

## 4b. Status of priority species: distribution

**Type:** State Indicator

### Indicator Description

This indicator measures change in the number of 1km grid squares across the UK in which priority species were recorded in any given year. This is referred to as the 'occupancy index' and is effectively equivalent to changes in the distribution of priority species for which data are available. The indicator will increase when priority species become more widespread on average, and decrease when species becomes less widespread on average.

This indicator should be read in conjunction with [4a](#) which provides data on those species for which abundance information is available.

### Distribution of priority species in the UK

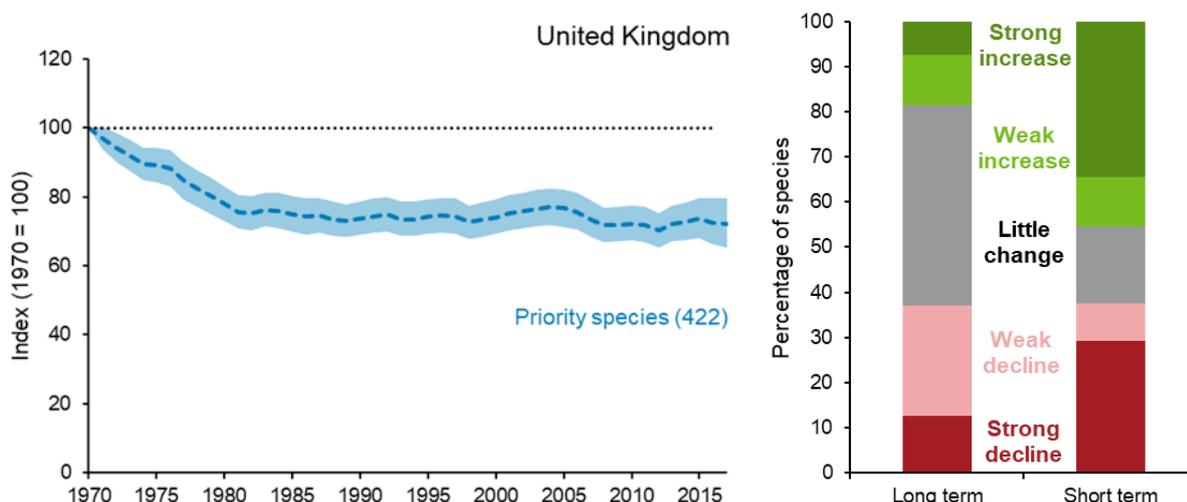
Since the 2019 publication, the Biological Records Centre has received additional data for Ants, Bees, Wasps, Spiders and Dragonflies. These data are included in this year's indicator.

Official lists of priority species have been published for each UK country. There are 2,890 species on the combined list; actions to conserve them are included within the respective countries' biodiversity or environment strategies.

Between 1970 and 2017, the index of distribution of priority species in the UK decreased, with a higher proportion of species decreasing in distribution than increasing. The long-term trend is assessed as a decline of 28%.

The index was 3% higher in 2017 than in 2012, with 45% of species showing an increase and 38% showing a decline. However, this short-term increase was not significant, and therefore the short-term assessment is stable.

**Figure 4b.1: Change in distribution of UK priority species, 1970 to 2017**



### Notes:

1. The line graph shows the unsmoothed trend (dashed line) with variation around the line (shaded area) within which users can be 90% confident that the true value lies (credible interval).
2. The figure in brackets shows the number of species included in the composite index.
3. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown little change in distribution (measured as the proportion of occupied sites), based on set thresholds of change.
4. All species in the indicator are present on one or more of the country priority species lists (Natural Environmental and Rural Communities Act 2006 – Section 41 (England), Environment (Wales) Act 2016 section 7, Northern Ireland Priority Species list, Scottish Biodiversity List).

5. These charts are not directly comparable to previous versions of the indicator. Inclusion of new data has increased the number of species that can be included in the indicator from 395 in 2019, to 422 this year.

**Source:** Biological records data collated by a range of national schemes and local data centres.

## Indicator assessment

### Assessment of change in distribution of priority species in the UK

**Long term (1970 to 2017): Deteriorating; Short term (2012 to 2017): No overall change; Latest year (2017): No change.**

**Note:** Analysis of the underlying trends is undertaken by the data providers.

## Indicator description

Priority species are defined as those appearing on one or more of the biodiversity lists of each UK country (Natural Environmental and Rural Communities Act 2006 - Section 41 (England); Environment (Wales) Act 2016 section 7, Northern Ireland Priority Species List, Scottish Biodiversity List). The combined list contains 2,890 species in total. The priority species were highlighted as being of conservation concern for a variety of reasons, including rapid decline in some of their populations. Actions to conserve these priority species are included within the respective countries' biodiversity or environment strategies.

