C8 Mammals of the Countryside [Bats]

This Evidence Statement should be read in conjunction with the *Summary of Evidence* document (Annex 3). Assertions in bold text have been assigned a confidence rating following assessment by a panel of independent experts (see main report for details).

A. Background, structure and statistical issues/biases

- This indicator describes trends in the UK abundance of eight bat species from 1999-2013. The indicator is a composite index of eight widespread bat species for which data were available: serotine; Daubenton's bat; Natterer's bat; noctule; common pipistrelle; soprano pipistrelle; brown long-eared bat; and lesser horseshoe bat.
- The indicator is constructed using data from the National Bat Monitoring Program (NBMP), which employs a suite of monitoring methods[i]. The NBMP draws data from all four countries of the United Kingdom, but for the majority of species there are insufficient data to report on Northern Ireland, so the indicator covers Great Britain only. The indicator is constructed using data from four annual survey schemes; sample sites for the Field Survey and Waterways Survey are selected using a random-stratified sample design, whereas sites for the Roost Count and the Hibernation Survey are self-selected by volunteers. Therefore the locations of sites within the composite index reflect the distribution of volunteers who contribute data. Lowland England is over-represented[ii], although the degree of spatial bias is less than other datasets based on volunteer effort. Individual species trends are weighted (except for those species with a restricted distribution) so that the data from Wales, Scotland and England contribute in proportion to the lowland area of each country. However, the data are not stratified by habitat type, so any habitat biases in site selection[ii] remain in the headline indicator.
- Each species is given equal weighting, and the annual index is the geometric mean of the individual species indices for that year. General Additive Modelling is used to produce smoothed trends for both the individual species indices and the composite index[i].

B. Representation

1. This indicator includes half (8/17) of the bat species resident to the UK. These are the more widespread and common species and it is not known whether rare species or habitat specialists have similar trends[iii]. **This indicator is the average trend in relative abundance of widespread and common bat species in Great Britain, but includes summer roost surveys that may exaggerate declines in some species** [High]**.** It does not represent other mammals.

C. The Trend

2. The indicator increased by 23% between 1999-2013[iv]. However, the long-term trend is somewhat sensitive to the start year[v], possibly reflecting the small number of species in the indicator and the relatively short span of years. **There is good evidence that the average abundance of bats in this indicator has increased since 1999** [Medium].

3. It has been suggested that **recent increases represent recovery from decades of long-term decline** [iv,vi], **but the evidence is largely circumstantial** [Medium].
4. Bats are more consistent in their trends than most other species indicators[vii]. Three of the eight species in the indicator have increased in the long-term, no species has decreased and five species show no significant change in abundance[viii].
5. The indicator has been stable over the past five years (2008-2013), with one species declining, five species showing no change and two species increasing. **There is no evidence that bats have experienced changes in abundance over the past five years** [Medium].
6. **There is qualitative evidence that trends are similar in the three countries of Great Britain** [Medium]. National bat indices are not published, but available data shows that long-term trends for individual species have similar magnitude in England and Wales[ix] and in Scotland[x].

D. Wider Application

7. All native British bats are insectivorous and are believed to play an important role in the regulation of moths and other insect pests of agricultural crops[xi]. However, little is known about the nature of the relationship between abundance or species richness of bats and the level of pest control provided, so it remains unclear how changes in the indicator could be used as a measure of pest control services.
8. Bats are charismatic animals that form an important component of human enjoyment of nature (cultural ecosystem services)[xii]. However, the link between species status and cultural services is not well-established, so it remains unclear how changes in the indicator could be used as a measure of cultural ecosystem services.
9. **The indicator does not directly measure progress towards, or achievement of, any Aichi targets** [High]. The bat indicator is used as a primary indicator of target 12 (the extinction of threatened species)[xiii], however few of the common and widespread bat species that make up this indicator would qualify as threatened by objective criteria. Moreover, indicator C4a is a more direct measure of progress towards Aichi target 12. The status of bats is also considered relevant to targets 5 (habitat loss) and 11 (protected areas), although other indicators are more directly relevant.

E. Drivers of change

10. There is evidence that legal protection of bats through the Wildlife and Countryside Act 1981 and the EU Habitats Directive 1992 has substantially contributed to the observed reduction in human disturbance of bat roosts. **The legal protection of bats is a very strong driver of the increase in the bat indicator**[xiv] [High].
11. The increase in native forest area in the UK has benefitted seven of the eight bat species in the indicator; **native forest planting has made a strong contribution to the increase in the indicator**[xv] [Medium].
12. **The loss of semi-natural habitat, principally hedgerows, in farmland as a consequence of agricultural intensification has had a strong negative impact on some bat species within the indicator**[xvi] [Medium].
13. There is varying evidence to suggest that **management leading to reduction in dead trees in woodland, increasing light pollution, and landscape fragmentation caused by roads have also had adverse impacts on populations of bats within the indicator**[xvii] [Medium].

Endnotes refer to the "Technical Report – Summary of Evidence" document, unless otherwise stated

[i] Barlow *et al* 2015 *Biol Conserv* 182**,** 14–26
[ii] Section 2.2, notably table 2.3.
[iii] Section 3.4.1.5
[iv] http://jncc.defra.gov.uk/page-4271
[v] Sections 2.3.4 – 2.3.6, notably figure 2.6.
[vi] Haysom et al 2010 in *Silent Summer: The State of Wildlife in Britain and Ireland*, 259–280.
[vii] Section 2.1.5, table 2.1.
[viii] http://jncc.defra.gov.uk/docs/UKBI2015_DS_C8_Final.xlsx
[ix] http://www.bats.org.uk/pages/summary_of_trends_in_england_and_wales.html
[x] http://www.snh.gov.uk/docs/A1759538.pdf
[xi] Riccucci & Lanza 2014. *Vespertilio* 17**,** 161–169
[xii] Section 3.4.2.1
[xiii] http://jncc.defra.gov.uk/page-6121
[xiv] Section 3.2.10 especially table 3.25, section 3.2.10.1
[xv] Section 3.2.10 especially table 3.25, section 3.2.10.3
[xvi] Section 3.2.10 especially table 3.25, section 3.2.10.4
[xvii] Section 3.2.10 especially table 3.25, section 3.2.10.2, 3.2.10.6 & 3.2.10.7