

# The State of Britain's Hedgehogs 2022



people's  
trust for  
**endangered**  
species

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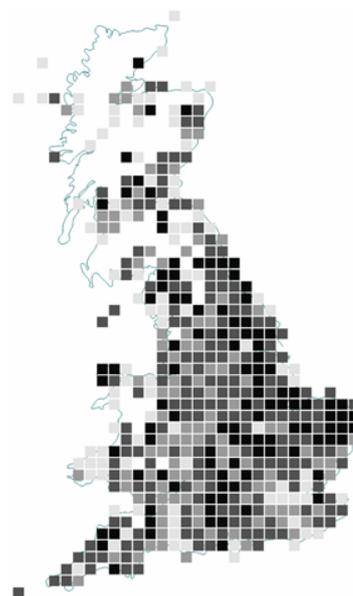
- ▶ **Hedgehogs in Britain have undergone a long historic decline, but differences between urban and rural populations are becoming increasingly apparent.**
- ▶ **In urban areas, the picture is of a stable population that might be recovering, highlighting the importance of gardens and green spaces, and local action, in ensuring a future for hedgehogs.**
- ▶ **In stark contrast, rural populations remain low and, in the last two decades, have continued to decline by between a third and three-quarters nationally. The largest declines are seen in the eastern half of England.**

## Introduction

In 2011, the first *State of Britain's Hedgehogs* report highlighted the findings of several surveys that pointed to a widespread loss of hedgehogs (*Erinaceus europaeus*) over the previous ten years. In 2020, hedgehogs were put on the IUCN Red List as vulnerable to extinction in Great Britain. A decade on from the original report, the current *State of Britain's Hedgehogs* assesses how the hedgehog population has changed since.

## Distribution

Hedgehogs occur widely across mainland Great Britain, but show regional variations, being most abundant in the north and east of England and Scotland. The map shows distribution based on records from the British Trust for Ornithology's (BTO) *Garden BirdWatch* (2007-20), the darker the square, the greater the likelihood of recording hedgehogs. White squares had too few data to estimate a likelihood.



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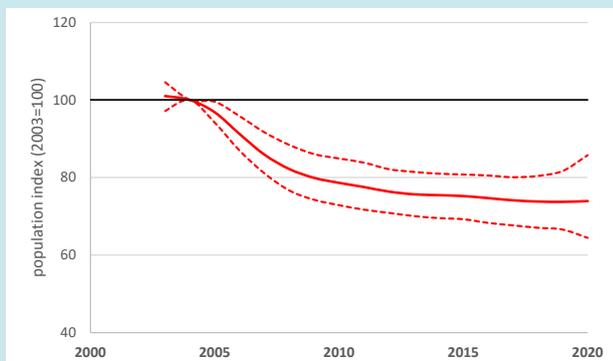
## How many hedgehogs are there in our towns and cities?

A handful of estimates of hedgehog density in urban areas have been made. These include sites such as amenity grassland and playing fields, and more broadly defined areas identified as 'urban' or 'greater than 25 per cent of built land cover', for example. Nine studies, in very different locations (from northeast London to the edge of a village) estimated densities from 7.4 to 176 hedgehogs per km<sup>2</sup>, with most between 20-50 per km<sup>2</sup>.

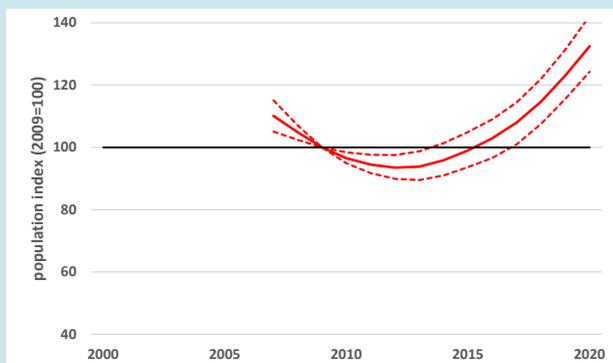
Information about green space in urban areas is published as part of the UK natural capital accounts developed by Defra and the ONS. They estimate urban areas in England, Scotland and Wales cover 17,686 km<sup>2</sup>, of which 60.2 per cent (10,657 km<sup>2</sup>) is either gardens or natural land cover.

If the average density of hedgehogs in these green spaces is taken to be 25 per km<sup>2</sup>, the total number of urban hedgehogs is around 266,000. If a lower density of 10 per km<sup>2</sup> is applied to the whole urban area (17,686 km<sup>2</sup>), the number is 177,000.