Of the 2,890 species on the combined priority species list, the 422 for which robust quantitative time-series of the proportion of occupied sites are available are included in the indicator. These 422 species include bees, wasps and ants (93); bryophytes and lichens (120); moths (117); and other taxa (92). The other taxa include a number of insect groups, molluscs and spiders. The species have not been selected as a representative sample of priority species and they cover only a limited range of taxonomic groups. The measure is therefore not fully representative of species in the wider countryside. See the [technical background document](#) for more detail.

The relative change in distribution of each of these species is measured by the number of 1km grid squares across the UK in which they were recorded – this is referred to as the 'occupancy index'. The occupancy index will increase when a species becomes more widespread; it will decrease when a species becomes less widespread.

The index of distribution of priority species in the UK fell by more than 20% between 1970 and 1981; this was then followed by a relatively stable period until 2010 when it dipped to its lowest point in 2012, before showing an increase between 2012 and 2017. Occupancy of priority species was assessed as declining between 1970 and 2017. The index was 28% lower in 2017 than in 1970, this is considered a significant change. The indicator increased by 3% between 2012 and 2017 and therefore, it was assessed as stable when taking into account the 90% credibility interval. Uncertainty in the species-specific annual occupancy estimates are incorporated into the overall indicator; details of how this was done are included in the [technical background document](#).

## Relevance

Priorities for species and habitat conservation are set at a country level through country biodiversity or environment strategies. Each country has an identified list of priority species, which are of high conservation concern due, for example, to restricted range or population declines. The indicator therefore includes a substantial number of species that, by definition, are becoming less widespread.

Measures of distribution are less sensitive to change than measures of abundance (see indicator [4a](#)). Nonetheless, if a threatened species that has been declining starts to recover, its distribution should stabilise, and may start to increase. If the proportion of species in the indicator that are stable or increasing grows, the indicator will start to decline less steeply. If the proportion declines, it will fall more steeply. Success can therefore be judged by reference to trends in both indicators

4a and 4b, as well as other information on other priority species for which there are insufficient data for inclusion in the indicator.

The indicator shows progress with commitments to improve the status of our wildlife and habitats. It is relevant to outcomes 1 and 3 in [Biodiversity 2020: A strategy for England's wildlife and ecosystem services](#) (see Annex A). It is also relevant to a number of international targets (see Annex B of the aforementioned publication for further details).

## Background

The measure is a composite indicator of 422 species from 20 taxonomic groups (8 of the 29 groups originally modelled did not contain any species with sufficient data to be included in the final analysis), see the [technical background document](#) for a detailed breakdown of the species and groups in the indicator. The priority species identified in each of the 4 UK countries were highlighted as being of conservation concern for a variety of reasons, including their scarcity, their iconic nature or a rapid decline in their population. They are not representative of wider species in general. They do however include a range of taxonomic groups and will respond to the range of environmental pressures that biodiversity policy aims to address, including land use change, climate change, invasive species and pollution. The short-term assessment of change can be used to assess the impact of recent conservation efforts and policy aimed at halting and reversing species declines. However, natural fluctuations (particularly in invertebrate populations) and short-term response to weather may have a strong influence on the short-term assessment.

Regardless of advances in statistical techniques and the increase in the number of biological records collected, there are likely to be species on the priority lists for which little monitoring or occurrence data is available. Reasons for this include rarity, difficulty of detection, or those for which monitoring methods are unreliable or unavailable. In order for the indicator to be representative of priority species, a method of assessing the changing status of these remaining data poor species would need to be considered.

