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Britain's Hedgehogs: research and the conservation effort in the face of serious decline



Hugh Warwick

Hedgehogs were a familiar sight, but we are seeing fewer of them every year. What are the leading causes for the drop-off in hedgehog numbers? The author summarises the growing body of research, and points towards solutions for reversing the decline.

The latest figures from the *State of Britain's Hedgehogs* report reveal that, since the turn of the century, the population of this mammal has declined by up to a third in urban areas and by at least 50% in rural areas. These figures, coupled with the annual decline of more than 3% in the data obtained from the 'Living with Mammals' survey, provide ample evidence of a species in trouble (Wembridge & Langton 2015).

Working together, the British Hedgehog Preservation Society (BHPS) and the People's Trust for Endangered Species (PTES) have been at the forefront of the research effort that seeks to untangle what is happening to this best-loved member of Britain's wildlife. It is also clear, however, that this cannot remain an academic

European Hedgehog *Erinaceus europaeus* among leaf litter in a Lincolnshire garden. Jack Perks/FLPA

exercise. Research needs both to have practical outcomes that will help Hedgehogs *Erinaceus europaeus* and also to draw on the enthusiasm of the public in order to have them contribute as 'citizen scientists'.

The Hedgehog is difficult to study. It is a generalist species that does not habitually use any specific habitat. It is nocturnal, secretive and wide-ranging. It frequents suburban gardens, which, while bringing it into regular contact with people, can be difficult for researchers to acquire access to. To face these challenges, BHPS and PTES started a formal collaboration on Hedgehog conservation in 2011. This involved aspects of public engagement, training, commercial projects and an extensive research programme.

History

Despite their obviousness and popularity, Hedgehogs have not been studied with the intensity afforded to many other species. This is partly because of the practical difficulties already outlined, but also because they have not fitted into the research niches of being pest, food or game. Organisms that cause trouble or provide food or

entertainment are always going to receive more attention.

To begin to understand what is happening to a population it is, of course, necessary to have some idea of the size and extent of that population and how it is changing. One of the earliest population estimates comes from Maurice Burton's 1969 book *The Hedgehog*. In this, he suggests a density of one Hedgehog per acre, which would lead to a population of 32 million Hedgehogs in England (Morris 2014). This, however, does not come with much reliability, based, as it is, on a walk around Kew Gardens (Pat Morris pers. comm.). It is interesting that, even in 1969, Burton wrote: 'My impression is that in Britain the numbers [of Hedgehogs] have fallen in the 1960s as compared with the 1950s'. So, the concerns surrounding a declining population have been apparent for some time.

It is to the change in population levels of the animal, rather than its absolute number, that we have to turn for most of the evidence on what is happening in the real world. For example, in 1961, the National Gamebag Census from the Game and Wildlife Conservation Trust started to collect data on the numbers of animals killed either directly for fun or during 'pest' control. Here, Hedgehog numbers show a steady decline over the last 50 years, although the data from 1981 are considered to be less robust, as the Wildlife and Countryside Act (1981) may have caused some gamekeepers to stop reporting Hedgehogs that were caught, either deliberately or accidentally.

Pat Morris undertook a small study comparing the numbers of Hedgehogs killed on the roads between 1992 and 2002 and found that around 30% fewer Hedgehogs were found in 2002. In 1995, Derek Yalden undertook a review of Britain's mammals and estimated the British population of Hedgehogs to be 1,555,000, with 1,100,000 in England, 310,000 in Scotland and 145,000 in Wales (Harris *et al.* 1995). This has to be about the best 'starting point' for the

studies that were to come, as these all measure change, not absolute numbers.

As part of her research, Anouschka Hof ran 'Hogwatch', in collaboration with PTES and BHPS, which got 26,000 people to contribute presence/absence data from around the country. She also asked participants whether they had a perception of change in Hedgehog numbers, and the majority believed that the population had declined in the previous ten years (Hof 2009).

In 2011, the first *State of Britain's Hedgehogs* report was published. This concluded, conservatively, that there had been a 25% decline in Hedgehogs in the previous ten years (Wembridge 2011). The exercise was repeated in 2013, and this indicated, more robustly, that there had been a 33% decline in the previous ten years. Now we have the disturbing report from 2015, indicating that the decline is showing a marked difference between habitats, with around a third fewer Hedgehogs in urban areas, but up to three-quarters fewer in the countryside.

