

Where have all the Bumble-bees gone?

Bumble-bees used to be a regular feature of the British countryside. They were often considered so common as to be unworthy of special mention by entomologists before the second world war and most collections have representatives of over half the six-teen species of social bumble-bees on the British list (a further two species were already extinct, or nearly so).

Nowadays only six species are widespread, and even these can be quite scarce in some parts of the country. Five species have been listed under the UK Biodiversity Action Plan: *Bombus distinguendus*, *Bombus humilis*, *Bombus ruderatus*, *Bombus subterraneus* and *Bombus sylvarum*.

Nesting sites are often at a premium. Many nests are made in old mouse and vole nests as this provides insulation material. The nest may be made on the surface in tall, but open, grassland or underground according to species. Nest searching queens are easily recognised as they fly along slowly with a typical zig-zag motion, dropping to the ground to explore a suitable hole or pile of old vegetation. If a queen finds an area which she likes, she makes an orientation flight of ever-increasing circles, which may finally be hundreds of metres in diameter. During this flight she is learning the landmarks necessary to re-find the area. New workers, leaving the nest for the first time, perform the same type of flight.

Bumble-bees need quite a complex habitat, with different areas being used for different parts of their life-cycle. They require:

- Nesting areas
- Foraging areas where they may find nectar and pollen, both to feed themselves and to provide food for the brood mating areas
- Hibernation areas where fertilised queens spend the winter

Many nests which are founded during the spring do not survive to produce new queens at the end of the summer. In one study, which looked at one of the commonest species, only 20% were successful. Bumble-bees nests occur at relatively low densities. Typically each species will only have one or two successful (those which produce new males and females) nests per square km of good quality habitat. This means that areas containing suitable habitat need to be large in order to support viable populations.

Bumble-bees gather both pollen and nectar from the flowers they visit. The nectar is mainly used to fuel the adult bees' flight and a little is fed to the developing larvae. The most important food for the larvae is pollen, which is collected on the back legs of the foraging workers.

Although they will not visit many different plants for nectar and pollen, some plants are particularly well utilised, particularly for pollen.

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These are mainly from the plant families which include the dead-nettles and pea-flowers. Legume pollen may account for as much as three-quarters of the pollen collected during the summer and clovers are especially important. Red clover has a particularly long flower-tube and is specialised for pollination by those bumble-bee species which have longer tongues. It can provide, if areas are grazed or cut in rotation, a very long-seasoned foraging resource. White clover is also heavily used by foraging bumble-bees, particularly those with shorter tongues. During the spring sallow blossom, white dead-nettle and birdsfoot trefoil (or 'eggs and bacon') are important food sources, whilst hemp-nettles, field scabious and black knapweed are important towards the end of the summer.

Forage for Bumble-bees

Bumblebees are active for a large part of the spring and summer, consequently continuity of forage resources is very important. As they can fly they can exploit resources in different localities around the nest but sufficient forage must always be present throughout the season. Grazing or cutting management which removes all the available forage throughout a large area all at once is very damaging to bumble-bee populations.

Pre-intensification, British farm land, dominated by a large number of small, usually mixed farms provided plenty of habitat which was suitable for bumble-bees. Relatively small, unfertilised fields supported good stands of 'common' plants such as red clover, birdsfoot trefoil and black knapweed. They were grazed by a few cattle in rotation, or cut for hay; conditions which resulted in there always being forage available within easy flight distance of a nest. The headlands of arable fields would be unglazed whilst they were in that phase of the farm rotation and would provide suitable nesting areas.

Creating Habitats

Between July and September new male and female sexual bees are produced. According to species, males wait for females around solitary bushes, or patrol a number of scent-marked plants or enter a nest where new females are preparing to fly. Newly mated queens quickly find a suitable place to hibernate. Hibernation sites are unknown for most of our bumble-bee species, but it is likely that many of them hibernate in litter or underground in taller grassland, possibly using old small mammal nests. Some species hibernate in light woodland or under hedge banks North facing locations are preferred as these take time to warm up during the spring and the bees will not emerge from hibernation during a short warm spell in the middle of winter.

