

**Initial Response to the recommendations of the
Quality Assurance Science Panel's
report of a
Review of UK biodiversity indicators that
provide status and trends for species.**

November 2016

Quality Assurance Science Panel's report can be found at
<http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=19504&FromSearch=Y&Publisher=1&SearchText=BE0102&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description>

Evidence statement can be found at
<http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=19528&FromSearch=Y&Publisher=1&SearchText=BE0112&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description>

**Initial Response to the recommendations of the
Quality Assurance Science Panel's
report of a
Review of UK biodiversity indicators that provide status and trends for species.**

This paper sets out an initial indicator-by-indicator response to the recommendations from the Science Panel, to improve:

1. The **quality** of the data underpinning the indicators;
2. The indicators' **relevance** to policy;
3. The **analytical methods** used to derive trends;
4. The **presentation** of the indicators;
5. The **interpretation** of the indicators (usually requiring research to improve our knowledge so that we can understand what it is telling us).

The quality assurance panel was convened to provide advice on improvements that could be made to a suite of UK biodiversity indicators that are used to assess the status and trends of a range of species, and which are linked in turn to a range of biodiversity targets.

The Science Panel review produced a large number of recommendations (57). This paper provides an initial response from the UK Biodiversity Indicator Steering Group¹ (BISG) focussing on those issues that potentially limit the use of the indicators by making trends unreliable or open to misinterpretation.

Consideration by UK BISG

Following on from discussion at the 13 June UK BISG meeting, a subgroup² met on 26 July to review a spreadsheet listing all the recommendations. The discussions took account of ongoing work in other areas, ownership and governance of datasets, and availability of resources. Proposed actions captured at the meeting were circulated to the subgroup for further review; this paper summarises the rationale for what work should be taken forward on each indicator, and identifies actions in the short and longer term. The report of the subgroup was discussed at a meeting of UK BISG on 20 September 2016 and it was agreed that the document provided an initial response which should be kept under review and made available for further consideration by partners involved in biodiversity monitoring and assessment.

General Points

In view of available resources the initial response has been prioritised as follows:

- a. Priority 1: Actions that will address weaknesses in the current indicator set which limit the use of the assessments, or risk misinterpretations;
- b. Priority 2: Actions that will make a substantial difference to the quality of the indicators by decreasing bias;
- c. Priority 3: Other long-term actions that would improve quality or relevance of the indicators.

In addition, in some cases there will be more than one solution to an issue. For example, a weakness in an analytical method might be addressed by improved presentation so that uncertainties or assumptions are clearer, or by investing in improved analytical methods. In

¹ The UK Biodiversity Indicators Steering Group provides governance of the development and publication of the UK biodiversity indicators. Membership includes Defra, other UK Government Departments as necessary, Devolved Administrations, Statutory Nature Conservation Agencies, and Wildlife and Countryside Link (representing non-governmental organisations). It reports to the Four Countries Biodiversity Group.

² Christine Holleran (Defra); Mark Stevenson (Defra); Dave Johnston (NRW); Claire McSorley (SNH); James Williams (JNCC).

these cases, both short-term and long-term actions may be identified, with short-term action being assigned to specific organisation for implementation, and long-term actions kept under review and assessed against available resources.

Some of the recommendations made by the Science Panel are outside the remit of BISG as they deal with the methods employed by external partners or the lack of research findings that would allow full interpretation of indicator trends. In these cases the recommendations should be shared with the wider monitoring and research community for their consideration.

The Science Panel report was prepared before the EU referendum on 23rd June. The response to some of their recommendations which relate to EU legislation will need to be considered when EU exit negotiations have been completed.

Indicator by Indicator points

B6 – Pressure from Invasive species

Key recommendations from Science Panel:

1. Improve **analytical techniques** to provide statistical assessment of change;
2. Review species included in the indicator to ensure **policy relevance**.

Rationale for response:

Any decisions on future Invasive Non Native Species (INNS) policy following EU exit will influence the selection of species for the indicator. In addition, as the Science Panel notes, the indicator currently only tracks established invasive species, and says nothing about new arrivals, which has been a key focus for policy in this area. It is the issue of policy relevance that should therefore be prioritised.

