4a. Status of priority species: relative abundance

Type: State Indicator

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 4b which provides data on those UK priority species for which distribution information is available.

Relative abundance of priority species in the UK

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 the 219 species for which abundance trends are available.

By 2018, the index of relative abundance of priority species in the UK had declined to 36% of its value in 1970, a statistically significant decrease (Figure 4a.1). Over this long-term period, 21% of species showed a strong or weak increase and 63% showed a strong or weak decline.

Between 2013 and 2018, the indicator did not change significantly, with species on average declining 7% between 2013 and 2018. Over this short-term period, 34% of species showed a strong or weak increase and 46% showed a strong or weak decline.

Figure 4a.1: Change in the relative abundance of priority species in the UK, 1970 to 2018
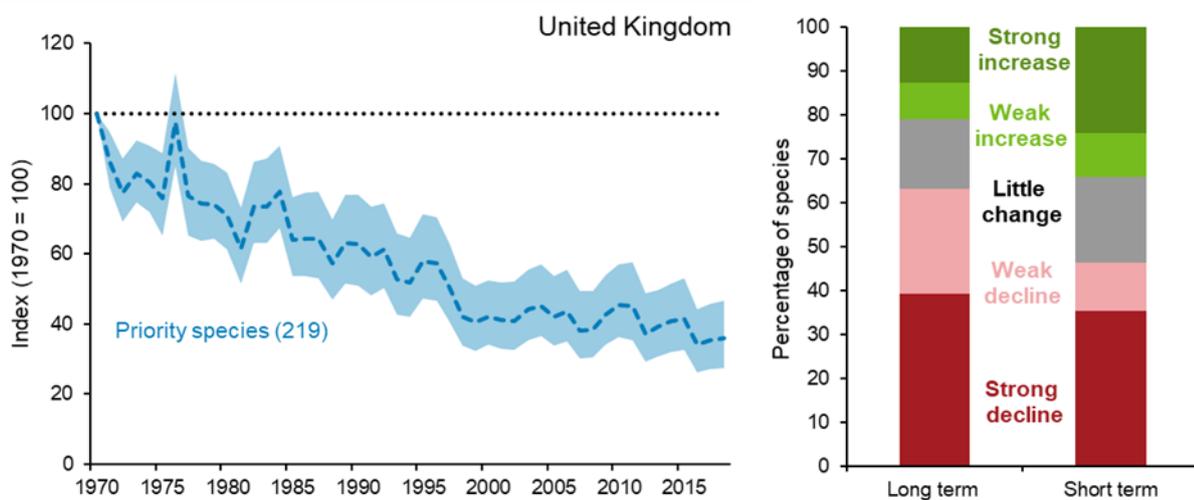
Notes:

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 (weekly or strongly), decreased (weakly or strongly) or shown little 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), Environment (Wales) Act 2016 section 7, Northern Ireland Priority Species List, Scottish Biodiversity List).
5. This indicator is not directly comparable with the previous publication; the number of species included in the composite index has increased to 219.

Source: 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.

Indicator assessment

Assessment of change in the relative abundance of priority species in the UK

Long term (1970 to 2018): Deteriorating; Short term (2013 to 2018): Little or no overall change; Latest year (2018): Increased.

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 219 for which robust quantitative time series of relative species abundance are available are included in the indicator. These 219 species include birds (103), butterflies (23), mammals (13) and moths (80). 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 2018, the index of relative abundance of priority species in the UK fell from 100 to 36. 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 2018. To calculate the short-term trend, a change statistic between 2013 and 2018 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). The 219 species on average showed little change between 2013 and 2018, the most recent estimate being on average 7% below that in 2013.

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 4b). 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 219 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.*, 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 2018).

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 4a.1). 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 4a.1) masks variation between the taxonomic groups. Figure 4a.2 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 (2018) that was only 14% of its value in 1970. Similar strong declines in moths were noted in 4b. Butterflies have also experienced a strong decline, with an index value in 2018 that was 23% of its value in 1976. These are counterbalanced by relative stability in the birds index (98% in 2018 relative to the base year of 1970) and an increase in the mammals index, which had a value of 83% in 2018 (relative to a base year of 1995).

