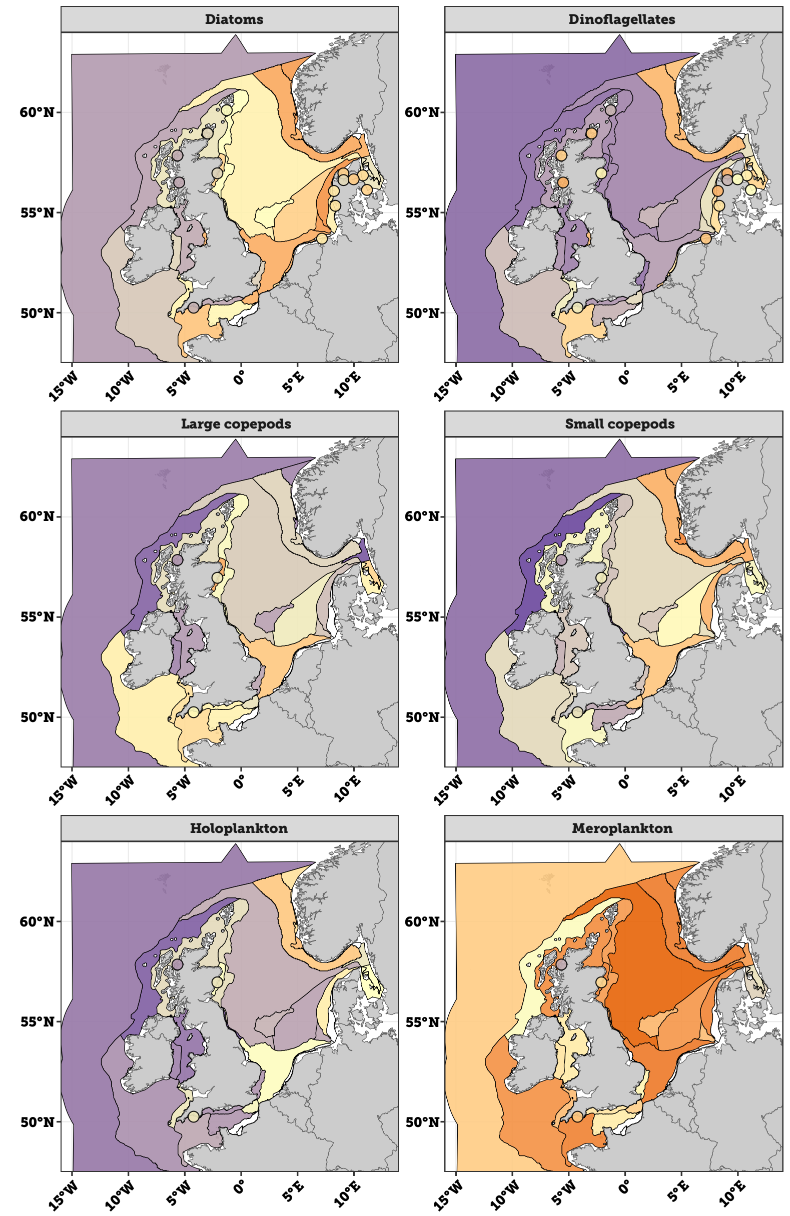


Figure 8: UK Biodiversity Indicator: C5 Seabirds, showing the average change in abundance of 13 species of seabirds[23]. Source: jncc.gov.uk/ukbi-C5. The blue line with shading shows the indicator and associated 95% Confidence Interval. The bar chart shows the percentage of species within the indicator that have increased, decreased (weakly or strongly) or shown little change in abundance.

Plankton – the base of the food web

The marine food web is founded on tiny phytoplankton and zooplankton. Plankton communities respond quickly to environmental changes, making them valuable indicators of ecosystem condition, although it can often be difficult to identify specific underlying causes of observed changes.

An indicator of phytoplankton biomass generated using satellite remote sensing data (Figure 9) shows increases in some areas over the past 60 years[25,26]. Changes in diatoms and dinoflagellates, two groups of phytoplankton underpinning marine food webs, are associated with shifts in trophic pathways and carbon cycling. Small copepods, a type of zooplankton that are important prey for larval fish, have shown long-term abundance increases in some coastal areas but decreases offshore. The abundance of planktonic larvae (ie meroplankton), including sea urchins and crustaceans, has increased in most areas and is associated with rising sea temperatures.



