

# UK Biodiversity Indicators 2019

This document supports  
C4a. Status of UK priority species: Relative abundance

## Fiche

For further information on C4a. Status of UK priority species: Relative abundance visit [jncc.gov.uk/ukbi-C4a](https://jncc.gov.uk/ukbi-C4a)

For further information on the UK Biodiversity Indicators visit [jncc.gov.uk/ukbi](https://jncc.gov.uk/ukbi)

C4. Status of UK priority species

C4a. Relative abundance

Type: State Indicator

Summary

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. This indicator shows the average change in 214 species for which abundance trends are available.

By 2016, the index of relative abundance of priority species in the UK had declined to 40% of its baseline value in 1970, a statistically significant decrease (Figure C4a1). Over this long-term period, 22% of species showed a strong or weak increase and 63% showed a strong or weak decline.

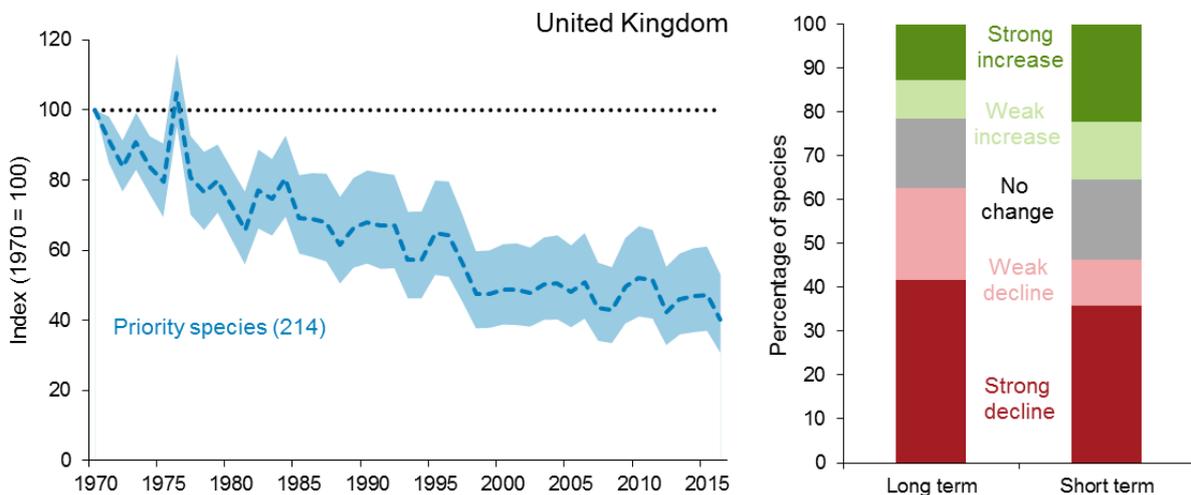
Between 2011 and 2016, the index was 22% lower than its value in 2011, again showing a statistically significant decrease. Over this short-term period, 35% of species showed a strong or weak increase and 46% showed a strong or weak decline.

Indicator Description

This indicator shows changes in the relative abundance of priority species in the UK for which data are available. The relative abundance of each priority species in this indicator is the estimated population (abundance) of that species in the latest year of the time series taken as a percentage of its estimated population in the earliest year of the time series (i.e. the base year). The indicator will increase when the population of priority species grows on average and decrease when the population declines.

This indicator should be read in conjunction with [C4b](#) which provides data on those UK priority species for which distribution data are available.

Figure C4ai. Change in the relative abundance of priority species in the UK, 1970 to 2016.



Notes:

1. The line graph shows the unsmoothed trend (dashed line) with its 95% confidence interval (shaded area).
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 (weakly or strongly), decreased (weakly or strongly) or shown no change in abundance 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),

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Environment (Wales) Act 2016 section 7, Northern Ireland Priority Species List, Scottish Biodiversity List).

- This indicator is not directly comparable with the previous publication. There have been a number of minor changes in the composition and a revision to the statistical methods used (see the indicator description section for more detail).

**Source:** Bat Conservation Trust, British Trust for Ornithology, Butterfly Conservation, Centre for Ecology & Hydrology, Defra, Joint Nature Conservation Committee, People's Trust for Endangered Species, Rothamsted Research, Royal Society for the Protection of Birds.

