



The demise of the bumblebee in Britain

The last 60 years have seen the number of bumblebee species that can be found in most of lowland Britain approximately halve. Three species have gone extinct in the UK and several more may follow in the near future. Given that bumblebees are widely accepted as keystone species that provide irreplaceable pollination services to crops and wildflowers, what can be done to halt and reverse their decline?

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Bumblebee
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Title image. The common
carder bumblebee
(*Bombus pascuorum*).

A surprisingly large majority of the UK population are unaware of the distinction between bumblebees (genus *Bombus*) and honeybees (*Apis mellifera*). Bumblebees are the large, furry and often colourful insects that frequently feature in children's storybooks, cartoons and on greetings cards. Honeybees, widely kept in domestic hives for their honey, are smaller, slender, drab and relatively hairless. Still fewer people are aware that there are lots of different species of bumblebee (with 27 known in

total from the UK – including six parasitic species, the cuckoo bees). Yet even a casual inspection of flowers in a garden or park will reveal several very differently coloured species (Figure 1a-d). In fact, with a little dedication, six or seven species can be found in almost any reasonable-sized garden.

However, if one were lucky enough to possess a time machine and could travel back 80 years to inspect an Edwardian garden for bumblebees, one would find as many as 15 species. Frederick Sladen was

the first person to study bumblebees in any detail, and much of his work was conducted in his garden in Kent in the early part of the twentieth century. He writes with familiarity of species such as the short-haired bumblebee, *Bombus subterraneus*, which he describes as being abundant, and he coined the name “large garden bumblebee” for *Bombus ruderatus*, a species which he describes as “very common” in England.

Sadly, the short-haired bumblebee was last seen in the UK at Dungeness in 1988, and is now presumed extinct, while the large garden bumblebee is BAP-listed and now known from just a handful of sites; you would be exceedingly lucky to see one in your garden. A whole suite of bumblebee species have vanished from most of the UK, and now cling on only in isolated pockets of habitat. So what has happened to our bumblebees?

The biology of the bumblebee

To understand this, we first need to know a little about the biology of bumblebees. As with all bees, bumblebees feed exclusively on nectar, which provides sugar (carbohydrates) for energy, and pollen, which is their sole source of protein for growth. Bumblebees are social insects; they live in a colony with a single queen, and up to 400 workers (daughters). Bumblebees are not terribly aerodynamic creatures, and flying is very energy demanding for them. It has been calculated that a running man uses roughly the energy in a Mars bar in 30 minutes. If a bumblebee were scaled up to the size of a man, it would consume the energy in a Mars bar in approximately 30 seconds of flight. Thus a nest of 400 bees needs an awful lot of food to keep them going, which means a lot of flowers.

And therein lies the problem. Flowers are much less abundant in the UK countryside than they once were. In particular, perennial herbaceous plants such as clovers, trefoils, dead-nettles and wound-worts have declined, and these are the plants on which bumblebees rely. Of course this then begs the question, why have these plants declined?

For most of the last 60 years, landowners have been encouraged to increase agricultural productivity at the expense of wildlife. Marshes have been drained and hedges grubbed up. Chalk downland, used for centuries for grazing sheep, was ploughed and turned over to cereals. Lowland hay-meadows rich in wildflowers were ploughed and reseeded with rye-grass. The UK has



Figure 1a. A honeybee (*Apis mellifera*).

lost 98% of its unimproved grassland since the Second World War. Increased use of herbicides and improved seed cleaning mean that arable crops are now virtual monocultures, whereas once they were rich in flowering weeds.

The end result of all of these changes is that there are now far fewer flowers in the countryside than there would have been in the first half of the twentieth century, and for bees this has been disastrous. These changes have been particularly acute in the lowlands of Britain, particularly the Midlands, East Anglia and much of the south of England, where farming is at its most intensive. It is in these regions that bumblebees have declined most and those species with a southerly distribution such as the short-haired bumblebee have been particularly hard hit.