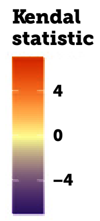


Figure 9. The change in plankton lifeform abundance of 6 functional groups between 1960 - 2019. Sea areas are coloured according to the results of the Kendall trend test which indicates how consistent the increase or decrease in abundance has been. Fixed point stations are represented by filled circles.


Scallop, Graham Eaton (rspb-images.com)

Marine benthos – life on the seafloor

Life on the seafloor around the UK is highly diverse, with more than 10,000 species. It is very challenging to obtain data and information about these organisms due to where they live. However, for the first time in the *State of Nature* report, trends in distribution between 2005 and 2021 have been modelled for 438 taxa using citizen science records from the Seasearch programme[28] (Figure 10). This is a first estimate of how coastal benthic organisms are faring, and the opportunistic nature of citizen science means the aggregated trend is likely to be biased towards better recorded groups, such as sea snails and red algae, with records from only more accessible locations. Despite the overall increasing trend, some taxonomic groups showed reducing occurrence. For example the distributions of starfish and related species decreased on average.

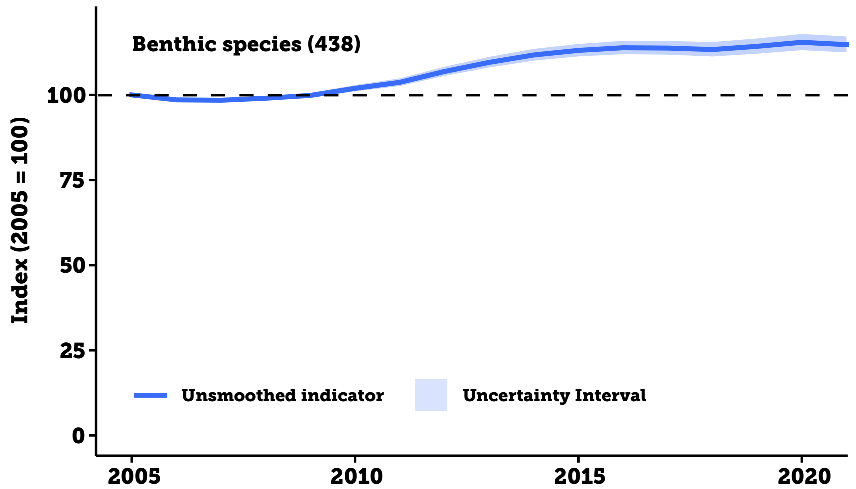


Figure 10: Change in average species' distribution of benthic species from 2005 to 2021 combined from models of 438 taxa across 20 different taxonomic groups. All records were collected by the Seasearch programme.


Northern Starfish, Graham Eaton (rspb-images.com)

Pressures and responses

The *State of Nature report 2019* reviewed the major pressures on the UK's nature over the past 50 years. Here we have summarised these pressures and looked at recent trends to see whether their impacts are likely to have been continuing over the last decade (Figure 11). We focus on the direct drivers of biodiversity change, rather than the underpinning societal values and behaviours, including production and the consumption patterns that may drive them.

Other pressures and responses

Pollution

Most air pollutants have declined substantially since 1970, but ammonia declined more slowly and has increased again in the last few years[31,32]. Despite these declines, 73% of the area of sensitive habitats in England is still exposed to damaging levels of acidification, and nitrogenous air pollution levels were exceeded in 97% of the area of sensitive habitats[33] in England. Some species of lichens and moss have responded positively to reduced air pollution[34], but many continue to decline in distribution, as do vascular plants adapted to habitats low in nutrients[35].

Freshwater insect species have, on average, shown a strong recovery in distribution since 1990 following earlier declines (see Key findings). This is likely in part to be due to improvements river water quality from the 1990s onwards[15,36]. The proportion of lakes, rivers and estuaries in the UK in good or high ecological status has remained static at 36% in the last decade[37] and there are indications that the recovery of freshwater invertebrates has slowed[36].