Response

No.	Description	Lead	Priority
Short-term actions			
B6.1	Work with the GB INNS Secretariat to develop options for developing the indicator, to ensure policy relevance.	JNCC, Defra	2
Long-term actions			
B6.2	Explore options for application of Bayesian modelling approach to INNS distribution data to provide statistically robust assessments of change; and implement through future biological recording and assessment contracts if resources are available.	JNCC	3

C3b – Status of UK species of European importance

Key recommendations from Science Panel:

1. Improve **analytical techniques** to integrate uncertainty into the index;
2. Improve **data quality** to allow for a statistical, rather than expert assessment;
3. Improve our capacity to **interpret** the indicator by assessing viable population sizes for each species.

Rationale for response:

Actions to improve indicator quality will have to be aligned with any processes established to consider reporting requirements following the EU exit decision. General improvements in quality of data collected by volunteers can be considered as part of the statutory agency programmes of work on monitoring and data management

Response:

No immediate action can be recommended until a decision has been made on future reporting on species of European importance. However improvements to data collection and access will benefit any future indicator development.

No.	Description	Lead	Priority
Long-term actions			
C3.1	Continue to work with the National Biodiversity Network Trust and Country Agencies to improve collection and access to data on high priority species.	JNCC, Defra	2

C4 – Status of Priority species

Key recommendations from Science Panel:

1. Address the issue that the species in the 'abundance' indicator (C4a), selected on the basis of data availability, are unlikely to be representative of all priority species, either by:
 - a. Alternative **analytical techniques** that weight by taxonomic group to reduce influence of birds and moths;
 - b. Changing the **presentation**, using the 'occupancy' indicator as the main indicator (which has a wider range of species).
2. Explore refinements to **analytical techniques** for occupancy indicator (C4b) to reduce bias (e.g. post-hoc stratification, Bayesian modelling, alternative bootstrapping methods).

Rationale for response

Indicators C4a and C4b are based on deriving trend information for as many species as possible for the combined lists of species which for the four countries have been identified as requiring conservation action. The wider taxonomic breadth and greater representativity of the occupancy indicator (C4b) suggests that this should replace C4a as the main indicator. However, there are three main benefits arising from the used of abundance data. Firstly, they are our best datasets – derived from structured surveillance and less prone, in the most part, to recorder bias. Secondly, abundance data is likely to give an earlier warning of long-term trend, as species abundance will respond to external pressures before distribution data. Thirdly, there is a significant body of research linking changes in populations of key groups such as birds to changes in the environment, helping us to understand the data.

At its meeting on 20 September 2016 BISG decided that the indicator should be recast by focussing the headline of the indicator on the bar charts which show the number of species increasing or decreasing in abundance or distribution within the trend lines for C4a and C4b, respectively, and moving the trend lines to the background section of the indicator.

Response:

No.	Description	Lead	Priority
Short-term actions			
C4.1	Commission an options paper from CEH and take back to BISG. Look at how to change explanation of trends in the indicator. Ask CEH for views on how to look at flux underneath the indicators.	JNCC	1
C4.2	Apply Bayesian techniques to occupancy data.	JNCC	1
Long-term actions			
C4.3	Consider further how to increase the number of species included in the indicator to improve representativity.	JNCC, Defra	2

C5 – Birds of the wider countryside and at sea

Key recommendations from Science Panel:

1. Changes to data collection methods to improve **quality** of data;
2. Review species included in the indicator to ensure **policy relevance**;
3. Improve **presentation** of variation in seabirds data;
4. Improve **presentation** to explain the differences between evenness and abundance.

Rationale for response:

Changing established monitoring protocols should be done with care to ensure that there are not unintended consequences in terms of the ability and willingness of volunteers to follow the protocols. The suggestions made therefore need to be considered as part of wider work on assessment of natural capital and monitoring the countryside.

There is a balance to be struck between being inclusive of species found in a habitat, and having a representative set which is consistently applied and for which reliable data are consistently available. The issue of including data for all seabird species is problematic because of the remote locations of some of their nesting sites. Including more species, for which there is a lack of reliable data, could introduce a bias that should be avoided.

