
11 BUMBLEBEES AND OTHER POLLINATING INSECTS

11.1 Introduction

Bumblebees are social bees of the genus *Bombus*, of which there are 27 species known from the UK. They are major pollinators of a large number of wild flowers, and of a number of crops including oilseed rape, field beans, sunflowers, peas, runner beans, raspberries, strawberries, apples and currants. The degree of dependency on bumblebees varies greatly; some crops such as field and runner beans are exclusively dependent on bumblebees, while other such as oilseed rape are also pollinated by other insects and/or the wind. There is evidence that yield of field beans drops due to inadequate pollination when field size exceeds 12 ha.

There are many other pollinating insects in the UK, best known of which is the honeybee, kept in domestic hives and also found as feral nests. In addition there are well over 200 other species of solitary bee found in the UK, most of which are small and rarely noticed but many of which are valuable pollinators. All bees feed exclusively on nectar and pollen that they collect from flowers. More broadly, many other insects visit flowers and provide something in the way of pollination services, including hoverflies (Syrphidae), various other flies (Diptera) and butterflies and moths (Lepidoptera). In total, the value of pollinating insects to European agriculture has been estimated at around 5 billion Euros.

Bumblebees have an annual life cycle, with mated queens emerging from hibernation in late winter or spring. They search for nest sites, and found a nest in which they initially rear workers (daughters). When they are adult the workers take over foraging duties and the queens never again leave their nest. The nest grows through the spring and early summer, and in some species may contain up to 400 workers by July. In mid- to late summer the nest produces new queens and males, which leave the nest to mate. The new queens rapidly enter hibernation after mating. They hibernate a few centimetres below the soil surface. The workers, males and the old queen die off in late summer.

Further reading

Goulson D (2003) *Bumblebees; their behaviour and ecology*. Oxford University Press.

Prys-Jones E and Corbet S A (1991) *Bumblebees*. Richmond Publishing Co. Ltd.

Further information

More information and advice on how best to manage farmland for bumblebees can be obtained from the Bumblebee Conservation Trust, (www.bumblebeeconservationtrust.co.uk), School of Biological and Environmental Sciences, University of Stirling, Stirling, FK9 4LA.

11.2 Populations and distribution

Bumblebees are broadly distributed across the temperate and montane regions of the northern hemisphere. Within the UK, some bumblebee species can be found in all regions. Some species are at the northern edge of their range in the UK, and so are more abundant in the south (such as the ruderal bumblebee). Unusually for an insect group, several species are towards the southern edge of their range in the UK and thus have northerly distributions; Scotland holds the bulk of the remaining populations of five UK bumblebee species.

A majority of bumblebee species have undergone dramatic declines across the UK, and also in Western Europe and North America. Of the 27 UK species, three have gone extinct in the UK. A further eight species have undergone major range contractions, and two of these, the shrill carder bee and the great yellow bumblebee, are severely threatened in the UK. Declines have occurred most in the lowlands, particularly south, east and central England, areas where farming is particularly intensive. Thus species with southerly distributions have been most hard hit (this group includes the three species to have gone extinct in the UK). Although historical data on abundance and distributions are sparse, declines in bumblebee range and abundance have probably been going on for c60 years, and recent evidence suggests that they are continuing.

Plate 11.1
The shrill carder bee, the rarest surviving bumblebee species in lowland England.



The social nature of bumblebees renders them particularly susceptible to habitat loss. The vast majority of bees seen on the wing are workers, which are sterile. The breeding unit for bumblebees is the nest, which contains just one breeding female, the queen. Workers can travel for >1 km from the nest in search of food. Each nest probably requires several hectares of good foraging habitat within flight range. Since a viable population must contain a minimum of around 50 nests, in total this requires a substantial area of flower-rich habitat. Nature reserves in the UK are too small to support viable populations of rare bumblebees. If we are to ensure that these species survive, it is vital that we provide more flowers in the farmed countryside.