51% of beached Fulmars in the North Sea have more than 0.1g of plastics in their stomachs. This reflects the abundance of floating litter and provides an indication of harm[38].

Invasive non-native species

The number of invasive species has increased in freshwater, terrestrial and marine biomes in the last decade in line with ongoing trends since 1970[39].

Key long-term drivers of change in nature			Recent changes in key drivers of change		
Biome	**Key drivers of change (IPBES driver if different)**	**Long-term impact**	**Changes in the last decade**	**Implications for nature**	**Full report chapter**
Terrestrial and freshwater	Intensive agricultural management (changing use of land and sea)	Policy driven increases in agricultural productivity have met increased food demand, but many management practices have had major negative impacts on nature.	Total farming productivity continues to increase[40]. Volume of fertiliser used continues to decline from a peak in the 1980s[40]. The percentage of farmland in agri-environment schemes has increased[41].	Good evidence that well-designed agri-environment schemes can benefit nature, but that current scales of roll out are inadequate for recovery[44].	Nature-friendly farming and sustainable fisheries and forestry.
	Climate change	Climate change has caused major changes to nature on land and at sea, including range shifts, population changes and disruption to food webs. Climate change also interacts with and exacerbates the impacts of other drivers.	Temperatures on land are 0.5°C warmer than 1981–2010 and 1.1°C warmer than 1961–90. Summers are 15% wetter than 1981–2010 and 17% wetter than 1961–90[42].	Climate change is accelerating and the negative impacts on nature are likely to increase. While warmth-adapted species are likely to continue to expand their UK distributions, montane species on the edge of their ranges in the UK will be squeezed out. Nesting birds will become increasingly mismatched with peaks in invertebrate food sources essential for their chicks. On land, well-designed nature-based climate mitigation measures are likely to have positive impacts for nature[45].	Ecosystem restoration, Nature, climate and people.
Marine	Climate change		Sea temperatures are 0.1°C warmer than 1991–2020 and 0.7°C warmer than 1961–90. Mean sea level is 16.5 cm higher than in 1900 and is rising increasing quickly[42].	At sea, future warming is likely to continue to shift primary and secondary plankton production northwards. This may negatively affect ocean carbon storage in the coming decades[46] as well as having a knock-on impact on the marine food web.	
	Overexploitation (direct exploitation of organisms)	Past overfishing caused declines in commercial fish species and damage to benthic habitats.	51% of marine fish stocks are now harvested at or below maximum sustainable yield, or within an acceptable mortality range, up from 23% 2009–2019[43].	The proportion of large fish per catch in the North Sea increased from a low of 4% in 2002 to 12% in 2012 but has more recently declined to 6%[47].	Nature-friendly farming and sustainable fisheries and forestry.

Figure 11: Summary of the key drivers of change in nature in terrestrial and freshwater, and marine biomes over the last 50 years. Summary of terrestrial and freshwater drivers of change based on expert elucidation, taken from Burns et al 2016[29]. Changes reflect the relative impact of each driver in explaining population change in a sample of 400 species from a wide range of taxonomic groups. Summary of marine pressures is taken from the UK National Ecosystem Assessment[30].

Through the Biosecurity for LIFE project, 95% of the UK's internationally important seabird islands now have biosecurity measures in place. Non-native American Mink predate many species, including endangered Water Voles. There is a successful control programme that now covers a large part of Scotland, and a similar initiative has also begun in East Anglia.

Habitat management
The UK has a rich diversity of habitats and ecosystems. The condition of these and the way they are managed is also an important driver of our changing nature. See Ecosystem Restoration and Nature-friendly farming and sustainable fisheries and forestry in the main report.

Emerging pressures

Transitioning to renewable energy
- All UK countries have committed to reach 'net-zero' by 2045 (Scotland) or 2050 (England, Wales, and Northern Ireland)[48].
- To meet these critical climate mitigation targets large-scale installation of renewable energy is needed[48] which comes with its own trade-offs as well as some potential co-benefits for nature[261].
- The UK Government and devolved administrations have committed to effective spatial planning and prioritisation, which will be essential if we are to achieve these goals while also helping nature to recover.
- See Nature, climate and people in the full report for more details.