If the population estimate from 1995 was accurate, it would suggest that Britain's Hedgehog population is now considerably fewer than one million.

Is this a population in danger? Certainly, there have been stories in the media that have described an imminent extinction. For example, the BBC Springwatch presenter, Michaela Strachan, declared in May 2015 that the Hedgehog would be

The author's son observes a Hedgehog before it is taken to a rescue centre, having been found outside during daylight. Hugh Warwick



extinct in ten years. The notion that if you plot a graph of current decline with a straight line and follow it to the x-axis you identify the point of extirpation is rather simplistic, and it does nothing to support the real need for rigorous science to underpin the conservation effort.

Underlying the numbers, however, is another, very important driver behind the work being done on the Hedgehog. It is a remarkably popular species, a regular winner of national wildlife-popularity polls. For example, *BBC Wildlife Magazine's* 2014 'Britain's National Species' poll had the Hedgehog receiving nearly twice as many votes as the second-placed Badger *Meles meles*, and four times as many as the third-placed Pedunculate Oak *Quercus robur*. In 2007, the Environment Agency undertook a similar poll to identify an 'Icon of the Environment'; again, it was the Hedgehog that came out on top.

Why should this matter? Well, people care, and they really care about the Hedgehog, and this represents a way of introducing them to the wonders of nature and giving them some relatively straightforward activities that will help not just Hedgehogs but a whole range of associated wildlife.

This level of caring means that there is the very real potential of tapping into the public to collect the data that a limited number of researchers simply cannot manage.

Citizen science

Thousands of individuals around the country have taken part in studies that have helped to build the picture we now have of the status of Hedgehogs in Britain. PTES's 'Mammals on Roads' grew out of the work which Pat Morris had done in looking at road-kill Hedgehogs. The assumption is that in certain circumstances the change in numbers of Hedgehogs found dead on the roads is an indicator of the changes in Hedgehog populations in the wider environment. Obviously, this does not tell us how many there are, but it does reveal a steady decline across much of the country.

There are instances where road-kill is not a useful tool. For example, radio-tracked Hedgehogs were shown to veer away from busy roads (Rondinini & Doncaster 2002). But the data from the 'Mammals on Roads' project, particularly for Hedgehogs, are now recognised as a good tool for monitoring population change. The obvious

concern that this method may have measured traffic density more than Hedgehog density was challenged. Using Rabbits *Oryctolagus cuniculus* (more easy to count as they are seen by day) as an analogue, the researchers are confident that a 'decrease in road kill counts of these species is highly likely to represent a decrease in absolute abundance and would therefore be a good index with which to monitor population decline' (Bright *et al.* 2015).

Since 2001 more than 500,000km of roads have been surveyed, following a carefully designed protocol, and the results have enabled assessment of the rates of change. PTES's Living with Mammals began in 2003 and takes monitoring to a different level. This requires a degree of commitment, and it

A Hedgehog at the side of a busy road. Edwin Kats/Nature in Stock/FLPA



has so far received more than 8,000 survey results from 3,000 sites. Whereas the Mammals on Roads project surveyed rural areas, Living with Mammals is concentrated on the built environment and is also very revealing. It is from these observations that we see the Hedgehog population falling at more than 3% per year, exceeding the IUCN Red List criteria for identifying species at greatest conservation risk.

The National Hedgehog Survey data, collected from 260 sites, using 150 volunteers to place and maintain tracking tunnels, are currently being analysed. These tunnels were developed by Richard Yarnell, at Nottingham Trent University. When placed correctly the tunnels, more than 1m-long corrugated plastic triangles baited in the middle, and with paper, and ink pads on each side to capture footprints, are an effective tool for presence/absence data. It has been shown that, if ten baited tunnels are set up within a 1km square and, after five nights, there are no signs of Hedgehogs, a surveyor can be 95% sure that Hedgehogs are absent from that area (Yarnell *et al.* 2014).

Useful data are coming in also from the British Trust for Ornithology's citizen-science programme. Both the Garden Bird Watch and the Breeding Bird Survey have been amended to encourage reports also of sightings of Hedgehogs. The Garden Bird Watch was launched in 1995 and initially covered birds alone, but in 2003 it began to include other taxa such as mammals, insects, amphibians and reptiles (Toms & Newson 2006).