Honeybees are domesticated rather than primarily wild organisms, and so are not of conservation concern. There is currently some debate as to whether other groups of pollinators such as hoverflies have declined significantly. Data are too few to be sure, but it seems highly likely that numbers of at least some species have declined in intensively farmed areas.

Factors affecting populations on lowland farmland

Bumblebees have been particularly hit by loss of unimproved grasslands (chalk downland, haymeadows etc), of which the UK has lost about 98%. Conversion of grazed downland to cereal production, and the switch from hay production from flower-rich meadows to silage production from grass monocultures have both greatly reduced floral availability in the agricultural landscape. Also abandonment of clover leys, once an important part of crop rotations in some regions, has undoubtedly had a major impact (in parts of Eastern Europe where they are still used they are a major food source for bumblebees). Removal of hedgerows and increases in field sizes are likely to be contributing factors, for hedges and adjacent margins provide both flowers and nesting sites. Drift of herbicides and

fertiliser runoff into field margins are also likely to have negatively impacted on wildflower populations.

Overall, these changes have resulted in significant declines in many wildflower species on which bumblebees depend. Red clover in particular is much less abundant than formerly, and is a major source of both nectar and pollen for the endangered long-tongued bumblebee species. Most authorities agree that it is probably declines in wildflower abundance that is the primary factor driving declines in bee numbers.

Nests of carder bumblebee that are above ground are susceptible to damage from farming operations, particularly cutting and mowing. The switch from hay to silage production has probably been damaging to these species since silage is cut much more frequently than hay. It is likely that many nests are destroyed each year in this way.

It is unclear how damaging direct effects of insecticides have been for bumblebees, although there are some isolated records of



Plate 11.2
The buff-tailed bumblebee, one of few species which remain relatively common across the UK.

significant mortality. Unlike honeybees, bumblebees often forage until late in the evening, so it is difficult to time applications to avoid their foraging period. The only option is thus to avoid spraying areas where there are flowers.

11.3 Habitat requirements

To flourish, bumblebees require an adequate supply of suitable flowers, and undisturbed places to nest and to hibernate. Different species tend to feed on different flowers, in part reflecting differences in tongue length. Species with short tongues tend to feed on shallow flowers (eg bramble), those with long-tongues on deep flowers such as foxglove, honeysuckle or red clover. Overall, bumblebees tend to prefer biennial and perennial herbaceous plants, and with some exceptions they tend to avoid annual flowers, most of which provide little nectar. Fabaceae (the pea family which includes clovers, trefoils, vetches etc) are particularly important as a source of protein-rich pollen needed to feed the larvae. The bumblebee species that have declined most in recent decades tend to be long-tongued, and these species are especially dependent on Fabaceae.

Different bumblebee species tend to nest in different places. Some species, notably the carder bumblebees, nest just above the ground in dense tussocky grass, and thus require undisturbed grassland or field margins where grass tussocks are allowed to form. Most other species nest below ground, often using abandoned burrows of rodents. Tillage removes such holes so once again undisturbed ground is needed for nesting. In agricultural landscapes the majority of nests of both groups tend to be along linear features such as hedges or fence lines.

Little is known about bumblebee hibernation sites, but they certainly need undisturbed soil, and are said to prefer north-facing banks. It is likely that areas suitable for nesting (hedgerows, uncultivated field margins etc) are also suitable for hibernation.



Plates 11.3 and 11.4
Two examples of flower-rich unimproved grassland, ideal habitat for bumblebees: chalk downland in Hampshire (top); coastal machair on South Uist, Hebrides (bottom).

11.4 Management advice

A number of options are available to encourage bumblebees in farmland. Simple measures include avoiding ploughing close to field margins to leave a strip of undisturbed ground which will provide both nest sites and some wildflowers. Similarly leaving field corners undisturbed will serve the same function. Where grass mixes are sown in field margins, there is added benefit from including wild flowers that can survive within a grass sward, such as knapweed, scabious, clovers and bird's-foot-trefoil. Cutting hedges every second year allows bramble and hedgerow shrubs to flower. Thick hedges are better because they support more small mammals and thus are more likely to provide more bumblebee nest sites. Conservation headlands (with reduced or no spraying) will reduce herbicide and insecticide penetration into hedge bases. Areas of deciduous woodland (even very small ones) are of value in providing spring forage (eg bluebells, sallow) and undisturbed nesting areas. Traditional orchards in which a diverse ground flora has been allowed to developed can provide excellent bumblebee habitat; in Germany established low-density orchards which are also periodically cut for hay support a diverse bumblebee assemblage including very rare species such as the short-haired bumblebee (now extinct in the UK).