Northern Gannet, Ashley Cooper (rspb-images.com)

Wildlife disease
Several plant and animal diseases threaten our wildlife, including the ongoing impacts of Ash dieback, phocine distemper in seals and trichomoniasis infections in finches.

Highly Pathogenic Avian Influenza
The ongoing outbreak of Highly Pathogenic Avian Influenza (HPAI) is the most serious the UK has ever recorded. A particularly virulent form has been affecting bird populations in the UK since 2021. Over the winter of 2021/22, avian flu primarily affected overwintering geese, as well as swans and ducks, some birds of prey and domestic poultry. The impact on the population of Barnacle Geese that come from Svalbard to winter on the Solway in Scotland was devastating, with around a third of the population dying. The breeding season of 2022 saw a much wider number of bird species affected, especially seabirds, and also a number of individuals of various mammal species believed to have eaten infected birds. In total over 70 bird and mammal species have been affected[49]. Eighteen of the 25 UK breeding seabird species tested positive for HPAI in 2022 and across RSPB reserves at least 15,000 birds were recorded dead[50] The full impact on seabird populations from the 2022 breeding season is the subject of ongoing monitoring and research. Impacts on seabirds are likely to be particularly severe, as they would normally have high adult survival rates and are slow to reproduce. For Great Skua and Gannet, two of the species where observed mortality was greatest, the UK hosts 60% and 56% of the global populations respectively. Initial estimates suggest a decline in occupied Great Skua territories of more than a half in Foula, Shetland, which is the largest colony of this species in the world[51]. The ongoing impact of avian flu is difficult to predict, but this unexpected additional pressure on our wildlife emphasises the need for resilient ecosystems and abundant species populations.

> ***"Over 70 bird and mammal species have been affected by Highly Pathogenic Avian Influenza"***

Funding for conservation
In recent years, public sector funding for biodiversity conservation has declined, both in absolute terms and as a percentage of Gross Domestic Product[52]. This amounts to a real-term decrease of 24% over the last five years. Governmental expenditure on international biodiversity conservation, including in the UK's Overseas Territories, has increased steadily since 2000/01, although in absolute terms this is typically around 4% of the annual amount spent in the UK. Non-Governmental Organisation (NGO) expenditure on biodiversity has increased by 16% in real terms since 2010/11, although this decreased by 3% in real terms over the five years to 2021.While public support for nature conservation is strong (see for example, People's Plan for Nature), the Covid-19 pandemic led to a reduction in the amount of financial support received by environmental NGOs.

CONSERVATION RESPONSE

Pasqueflower, Ben Andrew (rspb-images.com)

GLOBAL NATURE RECOVERY TARGETS

In December 2022 the Convention on Biological Diversity (CBD) COP15 summit agreed the Kunming-Montreal Global Biodiversity Framework[62] (known as the Global Biodiversity Framework). It confirmed a global mission to halt and reverse the loss of nature by 2030 and achieve recovery by 2050, so that nature will thrive, 'sustaining a healthy planet and delivering benefits essential for all people'. This is in line with the Nature Positive goal demanded by organisations worldwide in the years leading up to COP15[63].

The new Global Biodiversity Framework includes four outcome-oriented goals to achieve by 2050, covering:

(Goal A) Recovery of ecosystems, species and genetic diversity;

(Goal B) Sustainable use and human benefits;

(Goal C) Equitable sharing of benefits; and

(Goal D) Implementation (Figure 14).

These are underpinned by 23 action targets to be achieved by 2030, falling under three headings:

1) **Reducing threats to biodiversity**
2) **Meeting people's needs through sustainable use and benefit sharing**
3) **Tools and solutions for implementation and mainstreaming**

In the full report chapters we discuss conservation action in the UK countries, framed around one or a set of these targets in each case, but touching on many of them. We summarise what action is being taken, what we understand about the impact of these conservation actions on nature and people and, where possible, the future outlook.

