UK Biodiversity Indicators 2019

This document supports
C8. Mammals of the wider countryside (bats)

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C8. Mammals of the wider countryside (bats)

Type: State Indicator

Summary

The bat index has increased by 42% between 1999 and 2017. In the short term, between 2012 and 2017, the bat index has increased by 10%.

The bat index is a composite of 10 species trends (11 species with 2 combined). Since 1999, 5 of the bat species trends included in the index have increased and 5 have shown no significant change. The UK's rarer and more specialised bat species are not included in the index due to difficulties monitoring these species.

The increase in the index is underpinned by significant increases in populations of 3 species, greater horseshoe bat, lesser horseshoe bat and common pipistrelle. These increases indicate that some bat species are recovering after what are believed to have been major population declines during the 20th century.

> **Indicator Description**
>
> This indicator shows changes in the relative abundance of 11 of the UK's 17 breeding bat species, based on data from transect surveys, roost counts and counts at hibernation sites. Whilst 11 species are included there are 10 species trends, as an aggregate trend is used for the whiskered bat (*Myotis mystacinus*) and Brandt's bat (*Myotis brandtii*); these 2 species are difficult to distinguish in the field. Bat species make up a third of the UK's mammal fauna and occur in most lowland habitats across the UK.

Figure C8i. Trends in bat populations, 1999 to 2018
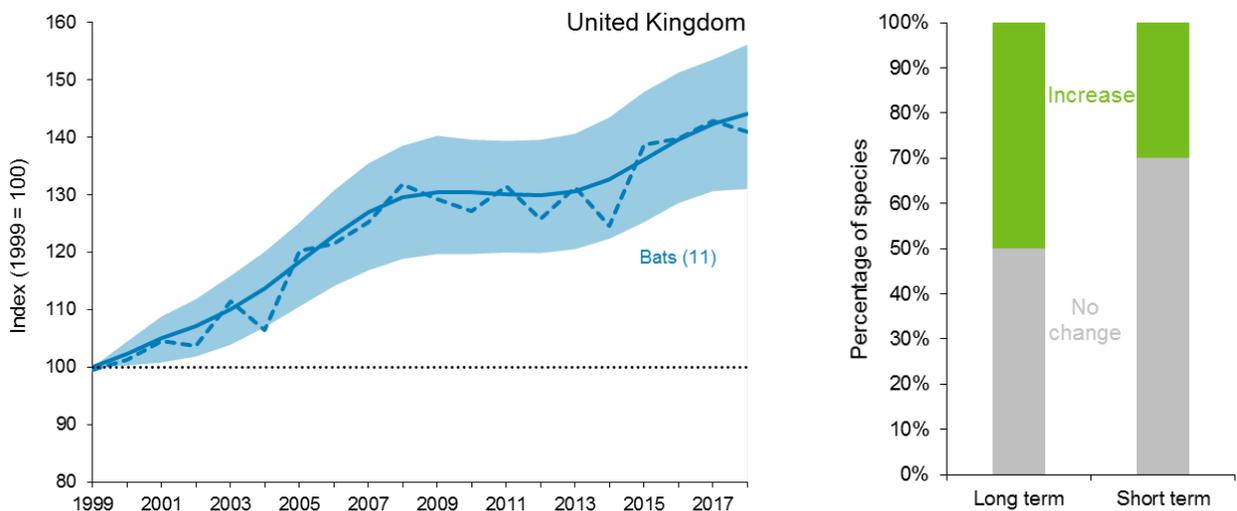
Notes:
1. The line graph shows the unsmoothed trend (dashed line) and smoothed trend (solid line) with its 95% confidence interval (shaded).
2. The figure in brackets shows the number of species in the index.
3. This indicator includes measures for 11 species of bats; the index only includes 10 trends. This is because an aggregate trend is used for the whiskered bat (*Myotis mystacinus*) and Brandt's bat (*Myotis brandtii*); these 2 species have been combined due to difficulties with distinguishing them in the field.