## Population change estimated from the proportion of sites recording hedgehogs in gardens and urban green spaces



(a) PTES *Living with Mammals*



(b) BTO *Garden BirdWatch*

**Figure 1.** Solid lines show the smoothed trends for estimates of the proportion of sites each year recording hedgehogs, from sightings or signs, in (a) *Living with Mammals* and (b) *Garden BirdWatch*. The proportion is expressed as an 'index' relative to that in a baseline year (=100). Broken lines show 95% confidence limits.

## Population size

Estimating the number of hedgehogs nationally with a high level of certainty is not easy. Hedgehogs are widespread but scarce, presenting practical challenges in finding them. So few might be encountered in a night-time survey, for example, that estimates of density (the number in a given area) are often imprecise.

If the number per hectare or per km<sup>2</sup> in a particular habitat (such as amenity grassland or arable farmland) is determined, then the population size can be estimated by multiplying density by total area, for a given habitat, and adding together the values for each habitat-type to obtain an overall total. In 2018, The Mammal Society estimated the population to be **879,000**, but there is considerable uncertainty in this figure.

Most counts of hedgehogs are from urban areas, often on amenity grassland, such as playing fields. The population of hedgehogs in gardens and other urban green spaces may be around **200,000-250,000**. This is derived from estimates of the extent of urban green space published as part of the UK natural capital accounts developed by the Office for National Statistics (ONS) and Defra, and a consensus value for density from several studies.

## Evidence that numbers are changing

Records of hedgehogs accidentally killed by gamekeepers, analysed thirty years ago, show a long-term decline, going back to the early 1960s. Between 1995 and 2009, gamebag records fell by 28 per cent and, over a similar period, the five surveys reviewed in the first *State of Britain's Hedgehogs* report showed annual declines of between 2.2 and 7.9 per cent. Since 1990, counts of hedgehog road casualties have fallen by perhaps as much as three-quarters.

For this report, data from five surveys, collected between 1981 and 2020, were looked at and new analyses of four of the surveys carried out. Two surveys covered predominantly urban areas, and three surveys, sites in rural areas (see p8).

## Hedgehogs in urban areas

Urban areas (mixtures of gardens, amenity grassland and other green space) are thought to be a refuge for hedgehogs from pressures in the wider landscape and can support high numbers of hedgehogs. However, road mortality is highest around towns, where there is a mix of urban and grassland habitats, and the loss of amenity grassland, and more enclosed gardens threaten populations in urban environments. Nevertheless, the picture emerging of hedgehogs in urban areas is encouraging.

The first *State of Britain's Hedgehogs* estimated that a quarter of the population in urban areas had been lost in the first decade of the century. The most recent data show no indication that that decline is continuing. **The picture is of a stable population that might be recovering.** It should be remembered, however, that any recovery starts from a low baseline at the end of a long period of decline.

Two surveys, People's Trust for Engangered Species' (PTES) *Living with Mammals* survey and BTO's *Garden BirdWatch*, collect records of hedgehogs in urban areas (mostly domestic gardens). Trendlines estimating the proportion of sites that recorded hedgehogs (from either sightings or signs) differ slightly between the two surveys.

The trend from *Living with Mammals* decreases until 2013 and then stays more or less flat (1a), 25% below its value in 2003. The proportion of sites recording hedgehogs in *Garden BirdWatch* similarly falls until 2013 but then increases sharply (1b). The proportion of sites is estimated as an 'index' (on the vertical axis on the graph) relative to baseline year. The baseline is given an arbitrary value (100) and is different in the two surveys. Values for individual years, therefore, are not directly comparable between the surveys, but the shape of the trendlines, showing how the population is changing, can be compared.

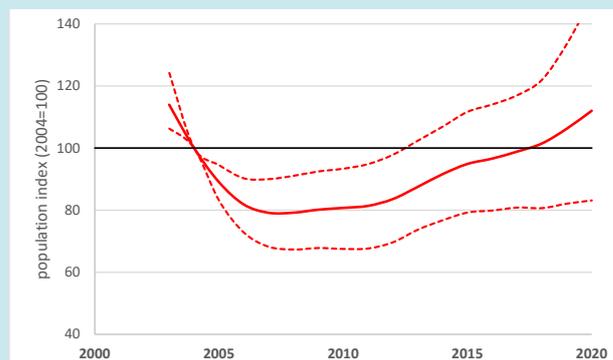
## In urban areas, the picture is of a stable population that might be recovering

Differences in the shape of the trendlines may be due to the different survey methodologies. In particular, mammals are only recorded optionally in *Garden BirdWatch*. To identify those weeks when participants looked for mammals, only those weeks when a mammal species was recorded were used in the analysis. This ensured null records (when hedgehogs were taken to be absent) occurred because no hedgehogs had been seen rather than because mammals weren't looked for that week. However, this means that weeks when participants did look for mammals, but didn't see any, were omitted.

