The contribution of biological recording to the State of Nature

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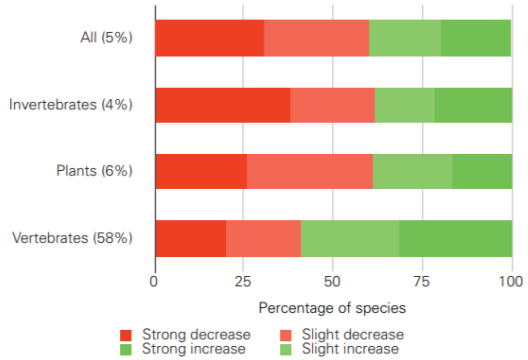
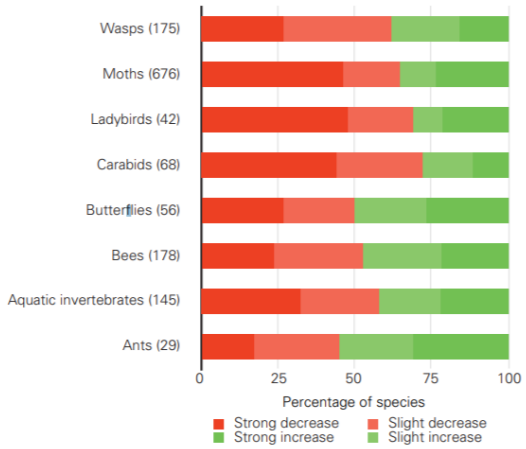
@DBHayhow
@RSPBScience
#stateofnature

state of nature

Wales

Trends in species' abundance and distribution





The Watchlist Indicator

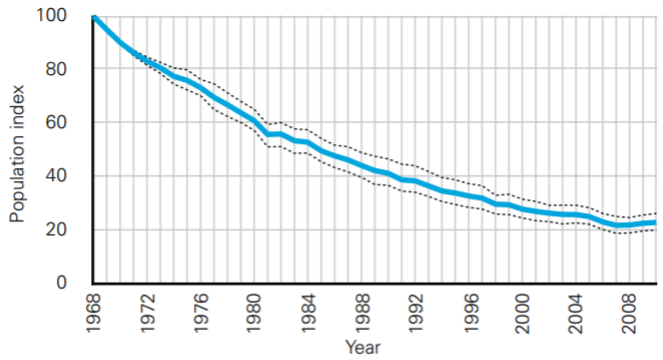


Figure 1
Watchlist Indicator showing the average population trend for 77 moths, 19 butterflies, 8 mammals and 51 birds listed as UK BAP priorities. Species are weighted equally. The indicator starts at 100; a rise to 200 would show that, on average, the populations of indicator species have doubled, whereas if it dropped to 50 they would have halved. Dotted lines show the 95% confidence limits.

Case study

Understanding the potential impact of ash dieback

Chalara dieback is a serious disease of ash trees caused by the fungus Chalara fraxinea *(more correctly known as* Hymenoscyphus pseudoalbidus*) which has caused widespread damage to European ash tree populations. The disease was unknown in Great Britain until the first cases were confirmed in a tree nursery in Buckinghamshire in early 2012. By October, it had been confirmed in mature ash trees. Work is currently underway to determine how far the disease has spread[16].*

Ash trees are an important component of our native woodlands and hedgerows; they are a common hedgerow tree and the third most common species in broadleaved woodland, accounting for 13% of trees. Across all woodlands, they account for 5% of trees[4]. They are important for fungi, invertebrates that need deadwood, and epiphytic lichens and bryophytes, although few species are totally reliant on ash. Large, mature ash trees, with their assorted cracks and hollows, also provide valuable nesting sites for many of our woodland birds, as well as roosting sites for bats. Ash-dominated woodlands also tend to be rich in plants, as they let in more light than oak woods, and tend to dominate

Saving woodland wildlife

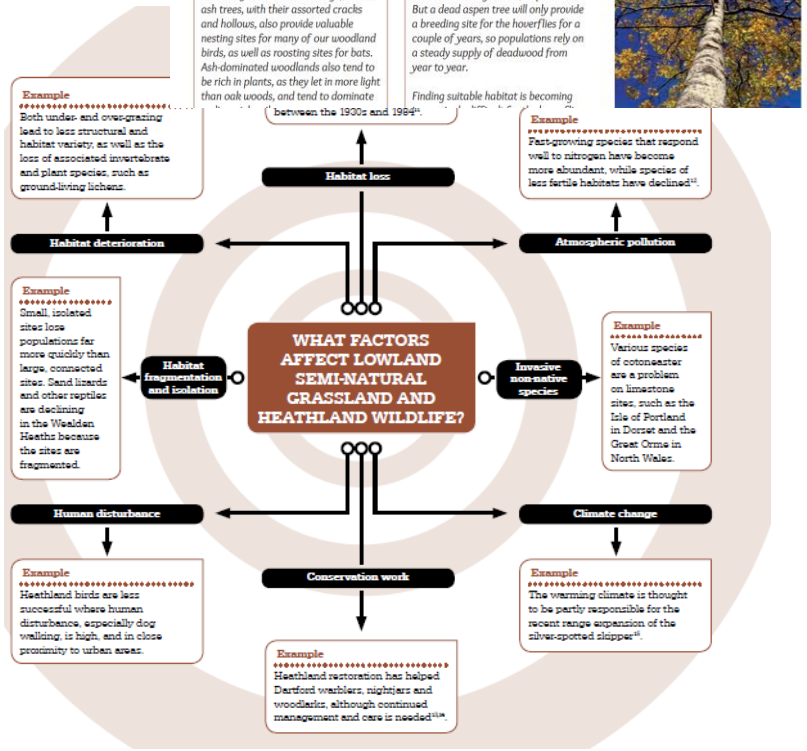
Woodlands and the species they support are conserved for a number of different reasons, including commercial timber, pulp and wood fuel production and game bird shooting, as well as for aesthetic reasons, recreation, and of course for wildlife. High priority species, such as the hazel dormouse, spreading bellflower and capercaillie, are often the focus of conservation efforts, but other programmes exist that aim to benefit a wider range of woodland wildlife via sympathetic management. Woodland Grant Schemes in England, Wales and Scotland provide financial incentives to encourage woodland managers to consider the needs of wildlife and manage woodlands accordingly. Statutory designations also help to ensure that woodlands are managed sympathetically, although the number of sites that hold such designations is low.

Case study

Aspen hoverfly

The little-known aspen hoverfly is one of the UK's rarest insects. Found only in the Scottish Highlands, this insect has very specific needs: its larvae can only survive under the rotting bark of aspen trees. But a dead aspen tree will only provide a breeding site for the hoverflies for a couple of years, so populations rely on a steady supply of deadwood from year to year.

Finding suitable habitat is becoming



State of Nature 2016

1601 species from biological recording = 2/3 of the total data!

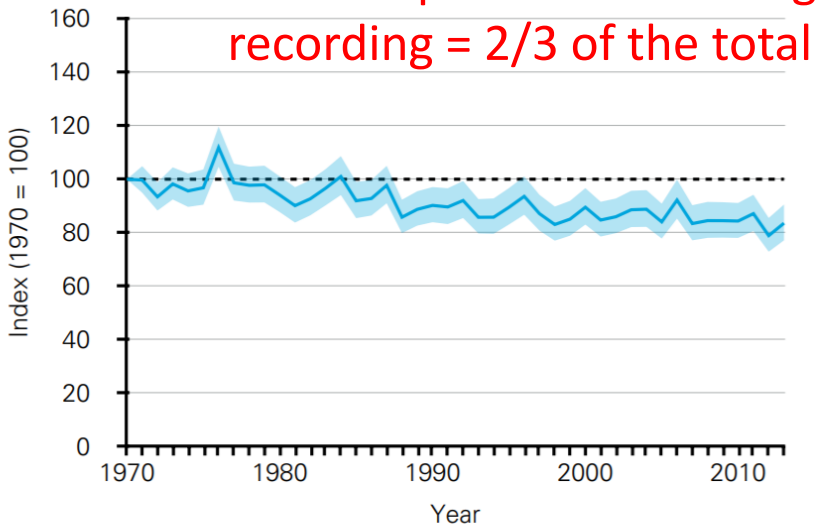


Figure 2

An index of species' status based on abundance or occupancy data for 2,501 terrestrial and freshwater species. The shaded area shows the 95% confidence intervals.

Marine

- *Over the long term, 38% of marine species declined and 62% increased. Over the short term, the overall picture was unchanged.*
- *The index of change in the abundance of marine species and groups has increased by 37% over the long term, and by 9% over the short term. When fish species are excluded from the groups assessed, the index has declined by 14% since 1970, and by 5% since 2002.*

For guidance on the results presented in this section, please turn to pages 72–77.

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Trends in the abundance and occupancy of freshwater and terrestrial species by broad taxonomic group

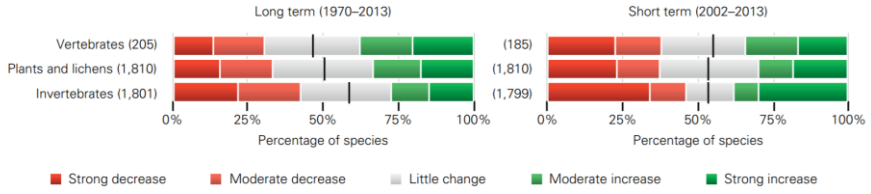
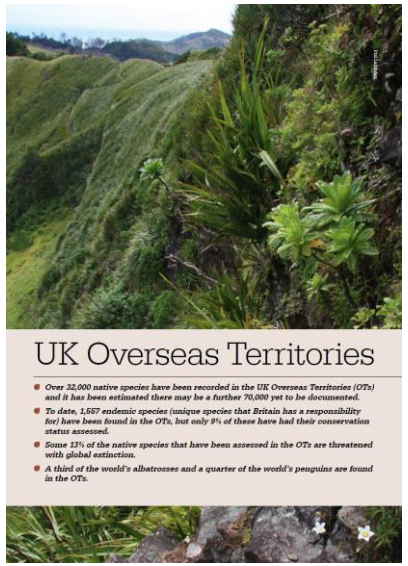


Figure 5

The percentage of species in each trend category over the long and the short term. The line in the "little change" category shows the division between declining species on the left and increasing species on the right. The values in brackets show the number of species assessed.