Using citizen science to study secretive nocturnal and widely distributed mammals is not easy. But it is clear that there are real benefits, especially when it concerns a mammal which people care about.

Media

Awareness-raising is crucial for more than just data collection. In order for action to be taken, people must be aware of the threats that Hedgehogs face, as revealed through the research, and also of the work which they can do to help. There comes a virtuous cycle of: engagement – research – guidance – action – engagement.

Dealing with the media can be unpredictable, but with Hedgehogs we have struck a highly productive seam. Over the years since the launch of the Hedgehog Street campaign there has been

a steady increase in the appearance of Hedgehog conservation-based stories in newspapers and magazines, and on radio and television. In 2015 there was a surge in interest, almost tripling the number of stories compared to previous years.

This is good, as it provides an easy way to reach thousands and, at times, millions of people. On the other hand, the increased interest in Hedgehogs sometimes results in confusing or inaccurate messages coming out on the crest of the media wave.

Threats

Explaining to people the key threats that Hedgehogs face is vital, but it requires care as this is a matter of ecology, a subject that rebels against simplicity. As is suggested by the difference in population changes between rural and urban Hedgehogs, there are different threats to be confronted.

Rural

Rural Hedgehogs have suffered from the industrialisation of agriculture. The end of the Second World War, with the move towards intensive production facilitated by rapid mechanisation and burgeoning agrochemical development, saw many species suffer dramatic declines, either directly through poisoning or indirectly through the destruction of food sources and habitat. The first to be really noticed were the birds. The publication of Rachel Carson's *Silent Spring*, in 1962, saw the beginnings of an environmental movement that has now shifted from the fringes into the mainstream.

The intensification of agriculture has led to larger fields and a reduced macroinvertebrate fauna in their margins (Hof & Bright 2010). The loss of habitat is an obvious threat that Hedgehogs face, but the type of habitat lost is more important than the absolute area. Hedges are crucial for Hedgehogs. It is not by chance that they have received their name. Studies in The Netherlands have shown that Hedgehogs spend disproportionately large amounts of time in and around hedgerows. For example, more than 60% of day nests were found in hedges, and a further 20% in woodland. Loss of either of these habitats clearly affects the Hedgehog's ability to thrive. Despite the fact that hedges cover a relatively small proportion of the rural landscape, Hedgehogs were



A highly fragmented landscape presents Hedgehogs with insurmountable challenges, here the A1M in Cambridgeshire. Hugh Warwick

found to spend 55% of their time within hedges or a 5m border on either side (Huijser 2000).

Losses of hedges in Britain have been considerable. Between 1984 and 1990, 121,000km were destroyed, 22% of the total (Moorhouse *et al.* 2014). What this does not consider, however, is the condition of the remaining hedges, and, while they may appear on a map, that does not mean that they fulfil their potential as a wildlife habitat. A gappy line of stunted, angular trees held in place by a string of barbed wire does not offer anything like the habitat of a rich hedge 5m wide and crammed with species that attest to its heritage.

As Hedgehogs are edge specialists, with a tendency to travel along whatever edge they are presented with, the loss of hedgerows has the capacity to reduce their ability to move through the landscape. Habitat fragmentation is a common theme to both rural and urban Hedgehogs.

In the countryside, busy roads also cause fragmentation. In some instances today, this is absolute, with the move to placing concrete barriers down the central reservations of motorways and

dual carriageways. Hedgehogs will never be able to cross that obstacle, however effectively they might navigate the traffic.

And then there is the rather politically sensitive matter of Badgers. There is no doubt that Badgers can and do prey upon Hedgehogs (Morris & Warwick 1994). There is clear evidence that where we have an increased Badger population we have a decreased Hedgehog population. Badgers are, in addition to being a predator, also a competitor. The bulk of the diet of both species is made up of macroinvertebrates. This puts them in an 'asymmetric intra-guild predatory relationship' (Doncaster 1992).

Complicating the relationship further is the evidence that Badgers fragment the landscape, restricting the ability of Hedgehogs to move freely. When radio-tracked Hedgehogs moved out of a village, their progress was stalled by the presence of Badger latrines or setts that they came across along the hedgerow. Researchers believe that the presence of Badgers creates a 'landscape of fear', forcing Hedgehogs to spend disproportionately

more time either very close to hedges or within villages. This finding was independent of the amount of food in the different examples (Hof *et al.* 2012).