In addition to a plentiful supply of food, bumblebees need a safe place to nest. Many species nest underground using abandoned burrows of rodents, and thick hedgerows provide an abundance of suitable sites. Other species prefer to nest above ground in dense tussocky grass which was readily available when hay-meadows were common. Loss of hedgerows



Figure 1b. A buff-tailed bumblebee (*Bombus terrestris*).

has reduced nesting sites for those species that nest underground, while the switch from hay to silage production means that those species which nest above-ground in grass are now likely to have their nests destroyed by cutting operations (silage is cut much earlier and more frequently than hay).

Bumblebee decline is not just confined to the UK. There are about 250 known species of bumblebee (about 65 in Europe), found throughout the cooler

parts of the northern hemisphere. Unfortunately for bumblebees, this region also contains much of the world's human population and the most intensively farmed agricultural regions. As a result of this, many bumblebees appear to be undergoing dramatic declines in range, particularly in Western Europe, North America and very probably in China.

Interestingly, a small number of species appear to be able to cope with intensive farming and remain widespread and reasonably abundant throughout Europe. These species appear to do particularly well in gardens, exploiting the range of flowers to be found there. There is little evidence that these species have declined at all, and at least one species, the tree bumblebee *Bombus hypnorum*, appears to be expanding its range, having recently colonised the UK from France. So why have some species undergone drastic declines while others remain abundant?

Survival for some

Many of the rarer species such as the large garden bumblebee and the short-haired bumblebee are heavily dependent on legumes (Fabaceae) as their major source of pollen. In particular, red clover (*Trifolium pratense*) seems to be a favourite with a number of bumblebee species. Red clover was once a very common plant in Europe for it was widely grown as a fodder crop (it is also a favourite with horses) and as a ley crop to boost soil fertility. It was also a common plant on the unimproved, nutrient-poor pastures and haymeadows which covered much of low-land Europe.

In the mountains of southern Poland, which have largely escaped agricultural intensification and where horses are still



Figure 1d. A red-tailed bumblebee (*Bombus lapidarius*).

widely used for farm transport, red clover leys are still common and rare bumblebees thrive. In contrast, in western Europe the advent of artificial fertilisers and mechanisation in the middle of the twentieth century led to the abandonment of clover leys and red clover is now much less abundant than formerly. The few places where rare bumblebees survive in the UK are rich in red clover and other wildflowers.

On the remote Western Isles of Scotland, traditional crofting survives (albeit in decline), and in summer there are drifts of red clover and other flowers which support a range of bee species including the exceedingly rare great yellow bumblebee, *Bombus distinguendus*, now more-or-less confined to a handful of islands off Scotland (Figure 2).

On the mainland of Britain the largest area to escape agricultural intensification is Salisbury Plain, now the largest piece of chalk downland surviving in the whole of western Europe. It was acquired by the military as a training area in 1897, the area being gradually extended over time up to and during the Second World War. It now provides a glimpse of what much of the downs of southern England must have looked like 100 years ago; in summer the Plain is carpeted with wildflowers as far as the eye can see.

Not surprisingly, Salisbury Plain is now the best place for rare bumblebees in the UK, with more species than any other. Rarest of all is the tiny shrill carder bee, *Bombus sylvarum*, so named because it makes a distinctive high-pitched buzz in flight. This species is now found at only seven sites in the UK, with one of the biggest populations on Salisbury Plain. Its other main stronghold in England is the Thames Estuary, where sadly some of the best habitat is threatened with imminent destruction by the Thames Gateway Project.

Why it matters

Does it really matter if bumblebees are in decline? For many, the loss of any of our native wildlife species is a deplorable tragedy and something we should fight to prevent at all costs. Others might question the economic value of conserving bumblebees or other insects. However, an appreciation of the role that bumblebees play as pollinators makes it clear that declines in bee numbers could lead to serious ecological and economic consequences. Bumblebees pollinate a number of crops including oilseed rape, field beans, sunflowers, peas, runner beans, raspberries,



Figure 2a. Flower-rich machair grassland dominated by red clover on the west coast of South Uist, Hebrides, Scotland.

strawberries, apples and currants. They also pollinate numerous wildflowers; many would set no seed at all without them. And without seeds, these plants would be doomed to extinction. This in turn would impact on all of the other animals that feed on these plants, such as seed-eating birds and herbivorous insects. It may be that declining bumblebee numbers are already reducing seed set of some plant species in a positive feedback loop in which fewer bees means fewer plants means fewer bees, and so on. Such a process would take a number of years to take effect because change would be buffered by the existing seed bank in the soil.