Assessment of change in the relative abundance of priority species in the UK			
	Long term	Short term	Latest year
Priority species – Relative abundance	 1970–2016	 2011–2016	Decreased (2016)

**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 in the combined priority species list, the 214 for which robust quantitative time series of relative species abundance are available are included in the indicator. These 214 species include birds (104), butterflies (23), mammals (11) and moths (76). This selection is taxonomically limited at present; it includes no vascular or non-vascular plants, fungi, amphibians, reptiles, or fish. The only invertebrates included are butterflies and moths. 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. The time series that have been combined cover different time periods, were collected using different methods and were analysed using different statistical techniques. In some cases, data have come from non-random survey samples. See the [technical background document](#) for more detail.

The relative abundance of each of these species is the estimated population (abundance) of the species in the latest year of the time series taken as a percentage of its estimated population in the earliest year of the time series (i.e. the relevant base year). The relative abundance of a species will increase when the population of the species grows; it will decrease when the population of the species declines.

Between 1970 and 2016, the index of relative abundance of priority species in the UK fell from 100 to 40. This change was assessed as a statistically significant decline. The long-term assessment is made on the unsmoothed time series of relative species abundance generated by the data providers. It is based on a test of statistical significance that compares the change and the 95% confidence intervals between 1970 and 2016. To calculate the short-term trend, a change statistic between 2011 and 2016 is calculated for each species, these short-term trend estimates are then re-sampled to provide confidence intervals on that change statistic (Eaton *et al.*, 2015). In 2016, the index of relative abundance of the 214 species included in the indicator fell by 22% relative to the 2011 level; a statistically significant decline.

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Whilst showing a similar general pattern to previously published iterations, the indicator given here shows a less substantial decline; the previous indicator ended on a value (relative to the 1970 baseline) of 32% in 2015, whereas the value for 2015 in this update is 47%. There have been a number of minor changes in the indicator in terms of species composition (214 species included in 2019 versus 215 species in 2018) and the treatment of data for both birds and bats, but the principal cause of the changed indicator is a revision in the statistical methods used to generate moth trends. See the [technical background document](#) for more detail.

### 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 abundant.

Measures of abundance are more sensitive to change than measures of distribution (see indicator [C4b](#)). 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 C4a and C4b, as well as other information on other priority species for which there are insufficient data for inclusion in the indicator.

### Background

The measure is a composite indicator of 214 species from 4 broad taxonomic groups, see the [technical background document](#) for a detailed breakdown of the species and groups included. 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, there are likely to be species on the priority lists for which little monitoring or occurrence data are 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 time series for each species in the indicator is converted into an index. Each time series is scaled as a percentage of its value in its first year (i.e. the first year has an index value of 100 regardless of when a species was first included in the indicator). This enables all species to be brought together on an equal basis – common species and rarer species are thereby given equal weighting, and the annual index value is the geometric mean of the scaled species values for that year. For species trends entering the indicator after the first year, their value in the first year is set to the geometric mean of those species trends already in the indicator. Any missing values are estimated using linear interpolation (Collen *et al.*, 2008) and 1% of the trend average is added to any trends containing zero values (Loh *et al.*,