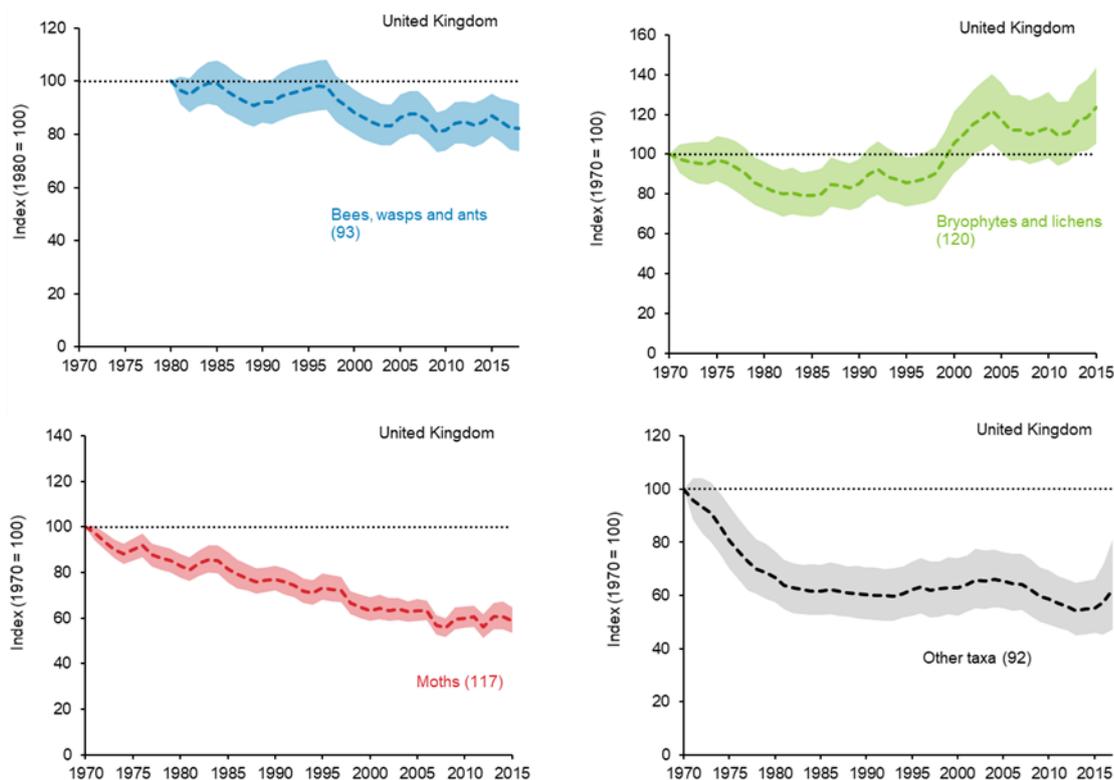
The Bayesian occupancy approach enables an estimation of species occurrence even though the data used in this indicator were collected without a standardised survey design (van Strien *et al.*, 2013; Isaac *et al.*, 2014a and b). For each species, records were extracted at the 1km grid square scale with records on different days being treated separately, and an annual time-series of the proportion of sites occupied was calculated. Each species-specific time series was scaled so the first value in 1970 was set to 100. The annual index was estimated as the arithmetic mean of the scaled species-specific occupancy estimates. Each species was given equal weighting within the indicator. Uncertainty in the species-specific annual occupancy estimates is represented by the 90% credible intervals. See the [technical background document](#) for further detail on production of the indicator.

Species were grouped into one of 5 categories based on both their short-term (over the most recent 5 years of data) and long-term (all years) mean annual change in occupancy. The threshold values for each category were based on those of the wild bird indicator. See the [technical background document](#) on the Bayesian indicator development for further detail on the calculation of the species-specific trends.

The trends of the taxonomic groups included within a multi-species indicator are often obscured by its composite nature. Indicator lines have been generated for a number of sub groups using the same method so that the trends for these groups can be seen more clearly (see Figure 4b.2). The bees, wasps and ants group experienced an overall decline, with an index value in 2018, 82% of that in 1980. These are counterbalanced by increases in bryophytes and lichens, which had an index value of 124 in 2015. The moths have undergone the most dramatic decline with an index value in the final year 59% of the value in 1970. Similar strong declines in moths were noted in 4a. The underpinning causes of this decrease are not completely understood.

Since 2019, data updates to the Biological Records Centre database were received for 5 taxonomic groups: Ants, Bees, Wasps, Spiders and Dragonflies.

**Figure 4b.2: Change in distribution of priority species, by taxonomic group, 1970<sup>4</sup> to 2017**



**Notes:**

1. The graphs show the unsmoothed trend (dashed line) and variation around the line (shaded area) within which users can be 90% confident that the true value lies (credible interval) for each of the taxonomic groups included in the composite indicator.
2. The figures in brackets show the number of species included in each measure.
3. Other taxa include a number of insect groups, molluscs and spiders.
4. All species in the indicator are present on one or more of the country priority species lists (Natural Environmental and Rural Communities Act 2006 – Section 41 (England), Environment (Wales) Act 2016 section 7, Northern Ireland Priority Species list, Scottish Biodiversity List).
5. The indicator for bees, wasps and ants starts in 1980.
6. These charts are not directly comparable to previous versions of the indicator. Inclusion of new data has increased the number of species that can be included in the indicator from 395 in 2019, to 422 this year.