Uncropped field margins are of limited value for bumblebees if they are tilled annually since they encourage only annual flowers which are generally avoided by bumblebees. If left untilled for longer periods, communities of perennial flowers will eventually establish and provide good bumblebee habitat, but the time this takes will depend on the local seed bank. A swifter option is to sow a 'pollen and nectar' wildflower seed mix now available under agri-environment schemes such as the Environmental Stewardship scheme in England. This mix includes clovers, bird's-foot-trefoil and knapweed, all excellent flowers for bumblebees. Whatever the method of establishment, these areas will need occasional mowing to prevent scrub

establishment. Cutting in September/October minimises impact on pollinator populations. Cutting half of the area in late June has been recommended for the pollen and nectar mix, to promote late summer flowering, but it is doubtful if this benefits bumblebees since late June is when most nests are at their peak, and cutting will destroy nests of above-ground nesting species. Also in lowland England most nests are finished by late July before this second flush of flowers appears.

Similar comments apply to set-aside; long-term set-aside could provide suitable habitat for bumblebees, but is of greatly reduced value if it is topped each year in midsummer (this removes all the

Table 11.1 Suitable wildflowers for bumblebees

<i>Anthyllis vulneraria</i>	Kidney vetch
<i>Ballota nigra</i>	Black horehound
<i>Centaurea</i> spp.	Knapweeds
<i>Dipsacus fullonum</i>	Teasel
<i>Digitalis purpureum</i>	Foxglove
<i>Echium vulgare</i>	Viper's bugloss
<i>Lamium album</i>	White deadnettle
<i>Lotus corniculatus</i>	Bird's-foot-trefoil
<i>Odonites vernus</i>	Red bartsia
<i>Onobrychis viciifolia</i>	Sainfoin
<i>Papaver rhoeas</i>	Poppy
<i>Rhinanthus minor</i>	Yellow rattle
<i>Rubus fruticosus</i>	Bramble
<i>Stachys</i> spp.	Woundworts
<i>Symphytum officinalis</i>	Comfrey
<i>Trifolium repens</i>	White clover
<i>Trifolium pratense</i>	Red clover
<i>Vicia cracca</i>	Tufted vetch



Peter Creed

Plate 11.5
Common
knapweed
(rayed form)

flowers). If topping is required, cutting as close to the 15 August deadline as possible is beneficial since by this time many bumblebee nests will have already finished. Also make use of the option to leave 25% of the area uncut for up to three years.

In some areas agri-environment schemes may be available for the restoration of flower-rich lowland haymeadows or chalk downland. In the long term, these will provide perfect habitat for bumblebees. However, it is important that they be grazed little or not at all in summer, since most grazing animals (especially sheep) preferentially eat the flowers first. Sheep can strip all of the flowers from a field in a few hours. Light grazing in winter, especially by cattle, is beneficial.

Any opportunity to incorporate leguminous ley crops into the farming

system would provide great benefits for bumblebees. Clovers (especially red and zig-zag), trefoils and sainfoin all provide excellent bumblebee forage.

Use of commercially reared bumblebee nests

It should be noted that in recent years many nests of the buff-tailed bumblebee have been imported to the UK, primarily for pollination of glasshouse tomatoes but increasingly to boost pollination of outdoor fruit crops such as strawberries. The strain being imported is not native to the UK, originating from southern Europe. There is a danger that these bees might interbreed with our native bees, or contaminate our native bee populations with diseases from abroad. The importation is in contravention of the wildlife and countryside act.