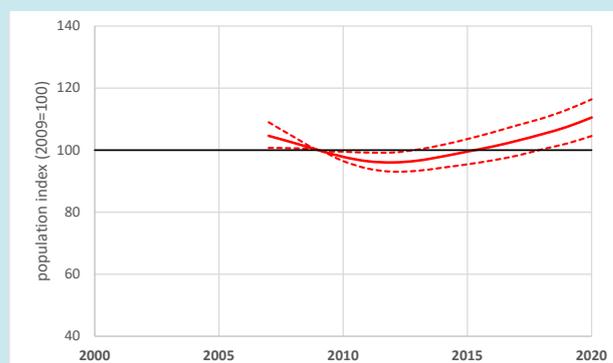
Looking at the proportion of sites recording hedgehogs shows presence or absence and not necessarily abundance; fewer hedgehogs may occupy the same number of sites, or the same number of hedgehogs, squeeze into fewer sites. The proportion of suitable sites might change independently of hedgehog numbers. The average weekly maximum count, when hedgehogs were seen, is more indicative of abundance at sites where hedgehogs are present. The smoothed trends for these are shown below.

Average weekly counts fall until about 2010/11, after which they increase, and both surveys show a similar pattern. This doesn't tell us anything about where hedgehogs occur - whether they're present at fewer or more sites - only that numbers are increasing at sites where they are found. Regionally, *Garden BirdWatch* data suggest the initial decline was most marked in the eastern half of England. An increase in counts might also occur, however, if hedgehogs are increasingly 'detectable'. There is some evidence to suggest that the use of trail cameras in *Living with Mammals* has increased in the last ten years and, if this

### Population change estimated from average weekly counts of hedgehogs in gardens and urban green spaces where they were found



(a) PTES *Living with Mammals*



(b) BTO *Garden BirdWatch*

**Figure 2.** Solid lines show the smoothed trends for average weekly maximum counts (the largest group of hedgehogs seen together each week) in (a) *Living with Mammals* and (b) *Garden BirdWatch*. Average counts are expressed as an 'index' relative to that in a baseline year (=100). Broken lines show 95% confidence limit.



is the case, larger counts of hedgehogs might be more likely. Neither proportion of sites nor maximum counts indicates an ongoing decline of hedgehogs in urban areas. Instead, they show a more stable population might be recovering.

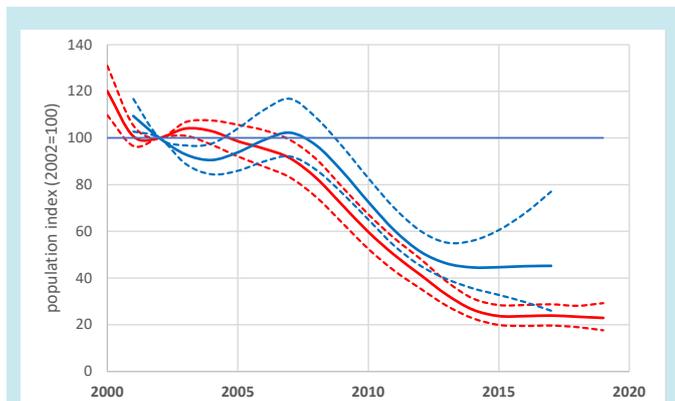
## Hedgehogs in rural areas

**Three surveys show a loss of hedgehogs in rural areas nationally of between a third and three-quarters of the population in the last two decades. The largest declines are in the eastern half of England.**

Data from three surveys, covering sites in rural areas, were analysed. Each shows a falling population trend and, although there are difficulties unpicking the data, and uncertainty in all of them, the common picture is strong evidence that the population has undergone a substantial decline.

Between 1981 and 2019, the population index estimated from records of hedgehogs in the Game and Wildlife Conservation Trust's *National Gamebag Census*, fell by a half. In recent years, the decline is less (statistically) clear, but the population estimate fell by 35 per cent in the last 25 years and by 16 per cent in the last decade (2009-19).