UK Overseas Territories

- *Over 32,000 native species have been recorded in the UK Overseas Territories (OTs) and it has been estimated there may be a further 70,000 yet to be documented.*
- *To date, 1,557 endemic species (unique species that Britain has a responsibility for) have been found in the OTs, but only 9% of these have had their conservation status assessed.*
- *Some 13% of the native species that have been assessed in the OTs are threatened with global extinction.*
- *A third of the world's albatrosses and a quarter of the world's penguins are found in the OTs.*

particular management regimes.

Decreasing forest management has had a substantial negative impact on woodland species. In the middle of the 20th century, 50% of our broadleaved woodland was coppice or shrub[6], but with the abandonment of traditional management methods, such as coppicing, that figure is now below 1%.

Many woodland species rely on open woodland habitats, with access to sunlight, a varied understorey, and the mosaic of different habitats produced by the rotation of coppicing throughout a woodland. The targeted reinstatement of coppicing within nature reserves, and through grant schemes, has been successful in maintaining populations of some species, although many still suffer as a result of the limited and fragmented nature of their habitat. In addition, management often has to contend with the adverse impacts of grazing from increasing populations of both native and non-native deer.

Increases in other forest management practices have also influenced woodland wildlife. For example, a decline in the availability of standing dead wood has led to a loss of breeding and roosting sites for bats, as well as habitat for a host of specialised invertebrates.

Although the loss of heathland and moorland habitat to conifer plantations is of great concern, the goldcrest is one of the species to have benefitted from an increase in its favoured habitat[7].

The large-scale abandonment of coppicing and other traditional management techniques has had a dramatic effect on pearl-bordered fritillaries and other butterflies of open woodland[9–11].

The targeted management of woodlands, and the control of grazing from increasing deer populations, has allowed oxlips to recover in some areas[12–14].

Barbastelle bats rely on roost sites under flaking bark and in cracks in veteran trees and dead wood. The removal of dead trees in woodlands may limit the population of these dead wood specialists[15].

The *State of Nature* report is a collaboration between the 25 UK conservation and research organisations listed below:

The *State of Nature 2016* report is a collaboration between the UK conservation and research organisations listed below:

Working closely with Statutory Agencies

state of nature

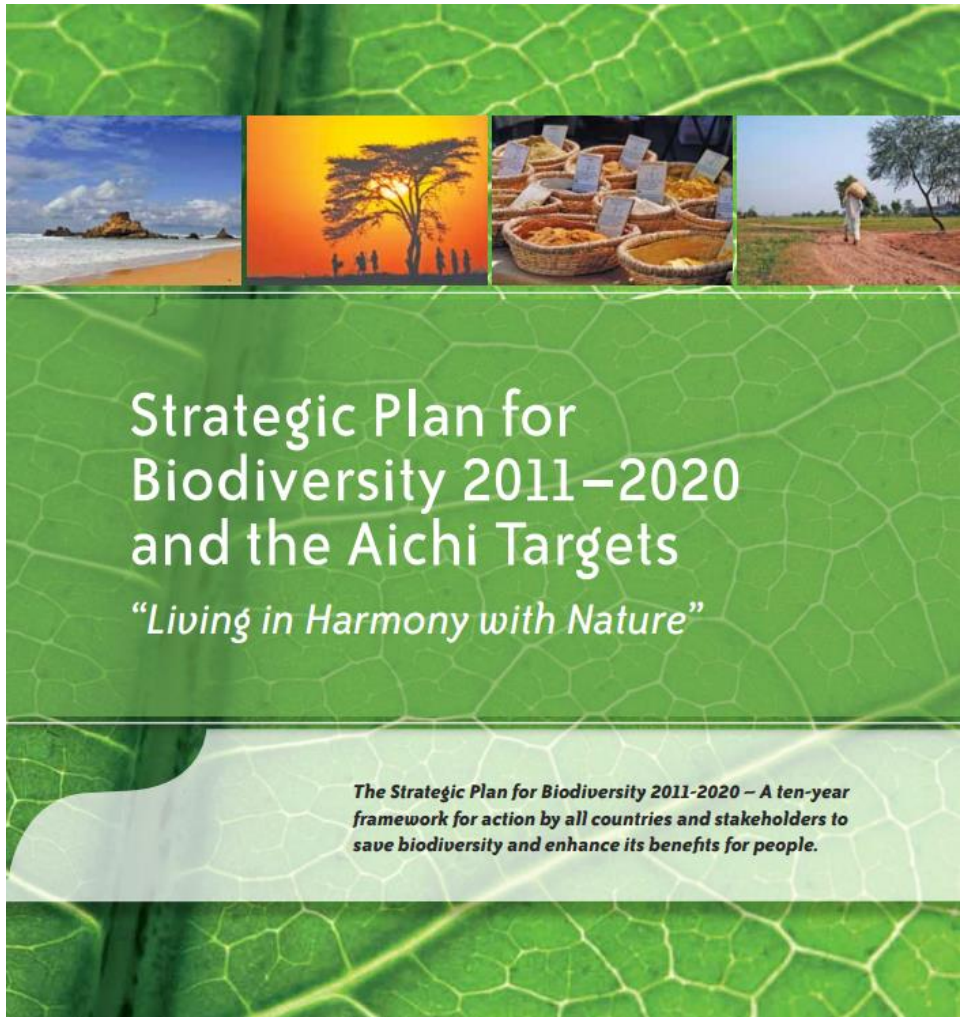
rspb.org.uk/stateofnature

Convention on Biological Diversity

United Nations Decade on Biodiversity 2011-2020

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.



Aims of UK State of Nature report:

- **To provide an authoritative, objective statement on the state of UK nature using the best available data and expertise:**

  = a representative & unbiased assessment (taxonomic, spatial & temporal bias)

Aims of UK State of Nature report:

- Produce an improved assessment of the **state** of the UK's wildlife, the **reasons** for this and the impact of current conservation **responses**.
- Make a significant contribution to the **evidence base** for partnership organisations' work in relation to **international targets**.
- Showcase the role of thousands of dedicated and **expert volunteers** in gathering the data that underpins the report and the value of these data.
- Increase the proportion of **target audiences** showing knowledge of the state of nature and the reasons underlying this.
- For the report to be used as a **key reference source** by the partnership and more broadly, for example for it to be cited in parliamentary debates by ministers and MPs/MSPs/AMs/MLAs, and widely known by leading businesses and media outlets.

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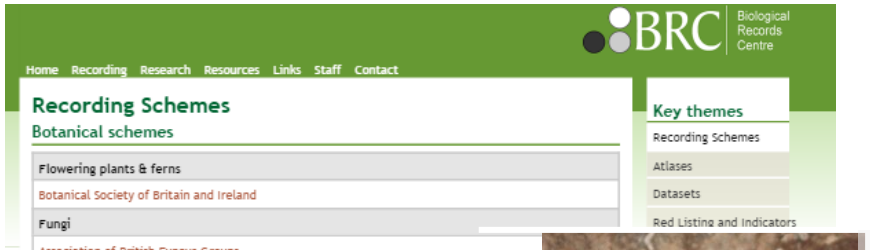
- Much of the data comes from dedicated expert volunteers working with professional teams in structured & unstructured surveys

UKBMS

ONLINE ATLAS
OF THE
BRITISH &
IRISH FLORA



Can we derive annual estimates of status, for large numbers of species, using biological records?

Improving the models –> occurance+detection=occ trends

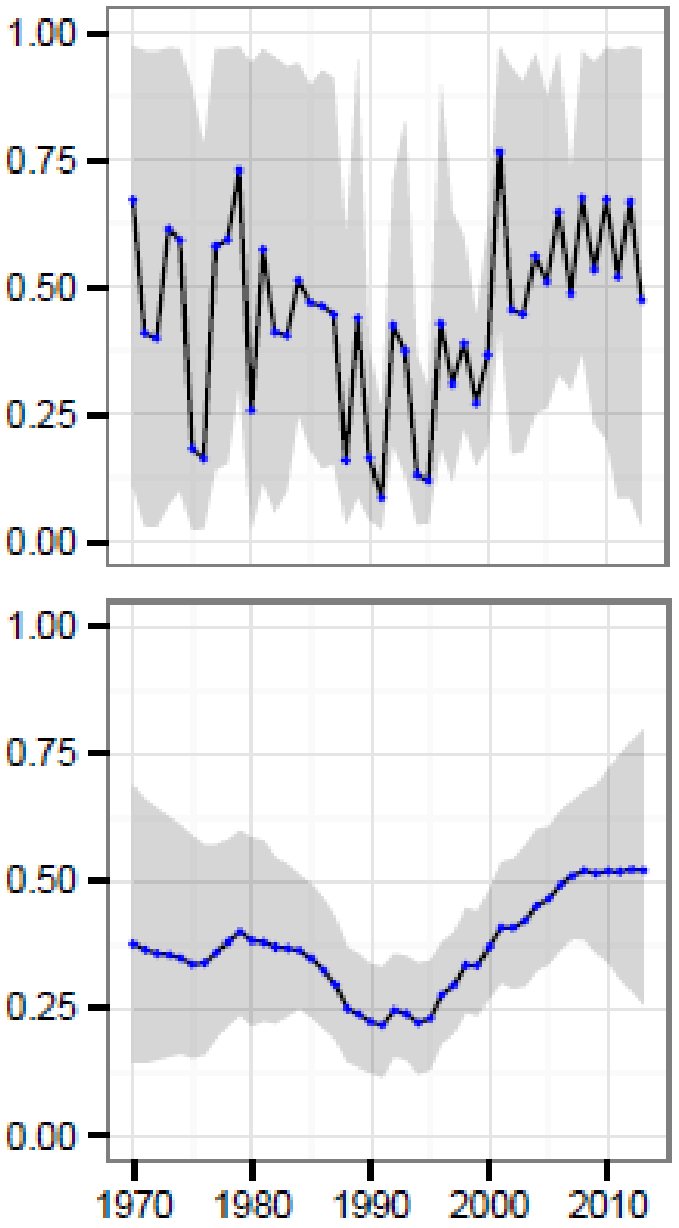
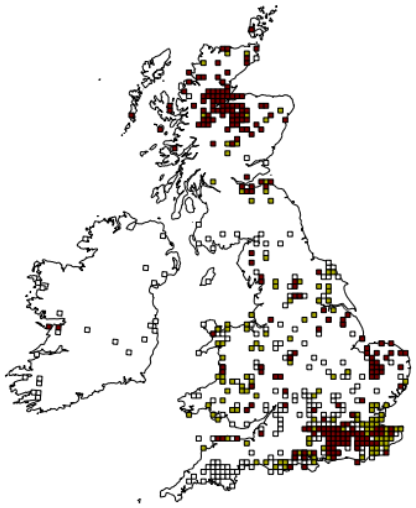