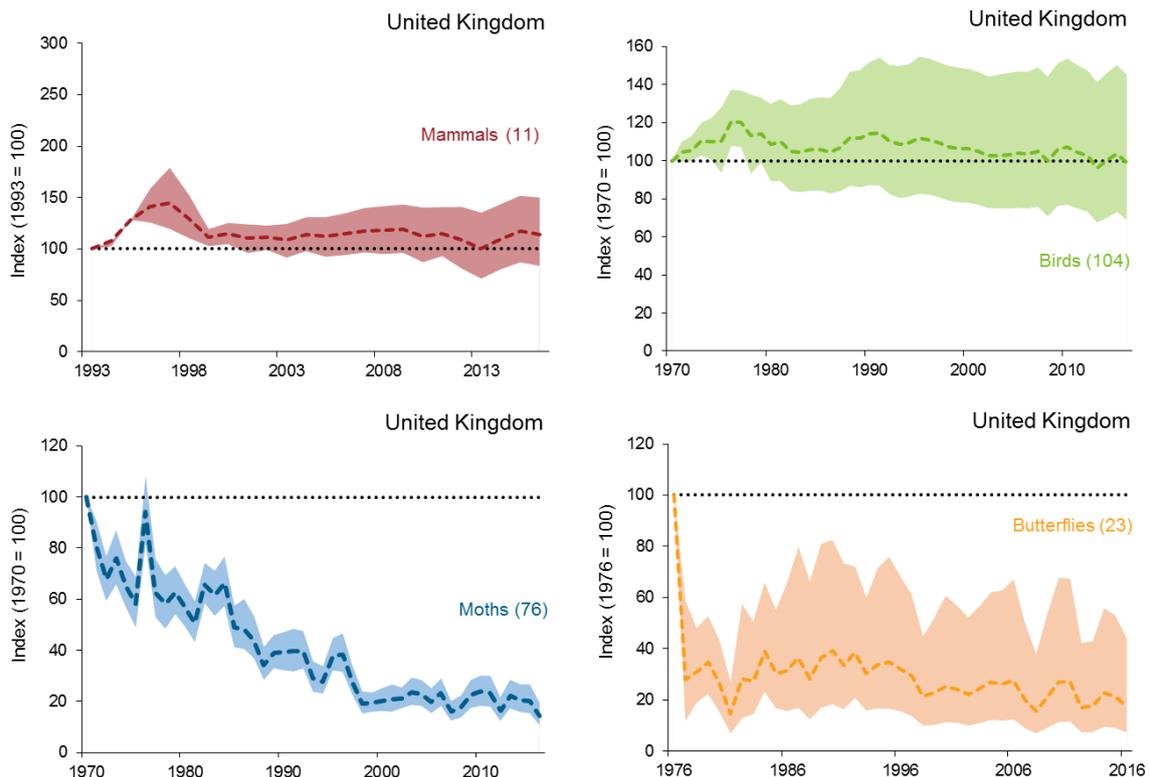
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2005). Species trends ending prior to the end year of the indicator are held at their final values to the end of the data series (currently 2016).

The overall trend shows the balance across all the species included in the indicator. Individual species within each measure may be increasing or decreasing in abundance (Figure C4ai). Estimates will be revised when new data or improved methodologies are developed and will, if necessary, be applied retrospectively to earlier years. Further details about the species that are included in the indicator, and the methods used to create the priority species indicator can be found in the [technical background document](#).

Confidence intervals for each year are created using bootstrapping (Buckland 2005; Freeman *et al.*, 2001). In each iteration, a random sample of species is selected and the geometric mean calculated. The headline indicator (Figure C4ai) masks variation between the taxonomic groups. Figure C4aii shows the index for each taxonomic group separately, generated using the same methods as the headline indicator. The moths have undergone the most dramatic decline with an index value in the final year (2016) that was only 14% of its value in 1970. Similar strong declines in moths were noted in C4b. Butterflies have also experienced a strong decline, with an index value in 2016 that was 17% of its value in 1976. These are counterbalanced by relative stability in the birds index (99% in 2016 relative to the base year of 1970) and an increase in the mammals index, which had a value of 114% in 2016 (relative to a base year of 1993).

**Figure C4aii. Change in relative species abundance by taxonomic group, 1970 to 2016.**



### Notes:

1. The graphs show the unsmoothed trend (dashed line) together with the 95% confidence interval (shaded area) for each of the 4 taxonomic groups included in the composite indicator.
2. The figures in brackets show the number of species included in each measure.

**Source:** Bat Conservation Trust, British Trust for Ornithology, Butterfly Conservation, Centre for Ecology & Hydrology, Defra, Joint Nature Conservation Committee, People's Trust for Endangered Species, Rothamsted Research, Royal Society for the Protection of Birds.

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

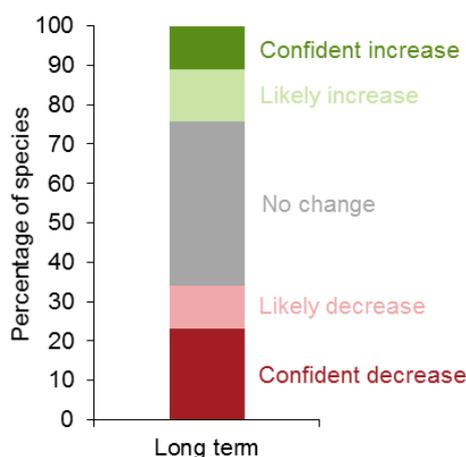
The assessment given here is based on the indicators published in 2018; it has not been updated in 2019 and does not reflect new data published in the fiches for C4a or C4b.

The priority species indicator currently comprises of 2 measures; this indicator (C4a) based on abundance data and [C4b](#) 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 C4a and C4b. 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 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 verses 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 C4aiii).

