Honey bee on wild marjoram

All photos by Francis Ratnieks

DOWNLAND WILD FLOWERS

Honey Bees Return in Summer 2014

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As most British beekeepers know, and many experienced directly, large numbers of honey bee colonies died in the winter of 2012–2013. It was not the winter that killed them but the previous summer, which was one of the worst ever.

The record amounts of rain would have severely reduced nectar collection. As a result, many colonies managed by beekeepers, and also wild colonies, would have gone into winter with insufficient honey stores to take them through to the spring when new sources of nectar were available. In fact, many colonies probably died of starvation in the summer itself. To make matters worse, the spring of 2013 was late owing to cold weather. Honey bees face multiple challenges, but nothing will kill a colony more surely than starvation.

Winter Losses

The British Beekeepers' Association (BBKA) reported 34% colony losses over the winter of 2012–2013, far higher than the 16% in 2011–2012. Since then we have had two good summers.

After a late spring, the summer of 2013 was good. Here in Sussex, the spring of 2014 was a month earlier than in 2013 and was followed by a good summer. Although the August weather was not very good, September has been very good here. The BBKA reported only 10% colony losses in the winter of 2013–2014 and we will hopefully have low colony losses in winter 2014–2015.

Insect populations can fluctuate from year to year. For butterflies, these changes have been monitored for four decades. Volunteers walk designated paths (transects) in defined locations up and down the country in good weather

every week during the active season and count the butterflies they see. A similar scheme has been started this year for bumblebees and volunteers are also recording honey bees.

Swarms

One indication of a probable rebound in the number of honey bee colonies in 2014 was the large number of reports in the British media about swarms. When a colony swarms it means that the number of colonies is increasing, as one colony has now become two or more, given that a swarming colony makes one prime swarm, may also make one or more after swarms or casts, and the existing colony also remains. Swarms are ideal fodder for media stories, especially when they land in unusual places such as on a parked car or shop doorway. In 2014 there was even one story about a school that was closed when a swarm landed in the grounds. Common sense, it seems, is no longer as common as it once was!

Over the years I have received many comments from people along the lines of 'I don't see any bees in my garden'. I don't normally take much notice. In my own garden I may have a lot of honey bees one week and then a week or two later very few, even on the same flowers. When I don't see honey bees, I assume they have found better forage elsewhere, given that they may forage as far as 12–14 km from their hive and routinely fly several kilometres. In addition, many garden flowers are not very attractive to bees.

However, this year I received a comment that was a bit different. It was in an e-mail from a woman in Guildford who had previously asked me to speak to the Merrow Horticultural Society about bees and flowers. I was able to tell her group about some of the research we are doing at the Laboratory of Apiculture and Social Insects (LASI), as part of the Sussex Plan for Honey Bee Health and Well Being, to understand better how to measure the attractiveness of garden flowers to bees and other insects, and the results we have obtained.

She told me that in the summer of 2014 she had a lot of honey bees on marjoram flowers in her garden whereas in 2013 there were almost none.

Black knapweed at Saltdean Oval

Marjoram

Marjoram is one of the flower varieties we have studied and it is one of the most attractive to insects. One of the good things about it is that it attracts a huge range of insects including honey bees, bumblebees, other bees, butterflies and moths, hoverflies and other flies. In fact, there is not much it does not attract and it is also attractive to humans, easy to grow and has quite a long blooming period. So it seemed that in 2014 the honey bees were back, at least in her garden. But what about other places?

Albury Downs

In 2013, I had been doing some research on flower-visiting insects and, as luck would have it, had collected data on insects visiting wild marjoram flowers growing on the North Downs near Guildford.

My study site was the Albury Downs, near Newlands Corner, where there is a large area of downland meadow rich in wild flowers, with the most abundant in bloom in late summer being wild marjoram, *Origanum vulgare*.

On a sunny summer day this area can be alive with flower-visiting insects. It is one of the few places I know where you can see hundreds of butterflies, with the most numerous in August being the Chalk Hill Blue. Over the years I have walked on the Albury Downs many dozens of times and remember seeing many honey bees on the wild marjoram flowers. That is, until 2013. In the summer of 2013 there were almost no honey bees on the marjoram.

A patch of wild marjoram at Albury Downs

Busy Bees

The aim of the research on the Albury Downs was not specifically to count insects, but to study the behaviour of flower-visiting insects in order to determine how busy bees were, in terms of the numbers of flowers visited per minute. The project, which also studied insects on other flower species and at other locations, was successful and LASI researchers Dr Margaret Couvillon, Dr Karin Alton, Chandra Walter and myself were able to show that honey bees and bumblebees were several times 'busier' than other insects. But on the marjoram on the North Downs it was almost impossible to find any honey bees to study! In 20 hours of field observations, I saw fewer than 20.