4. The bar chart shows the percentage of species trends which, over the time periods of the long-term and short-term assessments, have shown a statistically significant increase or decline, or no significant change.
5. Since 2018, this indicator has been extended to include 11 species instead of 8. The complete time series in the accompanying dataset has also been updated to reflect these changes.
6. The model used to analyse some individual species trends has changed since the previous publication, and these results are therefore not directly comparable (see Background section for more details).

Source: Bat Conservation Trust.

The smoothed bat index increased every year between the 1999 baseline and 2008. Between 2008 and 2013 it was relatively stable, before increasing again between 2013 and 2017. However, the composite indicator masks variation between the species that contribute to it. The long-term increase in the indicator is primarily driven by strong increases in 3 species; greater horseshoe bat, lesser horseshoe bat and common pipistrelle and between 1999 and 2017, the combined survey trend for these species increased by 159%, 107% and 87% respectively. The combined trend for the whiskered bat and Brandt's bat showed a weaker increase over the same period, as did the trend for noctule. The remaining 5 species showed no significant change. In the short term, between 2012 and 2017, 3 species have increased significantly and the rest show no significant short-term change. No species show a decline in either the long or short term, however it is not possible to produce separate trends for whiskered bat and Brandt's bat, as they cannot be reliably distinguished in the field. It is therefore possible that an increase in one species could mask a decline in the other. It is also important to note that the UK's rarer and more specialised bat species are not included in the index due to difficulties monitoring these species.

Long and short-term assessments are run to the penultimate year of the trend as the most recent smoothed data point (2018) is likely to change as future years of data are added. The assessment of change in the latest year (2018) is based on unsmoothed data.

Assessment of change in widespread bat populations			
	Long term	**Short term**	**Latest year**
Bat populations	✅ 1999–2017	✅ 2012-2017	Decreased (2018)

Note: Long-term and short-term assessments are made on the basis of smoothed trends to the penultimate year (2017) by the Bat Conservation Trust. This is because the most recent smoothed data point (2018) is likely to change in next year's update when additional data are included for 2019. As such, the latest year assessment is based on unsmoothed data.

Relevance

Bat populations utilise a range of habitats across the landscape and are sensitive to pressures in the urban, suburban and rural environment. All bats and their roosts are protected by domestic and European legislation. The UK is a signatory to the EUROBATs agreement, set up under the Convention on Migratory Species, with the intention of conserving all European bat populations. The wider relevance of bats as biodiversity indicators is presented in Jones *et al.* (2009).

Background

The species used in this index (Table C8i) occur throughout a variety of landscapes including urban areas, farmland, woodland, and river/lake systems. All bats in the UK feed at night and prey on insects. To thrive they require adequate roosting opportunities (particularly for breeding and hibernating), foraging habitat and connected landscape features, such as hedgerows and tree lines, which assist them in commuting between roost sites and feeding locations.

Key pressures on bats, including landscape change, agricultural intensification, development, habitat fragmentation, are also relevant to many other wildlife groups. Bats are believed to have experienced major declines throughout Western Europe during the 20th century, which have been attributed to persecution, agricultural intensification, habitat and roost loss, remedial timber treatment and declines of their insect prey. Evidence of these declines (synthesised in Haysom *et al.*, 2010) is fragmented as during this period few data were collected in a systematic way. Evidence includes:

- Well documented range contractions of greater horseshoe bat and lesser horseshoe bat across Great Britain and Europe.

- Reports of the loss of large colonies of several species from traditional roosting sites.

- Reductions in the number of known maternity colonies across Great Britain.

- A small number of published population trends (e.g. Ransome 1989; Guest *et al.* 2002).