> ***"In December 2022, the CBD COP15 summit confirmed a global mission to halt and reverse the loss of nature by 2030, and achieve recovery by 2050"***

Global Goals for 2050

Goal A:	Goal B:	Goal C:	Goal D:
Outcomes for ecosystems, species and genetic diversity	Sustainable use and nature's contributions to people	Equitable sharing of benefits from genetic resources	Means of implementation, including finance

2030 Mission

To take urgent action to halt and reverse biodiversity loss to put nature on a path to recovery for the benefit of people and planet

Global Targets for 2030

Reducing threats to biodiversity

Target 1: Spatial planning

Target 2: Ecosystem restoration

Target 3: Protected areas

Target 4: Recovery of ecosystems, species and genetic diversity

Target 5: Overexploitation

Target 6: Invasive non-native species

Target 7: Pollution

Target 8: Climate change

Meeting people's needs

Target 9: Sustainable use of wild species

Target 10: Sustainable production

Target 11: Nature's contribution to people

Target 12: Urban environment

Target 13: Access and benefit sharing

Tools and solutions

Target 14: Mainstreaming

Target 15: Business action

Target 16: Sustainable consumption

Target 17: Biosafety

Target 18: Subsidy reform

Target 19: Financial resource mobilisation

Target 20: Capacity building

Target 21: Knowledge and data sharing

Target 22: Indigenous peoples and local communities

Target 23: Gender

Full Report chapters	Core targets
Improved species status	Goal A, T4
Nature-friendly farming and sustainable forestry and fisheries	T10
Protected areas	T3
Ecosystem restoration	T2
Nature, climate and people	T1, T8, T12

Figure 14: Summary of the goals and targets agreed within the Kunming-Montreal Global Biodiversity Framework and how these targets are discussed within the full report.

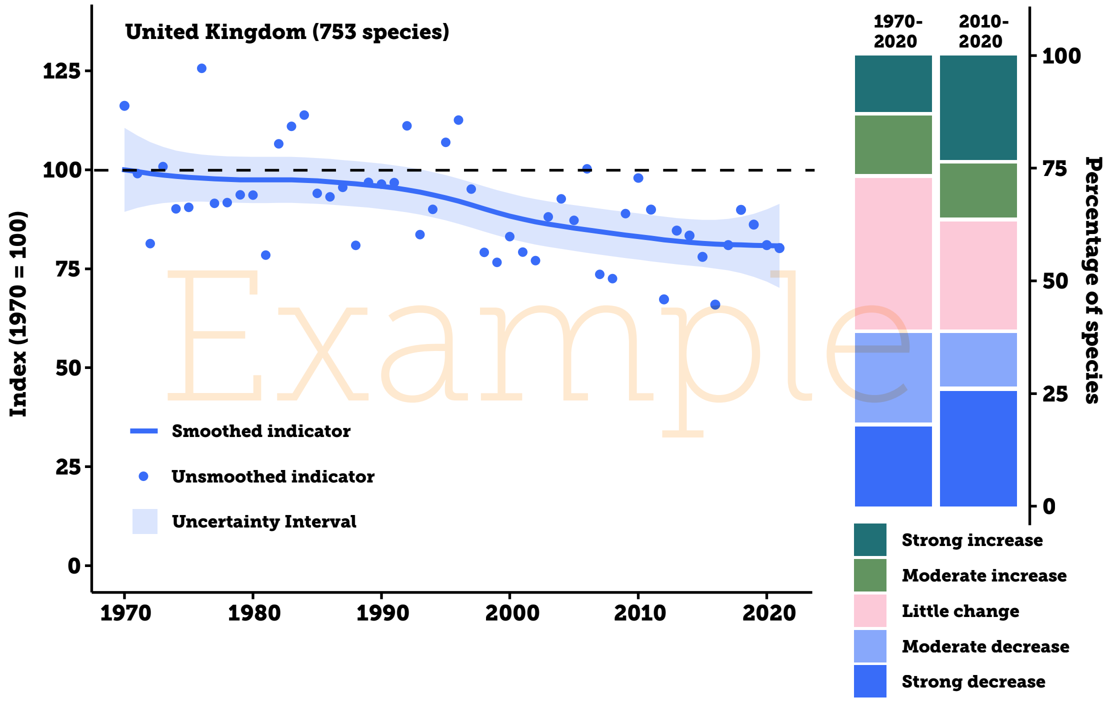
There is a consensus that it is vital for the new global targets to be more effective than their predecessors in driving action to stop and reverse biodiversity loss. Earlier CBD targets have been criticised for being imprecise, hard to measure progress towards and having insufficiently strong implementation mechanisms[64]. The new framework is underpinned by commitments to mobilise resources for implementation, and to follow a cycle of planning, monitoring, reporting and review. To avoid repeating past failures[65], countries agreed to these implementation steps to drive the delivery of the global framework at the domestic level.