Insect Census

I also made censuses of insects. Three times I counted 100 insects foraging on marjoram flowers and saw zero honey bees.

In August and the first week of September 2014, I went back to the same location and again counted 100 insects on marjoram five times. There were now quite a few honey bees, averaging 10.8% with counts of 9, 11, 13, 6 and 15. So it was clear that there had been a dip

in honey bee numbers in the summer of 2013 on the wild marjoram and a rebound in 2014, paralleling what was seen on the garden marjoram a mile or two away.

Saltdean Oval

Closer to the University of Sussex, my students and I have been doing several research projects that involved making many counts of insects on wild flowers. One of these projects took place in a local park, the Saltdean Oval. The Parks Department of the Brighton and Hove City Council had decided to allow the grass in half of the Oval to grow long to encourage wild flowers.

While planning this project, in late summer 2012, I visited the Oval and saw the huge numbers of wild flowers. They had been living there all along and were able to bloom now that frequent mowing had ceased. One of the most common was black or common knapweed, *Centaurea nigra*, and it had many honey bees foraging on it.

The following summer, 2013, LASI PhD student Mihail Garbuzov, summer helper Katie Fensome and I carried out a research project to quantify the numbers of wild flowers and flower visiting insects in the long grass area. We also interviewed park users to find out what the public thought.

It turned out that few park users, only 10% of those we interviewed, were unhappy with the reduction in mowing, as the wild flowers were beautiful and half the park was still short grass. Most people, 97%, felt that it was a good idea to encourage wild flowers, bees and butterflies. But, in contrast to 2012, we saw hardly any honey bees.

We made weekly counts of wild flowers growing in designated strips in the long grass area and the insects on these flowers. Across all the flowers we surveyed in August we counted 1943 insects. Of these just two were honey bees (0.10%). On black knapweed alone we counted 821 insects, of which just one (0.12%) was a honey bee. As at the Albury Downs, honey bees were not common at all in 2013.

In August 2014 and the first week of September, we counted insects on black knapweed at the Saltdean Oval. The figures could not have been more different from 2013. Mihail and I made four trips to the long grass area, each time counting 100 insects on black knapweed. Honey bees were now the most common insect at 75.0% of those seen, with counts of 72, 83, 78 and 67. Similar to the wild marjoram on the North Downs, it appears that there had been a dip in honey bee numbers in the summer of 2013 but that the numbers had increased in 2014.

A honey bee on black knapweed

Castle Hill

The third location we have information for is an area of downland approximately 2–3 km to the south east of LASI, which is on the University of Sussex campus, at a place called Castle Hill. This area is downland and is mostly used for grazing. It includes a National Nature Reserve. Our research decoding waggle dances made by bees in observation hives at LASI had shown that the Castle Hill area was a hotspot for honey bee foraging in the summers of 2009, 2010 and 2011.

Part of the Saltdean Oval showing long and short grass

A ground survey of wild flowers in 2012, made by LASI PhD student Nick Balfour and undergraduate summer helper Katie Fensome, showed that honey bees were abundant. In August 2012 they made up 65.6% of the 218 insects we surveyed on black knapweed flowers, which is also abundant at Castle Hill. However, in August 2013, when Nick was assisted by undergraduate

Adonis Blue butterfly on black knapweed at Castle Hill

summer helper Liz Samuelson, honey bees made up only 0.9% of 106 insects surveyed on black knapweed. In August 2014, Nick and I made two trips to the area and counted 269 insects on black knapweed. Honey bees now accounted for 47.6%.

Increase in 2014

Overall, our data show that foraging honey bees declined in all three locations in the summer of 2013 compared with the previous year or years, but had increased in 2014. Does this mean that honey bee populations had decreased in 2013 and increased in 2014? We cannot say for sure but this is a very likely explanation.

The challenge is that honey bees are so mobile and, as noted above, they routinely forage several kilometres from their hive and they can fly as far as 12–14 km. As a result, a reduction in honey bee numbers in one particular location or on a certain flower species does not necessarily mean that there are fewer honey bees in total. It is possible that in 2013 there were fewer insects of all types competing for nectar and, as a result, honey bees did not have to fly so far from their hives to locate profitable patches of flowers.

There were no hives at the three study locations, so the honey bees we saw must have flown in from managed hives and wild colonies. We have some evidence for this as, in 2013, the dances made by honey bees in observation hives at LASI showed that honey bees were not foraging at such great distances in the summer of 2013 as in previous summers and were visiting Castle Hill less often.