The bat index and long-term assessment reflect changes in bat populations since 1999, and indicate that more recently some UK bat populations are beginning to recover. This recovery is in line with a prototype European indicator of trends in bat populations, developed from counts at hibernation sites in nine European countries including the UK (Haysom *et al.* 2014). The greatest weight of evidence suggests that 2 factors have had a positive impact on bat populations: a reduction in human disturbance since the introduction of strict legal protection and a milder climate, in particular over winter and spring which enhances over-winter survival (Burns *et al.* 2016). Bats have also benefited from direct conservation action and public education (Mitchell-Jones 1993; Haysom *et al.* 2010), but remain vulnerable to pressures such as landscape change, climate change, development and emerging threats such as new building practices, wind turbines, and light pollution (Haysom *et al.* 2010; Kunz *et al.* 2007; Rebelo *et al.* 2010; Stone *et al.* 2009, 2012).

The National Bat Monitoring Programme was established in 1996, with the first surveys undertaken in 1997. It currently delivers trends for 11 of the UK's 17 breeding bat species (two of which are combined), and has deployed over 4,600 volunteers to record observations at 6,682 sites.

Since 2018, this indicator has been extended to include 11 bat species instead of 8. Data have been updated for the entire dataset to include all 11 bat species.

Figure C8ii. Location of National Bat Monitoring Programme monitoring sites
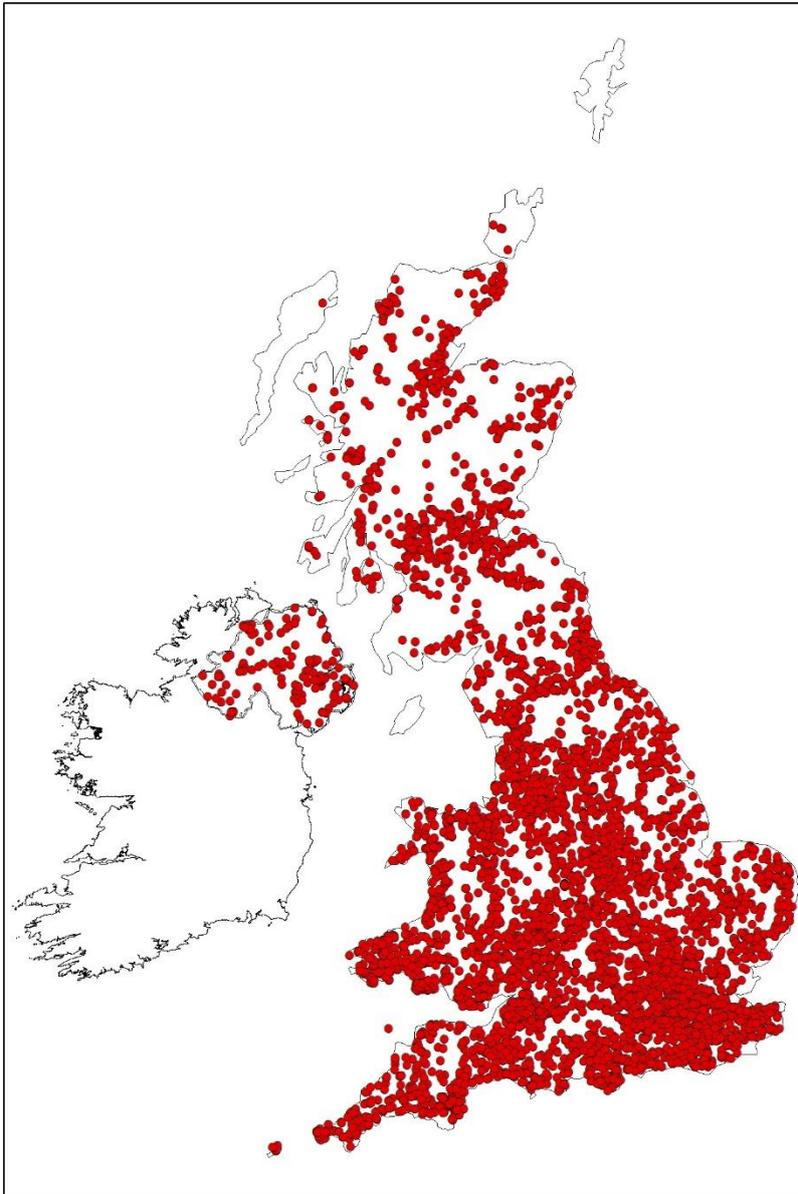
This indicator shows changes in the relative abundance of 11 of the UK's 17 breeding bat species: brown long-eared bat, common pipistrelle, Daubenton's bat, greater horseshoe bat, lesser horseshoe bat, Natterer's bat, noctule, serotine, soprano pipistrelle and whiskered/Brandt's bat (the latter two species cannot be distinguished during monitoring surveys and so are treated as a species group). It is compiled by the Bat Conservation Trust using data collected annually from the National Bat Monitoring Programme (NBMP). Surveys for these species include summer roost counts, counts at hibernation sites and visual and/or acoustic observations made along predetermined transects. Most species are surveyed by 2 different survey methods, both of which are included in the index apart from summer roost count data for common and soprano pipistrelle. Pipistrelle species' frequent 'roost switching' can cause a negative bias in trends calculated from summer roost counts, so these data are omitted.