There are two main issues with the seabird indicator: the sample may not be representative and the trends may be apparent rather than statistically significant. The first issue is more problematic - a more qualitative approach to the assessment of seabird populations is required, supplemented by information from the Seabird Census or by individual trends of key species - to provide an evidence based narrative, perhaps with a simplified indicator presentation (number of species increasing/decreasing in both Census and Seabird Monitoring Programme). On the second issues, we should stop giving a traffic light until we have an estimate of confidence.

Response:

No.	Description	Lead	Priority
Short-term actions			
C5.1	Remove the traffic light assessment for the seabirds measure until a way of assessing variability is devised.	JNCC	1
C5.2	Produce an options paper on the seabird indicator, including costs for creating confidence intervals. However any decision on investment should be delayed until we have sorted out whether the samples are sufficiently representative	JNCC	1
Long-term actions			
C5.3	Pass the review panel recommendations onto BTO, RSPB, WWT, and the Seabirds Monitoring Programme to inform discussions about what changes in monitoring protocols should be considered	JNCC	1
C5.4	Review the species make up of each measure when considering their use in regard to specific policy objectives.	JNCC, Defra, Devolved Administrations	2
C5.5	Consider the use of subsidiary information to further explain the variation in the data underpinning the indicator	JNCC, Defra	3

C6 – Insects of the wider countryside (butterflies)

Key recommendations from Science Panel:

1. Changes to data collection methods to improve **quality** of data;
2. Changes to **analysis** methods to make them more comparable with other indicators;
3. Improve **presentation** to explain the differences between evenness and abundance.

Rationale for response:

To achieve a randomised square survey would require a sampling stratification for butterflies; the current work on the wider countryside butterfly scheme is partly based on surveyors recording butterflies as they record in BBS squares (38% of 802 squares in 2015). Wales and Scotland are investing to try to increase the number of volunteers and to improve the amount of data available. Similarly, Butterfly Conservation have worked to get trend information at a country level, but it is hard to do without professional survey support.

The issue of analysis techniques for the butterfly data has been under consideration for some time; there is a need to make it consistent with the analysis used for the bat and bird indicators, but without losing the specificity of the modelling that is needed to be able to deal with the detail of the butterfly data.

Response:

No.	Description	Lead	Priority
Short-term actions			
C6.1	Work with BC to investigate the potential to change analysis method.	JNCC	1
Long-term actions			
C6.2	Pass the recommendations onto BC to inform discussions about what changes in monitoring protocols should be considered	JNCC, Defra	1
C6.3	Consider the use of subsidiary information to further explain the variation in the data underpinning the indicator	JNCC, Defra	3

C8 – Mammals of the wider countryside (bats)

Key recommendations from Science Panel:

1. Changes to **analysis** methods to focus on field data.
2. Improve **presentation** to explain the differences between evenness and abundance;

Rationale for response:

There may be significant bias from a number of sources within the data. Detection and geographical bias are addressed in the data analysis, but it is less clear if observational bias is. The expert view is that the field data is better than the roost data. BISG agreed that the roost count data should be removed if the consensus was that it introduced bias, but that the impact of removing the roost count data should be considered first.

Response:

No.	Description	Lead	Priority
Short-term actions			
C8.1	Investigate with BCT to see how different the index is just based on field data.	JNCC	1
Long-term actions			
C8.2	Consider the use of subsidiary information to further explain the variation in the data underpinning the indicator	JNCC, Defra	3

D1c – Status of Pollinating insects

Key recommendations from Science Panel:

1. Apply Bayesian modelling to improve the **analytical** techniques underpinning the indicator;
2. Consider how to change the indicator so it represents pollination service, thereby increasing its **policy relevance**.

Rationale for response:

As with indicator C4b, during the process of the review indicator was changed to be based on Bayesian Occupancy Detection models, and the species included were changed. The

Bayesian model assumes constant effort - more clarity on whether a full survey was done would help modelling, essentially knowledge of true absences can help improve the trend detection.