**Source:** Biological records data collated by a range of national schemes and local data centres.

**Combined long-term change in the relative abundance and distribution of priority species**

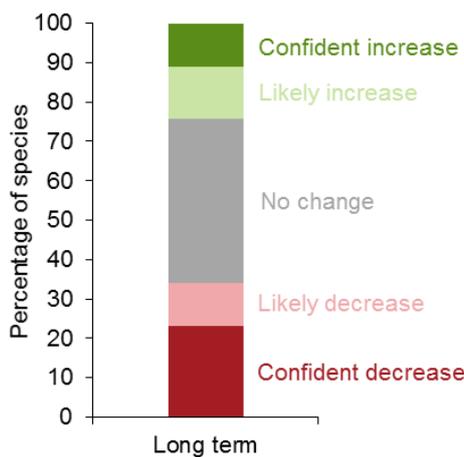
The assessment given here is based on the indicators published in 2018 using data up to 2015.

The priority species indicator currently comprises of 2 measures; [4a](#) based on abundance data and this indicator (4b) based on distribution data. The assessments are made separately for these 2 indicators, which can result in potentially different messages. Ideally, these would be combined into a single assessment for priority species, however such a combined indicator needs to address challenges about differences in the data types that contribute to 4a and 4b. Simply combining the species trends would assume equivalence across the 2 datatypes, i.e. that a 10% change in abundance is equivalent to a 10% change in distribution. This has, to date, been deemed an unreasonable assumption to make. Furthermore, combining change from different datatypes leads to a lack of clarity around what the indicator is actually measuring when using magnitude of change.

The UK Centre for Ecology & Hydrology have proposed a technique to produce a combined evaluation of priority species, using both abundance and distribution data. The key development is that rather than assessing the indicator based on magnitude of change, the assessment is based

on the balance of increasing versus decreasing species. This is consistent with existing indicators, in that the assessment is a statement of confidence in whether the overall trend line has increased, decreased or showed no overall change. It also sidesteps the challenges of combining different data types by only assuming that the confidence with which a species is assigned an increasing or decreasing trend can be compared across data types (see the [technical background document](#) for further details). As this technique is currently being refined, it has only been used to produce a measure of the combined long-term change in the 2 priority species indicators (Figure 4b.3).

**Figure 4b.3: Combined long-term change in the relative abundance and distribution of priority species in the UK, 1970 to 2015**



**Notes:**

1. Based on 929 species included in the 2018 update of indicators 4a and 4b. Each species contributes once only – so either to 4a or to 4b.
2. The graph provides information on the percentage of species which have increased, decreased or remained unchanged; it does not assess the amount of change in those species.

**Source:** Distribution data from: Biological records data collated by a range of national schemes and local data centres. Abundance data from: Bat Conservation Trust, British Trust for Ornithology, Butterfly Conservation, Defra, Joint Nature Conservation Committee, People’s Trust for Endangered Species, Rothamsted Research, Royal Society for the Protection of Birds, UK Centre for Ecology & Hydrology.

Of the 929 priority species included in the 2018 update of indicators 4a and 4b, 225 (24%) have increased, 317 (34%) have decreased and 387 (42%) have shown no significant change in either abundance or distribution between 1970 and 2015. Overall, the long-term trend for the combined measure of priority species abundance and distribution in the UK is declining.

**Web links for further information**

Aquatic Heteroptera Recording Scheme (Home page):

<https://www.britishbugs.org.uk/recording.html>

British Arachnological Society Spider Recording Scheme (Home page):

<http://srs.britishspiders.org.uk/>

Bees, Wasps and Ants Recording Society (Identification guides to download):

<http://www.bwars.com/index.php?q=content/identification-guides-download>

British Bryological Society (Home page): <http://www.britishbryologicalsociety.org.uk/>

British Dragonfly Society (Recording Dragonflies and Damselflies in the British Isles):

<http://www.british-dragonflies.org.uk/content/recording-dragonflies-and-damselflies-britain>

British Isles Neuropterida Recording Scheme (Home page): <http://lacewings.myspecies.info/>

British Lichen Society (Home page): <http://www.britishlichensociety.org.uk/>

British Myriapod and Isopod Group (Centipede and Millipede recording schemes):  
<http://www.bmig.org.uk/>