The *Breeding Bird Survey*, shown below, in red, shows a steeper decline: between 2002 and 2019, the trend, estimated from either sightings of live animals or other evidence that hedgehogs were present, fell by 77 per cent. Over much of the last two decades, the population has decreased by an average of 8.3 per cent each year. The trend does, however, level off and the population has remained at about a fifth of its 2002 value since 2015.



**Figure 3.** Smoothed population trends (solid lines) estimated from presence or absence records in the BTO/RSPB/JNCC *Breeding Bird Survey* (red) and PTES *Mammals on Roads* (blue) surveys. The population index is expressed relative to the baseline year, 2002 (=100) and broken lines show 95% confidence limits.

A similar rate of decline to that indicated by the *Breeding Bird Survey* is seen in counts of hedgehog road casualties in PTES' *Mammals on Roads* survey, despite very different survey methodologies.

Counts of hedgehog road casualties have been recorded since the early 1990s, and are used as an indication of changes in the wider population. If counts fall (despite a steady increase in traffic volume), abundance in the

landscape is likely to be falling. The trend (Fig. 3) is the most recent statistical analysis, but a crude comparison of counts in the table below tells the same story and, as circumstantial evidence at least, supports the finding of a large decline in rural areas.

	hedgehog casualties /100km	billion vehicle-kms (GB) /year
1990-93	2.16	412
2001-04	1.45	484
2011-14	0.62	503
2015-18	0.69	548

Counts of hedgehog road casualties (per 100km) collected in similar surveys in the 1990s, run by Pat Morris at Royal Holloway, University of London, and since 2000, as part of PTES' *Mammals on Roads*. Traffic volume has steadily increased, and the average collective distance travelled by road vehicles each year in England, Scotland and Wales is also shown (data from the Department for Transport).

## Comparing evidence

Differences in survey design and in the type of data collected (quantitative counts or presence data) make it difficult to directly compare trends. Records of presence or absence (largely from either field signs or local knowledge) don't necessarily say anything about abundance. In a daylight survey, however, such as the *Breeding Bird Survey*, hedgehogs are unlikely to be active and too few seen for counts to give a reliable trend. Difficulties with the data also come about because of small changes in the protocol from year to year and the fact that the *Breeding Bird Survey* is not primarily intended to record hedgehogs, so there is some uncertainty in the size of the decline. It is not unprecedented, however. In seven years, between the late 1980s and mid-1990s, the water vole population decreased by 88 per cent, to fewer than a million individuals. The picture for hedgehogs is alarmingly similar.

## Regional variation

Where there were sufficient data, regional trends were estimated from the National Gamebag Census. Since 1994, the largest declines have been in the East Midlands and East of England regions, with declines of 74 and 35 per cent respectively. In the last decade, the loss has been a third and a quarter of their respective populations.

Like the count analyses of *Living with Mammals* or *Garden BirdWatch* count data, those of the *National Gamebag Census* data don't include records when no hedgehogs were recorded. Hence, the change in gamebag records reflects a fall in the number of hedgehogs where they were present, rather than a change in the percentage of positive sites (those where hedgehogs were recorded). The latter also fell, from about a fifth in 1981 to less than one in twenty, in 2019.

The regional pattern seen in the National Gamebag Census, showing steeper declines in the east, was not apparent in either the *Breeding Bird Survey* or *Mammals on Roads* data.

## Geographical change over time

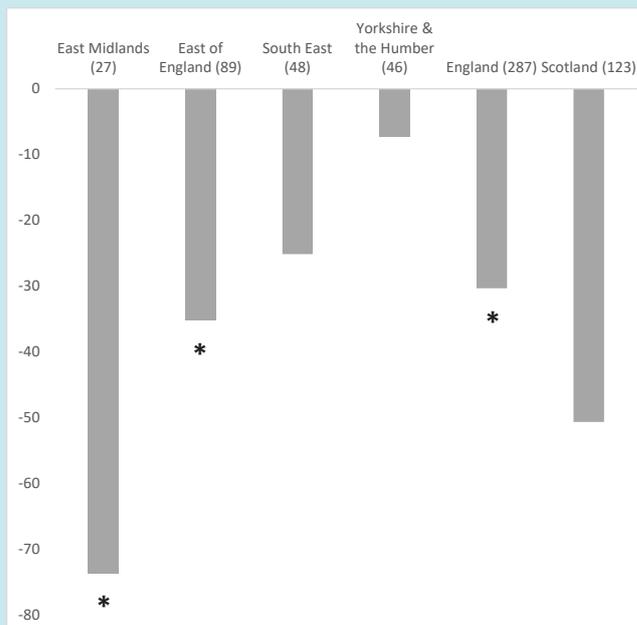
If the relative abundance of hedgehogs across the country is calculated for different periods, using records from the *National Gamebag Census*, a pattern of decline over time becomes apparent.