Of the 929 priority species included in the 2018 update of C4a and C4b, 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.

**Figure C4aiii. 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 C4a and C4b. Each species contributes once only – so either to C4a or to C4b.

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

### Goals and targets

#### Aichi Targets for which this is a primary indicator

**Strategic Goal C.** To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.



**Target 12:** By 2020, the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

#### Aichi Targets for which this is a relevant indicator

**Strategic Goal B.** Reduce the direct pressures on biodiversity and promote sustainable use.



**Target 5:** By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

**Strategic Goal C.** To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.



**Target 11:** By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

#### Web links for further information

Reference	Title	Website
Bat Conservation Trust	The National Bat Monitoring Programme	<a href="http://www.bats.org.uk/pages/nbmp.html">http://www.bats.org.uk/pages/nbmp.html</a>
British Trust for Ornithology	Indicators of wild bird populations	<a href="http://www.bto.org/science/monitoring/developing-bird-indicators">http://www.bto.org/science/monitoring/developing-bird-indicators</a>
Butterfly Conservation	Butterflies and Moths	<a href="https://butterfly-conservation.org/">https://butterfly-conservation.org/</a>
UK Butterfly Monitoring Scheme	Butterflies as indicators	<a href="http://www.ukbms.org/indicators.aspx">http://www.ukbms.org/indicators.aspx</a>

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Reference	Title	Website
Joint Nature Conservation Committee	Seabird Monitoring Programme	<a href="http://jncc.defra.gov.uk/page-1550">http://jncc.defra.gov.uk/page-1550</a>
People's Trust for Endangered Species	National Dormouse Monitoring Programme	<a href="http://www.ptes.org/?page=186">http://www.ptes.org/?page=186</a>
UK Biodiversity Partnership	UK Biodiversity Action Plans	<a href="http://jncc.defra.gov.uk/page-5155">http://jncc.defra.gov.uk/page-5155</a>
Wildfowl and Wetlands Trust	National waterbird estimates	<a href="http://www.wwt.org.uk/research/monitoring/">http://www.wwt.org.uk/research/monitoring/</a>
The Scottish Government	Scottish Biodiversity List	<a href="http://www.scotland.gov.uk/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL">http://www.scotland.gov.uk/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL</a>
Wales Biodiversity Partnership	Section 7 priority species in Wales	<a href="https://www.biodiversitywales.org.uk/Environment-Wales-Bill">https://www.biodiversitywales.org.uk/Environment-Wales-Bill</a>
Natural England	S41 List of priority species in England	<a href="http://webarchive.nationalarchives.gov.uk/20140605090108/http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx">http://webarchive.nationalarchives.gov.uk/20140605090108/http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx</a>
Northern Ireland Environment Agency	Northern Ireland Priority Species List	<a href="http://www.habitas.org.uk/priority/intro.html">http://www.habitas.org.uk/priority/intro.html</a>

### References

Buckland, S. T., Magurran, A. E., Green, R. E. and Fewster, R. M. (2005). Monitoring change in biodiversity through composite indices. *Philosophical Transactions of the Royal Society of London. Series B*, **360**, 243–254.

Collen, B., Loh, J., Whitmee, S., McRae, L., Amin, R. and Baillie, J. (2008). Monitoring Change in Vertebrate Abundance: the Living Planet Index. *Conservation Biology*, **23**, 317–327.

Freeman, S. N., Baillie, S. R. and Gregory, R. D. (2001). Statistical analysis of an indicator of population trends in farmland birds, BTO Research Report no. 251, Thetford.

[http://www.bto.org/sites/default/files/shared\\_documents/publications/research-reports/2001/rr251.pdf](http://www.bto.org/sites/default/files/shared_documents/publications/research-reports/2001/rr251.pdf) (PDF, 285kb)

Loh, J., Green, R. E., Ricketts, T., Lamoreux, J., Jenkins, M., Kapos, V. and Randers, J. (2005). The Living Planet Index: using species population time series to track trends in biodiversity. *Philosophical Transactions of the Royal Society. Series B*, **360**, 289–295.

**Full details of this indicator, including a datasheet and technical documentation is available at:** [jncc.gov.uk/ukbi-C4a](http://jncc.gov.uk/ukbi-C4a)

**Last updated:** September 2019

#### Latest data:

Abundance data – 2016;

Combined long-term abundance and distribution data – 2015