Bruchidae & Chrysomelidae Recording Scheme (Relevant BRC webpage):  
<https://www.brc.ac.uk/term/scheme/bruchidae-chrysomelidae-recording-scheme>

Butterfly Conservation (Butterflies and Moths): <https://butterfly-conservation.org/>

Conchological Society of Great Britain and Ireland (Home page): <http://www.conchsoc.org/>

Dipterists Forum (Cranefly, Empididae & Dolichopodidae, Fungus gnat Recording Schemes):  
<http://www.dipteristsforum.org.uk/>

Gelechiid Recording Scheme (Home page): <http://www.gelechiid.co.uk/>

Ground Beetle Recording Scheme (Home page): <http://www.coleoptera.org.uk/carabidae/recording>

Hoverfly Recording Scheme (Home page): <http://www.hoverfly.org.uk/portal.php>

Hypogean Crustacea Recording Scheme (Home page): <http://hcrs.freshwaterlife.org/>

National Moth Recording Scheme (Home page):  
[http://www.mothscount.org/text/27/national\\_moth\\_recording\\_scheme.html](http://www.mothscount.org/text/27/national_moth_recording_scheme.html)

Natural England (S41 List of priority species in England):  
<http://webarchive.nationalarchives.gov.uk/20140605090108/http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx>

Northern Ireland Environment Agency (Northern Ireland Priority Species List):  
<http://www.habitas.org.uk/priority/intro.html>

Orthoptera Recording Scheme (Home page): <http://www.orthoptera.org.uk/>

Riverfly Recording Schemes: Ephemeroptera, Plecoptera and Trichoptera (Home page):  
<http://www.riverflies.org/riverfly-recording-schemes>

Soldierflies and Allies Recording Scheme (Home page): <http://www.brc.ac.uk/soldierflies-and-allies/home>

Staphylinidae Recording Scheme (Relevant BRC webpage):  
<https://www.brc.ac.uk/scheme/staphylinidae-recording-scheme>

Terrestrial Heteroptera Recording Scheme - Shield bugs and allied species (Home page):  
<http://www.britishbugs.org.uk/recording.html>

The Scottish Government (Scottish Biodiversity List):  
<http://www.scotland.gov.uk/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL>

UK Biodiversity Partnership (UK Biodiversity Action Plans): <http://jncc.defra.gov.uk/page-5155>

UK Centre for Ecology & Hydrology – Biological Records Centre (Recording Schemes):  
<http://www.brc.ac.uk/> <http://www.brc.ac.uk/recording-schemes>; (Technical Background Document):  
<https://www.gov.uk/government/statistics/england-biodiversity-indicators>; (Technical Background Document: Deriving Indicators from Occupancy Models):  
<https://www.gov.uk/government/statistics/england-biodiversity-indicators>

Weevil and Bark Beetle Recording Scheme + Scolytidae (Relevant BRC webpage):  
<https://www.brc.ac.uk/scheme/weevil-and-bark-beetle-recording-scheme>

Wales Biodiversity Partnership (Section 7 priority species in Wales):

<https://www.biodiversitywales.org.uk/Environment-Wales-Bill>

## References

Isaac, N. J. B., August, T. A., Harrower, C. and Roy, D. B. (2013). Trends in the Distribution of UK native species 1970-2010. Preliminary report to JNCC. JNCC Report No 488.

[http://jncc.defra.gov.uk/pdf/488\\_Web.pdf](http://jncc.defra.gov.uk/pdf/488_Web.pdf) (PDF, 205kb).

Isaac, N. J. B., van Strien, A. J., August, T. A., de Zeeuw, M. P. and Roy, D. B. (2014a). Statistics for citizen science: extracting signals of change from noisy ecological data. *Methods in Ecology and Evolution*. <https://doi.org/10.1111/2041-210X.12254>

Isaac, N. J. B., van Strien, A. J., August, T. A., de Zeeuw, M. P. and Roy, D. B. (2014b). Extracting robust trends in species' distributions from unstructured opportunistic data: a comparison of methods. *BioRxiv*. <https://doi.org/10.1101/006999>

Van Strien, A. J., van Swaay, C. A. M. and Termaat, T. (2013). Opportunistic citizen science data of animal species produce reliable estimates of distribution trends if analysed with occupancy models. *Journal of Applied Ecology*, **50**(6), 1450–1458. <https://doi.org/10.1111/1365-2664.12158>

**Last updated:** October 2020

**Latest data:**

Distribution data – 2017;

Combined long-term abundance and distribution data – 2015