Relative spatial abundance was calculated for four periods: 1985-89, 1995-99, 2005-09 and 2015-19, and shown on the maps as a coloured scale.

Many sites in southwest England and Wales that reported hedgehogs in the 1980s, had stopped reporting them by the 1990s. In the following decade, areas of relative high abundance had shrunk further, while areas with no records of hedgehogs expanded. The earliest declines are in the west and occur later further eastward, but by the end of the 2010s, declines are widespread. By 2015-19, areas of high abundance were restricted to south-east Scotland, north Wales and eastern England. Hedgehogs were not reported in most of western and northern Scotland and much of England.

Some caution should be taken interpreting the data from the *National Gamebag Census*. It isn't known how much trapping effort has changed over the period—the number of traps or the length of time they're set - or whether the willingness to report hedgehogs has changed. In addition, the use of excluders on tunnel traps, which reduce the number of hedgehogs caught, may have increased over time. The extent of these isn't known, but the spread of the decline, from west to east, doesn't support the idea that it is due to changes in trapping effort or reporting.

## Percentage change in rural population estimates from the *National Gamebag Census* 1994 to 2019



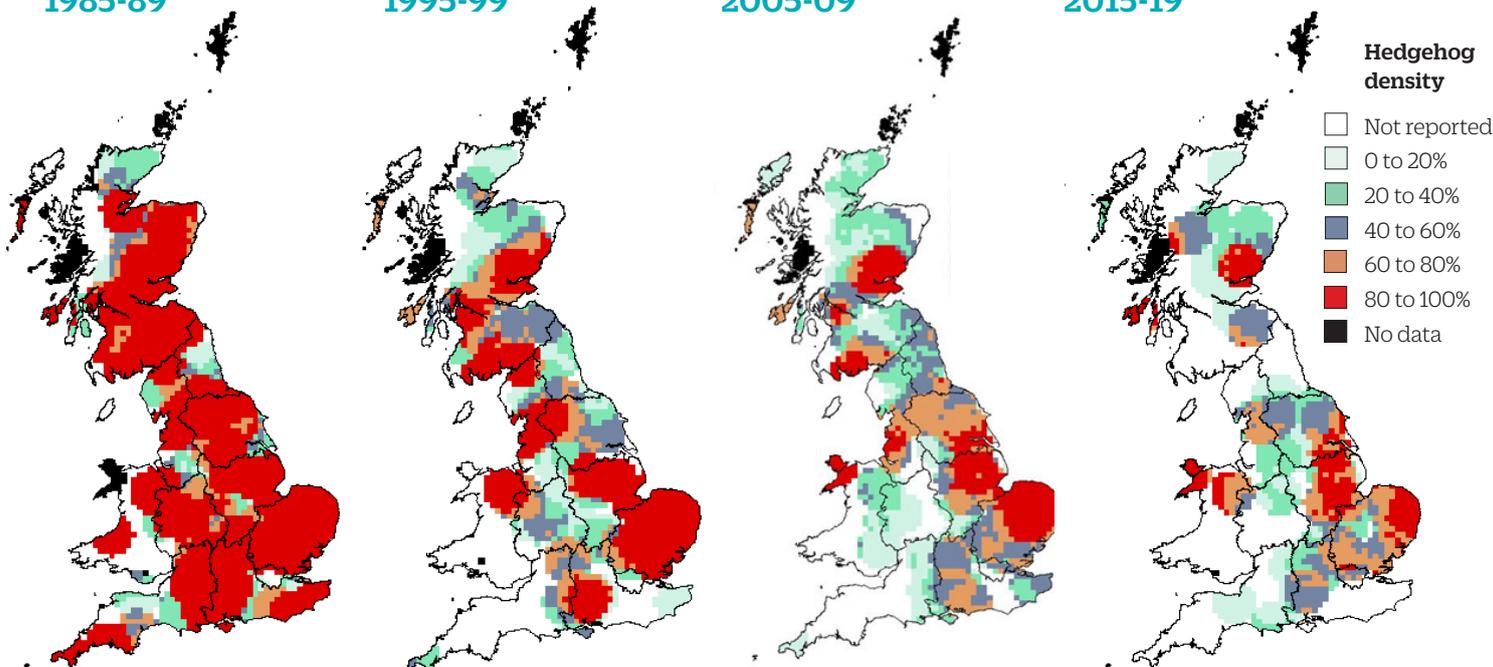
**Figure 4.** Values were calculated from smoothed estimates (of the number of hedgehogs in a given area) for the first and most recent year (for the East Midlands, the change is for 1981 to 2018). The change is statistically significant in the East Midlands and East of England regions, and in England (indicated by a “\*”). The number of participating sites is shown in parentheses. There were too few sites in other regions and in Wales over the period to estimate a change.