The Global Biodiversity Framework targets have been recognised by governments in the UK. The Welsh[66] and Scottish Governments[67] have promised to bring forward legislation to introduce binding nature recovery targets, and the UK Government has recently done so for England through the Environment Act 2021[68]. Northern Ireland is currently drafting a new biodiversity strategy. Statutory targets have been shown to increase accountability, drive action and embed cross-sector responses in areas of environmental policy such as climate change mitigation, waste and air quality[69]. The response for nature needs to be given the same priority.


Bittern, Andy Hay (rspb-images.com)

How to interpret this report

We have included this section to help you understand the different measures presented in the *State of Nature 2023* report and how they should be interpreted. For full details of the methods and how these measures were calculated, as well as caveats around interpretation, please refer to pages 188 to 194 of the main report.



Which data have we used?

- We present trends in abundance (for 753 species) and distribution (for around 9000 species) for terrestrial and freshwater species' across the UK, and trends in abundance for over 100 marine species (demersal fish, marine mammals and seabirds) and distribution for 437 species (benthic invertebrates, fish and algae).
- Abundance trends are based on changes in the number of individuals at a monitored site, a measure that reflects a species' population size. Distribution trends are based on changes in the number of sites where a species is present. Distribution trends may be calculated at different spatial scales, here we use 1 km^2 for terrestrial and freshwater invertebrates and 10 km^2 for plants and lichens.
- These records came from a wide range of sources, including national monitoring schemes and biological records.
- Abundance trends are for native species only. Distribution trends for invertebrates and marine benthic organisms are primarily for native species but may include a small number of non-native species. Due to the small number of these species, their impact on the average trend lines is likely to be minimal[296]. Distribution trends for vascular plants include species' introduced to the UK more than 500 years ago.
- We present assessments of national Red List status for 10,008 native species.
- Details of our data sources and the species they cover are at stateofnature.org.uk

How are distribution and abundance metrics related?

The status of species as measured by abundance is considered a key metric for conservation – providing information as to how species are faring and assessing the effectiveness of conservation measures or the impact of particular pressures. However, such data are taxonomically limited, and in contrast the volume of opportunistic species' records[297] extends the taxonomic, spatial and temporal coverage of species' datasets and analyses. Recent statistical developments have enabled greater use of these datasets for the estimation of species' distribution trends[298-300]. Distribution and abundance trends are often related, and there is evidence that they tend to operate in the same direction[301,302]. However, the relationship between the two measures of change can be complex. In particular, there is evidence that the magnitude of change in distribution trends is smaller than changes in abundance. This is because many species can show substantial variation in abundance without disappearing from sites or occupying new ones. Additionally, for some species or species' groups abundance and distribution trends move in opposite directions, but this is less common[303,304].

What are the graphs telling me?

The measures we present, at a UK and individual country level, show the following:

- Change over time – Species indicator – The average change in the status of species, based on abundance or distribution data.
- Categories of change – The percentage of species in each trend category eg strong increase or little change.
- Extinction risk – An assessment of Red List status for each species occurring in that country.

Please note that our measures are not directly comparable with those presented in the previous *State of Nature* reports because the current report is based on an increased number of species, updated methods and, in some cases, different data sources.

Change over time – Species indicator

These graphs show indicators based on the abundance data and distribution data separately. Species indicator graphs show the average change in the status of species based on either abundance or distribution data. The shaded areas show a measure of uncertainty around the indicator. This is measured in several different ways, which are described in the Methods section in the full report.

Results reported for each figure include total percentage change in the indicator over the long term and the short term.

Categories of change

Each species was placed into one of three or five trend categories based on annual percentage changes. Results reported for each figure include the percentage of species that showed strong or moderate changes, and those showing little change, in each time period.

Thresholds for assigning species' trends to the categories are given on page 192. A small number of species did not have a short-term assessment, as data were unavailable for recent years.

