D1. Biodiversity and ecosystem services

D1c. Status of pollinating insects

Type: State / Benefit indicator

Summary

There was an overall decrease in the pollinators indicator from 1987 onwards. In 2016, the indicator had declined by 22% compared to the value in 1980. The long-term trend was assessed as a decline.

Between 2011 and 2016 the indicator showed a minor increase of 2%, however given the uncertainty, the short-term trend was assessed as stable.

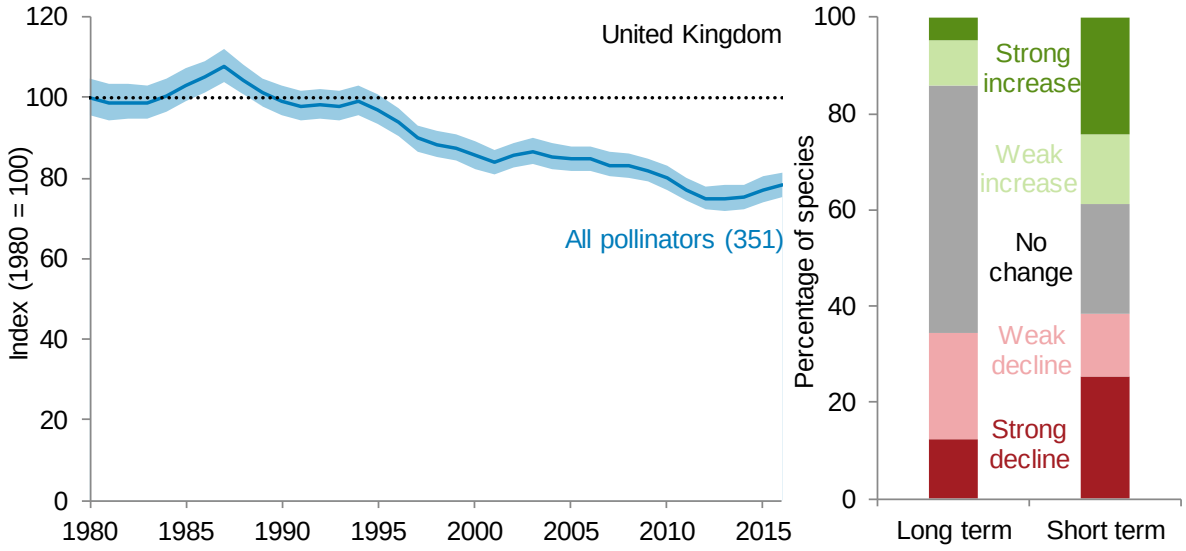
Over the long term, 14% of pollinator species became more widespread (5% showed a strong increase), and 34% became less widespread (13% showed a strong decrease). The ratio between increasing and decreasing species was more balanced over the short term, with 39% of species increasing and 38% of species decreasing.

As individual pollinator species become more or less widespread, the communities in any given area become more or less diverse, and this may have implications for pollination as more diverse communities are, in broad terms, more effective in pollinating a wider range of crops and wild flowers. Despite the inter-annual variation, the overall trend for pollinators remains downward.

Indicator Description

This indicator illustrates changes in pollinator distribution (bees and hoverflies) in the UK. The indicator is based on 351 species of pollinator (137 species of bee and 214 species of hoverfly), and measures change in the number of 1km grid squares across the UK in which they were recorded in any given year – this is referred to as the 'occupancy index'. Many insect species are involved in pollination but bees and hoverflies are known to be important and are presented here as an indicator of overall pollinator trend.

Figure D1ci. Change in the distribution of UK pollinators, 1980 to 2016.



Notes:

1. Based on a total of 351 pollinators, comprising 137 wild bee species and 214 hoverfly species.
2. The graph shows the unsmoothed composite indicator trend with variation around the line (shaded) within which we can be 90% confident that the true value lies (credible interval).

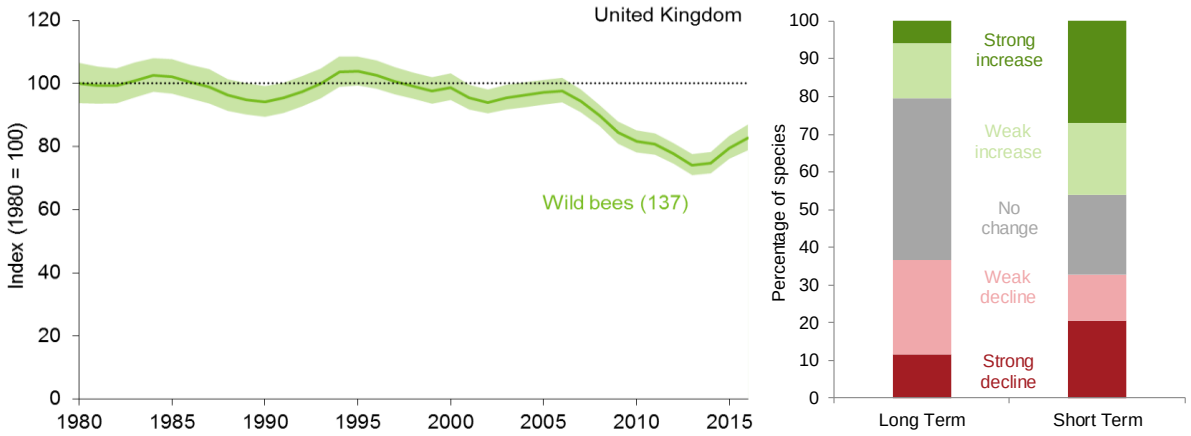
3. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change in occupancy, based on set thresholds of change.
4. This indicator is not directly comparable with the previous publication as the Bayesian modelling methods have been improved and 38 species (10 wild bees and 28 hoverfly species) have been removed from the analysis.