1985-89

1995-99

2005-09

2015-19



**Figure 5.** Maps show the relative density of hedgehogs reported in the *GWCT National Gamebag Census* between 1985 and 2019. Annual numbers of hedgehogs at each site and year were divided by site area and averaged over the five-year period. An average value for each 10-km Ordnance Survey grid square was calculated and is shown as a relative abundance. Pale blue indicates the lowest abundance and dark red, the highest. White areas are those in which no hedgehogs were reported. Data from 619 sites were included in the mapping for the period 1985-89, whilst 788 sites were included in the mapping for 2015-19.

## Are badgers responsible for the hedgehog decline?

Badgers are most abundant in lowland pastoral landscapes (over half the population is in the south-west of England and south Wales), areas where hedgehogs are comparatively scarce. The two species compete for food, such as earthworms and beetle larvae, and badgers will also eat hedgehogs. When they are foraging, hedgehogs tend to avoid areas where badgers have recently been active.

But while competition, predation, and avoidance are likely to reduce hedgehog numbers in areas with lots of badgers, the two species can co-exist and, moreover, in a national survey, hedgehogs weren't found in 71% of rural sites where there are no badger setts.

Researchers at Nottingham Trent University are trying to understand the interaction between badgers and hedgehogs more fully and the extent of competition between the two species.

## Why are hedgehog numbers falling?

Hedgehogs have existed here for at least half a million years. But they might not survive in our natural environment for many more. Britain is one of the most nature-depleted nations in the world and wildlife continues to be lost. The reasons for the decline in hedgehog populations, apparent in the last twenty or more years, aren't fully understood yet. Pointing the finger at a single cause, such as predation by badgers or road casualties, likely misses the bigger, more complex picture.

Research funded by PTES, the British Hedgehog Preservation Society (BHPS) and others in the last decade has improved understanding of rural hedgehogs. They prefer villages to open farmland, particularly arable land, and follow field margins and hedgerows. Badgers and major roads have a negative impact and might threaten populations locally, but even where badgers are absent, hedgehogs choose areas in villages rather than farmland habitats.

Foremost of the pressures that hedgehogs face is an impoverished environment. The loss of landscape features such as hedgerows is responsible in part but isn't the whole story. An estimated half of Britain's hedgerows were lost in the second half of the last century, but in the last twenty years efforts have been made to restore and improve them. A lot more can be done, but we also need to look at other aspects of the countryside: at the management of field margins and soils, and the number and abundance of invertebrate species; at connectivity in the landscape, linking habitats and populations; at climate change; and at the interaction of species in a changing environment. The continuing loss of a generalist species such as hedgehogs, like that of farmland songbirds, is the 'canary in the coal mine'. To stop it, we need to recognise the essential value of biodiversity, our dependence on the tapestry of natural habitats and species. That tapestry is becoming threadbare. Even if you care little about hedgehogs, we should all care about the nature that supports them and us.



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## Hedgehog conservation: Hedgehog Street ten years on



### Tackling the urban decline

In 2011 Hedgehog Street was launched by BHPS and PTES to raise awareness and build community action to support hedgehog populations. The campaign aims to improve habitats for hedgehogs and to join up green spaces at a neighbourhood scale. Small holes at the base of fences to give access to gardens, known as 'hedgehog highways', are a cornerstone of the campaign and one of its Top Tips for encouraging hedgehogs in urban areas. Other tips include eliminating the use of chemicals, such as slug pellets, leaving a small area to grow wild, dealing with hazards, such as discarded netting and steep-sided ponds, and providing 'hedgehog houses' and supplementary food.