Image: http://formicopedia.org/

Leptotorax acervorum



Outhwaite *et al* (in review)
Ecological Indicators

Ad hoc recording is biased

- in time
- in space
- detectability
- effort per visit (importance of complete lists)

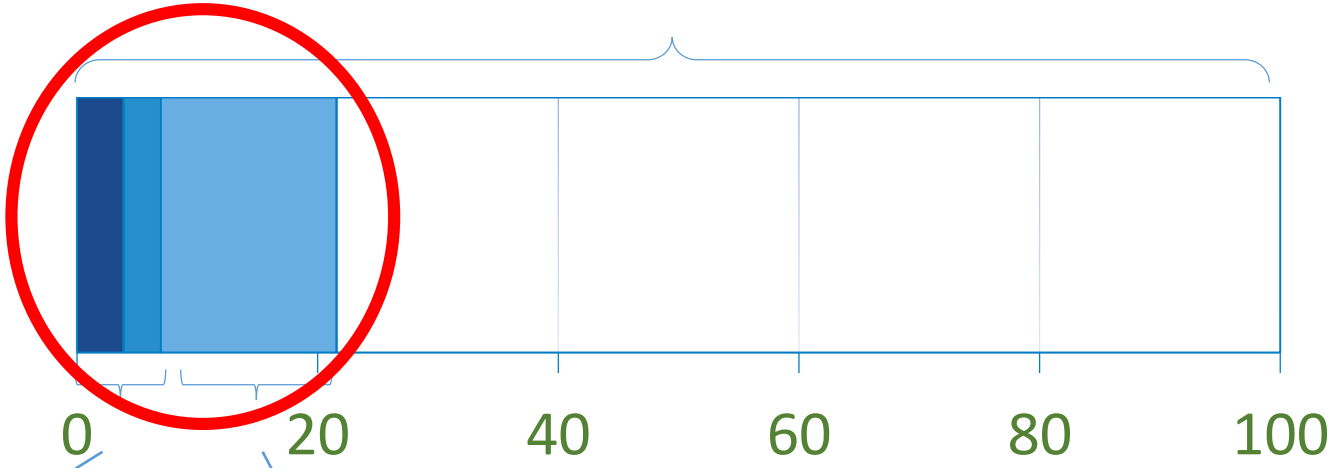
The State of Nature report 2016 metrics:

1. **Measures of population change in the UK**
   - Categorical change available for ~4k species
   - Temporal change available for ~2.5k species
2. **Measures of extinction risk in the UK**
   - Red list assessments available for ~8k species

Species bias – does SoN scratch the surface?

the known knowns and the known unknowns

All UK species, 55,000



Population change **~7%** of species = 3816

National Red List **~ 15%** of species = 7966

= Information available to the State of Nature

Headlines

This report pools data and expertise from more than 50 nature conservation and research organisations to give a cutting edge overview of the state of nature in the UK and in its seas, Crown Dependencies and Overseas Territories.

We present newly developed measures of change, the latest

- *Between 1970 and 2013, 56% of species declined, with 40% showing strong or moderate declines. 44% of species increased, with 29% showing strong or moderate increases. Between 2002 and 2013, 53% of species declined and 47% increased. These measures were based on quantitative trends for almost 4,000 terrestrial and freshwater species in the UK.*
- *Of the nearly 8,000 species assessed using modern Red List criteria, 15% are threatened with extinction from Great Britain.*
- *An index of species' status, based on abundance and occupancy data, has fallen by 16% since 1970. Between 2002 and 2013, the index fell by 3%. This is based on data for 2,501 terrestrial and freshwater species in the UK.*
- *An index describing the population trends of species of special conservation concern in the UK has fallen by 67% since 1970, and by 12% between 2002 and 2013. This is based on trend information for 213 priority species.*
- *A new measure that assesses how intact a country's biodiversity is,*

Main results

What did the report tell us about the state of nature in UK?

To what degree are the data representative?

- *The UK has commitments to meet international environmental goals, such as those in the Convention on Biological Diversity's Aichi Targets and the United Nation's Sustainable Development Goals. However, the findings of this report suggest that we are not on course to meet the Aichi 2020 targets, and that much more action needs to be taken towards the 2030 Agenda for Sustainable Development if we are to meet the Sustainable Development Goals.*

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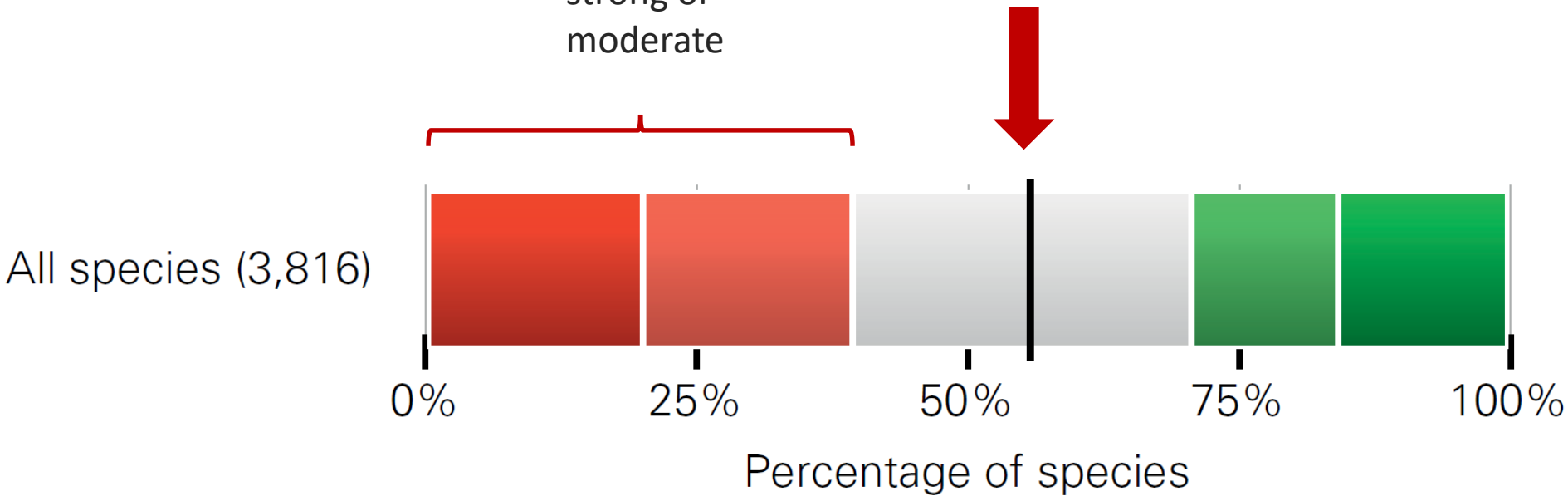
UK ‘long-term’ trends (1970-2013)

40% strong or moderate

56% of species declined



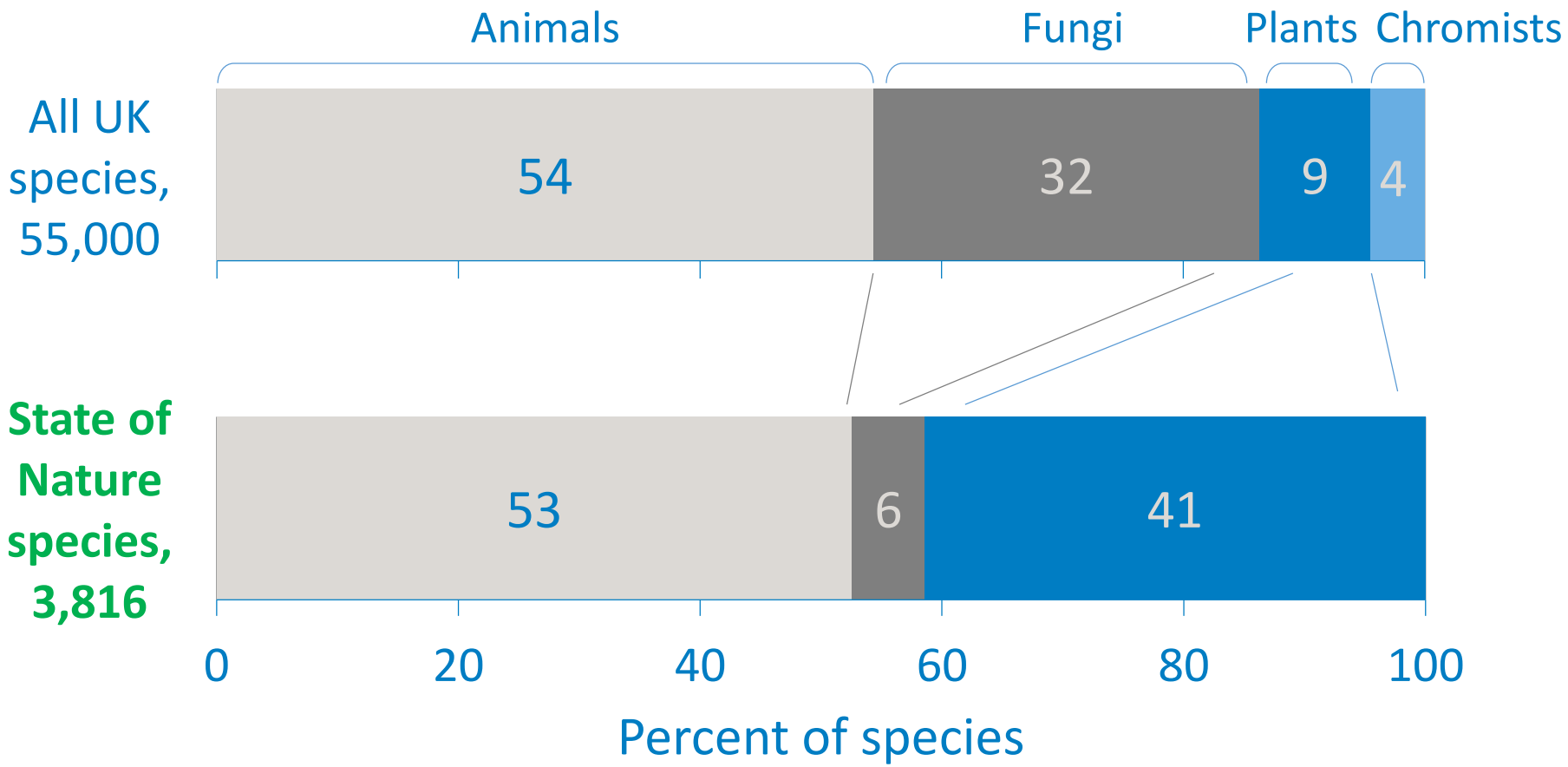
Based on quantitative trends for ~ 4,000 terrestrial and freshwater species in the UK. We categorise species trends into classes of increase, stability or decline.