For each species, Generalised Additive Modelling (GAM) is used to calculate the trends in numbers over time (Fewster *et al.* 2000). The models include terms for factors that can influence the apparent population averages (e.g. bat detector model, temperature, etc.), so their effect can be taken into account. The GAM models produce smoothed trends which are

more robust against random variation between years. For easier interpretation the means are then converted to an index that is set to 100 for the selected baseline year of data. The species indices are revised when new data become available or when improved modelling methods are developed, and applied retrospectively to data from earlier years. As such, indices published in previous years are not strictly comparable to the current index. To generate the composite bat indicator and confidence intervals, each species has been given equal weighting, and the annual index figure is the geometric mean in that year (Figure C8i). Confidence intervals are relatively wide due to the high variability inherent in bat monitoring data and the rarity of several species. Long and short-term assessments are run to the penultimate year of the trend as the most recent year's smoothed data point is likely to change as future years of data are added. The assessment of change in the latest year is therefore based on unsmoothed data. The survey methods and statistical analysis used by the NBMP to produce individual species trends are described in Barlow *et al.* (2015).

Table C8i. Long-term and short-term percentage change in the species trends used in the bat indicator

Species	Long-term percentage change (1999–2017)	Short-term percentage change (2012–2017)
brown long-eared bat *Plecotus auritus*	6.5 (2001–2017)	0.9
common pipistrelle *Pipistrellus pipistrellus*	87.1*	12.9*
Daubenton's bat *Myotis daubentonii*	19.3*	6.0
greater horseshoe bat *Rhinolophus ferrumequinum*	159.2*	29.9*
lesser horseshoe bat *Rhinolophus hipposideros*	107.3*	12.2*
Natterer's bat *Myotis nattereri*	24.5* (2002–2017)	9.6
noctule *Nyctalus noctula*	25.7	8.6
soprano pipistrelle *Pipistrellus pygmaeus*	24.3	12.9
serotine *Eptesicus serotinus*	-7.4	-3.6
whiskered/Brandt's bat *Myotis mystacinus/Myotis brandtii*	31.3	8.9

* Denotes a statistically significant change (based on smoothed data).

Note: To better capture patterns in the data, long-term and short-term assessments are made on the basis of smoothed data, with analysis of the underlying trend undertaken by Bat Conservation Trust. All 11 species are protected through Annex IV of the Habitats Directive. Greater horseshoe bat and

lesser horseshoe bat are also listed on Annex II of the Directive – leading to Special Areas of Conservation being designated for this species.

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 landscape and seascapes

Web links for further information

Reference	Title	Website
Bat Conservation Trust	The National Bat Monitoring Programme	https://www.bats.org.uk/our-work/national-bat-monitoring-programme
EUROBATS	EUROBATS (The Agreement on the Conservation of Populations of European bats)	http://www.eurobats.org/
European Environment Agency	European bat population trends – a prototype biodiversity indicator	http://www.eea.europa.eu/publications/european-bat-population-trends-2013

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Full details of this indicator, including a datasheet and technical documentation are available at: jncc.gov.uk/ukbi-C8

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Latest data available: 2018