### Hedgehog Champions

Simple, practical guidance for the public, and tailored advice for housing developers and land managers, is provided online, distributed through leaflets, training courses and at events. Over 100,000 people have signed up to be Hedgehog Champions, adding hedgehog-friendly features to their gardens and raising awareness of the ways local communities can help improve urban environments.

An important element of Hedgehog Street is the BIG Hedgehog Map, mapping sightings of hedgehogs submitted by the public. These records, of live and dead hedgehogs, improve our understanding of hedgehog distribution across the UK and how this changes over time. The interactive map can highlight local records, so that community projects can focus conservation efforts. To date, the map shows over 120,000 sightings and the data are shared with local and national record centres.

Hedgehog Street has also run several citizen science projects involving the Hedgehog Champions. The Hedgehog Housing Census explored hedgehog nesting habits; Hedgehogs After Dark recorded nocturnal behaviour; and the Hedgehog Hibernation Survey looked at winter activity patterns.

## Tackling the rural decline

Greater awareness of the need for conservation, and individual and community actions such as hedgehog highways, may have turned the decline of hedgehog populations in urban areas. To do the same for rural populations, we need greater understanding, awareness, and action. We know that:

- ▶ wide, grassy field margins support more earthworms and ground beetles, increasing the availability of prey
- ▶ increasing the complexity of the habitat – with more and denser hedgerows, for example, that offer greater shelter – may reduce the impact of predators
- ▶ hedgehogs occupy only about a fifth of the rural landscape. Their presence is inversely related to the density of badger setts, but hedgehogs are also absent from 71% of sites that had no badger setts
- ▶ hedgehogs follow linear features in the environment and do so more where there are badgers. We don't yet know the extent to which the loss of hedgerows or poorer quality hedgerows increases the risk of predation by badgers
- ▶ in arable areas, hedgehogs preferentially seek out gardens and built environments to forage
- ▶ hedgehog density is lowest in arable areas and highest in gardens and on amenity grassland in rural areas. Although new research is addressing the problem, estimates of hedgehog density in different habitat types are still few, and population estimates, uncertain
- ▶ nationally, road casualties might account for around 10-20% of the population each year, but it's unclear whether road mortality itself is responsible for the decline
- ▶ the risk of road mortality is highest in urban and suburban areas, with a mix of grassland and urban habitats
- ▶ hedgehogs will use road underpasses, but it isn't known how effective these are in reducing road mortality at the population level.

PTES and BHPS are currently funding and supporting research into rural hedgehogs and their decline, looking at:

- ▶ nest site selection and over-winter survival
- ▶ garden use in urban areas and the impact of connecting them
- ▶ prey availability, habitat quality and predation in relation to abundance
- ▶ road mortality and its impact on populations
- ▶ use of tunnels under roads, and the effectiveness of tunnels in reducing the risk of casualties.



As well as:

- ▶ helping farmers manage their land for hedgehogs
- ▶ regularly updating land management advice to reflect the latest research
- ▶ training green space managers to create hedgehog friendly amenities
- ▶ developing improved tools and methodologies for hedgehog surveying
- ▶ working to increase the legal protection of hedgehogs.

PTES and BHPS remain committed to hedgehog conservation. Our future priorities are to:

- ▶ continue to extend the reach of Hedgehog Street and its amazing Hedgehog Champions
- ▶ reach new audiences through farming clusters, events and publications and assist farmers with new ELM schemes to benefit hedgehogs
- ▶ promote the importance of hedgerows and hedgerow management for hedgehogs and other wildlife through PTES' *Great British Hedgerow Survey*
- ▶ engage with government consultations about sustainable farming, local nature and landscape recovery, and planning
- ▶ set up a national monitoring programme to understand factors affecting distribution, especially in the rural landscape.

As we learn more, practical conservation efforts will be put in place. Current research at Nottingham Trent, Reading, and Hartpury Universities and at the Institute of Zoology, will also increase our understanding of the factors driving the decline of rural hedgehogs. Working with farmers and conservationists, we continue to push for practices that benefit biodiversity and a countryside where hedgehogs are not pushed to extinction. But until the natural environment improves, the trend in rural hedgehog numbers is unlikely to change.

## Key references and resources

### Data used in this report

**PTES Living with Mammals** (2003-20): maximum counts (the largest number of animals seen at one time) and signs of hedgehogs recorded weekly through April, May and June. Around 1300 gardens and green spaces in the built environment (predominantly urban areas), surveyed in two or more years, were used in the analysis.