44% of species increased

29% strong or moderate

Strong decrease | Moderate decrease | Little change | Moderate increase | Strong increase

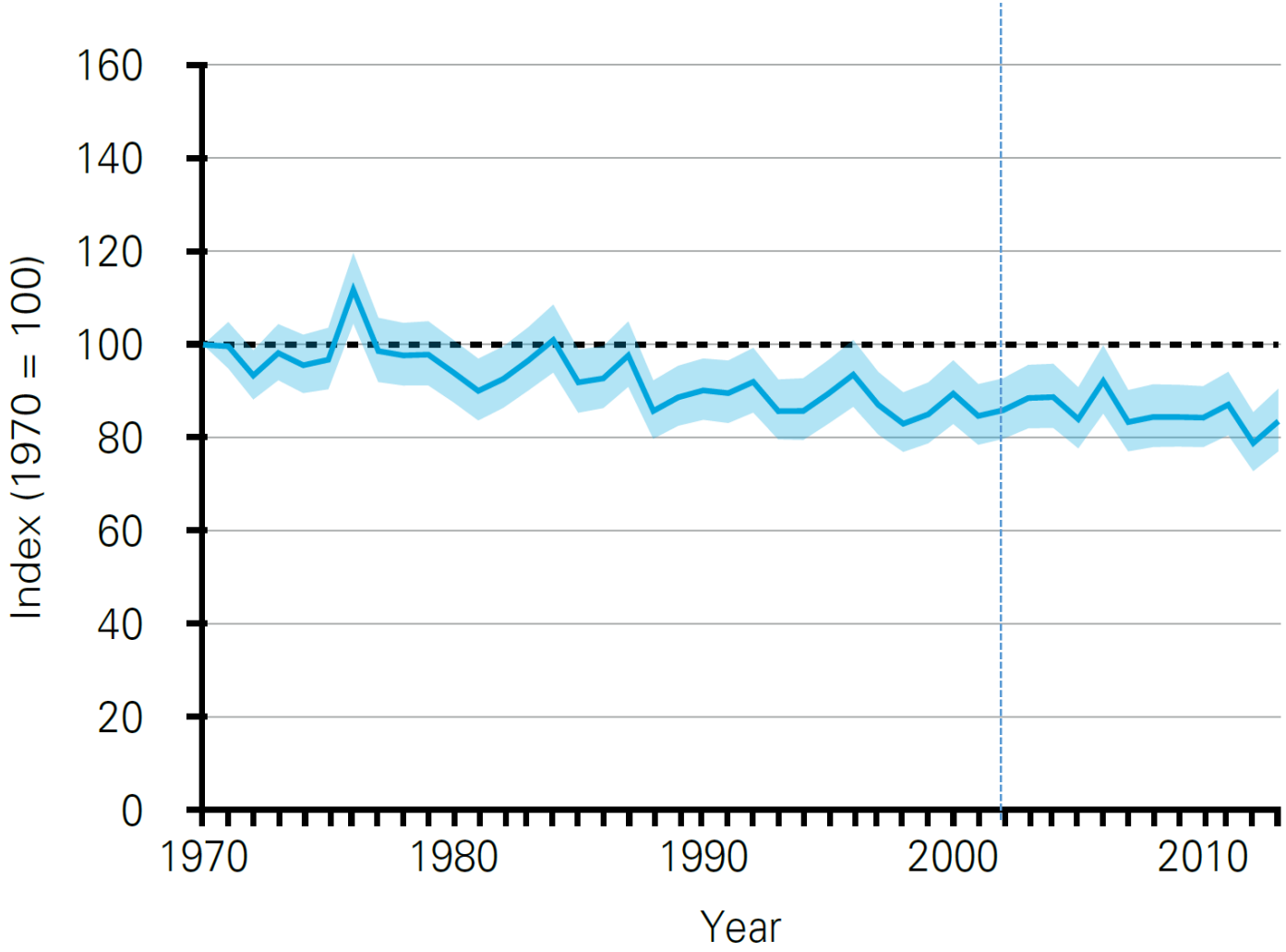
Taxonomic coverage of species - categorical change



Medium bias

Measures of temporal change a population index

c2.5k species = ‘Living Planet Index’ for UK



16% **decline since 1970**

3% **decline 2002 - 2013**

No significant difference in rate of change between the long & short term

Based on data for 2501 terrestrial & freshwater species in the UK.

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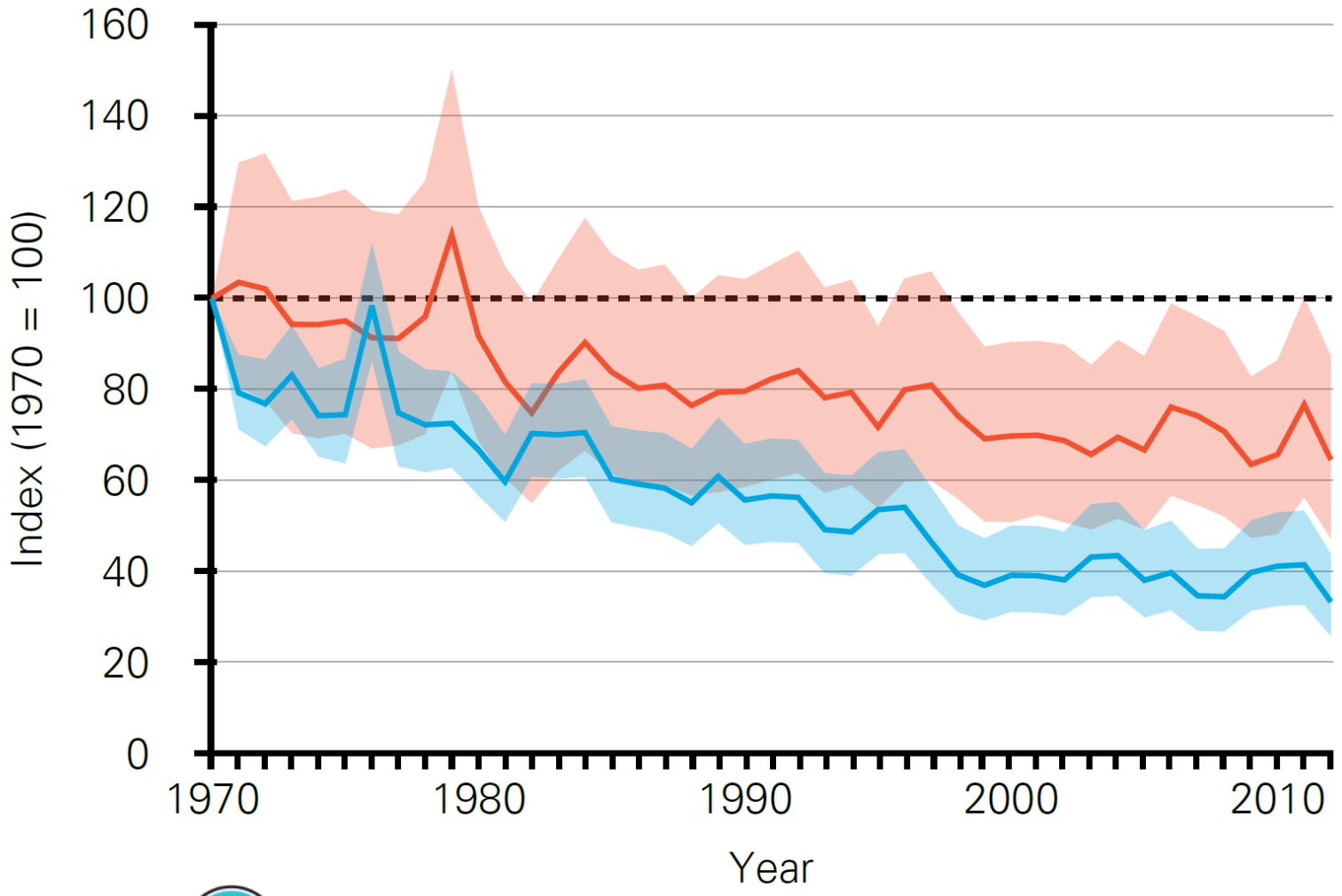
UK Priority Species Indicator – as shown in SoN2016



