



TO BEE OR NOT TO BEE

As news of falling honey bee numbers hits the headlines again, Karin Alton and Francis Ratnieks explain why encouraging urban beekeeping may not be the answer

Honey bees, although still a common insect, have declined significantly in number over the past century. This winter's losses of honey bee colonies were the worst since records began six years ago, according to a survey carried out by the British Beekeepers Association. The number of managed hives in England is also believed to have fallen from 300,000 to 135,000 in the past 60 years (Defra; National Bee Unit database, and in Potts *et al.* 2010).

Urban beekeeping, however, has never been more popular. But instead of providing a helpful solution to the reduced population of honey bees, more city hives could be doing more harm than good.

Many causes for the decline in bee numbers have been suggested, including factors that are likely – and unlikely, such as mobile phones. Most bee scientists, however, would probably rank agricultural intensification (large areas of high intensity farming) as the main cause (Goulson *et al.* 2008).

Since World War II the spread of intensive farming has greatly reduced areas rich in wildflowers, such as hay meadows. This is especially significant in the UK, where 75% of the total land is agricultural. Honey bees have many pests and diseases, including two species that have recently 'jumped ship' from the Asian honey bee, *Apis cerana*.

But honey bee diseases do not affect other species, and the general decline of wildlife in the UK (*State of Nature*, 2013), cannot be due to newly introduced honey bee pests. Although lab-based research shows that neonicotinoid insecticides

can harm bees, the effects in the field, where bees forage mainly on non-treated flowers, are less clear. The three bumble bee species now extinct in Britain were last seen in 1864, 1941 and 1988, well before the introduction of neonicotinoids some 20 years ago.

Campaigns take flight

Over the past few years the loss of honey bees has attracted a great deal of attention from the media, the general public and organisations and businesses, many of which want to help.

For example, The Co-operative launched 'Plan Bee' in 2009 and *The Daily Telegraph* launched its 'Bring Back Bees' campaign in 2010. Various organisations, including The British Beekeepers Association, Urban Bees and Friends of the Earth, encourage people to take up beekeeping, often combined with the advice that towns are good for bees thanks to all the flowers in gardens and parks.

In midtown, an organisation that represents the interests of 570 London businesses, gives away free hives to put on rooftops as a way to help bees, and to 'boost office morale'. Many restaurants, galleries and shops, such as The Tate Modern and Fortnum and Mason, and city firms, including Lloyd's of London, use rooftop hives as a means of publicly greening their business or as a team building exercise for staff.

But is this actually a good idea? Surveys being carried out at the University of Sussex's Laboratory of Apiculture and Social Insects (LASI) on garden and wild flowers and crops requiring pollination show that honey bees are common, making up between 20% and

BIOGRAPHY



Francis Ratnieks is professor of apiculture and head of the Laboratory of Apiculture and Social Insects at the University of Sussex. He took his PhD at Dyce Laboratory for Honey Bee Studies at Cornell University. He is the author of 220 research articles on bees and social insects, and his experience includes owning 180 hives, producing comb honey, rearing queens and pollinating almonds.



Dr Karin Alton took a zoology degree at the University of Nottingham, then a PhD in entomology. She has been a researcher at the Laboratory of Apiculture and Social Insects at the University of Sussex for five years and has a special interest in bees, flowers and public outreach.

60% of all flower-visiting insects. Geographically widespread and – weather permitting – active for most of the year, the honey bee may have declined in number but is in no imminent danger of becoming extinct, unlike some other critically endangered insects in the UK.

Most importantly, it is flowers that provide the pollen and nectar that are the main food for bees. If there is a growing shortage of flowers due to agricultural intensification and urbanisation, will increasing the number of hives help honey bees? Would we try to help the population of elephants in a region of Africa by introducing more elephants if it was known that there was a food shortage?

A buzz in the city

Most of the promotion of beekeeping is directed at urban areas, especially London. Data from BeeBase, a register of apiaries maintained by the UK's National Bee Unit (NBU), shows that in five years, from 2008-13, the number of beekeepers in Greater London tripled from 464 to 1,237, and the number of hives doubled from 1,677 to more than 3,500.

At approximately 10 hives per km², hive density in London is much higher than the 5.6 per km² in Brighton, or 0.9 per km² in England and Wales as a whole. Research shows densities of wild or feral colonies of 0.1-10 per km² (Ratnieks *et al.* 1991). There are, of course, situations in which much higher densities occur, but generally only for a brief time and in an area with abundant food or the need for intense pollination. For example 250 to 500 per km² (2.5 to five hives per hectare) can be found where crops such as apples or almonds require pollination. Beekeepers often move a large number of hives to areas of abundant nectar



Honey bees can fly at speeds of up to 15mph (24km/h)

The placement of hives in urban areas needs to take into account the availability of forage



production, such as the citrus groves of Florida, but the hives are moved out once the citrus stops blooming.

With the number of urban hives on the increase, there needs to be sufficient food. Although urban areas have gardens, parks and other green areas, they also have a high proportion of buildings, roads and other non-green areas. And many green areas, such as amenity grass, have few flowers.

A certain area of flowers is also needed to support a colony of honey bees. A research project carried out by LASI student Mihail Garbuzov as part of his PhD on 'Helping the honey bee and insect pollinators in urban areas' gives some insight.

It compared 32 varieties of garden flowers for attractiveness to insects. The most attractive to honey bees was borage, with an average of 9.6 honey bees and 0.31 bumble bees per m² at peak bloom. Lavender is also attractive to bees, and 13 varieties were compared. They varied from 0-1.8 (average 0.6) honey bees and 0.2-4.0 (average 2.0) bumble bees per m². Many of the 32 plants attracted very few insects at all.