The Randomised Badger Culling Trial provided an opportunity to see whether Hedgehogs responded to localised removal of Badgers. The data revealed a doubling of Hedgehog abundance in amenity grassland, from 0.9/ha to 2.4/ha, over the five years since the start of the cull (Trewby *et al.* 2014).

Whether all of this leads one to be able to make a case for 'blaming' Badgers for the Hedgehog's decline is another matter. Certainly, it provides no justification for an extension of the Badger cull on the grounds of a suddenly discovered compassion for Hedgehogs. Moreover, the fact that the two species have clearly coexisted since at least the retreat of the last ice sheet, over 10,000 years ago, would suggest that the problem is anthropogenic.

Urban

Urban Hedgehogs face a different set of threats, although Badgers do continue to play a part. The monitoring from Living with Mammals showed a yearly increase of 2.49% in the number of sites recording Badgers, while Hedgehog sightings dropped by more than 3%. There were, however,

similarly steep declines in Hedgehog numbers in sites with no resident Badgers (Wembridge & Langton 2016).

Clearly, roads play an important role in the status of urban Hedgehog populations. The total figure for casualties has been recalibrated from earlier figures presented by Pat Morris (2014), and it suggests that his estimate of 15,000 per year killed on roads was a considerable underestimate (Wembridge *et al.* in press). This, coupled with the fragmentation caused by roads and traffic, makes roads a significant factor in the plight of the urban Hedgehog. Research underway at Reading University is looking to identify whether there are genetic differences between Hedgehogs from either side of major roads, such as the M4.

Fragmentation has become a serious consideration. Radio-tracking studies have shown males covering a distance averaging nearly 2km per night, females moving just over 1km (Reeve 1982). A Minimum Viable Population (MVP) analysis has shown that for the very best habitat, which is not far off suburbia for a Hedgehog, the minimum estimate for a sustainable population would be 32 individuals in 90ha of contiguous land. That is nearly 1km² of good-quality, connected land. The MVP estimate for a rural landscape is considerably larger, with a minimum of 120 individuals in at least 3.8km² (Moorhouse 2013).

A canalised drain as an example of urban fragmentation. Hugh Warwick



Fragmentation is not caused just by roads, but also by the way in which we partition the land. Fences and walls have the capacity to cut off access to the potentially important suburban gardens with which Hedgehogs have traditionally been associated. In addition, much other human activity has an unquantified but probably substantial impact. For example, Hedgehogs lack a 'fight-or-flight response', as their coat of spines protects them from most natural predators. This does not, however, provide protection from machinery, whether an industrial mower taking out the margins in parkland or a domestic strimmer in a garden. There are many reports of injured animals

being taken to wildlife rescue centres, but the majority of Hedgehogs will undoubtedly have their passing unmarked.

Netting around fruit bushes and on sports pitches is a real danger, leaving the Hedgehog vulnerable to predation, dehydration, hypothermia and fly strike. Entanglement with rubbish is also a risk. Drowning in artificial ponds and cattle grids and burning in bonfires are further problems which also present ready solutions. In each instance, a degree of common sense, coupled with the mantra 'think Hedgehog', can be remarkably effective.

There has been considerable debate among Hedgehog carers over the significance of direct poisoning by slug pellets. Some believe that these chemicals – metaldehyde in gardens, methiocarb/thiocarb on farmland – are a primary cause of Hedgehog decline. Individual cases of apparent poisoning would suggest that this is a potential hazard, but there are not enough data to mark it as a major conservation concern. Direct poisoning is not, however, the only impact of these chemicals, as there are other problems that their use presents. They remove Hedgehog food from the environment, and not all slugs cause damage to new growth as around half of slugs are detritivores.

The effect of leaching of sublethal concentrations of industrial chemicals into the environment and their concentration through the food chain is to an extent untestable, but is probably one of the most insidious impacts of the modern world. The most obvious example of this was the use of DDT, which gave us the 'silent spring', but, operating at a less dramatic level, it is not hard to imagine Hedgehogs receiving doses of slug pellets through routine feeding. It has been noted that sublethal doses have a negative impact on rat fertility (WHO/FAO 1996). In restricted populations, a reduction in the rate of reproduction would have a profound impact. These sublethal impacts are complicated by the synergistic potentials that come from exposure to a cocktail of possibly damaging compounds, such as flame-retardants and anticoagulants.