Occupancy Index
111 species

Abundance Index
213 species

Department for Environment Food & Rural Affairs

JNCC Joint Nature Conservation Committee

CEH Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

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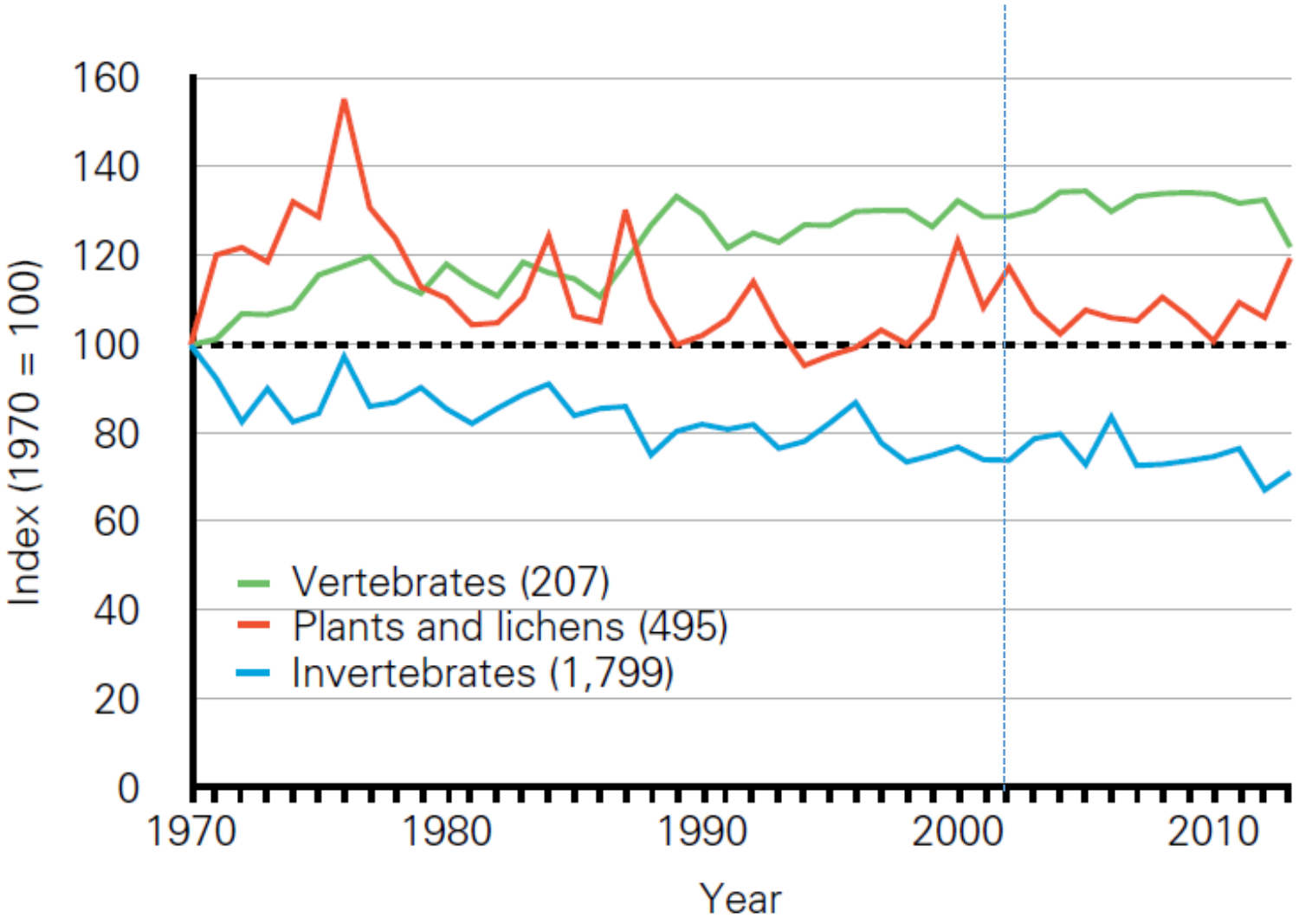
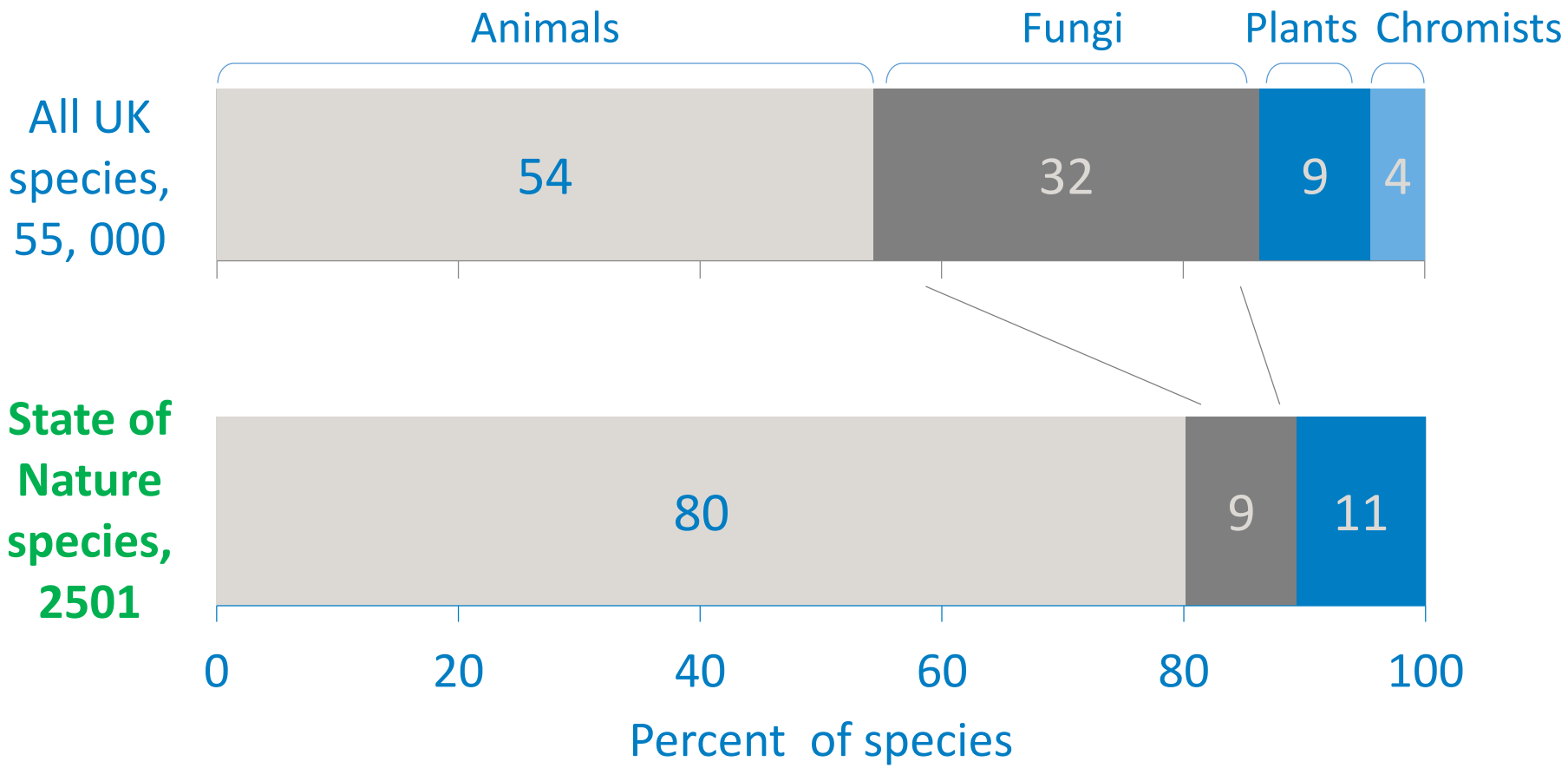
Population index: higher taxa breakdown



Population trends of invertebrates clearly worse than for other groups

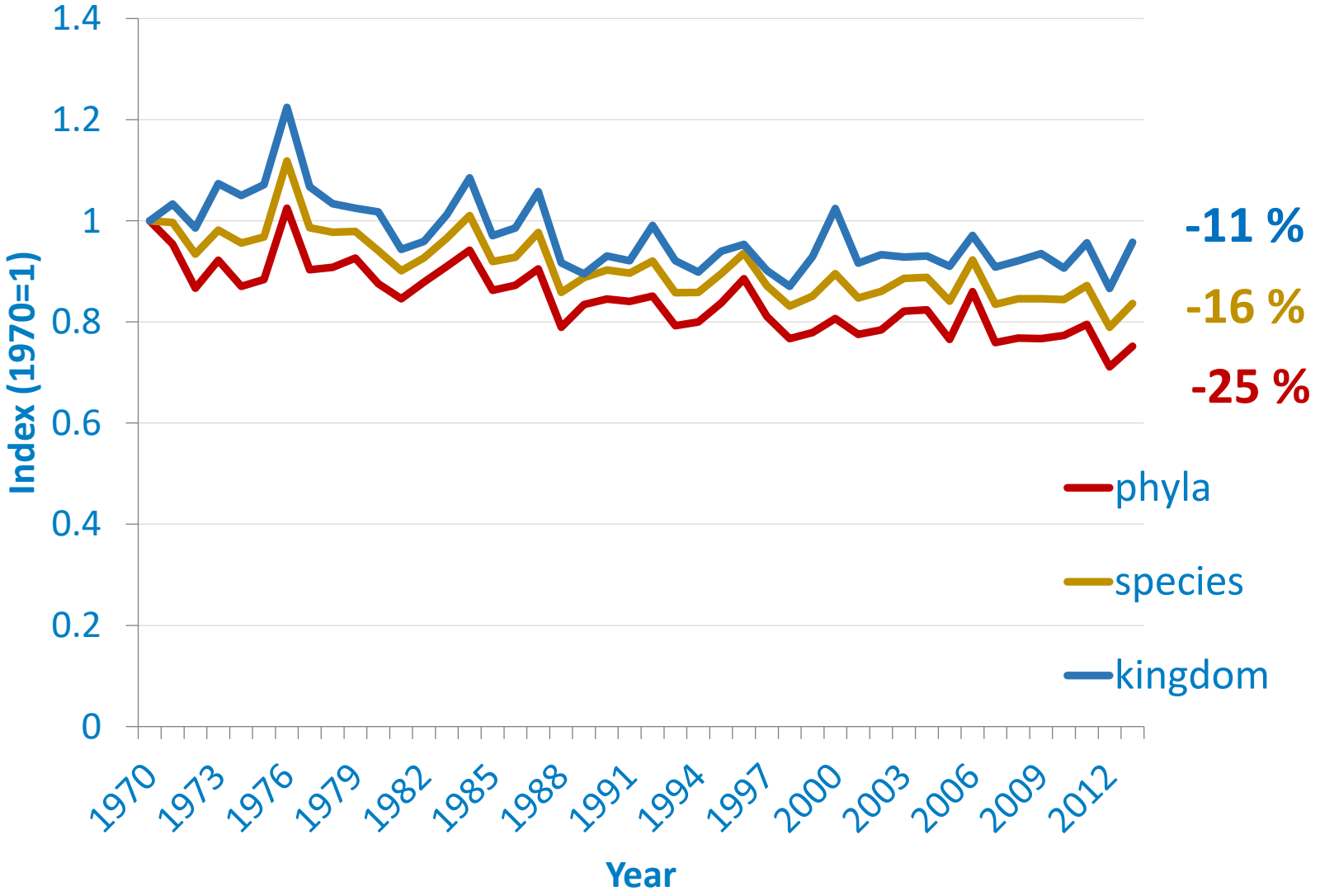
29% decline since 1970

Taxonomic coverage of the population index



High bias

Possible to account for taxonomic coverage by up - & down-weighting:

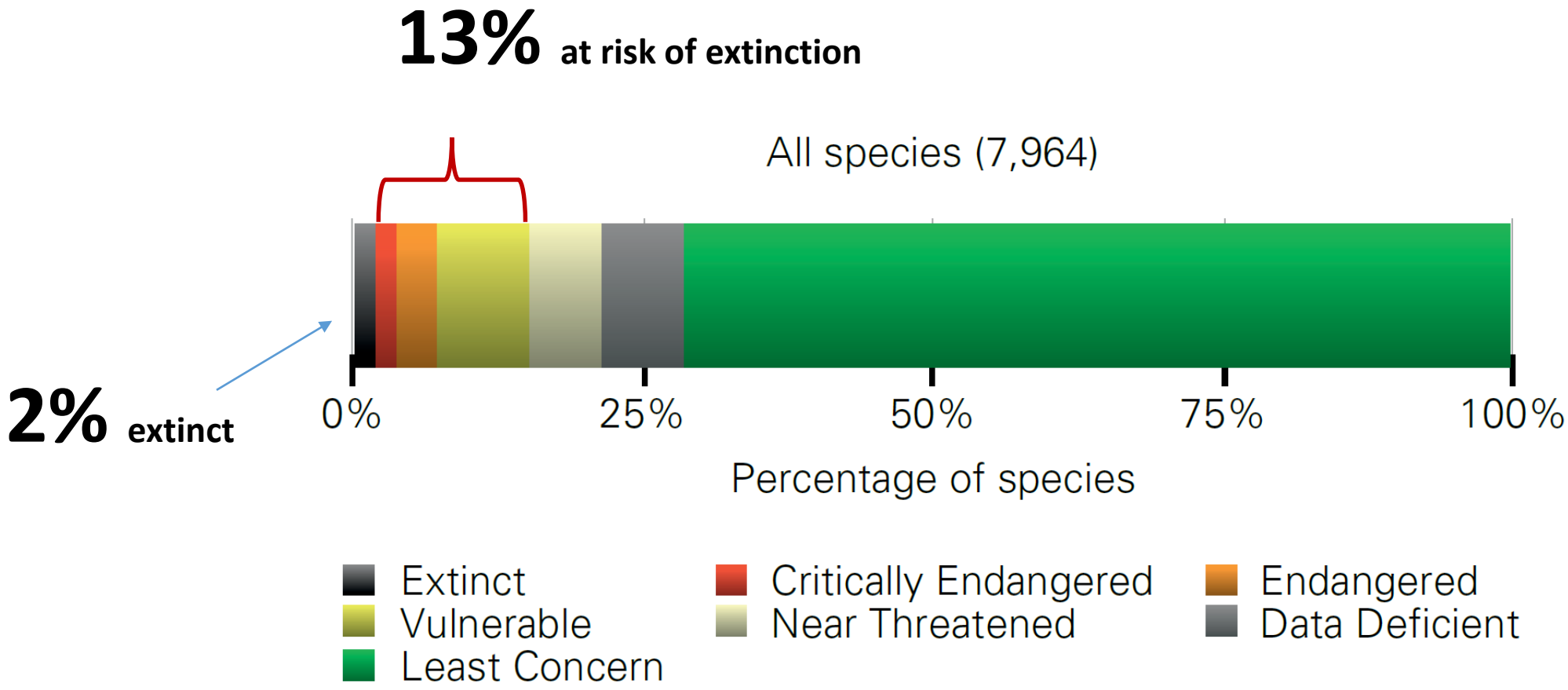


Calculate weight for each group as the proportion of the total species it represents

standard index with species weighted equally

Measures of extinction risk

Red list assessments for GB



Nearly 8,000 species assessed using modern Red List criteria

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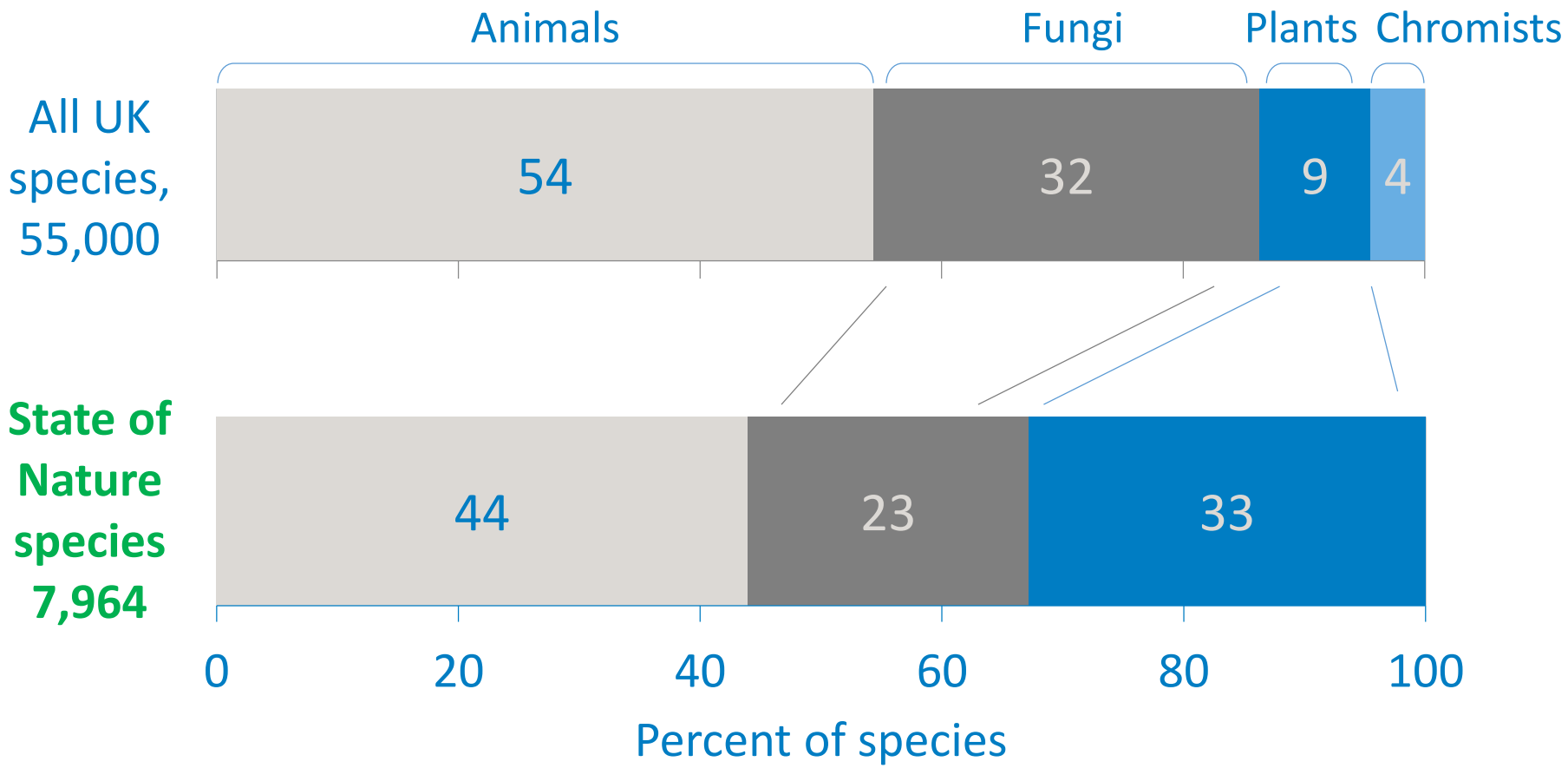
Taxonomic coverage of red list assessments



Low bias

state of nature 2019....

Technical report:
State-Pressure-Response

STATE:
SoN Species metrics – updated

PRESSURES & DRIVERS

RESPONSE:
Conservation & management

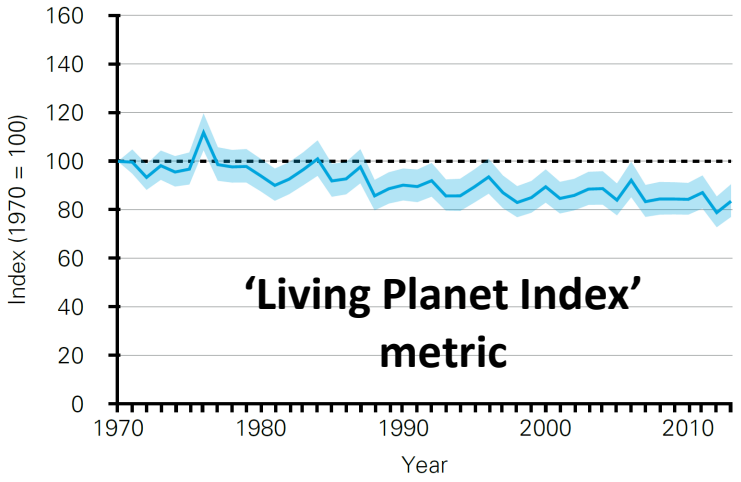
Technical report: State-Pressure-Response

STATE: SoN Species metrics – updated

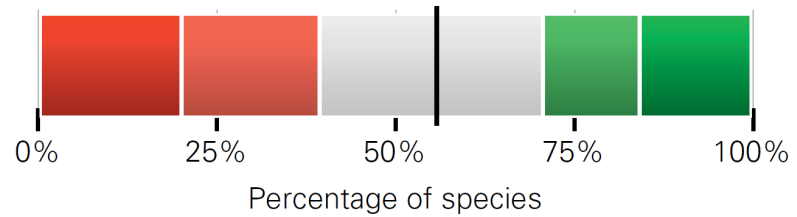
PRESSURES & DRIVERS

RESPONSE: Conservation & management

Terrestrial & Freshwater Occupancy and Abundance metrics
& separate analyses for Marine species