A strong honey bee colony at its summer peak can have 65,000 workers, but a more typical size for a strong colony would be 30,000. Assuming that a third of these are foragers and that half of them

Within the hive, the brood is kept at 34°C. Bees either ventilate the hive or huddle together to conserve heat



(5,000) are out foraging at any time in good weather, they would spread out over 1,087m² of borage (0.11 hectares or 0.11% of a square km) or about 8,333m² of lavender (0.8333 hectares or 0.83% of a square km). However, each plant is not in bloom all the time. With a peak bloom of three to four weeks in a foraging season of 30-40 weeks (March-October), then the actual area needed across the whole season would be up to 10 times as much.

This would indicate that for each new hive placed in London, the equivalent of one hectare of borage or 8.3 hectares of lavender

is needed. With the number of colonies of honey bees increasing from 1,677 to 3,745 in just six years, these additional 2,068 hives would need 2.1 km² of borage or 17.2 km² of lavender. Clearly, this, or the equivalent in other flower varieties, has not been provided, and neither would it be practical to do so.

Inmidtown recommends planting PlantLocks (a metal plant box to which one can lock bicycles) with bee-friendly plants to increase the amount of forage for the new hives it gives out. However, while they are a great way to secure a bike and at the same time provide some greenery and flowers, 28,000 PlantLocks filled with borage would be required for each additional hive. In the city of Exeter the roof of the Princesshay shopping centre in May became home to two bee hives, with more to follow later this year. The well-meaning centre manager has also set up three raised beds with bee-friendly plants on the roof, but totalling less than 20m².

In 2012, nationwide honey yields dropped dramatically due to the wet and cold summer and London, which usually fares better than most regions, was hit the worst. In fact, some beekeepers are known to have reluctantly moved their hives out of London due to declining honey crops. At various allotments across the capital, the number of beekeepers is now being restricted as there are considered to be too many hives.

High colony density in the capital and an influx of inexperienced beekeepers also run the risk of spreading certain honey bee diseases, especially American foulbrood (AFB), which is a highly contagious bacterial infection of honey bee larvae. AFB is rare in Britain, but a high density of hives managed by novice beekeepers creates a situation in which it could easily spread if it got started. In addition, honey bees can annoy the neighbours by stinging and swarming. Novice beekeepers may be unlikely to have the experience need to requeen colonies that are defensive with more gentle stock.

The honey bee is just one of many insect species that visit flowers. Having a high density of honey bee hives is not only bad for honey bees, but may also

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affect bumble bees and other species. Research has shown that in bumble bees, workers are likely to be smaller where they co-occur with honey bees, suggesting competition for food sources between these bee species (Goulson and Sparrow, 2009).

Keeping a hive of bees is a significant undertaking. The RSPCA investigates the suitability of a potential new dog or cat owner before allowing a pet to be adopted, with a detailed questionnaire and an interview and home visit. However, anyone can obtain a colony of bees without prior training on how to care for them or even any advice on where to safely site the hive. Bee hives have even been given away in raffles.

Channelling concern

Clearly, there are better ways to help our declining bee populations than encouraging beekeeping to the point of overpopulation in certain areas. One practical alternative is to focus the amazing enthusiasm and concern the public has for bees towards improving habitat and growing more flowers. It would help not only honey bees but all bees and flower-visiting insects. It also means many more people can get involved - to help bees all you need is a garden, or even a window box; plant the right flowers and the bees will fly many miles to find them.

Within the city boundaries of London there is plenty of scope to make green spaces and gardens more flower rich. Within a 5km radius of Holborn Circus there is nearly 6km² (600 ha) of amenity grassland (GiGL, 2010), much of which could be improved for wildlife just by reducing mowing.

The colourful annual and perennial

planting schemes featured at the 2012 Olympic Park have boosted enthusiasm for meadow-style plantings, and TV programmes such as Sarah Raven's *Bees, Butterflies and Blooms* encouraged local

councils and the public to consider switching

from costly bedding plants to more insect-friendly flowers.

The surge of interest in beekeeping may well tail off

naturally, probably to be

replaced by enthusiasm for another topical issue. But in the meantime we should not continue to encourage more hives within urban areas, and especially in London, with scant regard for the flowers that provide bees' food.

It is encouraging that so many people and organisations want to help bees, a popular symbol of nature. But it would be better to channel this into providing flowers and habitat. Beekeeping is also a fascinating activity, and we would not want to discourage people from taking it up. But it should probably not be seen as a way of helping bees, and people should go into it with careful preparation and investment.

To have bees you don't need a bee hive. Just plant bee-friendly flowers such as marjoram, borage and lavender in your garden.

Honey bee queens mate at the beginning of their life with 10-20 males, and store the active sperm in their body for as long as they live

Honey bee queens can lay up to 2,000 eggs per day and several hundred thousand in their lifetime

A figure-of-eight movement known as the 'waggle dance' allows honey bees to share information about the distance, direction and quality of patches of forage with others in the hive



CREATING HABITATS

Commercial businesses, rather than placing bee hives on their rooftops, could invest in community projects with the emphasis on habitat creation schemes.

For instance, residents at Westcott Park Community Garden in West London, left, have spent £4,000 on plants to ensure their bee hive has year round forage.

There are other promising examples of promoting bee forage. The London Mayor's Office supports the Pocket Parks Programme, which aims to deliver 100 new

or enhanced 'small areas of inviting public space' across the city by March 2015.

The Parks for People programme, initiated by the Heritage Lottery Fund, has invested £10m in improving London's parks and green spaces. Burgess Park in Southwark has acquired new large scale prairie-style planting schemes.

Friends of the Earth is offering a free pack of wildflower seeds with each donation to their Bee Cause campaign. See www.foe.co.uk for details.