**BTO Garden BirdWatch** (2007-20): mammals are recorded optionally in the survey, either as a count or as present in a given week. For the analysis, only those weeks that recorded at least one mammal species were used (to identify those weeks when participants were looking for mammals) and only sites that had surveyed in two or more years (up to 3591 sites). Week numbers 20 to 35 (roughly corresponding to the survey period in *Living with Mammals*) were used in the analysis.

**BTO/JNCC/RSPB Breeding Bird Survey** (2000-19). The *Breeding Bird Survey* is a partnership jointly funded by the British Trust for Ornithology (BTO), Royal Society for the Protection of Birds (RSPB) and the Joint Nature Conservation Committee (JNCC), with fieldwork undertaken by volunteers. Transect surveys are walked each year at randomly selected OS grid-squares, optionally recording mammals, including live animals, field signs, dead animals, and local knowledge of presence. The number of surveys has increased over time (in 2019, 3,605 squares were surveyed for mammals). The daytime survey, however, is not primarily suited to recording nocturnal species such as hedgehogs. Since 2010, in any single year, hedgehogs have been recorded in between 34 and 91 squares.

**GWCT National Gamebag Census** (1981-2019) The *National Gamebag Census* is a voluntary survey run by the Game and Wildlife Conservation Trust, collecting annual records from shooting estates in England, Scotland and Wales of animals killed. It collects data on 20 mammal species that are either game or pest species. The analysis used data from 418 sites and. An average of 90 sites returned records of hedgehogs each year.

**PTES Mammals on Roads** (2001-18) The survey collects records of hedgehog road casualties outside urban areas, together with information about the length and location of the route. The analysis of data up to 2017 was presented in the *State of Britain's Hedgehogs* 2018, More recent data, up to 2018, are compared here without a statistical analysis.

### Other key references

*State of Britain's Hedgehogs* 2011,

<https://ptes.org/wp-content/uploads/2014/06/SOBH2011lowres.pdf>

*Hedgehog Street*, <https://www.hedgehogstreet.org/>

*Review of the Population and Conservation Status of British Mammals* (Mathews et al., 2018), <https://www.mammal.org.uk/science-research/mammal-review-2018-technical-summary/>

*Trends and Distribution of Hedgehogs Reported to GWCT's National Gamebag Census from 1981 to 2019* (Aebischer & Ewald, 2021) [https://www.gwct.org.uk/media/1245072/NGC\\_Hedgehog\\_Report\\_to\\_PTES\\_2021.pdf](https://www.gwct.org.uk/media/1245072/NGC_Hedgehog_Report_to_PTES_2021.pdf)

'Hedgehog Highways' petition, <https://www.change.org/saveourhedgehogs>

### Scientific publications from PTES/BHPS-funded work in 2020

Gazzard, A. & Baker, PJ (2020) Patterns of feeding by householders affect activity of hedgehogs (*Erinaceus europaeus*) during the hibernation period. *Animals*, 10(8): 1344

Yarnell, RW, & Pettett, CE (2020) Beneficial Land Management for Hedgehogs (*Erinaceus europaeus*) in the United Kingdom. *Animals*, 10(9): 1566

Bearman-Brown, LE, Wilson, LE, Evans, LC, & Baker, PJ (2020) Comparing non-invasive surveying techniques for elusive, nocturnal mammals: A case study of the West European hedgehog (*Erinaceus europaeus*). *Journal of Vertebrate Biology*, 69(3): 20075-1

Bearman-Brown, LE, Baker, PJ, Scott, D, Uzal, A, Evans, L, & Yarnell, RW (2020) Over-winter survival and nest site selection of the west-European hedgehog (*Erinaceus europaeus*) in arable dominated landscapes. *Animals*, 10(9): 1449

Moore, LJ, Petrovan, SO, Baker, PJ, Bates, AJ, Hicks, HL, Perkins, SE, & Yarnell, RW (2020) Impacts and potential mitigation of road mortality for hedgehogs in Europe. *Animals*, 10(9): 1523

## Acknowledgements

Steve Langton and, separately, Nicholas Aebischer and June Ewald (GWCT), produced the most recent estimates of trends reported here and we thank BTO, GWCT and RSPB for sharing their data. In particular, we thank David Noble (BTO) and Richard Yarnell (NTU) for helpful discussions. Thanks also to the many survey volunteers, without whom this report couldn't be produced, and to each and every Hedgehog Champion making a difference for hedgehogs.

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