Figure 4a.2: Change in relative species abundance by taxonomic group, 1970 to 2018
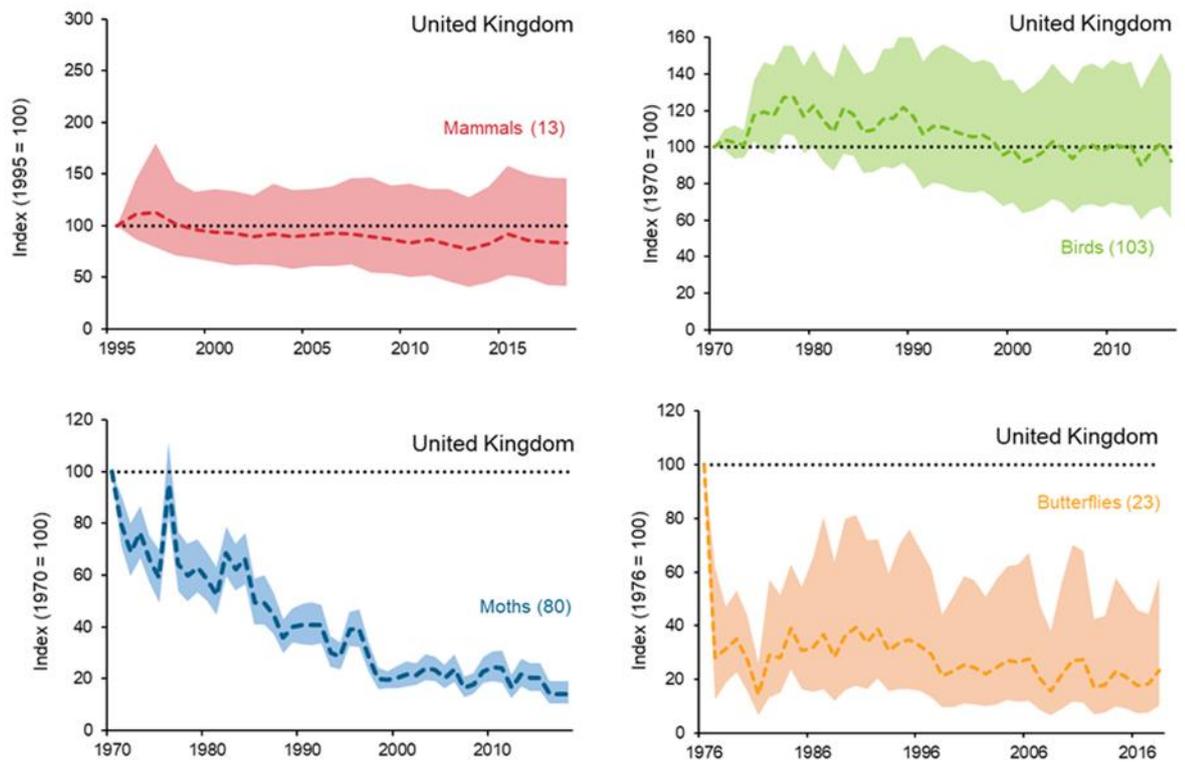
Notes:

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, 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.

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; it has not been updated.

The priority species indicator currently comprises of 2 measures; this indicator (4a) based on abundance data and 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 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 4a.3).

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.

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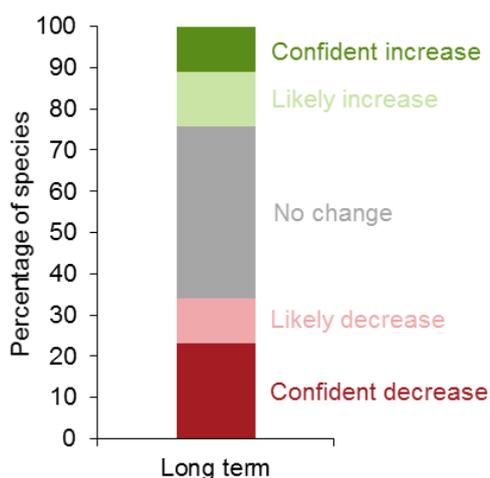
Notes:

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.

Web links for further information

Bat Conservation Trust (The National Bat Monitoring Programme): http://www.bats.org.uk/pages/nbmp.html

British Trust for Ornithology (Indicators of wild bird populations): http://www.bto.org/science/monitoring/developing-bird-indicators

British Trust for Ornithology, Royal Society for the Protection of Birds and UK Centre for Ecology & Hydrology (Technical Background Document): https://www.gov.uk/government/statistics/england-biodiversity-indicators

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

Joint Nature Conservation Committee (Seabird Monitoring Programme): http://jncc.defra.gov.uk/page-1550

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

People's Trust for Endangered Species (National Dormouse): http://www.ptes.org/?page=186

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

Wales Biodiversity Partnership (Section 7 priority species in Wales): https://www.biodiversitywales.org.uk/Environment-Wales-Bill

Wildfowl and Wetlands Trust (National water bird estimates): http://www.wwt.org.uk/research/monitoring/

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

UK Butterfly Monitoring Scheme (Butterflies as indicators): http://www.ukbms.org/indicators.aspx

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.

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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 (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.

Last updated: October 2020

Latest data:

Abundance data – 2018;

Combined long-term abundance and distribution data – 2015