Action

The ability for individuals to change our national infrastructure or industrial agriculture is limited, but that does not mean that we should not try to influence policy and attempt to alter legislation in ways that will help. It does mean that conservation



Hedgehogs face many dangers in the environment. However, many of these can be alleviated with a little common sense – note the Hedgehog and small-mammal steps fitted to the cattle grid below (top right). Netting, Andrew Bailey/FLPA; cattle grid, David Hosking/FLPA



organisations need to offer paths of action appropriate to individuals, small groups and other NGOs. This was the reasoning behind the launch of the Hedgehog Street campaign in 2011. The simple task was to get people to make holes in fences, but it was also a gateway to getting people more engaged with helping Hedgehogs. Once they have made a hole, there is an increased chance that people will get involved with the citizen science which, in turn, helps us to formulate a strategy to assist the animals. The first stage is the Big Hedgehog Map, on which people can report sightings of Hedgehogs, along with improvements which they have made to their gardens.

Research remains crucial, and it is at the heart of the conservation strategy for the Hedgehog that the BHPS and PTES have put together in consultation with a range of experts, NGOs and Government (www.ptes.org/hedgehogstrategy). We need to learn more about ways in which we can improve the urban and rural landscape for this species. Further, with the hope that Hedgehogs will start to be taken more seriously, it is imperative that we develop improved tools and methodologies for surveying by professionals.

One of the most effective mechanisms to come out of the PTES/BHPS collaboration is the courses that we run. Aimed at people who manage land or are involved in surveys, 'Hedgehog Ecology and Management for Practitioners' courses have so far been attended by nearly 300 professionals, and are a great way of pushing for change.

The demand for new housing is a potential threat to wildlife habitat but, if estates are constructed with wildlife in mind, at least this aspect can be mitigated. One of the simplest approaches is to encourage Hedgehog-friendly new fencing, built with suitable access points. Some developers have



Major Adrian Coles, founder of the BHPS, at the Hedgehog Street campaign at the Royal Horticultural Show in Hampton Court. Hugh Warwick

taken this on board, and it is hoped that others will follow.

Is disease an important consideration for Hedgehogs in urban areas, as it has been for both Greenfinches *Chloris chloris* (trichomonosis) and Common Frogs *Rana temporaria* (ranavirus)? Work is being carried out by the Institute of Zoology's Garden Wildlife Health project. There is also a vast amount of unprocessed data in the hands of Hedgehog/wildlife carers. We do not even know how many thousand Hedgehogs are taken into care each year, or for what reason.

There have been calls to raise the status of Hedgehogs in the Wildlife and Countryside Act (1981) from Schedule 6 to the more restrictive Schedule 5. This would impose additional demands on housebuilders and other developers to ensure that their activities are not having a negative impact on Hedgehogs. So far this has not been successful, despite a Parliamentary Petition proposed by Plymouth Sutton and Devonport MP, Oliver Colville.

Of all the work that has come from Hedgehog Street, the appearance of 'Hedgehog Officer' as a job of choice has to be one of the most impressive. Currently, the Warwickshire Wildlife Trust has two and Suffolk has one. They are part of the move to expand the vision from the 'street' to



Various Hedgehog 'highways' in fences. Hugh Warwick

the wider community, recognising that the areas needed to sustain Hedgehogs are bigger than just the streets can manage. Chester Zoo has launched a Wildlife Connections project that seeks to find ways of reconnecting the landscape – not just for Hedgehogs – and also connecting people to the wildlife with which they share the land.

All this effort goes to show that we take the decline in Hedgehog numbers very seriously. While there is no threat of imminent extinction for the Hedgehog in Britain, there is the real risk that it will become far less common. While that has its own associated ecological consequences, it also has the effect of removing one of the most accessible and iconic wildlife species from regular contact with people, in particular children. It is very hard to get people to commit to acting on behalf of wildlife if they lose the chance of this direct experience. Watching beautiful images on television is no substitute for a real connection.

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