Extinction risk

We summarised the Great Britain Red Lists to present the proportion of species in each threat category overall, and by different taxonomic groups. In each country we interpret existing Great Britain Red Lists, based on those species known to have occurred in a particular country, with the exception of Northern Ireland, where we used all-Ireland Red List assessments. For the Overseas Territories and Crown Dependencies we summarised available global IUCN Red List assessments.

Results reported for each figure include: the overall percentage of species assessed that are regarded as threatened with extinction from Great Britain, Ireland or globally. This is the percentage of extant species, for which sufficient data are available, classified as Critically Endangered, Endangered or Vulnerable in the latest IUCN Red List assessments.

Official statistics

Where appropriate, trend figures from the official UK or UK country biodiversity indicators[305] are presented. In these cases the source url is given in the figure caption.

What time period does this report cover?

In general we show abundance trends in species from 1970 to 2021 and distribution trends from 1970 to 2020. We refer to this as our long-term period. Our short-term period covers the final 10 years of an indicator, often 2010 to 2020. Data availability means that some abundance and distribution indicators start after 1970. For instance, distribution trends for benthic marine species run from 2005 to 2021.

Green satin lichen, Jill Donnachie / WTML

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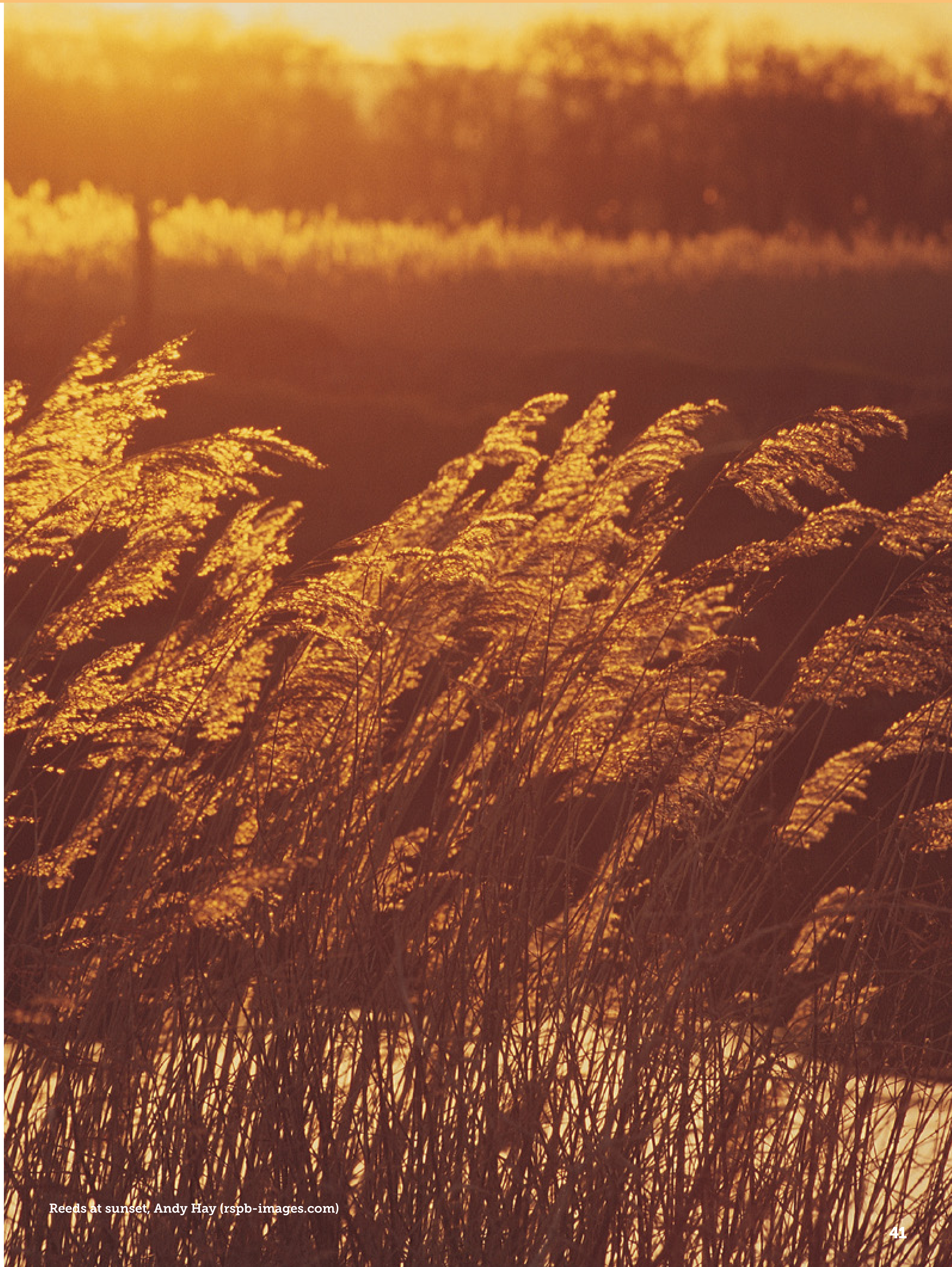
Reeds at sunset, Andy Hay (rspb-images.com)