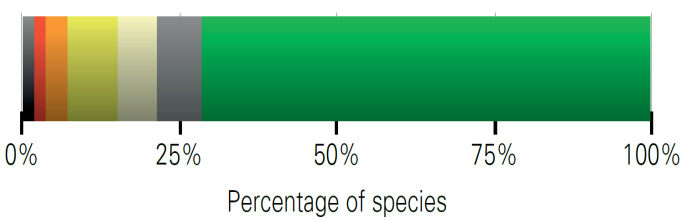


'Living Planet Index' metric



Strong decrease
Moderate decrease
Little change
Moderate increase
Strong increase

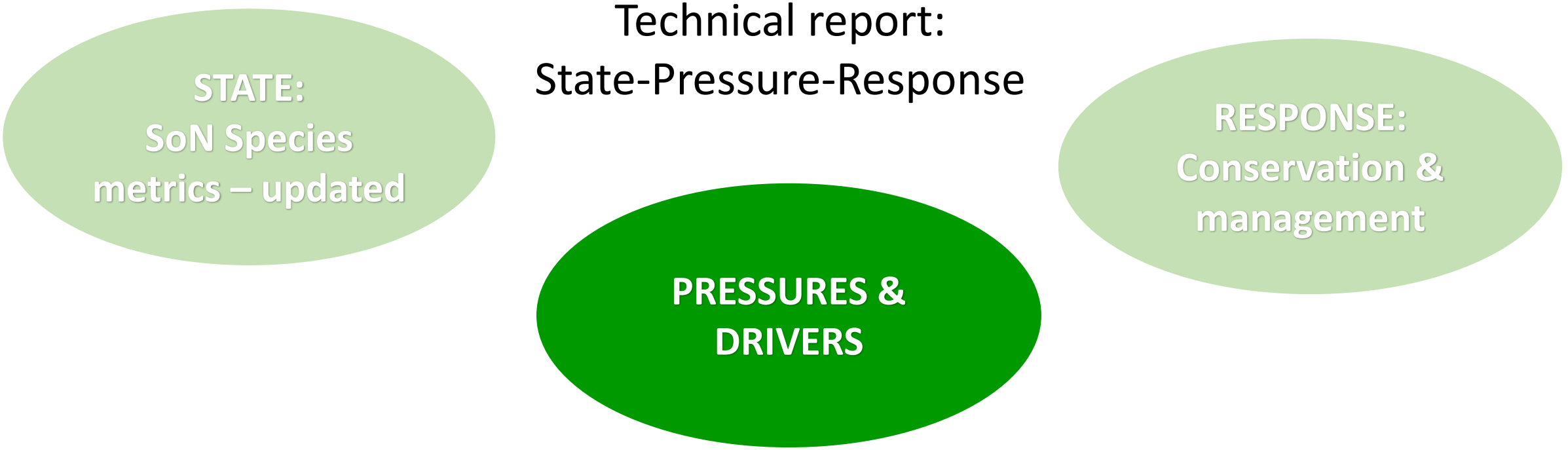
Categorical Change metric



Extinct
Critically Endangered
Endangered
Vulnerable
Near Threatened
Data Deficient
Least Concern

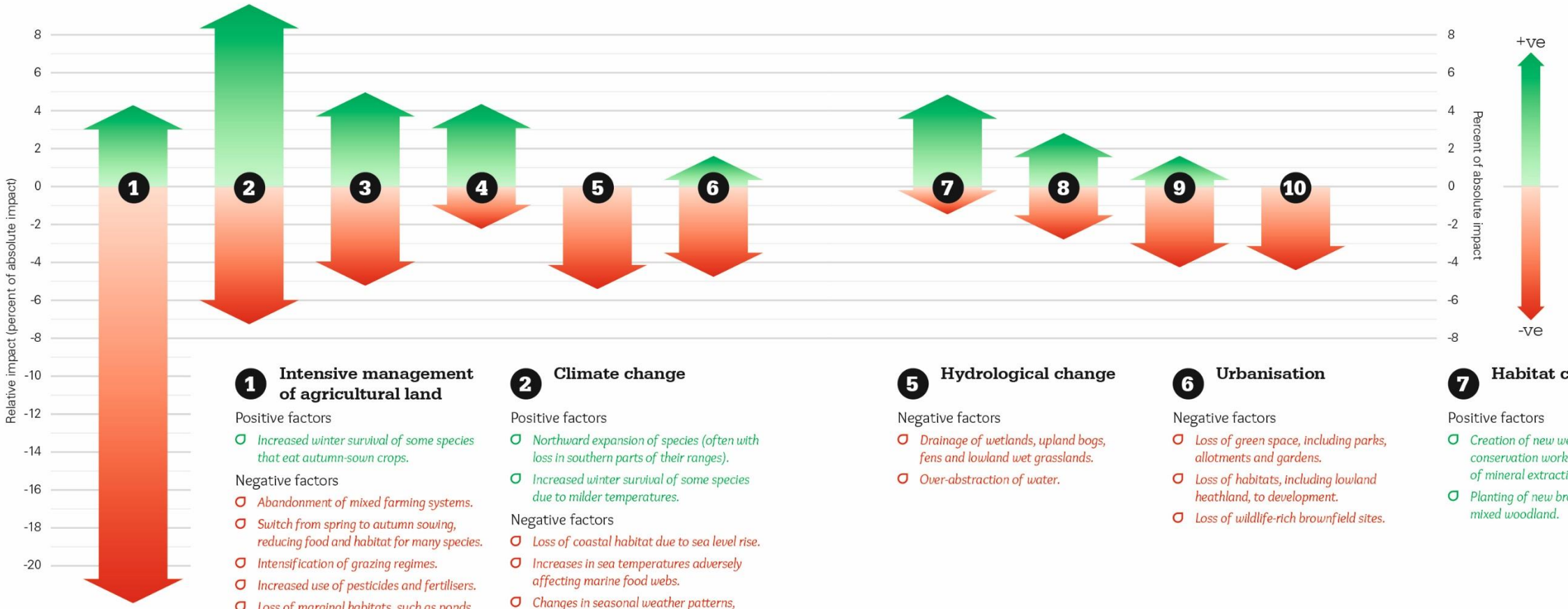
Red List metric

Technical report: State-Pressure-Response



Burns et al (2016) PLoS ONE 11: e0151595

Why is nature changing in the UK?



1 Intensive management of agricultural land

Positive factors

- *Increased winter survival of some species that eat autumn-sown crops.*

Negative factors

- *Abandonment of mixed farming systems.*
- *Switch from spring to autumn sowing, reducing food and habitat for many species.*
- *Intensification of grazing regimes.*
- *Increased use of pesticides and fertilisers.*
- *Loss of marginal habitats, such as ponds and hedgerows.*

2 Climate change

Positive factors

- *Northward expansion of species (often with loss in southern parts of their ranges).*
- *Increased winter survival of some species due to milder temperatures.*

Negative factors

- *Loss of coastal habitat due to sea level rise.*
- *Increases in sea temperatures adversely affecting marine food webs.*
- *Changes in seasonal weather patterns, such as winter storms and wetter springs.*

3 Low-intensity management of agricultural land

Positive factors

- *Introduction of wildlife-friendly farming through agri-environment schemes.*

Negative factors

- *Abandonment and reduced grazing, leading to the loss of some habitats.*

4 Increasing management of other habitats

Positive factors

- *Conservation management, often by reinstating traditional methods.*

Negative factors

- *Increased grazing pressure.*

5 Hydrological change

Negative factors

- *Drainage of wetlands, upland bogs, fens and lowland wet grasslands.*
- *Over-abstraction of water.*

6 Urbanisation

Negative factors

- *Loss of green space, including parks, allotments and gardens.*
- *Loss of habitats, including lowland heathland, to development.*
- *Loss of wildlife-rich brownfield sites.*

7 Habitat creation

Positive factors

- *Creation of new wetlands through conservation work and as a by-product of mineral extraction.*
- *Planting of new broadleaved and mixed woodland.*

8 Increasing plantation forest area

Positive factors

- *Increased habitat area for species using coniferous plantations and woodland edges.*

Negative factors

- *Loss of the habitat that plantations replace, particularly lowland heaths and upland habitats.*

9 Decreasing forest management

Negative factors

- *Cessation of traditional management practices, such as coppicing, leading to the loss of varied age structure and open habitats within woodland.*

10 Decreasing management of other habitats

Negative factors

- *Abandonment of traditional management, including grazing, burning and cutting, which is crucial for the maintenance of habitats such as heathland and grassland.*

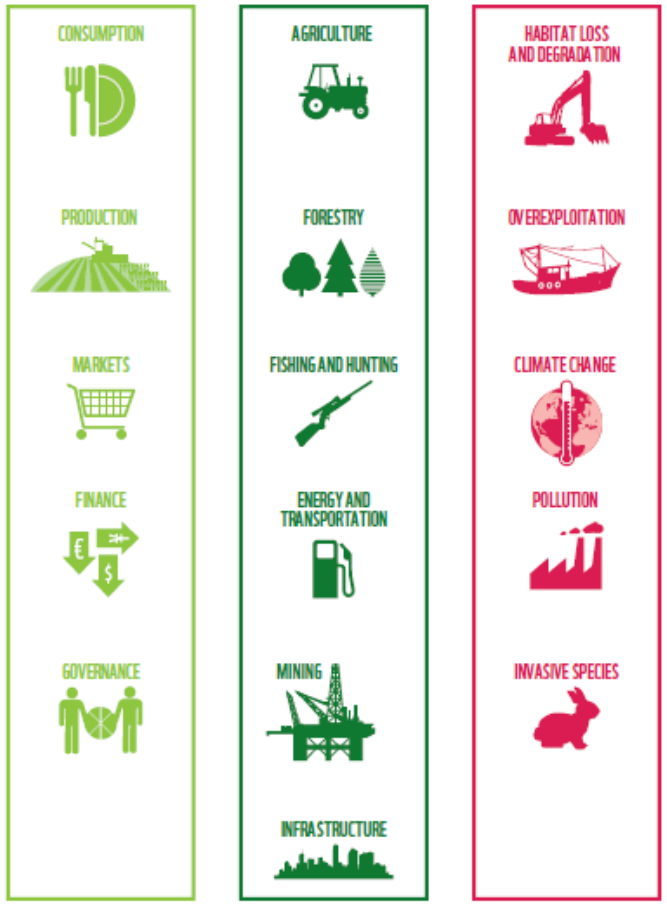
The figure shows the most significant drivers of change in our nature. Green arrows show positive impacts; red arrows show negative impacts. For full details and further results, see tinyurl.com/j8rxyyl