Further consideration of how the indicator measures pollination would be focus the indicator on the pollination service; information on relative rates of visit by particular bee and hoverfly species to individual plant species would be needed – this is the subject of research at present.

Response:

No.	Description	Lead	Priority
Short-term actions			
D1c.1	Develop and apply Bayesian models.	JNCC, Defra	1
Long-term actions			
D1c.2	Build relative pollination into concept of pollinator monitoring and research platform.	JNCC, Defra,	2

General framework of good practice

Species selection

Key recommendations from Science Panel:

1. Review species included in the indicators to ensure **policy relevance** and improve clarity of **presentation**.

Rationale for response:

The species chosen for each has been carefully considered based on available evidence, but the rationale may not be clear enough – further information could help users understand what the indicator does and does not show. Information for this is provided by the [Evidence statements project](#)³ and in technical documentation, but may need to be more explicit or more clearly flagged. There is a balance to be struck between being inclusive of species found in a habitat, and having a representative set which is consistently applied and for which reliable data are consistently available.

Response:

No.	Description	Lead	Priority
Short-term actions			
F.1	Use text from the Evidence Statements project to help with clarity on what the indicators are representing.	JNCC	1
F.2	Provide information in the background section of each species indicator fiche to explain why the species in the indicators have been chosen, and the protocols for changing selection based on availability of reliable data. It may also help to	JNCC	1

³

<http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=19528&FromSearch=Y&Publisher=1&SearchText=BE0112&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description>

	flag links to trend in species not included in the indicators so the picture is seen as more complete.		
--	--	--	--

Data quality

Key recommendations from Science Panel:

1. Improve **data quality** by focussing on data collected through stratified, random sampling designs, and clarification of biases in data presented.
2. Use modelling to improve **analysis** of non-structured data.

Rationale for response:

Recommendations are made to move away from volunteer selected sites to randomly sampled locations. This is an issue to be considered on a case by case basis by the various monitoring schemes – there are issues of cost, practicability, and of volunteer willingness to be overcome. For unstructured biological records the use of Bayesian models is recommended.

Response:

No.	Description	Lead	Priority
Short-term actions			
F.3	Provide information in the background section of each species indicator fiche to explain biases in the data presented.	JNCC, Defra	1
F.4	Use Bayesian models in both the priority species and pollinator indicators. Whether this is appropriate for the invasive non-native species needs further consideration.	JNCC, Defra,	1
Long-term actions			
F.5	Pass the recommendations from the indicators review to data providers to inform discussions on changes to monitoring methodologies.	JNCC, Defra	2

Trend analysis

Key recommendations from Science Panel:

1. Standardise **analytical methods** used across indicators to implement good practice;
2. Improve **presentation** and **analysis** by use of smoothing techniques that are relatively insensitive to start and end conditions.

Rationale for response:

Standardising analysis techniques may have some value, but care is needed to make sure that the ecology of species is properly taken into account – e.g. detector type for the analysis of bat data.

Response:

No.	Description	Lead	Priority
Short-term actions			
F.6	Consider further the generic analysis pipeline that has been developed by CEH in the refinement of analysis work for bat and butterfly indicators.	JNCC	1
Long-term actions			
F.7	Consider how to reduce the effect of start and end conditions on trend analysis	JNCC	2

Interpretation

Key recommendations from Science Panel:

1. Improve **presentation** to explain the differences between evenness and abundance;

Rationale for response:

The issue of evenness versus abundance was discussed by the BISG sub-group at length. It was agreed that it is difficult to communicate what a change in average relative abundance of a set of species means. Some further work is needed to explore supplementary metrics on diversity and different spatial scales (it would be possible for average diversity per unit areas to decline without a change in overall relative abundance). However, this is not a priority for indicator development in the context of the other actions identified. It is worth adding as a discussion item with CEH (perhaps in the context of the JNCC-CEH partnership project 'Biological Recording Analysis and Interpretation (BRAIn)') - could the occurrence data be used to develop diversity or evenness metrics?

Response:

No.	Description	Lead	Priority
Long-term actions			
F.8	Consider the use of subsidiary information to further explain the variation in the data underpinning the indicator	JNCC, Defra	3