Source: Bees, Wasps & Ants Recording Society; Hoverfly Recording Scheme; Biological Records Centre (supported by Centre for Ecology & Hydrology and Joint Nature Conservation Committee).

Assessment of change in the distribution of pollinators in the UK			
	Long term	**Short term**	**Latest year**
Distribution of UK pollinators	1980–2016	2011–2016	Increased (2016)

The indicator occupancy index was also produced for the bee (Figure D1cii) and hoverfly (Figure D1ciii) species separately. The bee index was relatively stable up to 2006, before undergoing several years of decline. From 2013 onwards, there was evidence of a recovery, however, the bee index in 2016 was estimated to be 17% lower than in 1980. A larger proportion of bee species had decreased than increased over the long term (37% decreased and 20% increased), however, over the short term, a greater number increased (46%) than decreased (33%).

Figure D1cii. Change in the distribution of wild bee species in the UK, 1980 to 2016.



Notes:

1. Based on 137 wild bee species.
2. The graph shows the unsmoothed composite indicator trend with variation around the line (shaded) within which we can be 90% confident that the true value lies (credible interval).
3. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change in occupancy, based on set thresholds of change.
4. This indicator is not directly comparable with the previous publication as the Bayesian modelling methods have been improved and 10 wild bees species have been removed from the analysis.

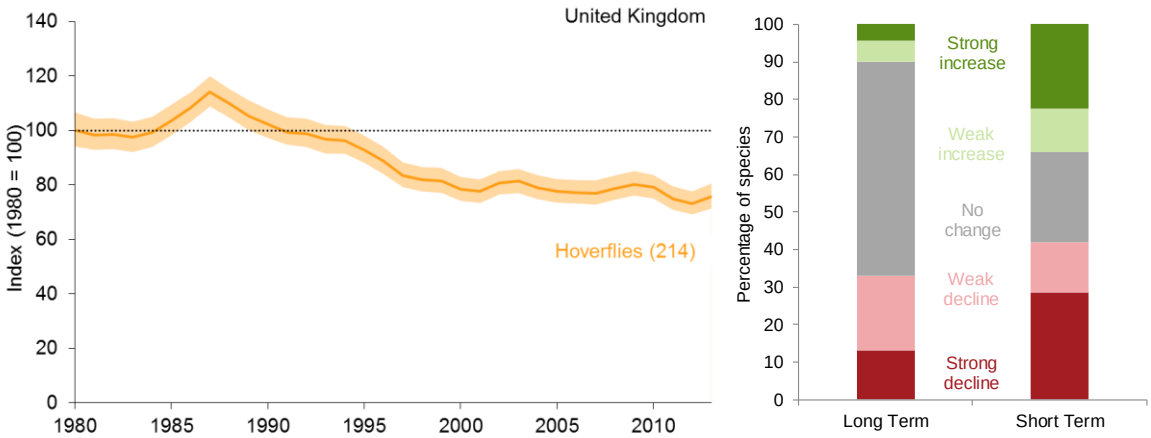
Source: Bees, Wasps & Ants Recording Society; Biological Records Centre (supported by Centre for Ecology & Hydrology and Joint Nature Conservation Committee).

There was a noticeable decline in the bee index from 2007 to 2014. Loss of foraging habitat is understood to be a major driver of change in bee distribution (Vanbergen *et al*., 2014) and

pesticide use has been shown to have an effect on bee behaviour and survival (Stanley *et al*., 2015). Weather effects, particularly wet periods in the spring and summer, are also likely to have had an impact. Further research would help to better understand the relative importance of these potential drivers of change.

In contrast to bees, the hoverfly index (Figure D1ciii) shows a gradual decline between 1987 and 2001. In 2001, the composite index was approximately 78% of the value in 1980. The trend was then relatively stable up to 2013, ending 24% lower than the value in 1980. A greater proportion of hoverflies have declined than increased in occupancy over both the long and short term (1980-2013: 33% decreased and 10% increased; 2008-2013: 42% decreased and 34% increased). It is not clear why hoverflies show a different trend to bees, although differences in the life cycle will mean they respond differently to weather events and habitat change.