Unfortunately, most of the modern countryside provides little opportunity for bumble-bees to complete their life-cycle. Under modern, intensive, farming methods there has been an enormous loss of hedgerows and field margins, with cultivation being practiced right up to the margins of fields and a consequent loss of both foraging and nesting areas. Rotations are short and reliant upon large inputs of fertiliser, with hay-making being replaced with silage making. The red clover ley, once a central part of rotation, is not part of these rotations. Farms and fields are much larger and tend to concentrate upon a much smaller set of crops, or have much larger herds of animals, reducing the foraging opportunities still further. Bumble-bees which are hibernating in fields may be destroyed during autumn ploughing.

Modern agri-environment schemes are attempting to redress the balance, with farmers being encouraged to provide areas within their farms where farmland wildlife can survive. This process is not only for landscape and conservation value, there are good ecological reasons why a more diverse farmland makes long-term farming more sense. For instance, flowers

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require pollination before they set seed. Bumble-bees are very efficient, even essential, pollinators for some crops.

Experimental schemes are being developed with farmers and conservation land-owners to develop management prescriptions which will maintain and restore bumble-bee friendly habitat throughout Britain. These schemes are concentrating on the potential of buffer-strips, restored hedgerows and headlands to provide suitable habitat, within a modern farmed countryside. Within cropped fields small sections of clover leys which are not cut can also provide useful food resources for bumble-bees.

Management to support bumble-bees in the countryside requires the provision of three main things

- Suitable nesting sites,
- A succession of areas with suitable foraging opportunities.
- Suitable hibernation sites.

Areas chosen to provide bumble- bee habitat should not be alongside roads, as road-kill is a major source of loss of both bumble-bees and the birds which will be attracted to such areas. Neither should such areas be created by additional sowing into remnants of unimproved vegetation, which are best managed by light, rotational grazing or cutting and will provide foraging areas naturally.

The creation of nesting and hibernation sites requires little management input. A rough, tussocky grass- land, such as develops naturally on unglazed or unmown headlands, is suitable. Such areas should be cut, with cuttings removed, or grazed every three to five years to stop the accumulation of excessive plant litter and the development of stands of false oat-grass. Management should be carried out on a rotation, with only parts of the habitat managed each year. Occasional rough ploughing of parts, sufficient to turn over the grass, but not bury it fully, can provide further opportunities for voles and mice to nest, which then provide future bumble-bee nest sites.

This type of habitat will also be good for barn owls and provide winter cover for partridges. The modern decline of previously common farm- land birds is of great concern.

Changing times

The provision of foraging areas requires a little more effort as the regular grazing or cutting of such areas helps maintain the flowers. If cutting is used then it is important that the mowings are removed. If they cannot be picked up and baled then a silage cutter, or even a flail used on a windy day, can be used to blow them away. It is also important that cutting or grazing is carried out on a rotational basis throughout the farm. This ensures that the bees always have places to forage. These areas will also provide habitat for partridge and skylark.

A suitable grassland, with clovers, birdsfoot trefoil and black knapweed, may well develop on its own if the area is managed as above, especially

if there is not a high level of fertilisers present. However, on very intensively farmed areas, sowing a suit- able seed mixture will hasten the process considerably. Seed may be obtained by scattering cuttings from a meadow which already contain these plants; black knapweed seed may be hand collected and scattered during the autumn. Alternatively, suitable seed

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mixtures are increasingly available through commercial seed merchants. In this case it is preferable to use the native varieties, rather than the often cheaper continental ones.

For those considering organic farming or possibly in nitrate restricted areas, the restoration of a clover based ley may return as an essential part of farming practice. The successful production of clover seed, and that of many other legume crops, depends upon the presence of suitable bumble-bees or honey bees are not suited. Hence the provision of bumble-bee habitat becomes part of the essential management of the farm.

Habitat restoration as outlined above may qualify for one of the existing agri-environment payments. It requires the removal from cash-cropping of a relatively small percentage of the intensively farmed area and will benefit other formerly common farmland wildlife as well as bumble-bees.

- By Mike Edwards of the UK Biodiversity Action Plan Bumble-bee Working Group