The fact that honey bees can forage so far from their hives means that they are probably more challenging to survey on flowers than butterflies if the aim is to determine overall abundance, rather than abundance at a particular location. For example, if on a sunny day in August, you go to an area of chalk downland in southern England that normally has large numbers of Chalk Hill Blue butterflies, such as Castle Hill or the Albury Downs, and see few, then this means that there really are few Chalk Hill Blues as this butterfly species is not found in other habitats. It pretty much stays put. But if you see few honey bees, it may mean that they are simply foraging elsewhere.

We saw huge differences in the proportion of honey bees on knapweed and marjoram between 2013 and 2014 at our three sites. At the Saltdean Oval, for example, the proportion went up from 0.12% to 77.7%. But we certainly do not think that total honey bee numbers had increased 650 times. For one thing that would be impossible, as honey bee numbers can probably only increase by a few times in a good year via colony growth and colony division, whether naturally by swarming or through beekeeper management.

Good News

Beekeepers have probably become used to hearing bad news about honey bees. so it is good to report something encouraging, namely that honey bee numbers have probably increased from 2013 to 2014.

It is normal for insect populations to fluctuate and for the weather to have an effect. Honey bees are affected by the weather as their foraging needs warm and, ideally, sunny weather. How many times as beekeepers do we get frustrated by the British weather! Also, foraging for honey bees is not just a sideline activity. Every piece of food used by a honey bee colony, and indeed by other bees as well, is collected by foragers and brought back to the hive or nest.

It is not the same for most other insects. Adult butterflies need to have good weather to find a mate, lay their eggs and feed on nectar. But a caterpillar does not need a sunny day to chew on a leaf.

For honey bees, a bad summer followed by greater winter loss of colonies is disappointing but is not a disaster. Of much greater importance than the effects of weather, which may be bad one year and good the next, are long-term changes in the environment that are bad for bees. Foremost among these is probably the intensification of the area of agricultural land, covering 80% of Britain, which has led to there being fewer flowers.

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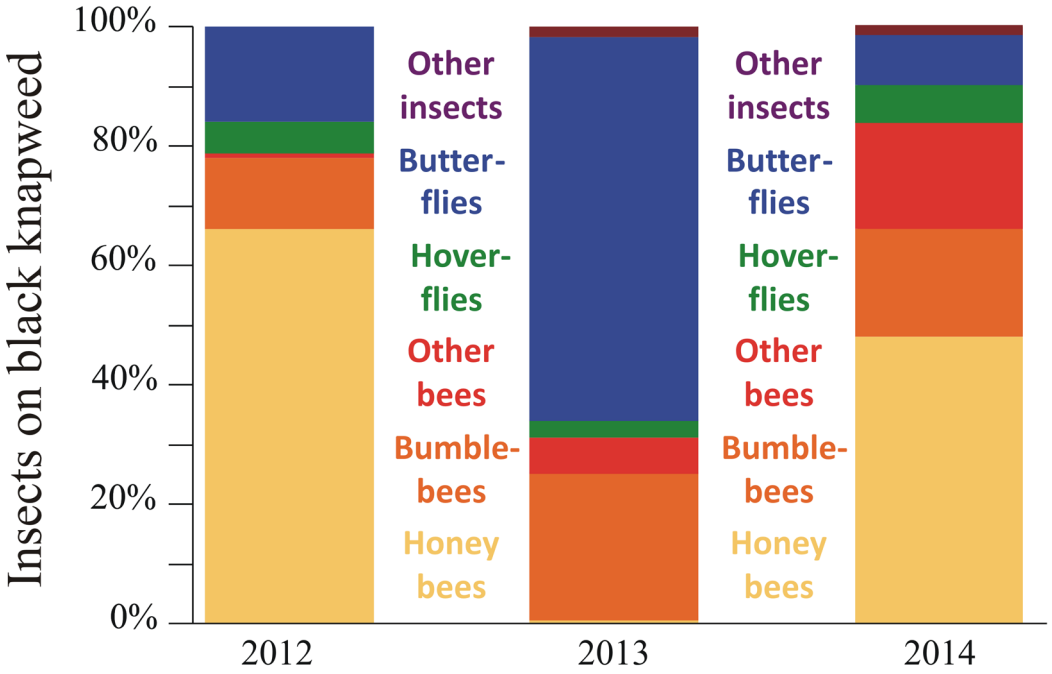
Proportions of honey bees and other insects seen on black knapweed flowers at Castle Hill in the South Downs near Brighton in August 2012, 2013 and 2014. Honey bees were common in 2012, almost absent in 2013 and common again in 2014



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