Figure D1ciii. Change in the distribution of hoverfly species in the UK, 1980 to 2013.



Notes:

1. Based on 214 hoverfly species.
2. The graph shows the unsmoothed composite indicator trend with variation around the line (shaded) within which we can be 90% confident that the true value lies (credible interval).
3. The bar chart shows the percentage of species within the indicator that have increased, decreased or shown no change in occupancy, based on set thresholds of change.
4. This indicator is not directly comparable with the previous publication as the Bayesian modelling methods have been improved and 28 hoverfly species have been removed from the analysis.

Source: Hoverfly Recording Scheme; Biological Records Centre (supported by Centre for Ecology & Hydrology and Joint Nature Conservation Committee).

Relevance

Nature is essential for human health and well-being. Pollination is an important ecosystem service that benefits agricultural and horticultural production, and is essential for sustaining wild flowers. Bees and hoverflies are also popular insects and people enjoy seeing them in towns, cities and the wider countryside. Insect pollination depends on the abundance, distribution and diversity of pollinators. Knowledge of the population dynamics and distribution of those species that provide the service, the pollinators, helps us assess the risk to these values. Many wild bees and other insect pollinators have become less widespread, particularly those species associated with semi-natural habitats. At the same time, a smaller number of pollinating insects have become more widespread. This may have implications for the pollination service they provide to crops and wild flowers and is an area of active research (Potts *et al*., 2010; Garratt *et al*., 2014).

Background

Occupancy of pollinators refers to the overall area where each species is found and does not refer directly to their abundance. The reduction in the index shows that overall pollinators are becoming more restricted in their distributions so that on average, in any one place the diversity of pollinator species found is reduced.

The indicator is the average trend across all 351 species included in the analysis. Individual species within the indicator will have different time-series trends (i.e. some may be increasing while others may show strong declines). The shaded region on Figures D1ci, D1cii and D1ciii is the 90% credible interval of the annual occupancy estimates and represents the statistical uncertainty surrounding the annual occupancy estimates. Credible intervals are similar to the confidence intervals used in parametric statistics, but are the appropriate metric to use with Bayesian statistics. Estimates will be revised as new data become available.

The Bayesian occupancy approach is an established analytical method that enables an estimation of species occurrence even though the data utilised in this indicator were collected without a standardised survey design (van Strien *et al.*, 2013; Isaac *et al.*, 2014). For each species, records were extracted at the 1km grid cell scale with day precision, and an annual time-series of the proportion of sites occupied was calculated. Each species-specific time-series was scaled so the first value in 1980 was set to 100. The annual index (the pollinator occupancy indicator) was estimated as the arithmetic mean of the scaled species-specific occupancy estimates. Each species was given equal weighting within the indicator. Uncertainty in the species-specific annual occupancy estimates is represented by the 90% credible intervals. A lag in submission and collation of hoverfly records means that post 2013 records per year tended to drop off. Therefore, for the composite indicator and the assessment, hoverfly occupancy estimates post 2013 were held at their value in 2013. See the technical background document and the Bayesian technical report for further detail on the production of this indicator.

As species become more or less widespread, individual grid squares will have richer (more species) or poorer (fewer species) pollinator communities; pollination services are generally likely to be higher where the pollinator community is richer (Vanbergen *et al.*, 2013). The area occupied does not necessarily relate to pollinator abundance, as a species with one individual in each of 10 grid squares would receive the same occupancy score as a species with 100 individuals in each of the same grid squares, although generally, species with greater occupancy are likely to be more abundant. National level data on changes in abundance of pollinators is not currently available.

The short-term trends tend to have a fewer species falling into the “stable” category than the long-term trends. This is likely a result of the high level of short-term variation in invertebrate populations. The species-specific trends were calculated as the mean percentage change in occupancy per year, therefore across a 36-year period, the influence of short-term variation on the trend is reduced compared to its influence on a shorter 5-year period.

Goals and targets

Aichi Targets for which this is a primary indicator

Strategic Goal D. Enhance the benefits to all from biodiversity and ecosystems.

Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Aichi Targets for which this is a relevant indicator

Strategic Goal B. Reduce the direct pressures on biodiversity and promote sustainable use.

Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Strategic Goal D. Enhance the benefits to all from biodiversity and ecosystems.

Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Web links for further information

Reference	Title	Website
Bees, Wasps & Ants Recording Society	BWARS homepage	http://www.bwars.com/
Hoverfly Recording Scheme	HRS homepage	http://hoverfly.org.uk/portal.php
Centre for Ecology & Hydrology	Biological Records Centre homepage	http://www.brc.ac.uk/
Department for Food, Environment & Rural Affairs	The National Pollinator Strategy: for bees and other pollinators in England	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/370199/pb14221-national-pollinator-strategy.pdf (PDF, 3.37MB)

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Full details of this indicator, including a datasheet and technical documentation are available at: http://jncc.defra.gov.uk/page-6851**.**

Last updated: July 2018

Latest data: Pollinators and wild bee species (2016), hoverfly species (2013)