In addition to their vital roll as pollinators, bumblebees and their nests support a host of parasitic and commensal organisms. Various mites, flies, moths, wasps, nematodes and beetle species either parasitise the bees themselves or their larvae, or scavenge within bumblebee nests. Many are found only on or with bumblebees, and so would be doomed without them.



Figure 2b. One of the residents of the machair, the great yellow bumblebee, *Bombus distinguendus*.

Not all doom and gloom

Although things look pretty bad for our bumblebees at the moment, it is not all doom and gloom. EU farming policy has moved away from subsidising production, and now farmers can receive payments for replanting hedgerows and restoring wildflower meadows. One popular and simple measure available to farmers

wishing to encourage bumblebees and other insects is to sow strips of 'pollen and nectar mix' along field margins. This mixture contains a range of wildflowers such as clovers and knapweed, designed to cater for a broad range of bees, butterflies and hoverflies. More and more farmers are minimising their pesticide use, and slowly growing numbers are switching to organic production which must in the long run benefit wildlife. Gradually, UK wildlife may recover. Perhaps we can look forward to a day when rare bumblebees such as the shrill carder bee can spread out from their last remaining strongholds, and recolonise the wider countryside.

The UK is leading research into the ecology of bumblebees, and we now know far more about their distribution and the details of the biology of individual species, such as the density of nests found in different habitats, how far they travel to forage, and how far queens can disperse to find new habitat. This information is helping us to devise sensible strategies to conserve the rarest species. A new UK charity, the Bumblebee Conservation Trust, was formed in 2006 to promote public awareness of and involvement in conserving bumblebees. Over 1000 people have joined within the first four months from launch.

There is something that we can all do to help conserve bumblebees. Gardens cover more than 1 million hectares (>2 million acres) of Britain, far exceeding the combined area of all our nature reserves. On average, gardens provide far more flowers than agricultural land, but at present a lot of gardens are not especially friendly



Figure 3. Some farms in southern Poland still employ small fields and simple farming techniques, encouraging the growth of red clover which provides suitable habitats for bumblebees.

to wildlife. Many are regularly doused in pesticides, and are populated with the intensively bred bedding plants that are so widely planted in borders and hanging baskets. Most of these have little or no nectar, and so are of no interest to wildlife. Pansies, petunias, busy-lizzies, begonias and the like undoubtedly add a splash of colour, but years of selection for increasingly showy blooms have resulted in the flowers losing their original function (to attract pollinating insects).

To encourage wildlife it is far better to grow old-fashioned cottage garden perennials such as lavender, lupins, *Aquilegia* and sage, which will attract a multitude of insects. Better still is to make room for some wildflowers in the garden. There is a perception amongst many that wildflowers are necessarily invasive weeds, but this is not so. All garden flowers have been developed from wild ancestors. Some wildflowers are readily accepted as garden flowers; foxgloves and bluebells are good examples, and both are much loved by bumblebees. But there are many other less well-known wildflowers that look beautiful in the garden, and can help to provide food for beleaguered wildlife. Viper's bugloss is a splendid example,

with spikes of blue and purple flowers up to 1.5m tall. There are many others: comfrey, sainfoin, tufted vetch, bird's foot trefoil, teasel and knapweed all make lovely garden plants. If every garden had just one of these, the number of flowers available for bumblebees would be vastly increased, and the future of our surviving bumblebee species would be a little more secure.

References

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If you wish to find out more about bumblebees and what you can do to help their plight, contact the Bumblebee Conservation Trust, (www.bumblebeeconservationtrust.co.uk), School of Biological & Environmental Sciences, University of Stirling, Stirling FK9 4LA, UK.