Technical report: State-Pressure-Response

STATE: SoN Species metrics – updated

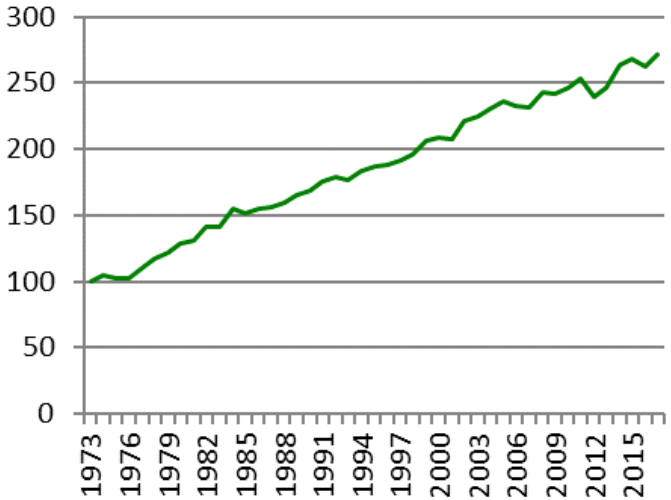
PRESSURES & DRIVERS

RESPONSE: Conservation & management

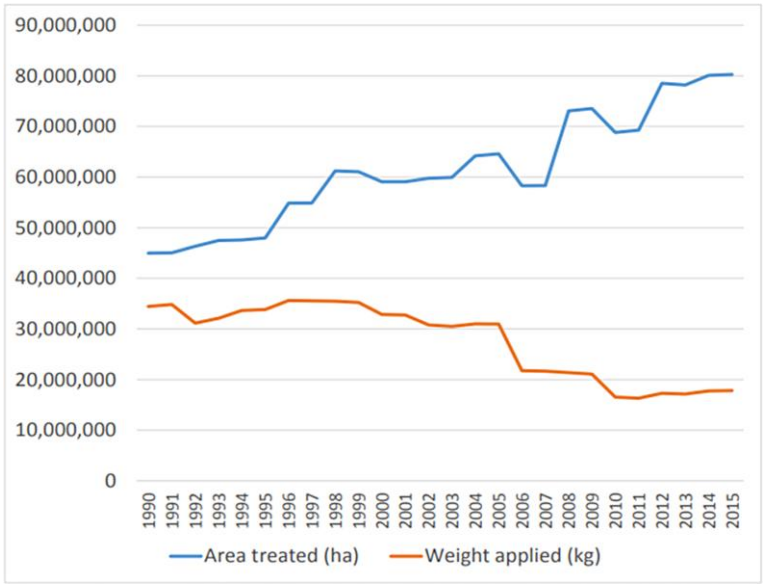


Living Planet 2018

e.g. Agricultural Productivity (UK) – Total Output/Labour



e.g. Area of crop treated with Pesticide



Technical report: State-Pressure-Response

STATE: SoN Species metrics – updated

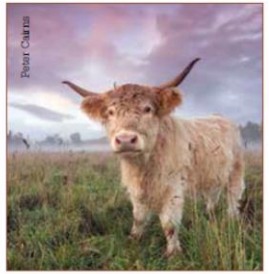
PRESSURES & DRIVERS

RESPONSE: Conservation & management

- **How are we helping nature in the UK?**

Protecting the best places

Designated sites cover 10% land



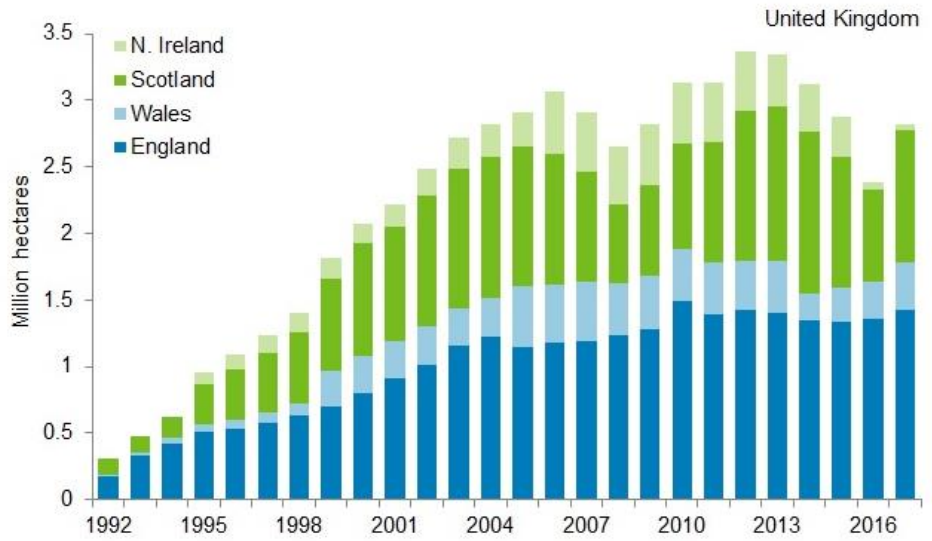
Improving habitats

Combining traditional methods with new approaches

Creating new wildlife sites

New wetland site like Avalon Marshes

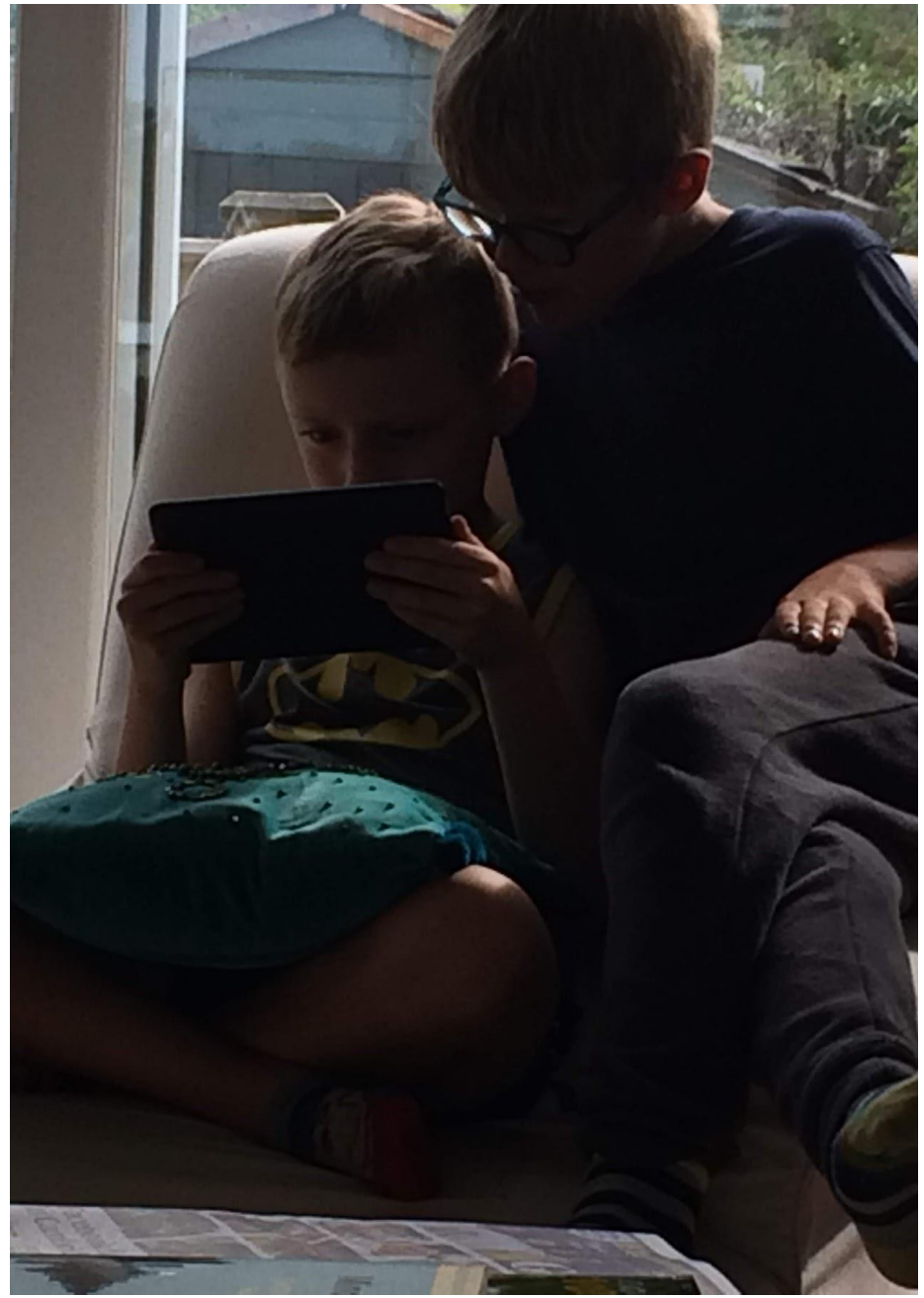
Figure B1ai. Area of land covered by higher-level or targeted agri-environment schemes, 1992 to 2017.




Recorders…..
Data providers…..
Volunteers…
Monitoring scheme coordinators


Make the most of technological developments


Maximising data collection



Data were provided by the Biological Records Centre from the following recording schemes:

Bees, Wasps and Ants Recording Society;
Ground Beetle Recording Scheme;
British Myriapod and Isopod Group;
Centipede Recording Scheme;
Dipterists Forum;
Cranefly Recording Scheme;
British Dragonfly Society;
Dragonfly Recording Network;
Empididae and Dolichopodidae Recording Scheme;
Hoverfly Recording Scheme;
Millipede Recording Scheme;
Orthoptera Recording Scheme;
National Moth Recording Scheme;
Soldierflies and Allies Recording Scheme;
British Arachnological Society;
Spider Recording Scheme;
Riverfly Recording Schemes:
Trichoptera; British Lichen Society;
British Bryological Society.

The *State of Nature 2016* report is a collaboration between the UK conservation and research organisations listed below:

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