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Collecting biodiversity data

Structured monitoring schemes

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Recording societies

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Aquatic Heteroptera Recording Scheme; Bees, Wasps and Ants Recording Society; Botanical Society of Britain and Ireland; British Arachnological Society – Spider Recording Scheme; British Bryological Society; British Dragonfly Society – Dragonfly Recording Network; British Lichen Society; British Myriapod and Isopod Group – Centipede and Millipede Recording Schemes; Chrysomelidae Recording Scheme; Conchological Society of Great Britain and Ireland; Cranefly Recording Scheme; Empididae, Hybotidae & Dolichopodidae Recording Scheme; Fungus Gnat Recording Scheme; Gelechiid Recording Scheme; Grasshopper Recording Scheme; Ground Beetle Recording Scheme; Hoverfly Recording Scheme; Lacewings and Allies Recording Scheme; National Moth Recording Scheme; Riverfly Recording Schemes: Ephemeroptera, Plecoptera and Trichoptera; Soldier Beetles, Jewel Beetles and Glow-worms Recording Scheme; Soldierflies and Allies Recording Scheme; Staphylinidae Recording Scheme; Terrestrial Heteroptera Recording Schemes; UK Ladybird Survey; Weevil and Bark Beetle Recording Scheme and by the Mammal Society.

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- A Rocha UK – Caring for God's Earth
- Action for Conservation
- Alderney Wildlife Trust
- amphibian and reptile conservation
- ALERC – Association of Local Environmental Records Centres
- Bat Conservation Ireland
- Bat Conservation Trust
- Botanical Society of Britain & Ireland
- British Arachnological Society
- British Bryological Society – 100 Years 1923–2023
- British Dragonfly Society – 40 Years 1983-2023
- British Lichen Society
- BTO – Birds Science People
- buglife
- Bumblebee Conservation Trust
- Butterfly Conservation – Saving butterflies, moths and our environment
- CEDaR – Centre for Environmental Data and Recording
- UK Centre for Ecology & Hydrology
- BRC – Biological Records Centre
- CIEEM
- Chester Zoo
- earthwatch Europe
- Freshwater Habitats Trust
- Friends of the Earth
- iSpot – ispotnature.org
- The James Hutton Institute
- Government of Jersey
- John Muir Trust – For wild land & wild places
- JNCC – Joint Nature Conservation Committee
- Local Environmental Records Centres Wales – Canolfannau Cofnodion Amgylcheddol Lleol Cymru
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- Marine Conservation Society
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- NFBR
- National Trust
- National Trust for Scotland
- Natural England
- Natural History Museum
- Cyfoeth Naturiol Cymru – Natural Resources Wales
- NatureScot – NàdarAlba – Scotland's Nature Agency – Buidheann Nàdair na h-Alba
- NIEA – Northern Ireland Environment Agency – www.daera-ni.gov.uk
- Northern Ireland Marine Task Force
- ORCA – Looking out for Whales and Dolphins
- people's trust for endangered species
- Plantlife
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- Royal Botanic Garden Edinburgh
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- Scottish Environment LINK
- Scottish Wildlife Trust
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- WDC – Whale and Dolphin Conservation
- WWT
- The Wildlife Trusts
- Woodland Trust
- WWF
- ZSL

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